structures to this end, and their absence in a very marked desert type of plant is not to be overlooked. That the absorption of water by the stem is of no very great importance, if any, in the economy of the ocotillo, may perhaps well be maintained ; while on the other hand we might argue that in regions where the rain is very scarce the very rapid production of foliage would be of so great importance that even the little water absorbed would be equally so. At any rate, the question here barely touched upon is one of a host of similar ones which need elucidation by constant study under just such special conditions as are to be found in the desert.

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AN OLD SWAMP-BOTTOM

By Edward W. Berry

We all make our pilgrimage to the swamp : the lover of flowers for the pink lady's-slipper, giant rhododendron, fragrant pogonia and Indian tea-kettle (*Sarracenia*) ; the collector for these and for coptis, the sun-dew, and the ferns and sedges that haunt the inaccessible tangles of verdure which no swamp ever lacks. There are swamps and swamps, but all are of unfailing interest, whether the pilgrim be botanist, entomologist, or merely a seeker for cranberries or blueberries. They have equally their vernal and autumnal coloration. In the spring, the violet and marsh-marigold ; in the fall, the closed gentian and bidens.

No swamp is of more interest than a fossil swamp, and it is my purpose to take you on a little journey to one such — not to one of those gigantic examples of buried marshes where in the far-oft Carboniferous age was laid down the world's supply of coal, but to the remains of one of those smaller swamps that flourished during the Cretaceous and was like the many swamps that dot the country at the present time, where the mosquito and hyla flourish and the magnolia blooms.

Going back a few million years, three to five is a reasonable estimate, we come upon a time when deposition was active along

our eastern coast; a time when the clays and sands of the Raritan formation were being laid down and a long-continued series of fresh or lacustrine deposits had culminated by a slow sinking of the land, which presently substituted marine conditions. The series of beds comprising the Cliffwood clays and Magothy sands represents the results of this transition period. In one locality clays were forming while close by sands were being deposited.

All through these beds we have abundant evidence that the adjoining land supported a luxuriant vegetation, and that this land was not far removed from the area of sedimentation; possibly we have to do with a series of islands or inlets, which would well explain the varying character of the deposits and the contained plant remains. This evidence is furnished by the abundance of sulphates and carbonates of iron, the dark color of the clay due to carbonaceous matter, the layers of lignite intercalated with the sand beds, and to thicker layers of lignite which are everywhere present. Some of these lignite beds have all the appearance of having been old swamp-bottoms.

In mining the overlying and underlying clays, immense logs of lignite are uncovered, lying as if overwhelmed by a sudden influx of sediment. I have seen logs of this sort three or four feet in diameter and what was left of them, ten feet or more in length, and if the statements one hears about the pits are to be relied upon, much larger remains are often uncovered.

Such a lignite bed in the pits of the Cliffwood Brick Company has interested me exceedingly. It is situated on Whale Creek about a mile southwest from Raritan Bay, in Monmouth County, New Jersey. The lignite consists of matted vegetation but slightly triturated, showing a mixed mass of partially decayed leaves, bits of sticks and small stems, scales of cones and various fruits and seeds, exactly such things as you would find at the bottom of some woodland pool at the present time. One never tires of the fascination of breaking open these lignite masses, exposing the faint impression, perhaps of a large leaf, or the remains of what was a button-ball in the far-off days, or the thousand and one evanescent promises of what was once definite living matter.

Exposure after such a long entombment soon reduces these lignite masses to fragments. A satisfactory way to study their flora, however, is to bring away large pieces of the lignite and macerate them in water at leisure moments, when they may be easily separated into their component parts and any remains of definite shape can then be more readily seen.

Distributed through the lignite beds are little globules and tear-shaped masses of amber; one hears of large masses being found occasionally, but the largest piece that I have taken out is

FIG. 1. Some of the fruits, seeds, twigs and cone scales washed out of the lignite.

about the size of a lima bean. This amber is the fossil resin of some of the trees of the period, the weight of the evidence pointing to the *Sequoia*, as little leafy twigs of two or three species are found all through the lignite, while cones occur elsewhere in the neighboring clays.

A clay pit is a most desolate looking place all the year round. Under a scorching July sun, with the thermometer standing at over 100° and no shade, one has a perfect imitation of an oven, and the imagination almost fails to picture the verdure of this identical spot in the ancient days. Here flourished tall sequoias and plane-trees, close by grew ancient spruces and cycads and semi-tropical ferns. In the spring, the magnolia and sheep-berry bloomed. In the fall, the figs ripened, and the autumnal tints of the oak and maple vied with the vernal coloration.

Besides the larger pieces of stems and fragments of leaves as well as an abundance of needles of *Sequoia* and *Cunninghamites*,

I have found the following: Twigs of *Juniperus hypnoides* Heer and *Sequoia Reichenbachi* (Gein.) Heer; aments of probably a *Sequoia;* eight or ten varieties of seeds; several varieties of fruits, including *Myrica* and *Platanus;* leaves of *Brachyphyllum;* five or six varieties of cone scales, including *Dammara* and *Picea;* and a miscellaneous assortment of undeterminable remains.

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MESADENIA LANCEOLATA AND ITS ALLIES

BY ROLAND M. HARPER

In the genus *Mesadenia* Raf. (*Cacalia* L. in part) there is a small group of species growing in moist places in the coastal plain of the southeastern United States and flowering in late summer, characterized by terete stems, leaves with parallel or subpinnate primary veins, and involucral bracts not keeled. These plants are distinguished from each other by comparatively slight morphological characters, but differ more in range and habitat.

The first published species of this group is *M. lanceolata*, described by Nuttall in 1818 from specimens collected in Georgia and Florida (presumably in the maritime counties) by Dr. Baldwin. Its leaf-blades are glaucous, especially beneath, and lanceolate to oblanceolate in outline.

In 1822 Elliott described a plant collected by himself on his trip to the Alabama territory, identifying it with *Cacalia ovata* Walt. According to Elliott's description, and specimens which have since been collected in the same general region, this plant differs from Nuttall's *Cacalia lanceolata* chiefly in having leaf-blades nearly as broad as long; but its range and habitat are so different that there is little danger of confusing the two species in the field.

But the identity of Elliott's *Cacalia ovata* with Walter's is by no means certain, since the former is not now known east of the Ocmulgee River, while the latter presumably came from South Carolina. There are also some serious discrepancies between Elliott's description and that of Walter, as was noted by Torrey