

which is common from south of Mer Rouge to New Orleans. Here I saw also the common Papaw, which I had not observed further south. Leaving Mer Rouge, I went to Varner, Arkansas, where I spent two days in examining the country near the railway station. Here I observed the French Mulberry in abundance, and also the White Ash. The second day I went some distance into the lowlands, across Cypress Creek, and here I found *Fraxinus profunda* in great quantities, besides plenty of Green and White Ashes. I examined several hundred trees of *Fraxinus profunda*, but could not find any fruit, although I secured good leaf specimens, as well as those of *Leitneria*, which is also abundant here. My guide told me that the people in the neighborhood called *Fraxinus profunda* Pumpkin Ash on account of its being swell-butted, a character which I had already noted in the trees in Missouri. This Ash grows here to a height of one hundred feet, with a trunk eighteen inches in diameter, and is larger and better developed and more abundant than I have seen it elsewhere. The *Leitneria* was also larger than at Apalachicola, being here about twelve feet in height, with stems nearly four inches in diameter. The Arkansas River is only six miles distant from this point, and although I examined the country carefully the next day I did not see either a Pumpkin Ash or *Leitneria* on its banks.

Leaving Pine Bluff, I went next to Marked Tree, Arkansas, where I fully expected to find both *Fraxinus profunda* and *Leitneria*, as this place is at the junction of the St. Francis and Little Rivers, on which further up in Missouri I had collected the two trees. I was disappointed however, in not finding either of them. Leaving Marked Tree, I went to Papaw Junction, in New Madrid County, Missouri, where I found the *Fraxinus profunda* in abundance, and where it is almost the only Ash. Here the trees were in splendid fruit. At this point the Green Ash appears to be rare, and, on account of the exceedingly dry season and the draining of the overflow of Little River by a new canal, the fruits of the Pumpkin Ash were remarkably small here, still showing, however, the characteristic form which first attracted my attention.

I saw no *Leitneria* at Papaw this year, although when I was there two seasons ago I was told that it grew in the neighboring swamp. This is probably true, as the conditions for it are exactly right. The Pumpkin Ash here is a rather medium-sized tree, growing to a height of about fifty feet, with a trunk a foot in diameter. I am of the opinion that the regions of the greatest abundance and largest development of the Ash and the *Leitneria* are somewhere in the vicinity of Big Lake, that is, in south-eastern Missouri and north-eastern Arkansas.

Courtney, Mo.

B. F. Bush.

The Forest.

The Shasta Fir (*Abies Shastensis*).

AMONG the conifers of the Pacific coast, two Firs, *Abies nobilis* and *Abies magnifica*, have long been a hard knot for botanists. *Abies nobilis* was described in 1833, *Abies magnifica* in 1863, and after various bibliographical vicissitudes, during which the real distinctness of the two was seriously questioned by the highest botanical authorities both in the United States and Great Britain, the essential distinctive character of the species was considered by Dr. Engelmann in 1878* to be the exserted bracts on the cones of *A. nobilis*, a tree of the Cascade Mountains of Oregon, and the included bracts of *A. magnifica*, a tree of the Sierra Nevada of California, a position he still maintained in 1880.† Two years later, however, after a trip through Oregon and California with Professor C. S. Sargent, he expressed the opinion that the real differential mark of the two trees was the grooved leaf of *A. nobilis* and the two-keeled leaf of *A. magnifica*. ‡ Now, on Mount Shasta, which is inter-

mediate in geographical position between the Cascades and the Sierra Nevada, occur large forests of a Fir with two-keeled leaves and exserted bracts. In the light of his earlier opinion Dr. Engelmann considered this tree a form of *A. nobilis*, but afterward, in the light of his later opinion, a form of *A. magnifica*.

In 1890 Mr. J. G. Lemmon took the matter up, following Dr. Engelmann's later view that the grooved leaf constituted the real character of *A. nobilis*, and ventured to describe the Mount Shasta tree as a variety, *Shastensis*, of *Abies magnifica*; and in May of the present year he published it as a distinct species, *Abies Shastensis*.

During the past summer the writer, in company with Mr. Elmer I. Applegate, of Klamath Falls, Oregon, had ample opportunity, on a journey from end to end of the Cascade Mountains of Oregon, to examine both *A. nobilis* and *A. Shastensis*. As no botanist has made this trip before, many new facts regarding the geographical distribution of plants were observed, and among other interesting things, the most of which must be deferred for later publication, the rather startling discovery was made that the bracted Fir abundant in the Crater Lake region and for nearly a hundred miles toward the north along the Cascades, is not *Abies nobilis*, as has heretofore been supposed, but is in reality *Abies Shastensis*.

We entered the Cascade Mountains from the east at a point about fifteen miles north of the Oregon-California boundary, and turning northward from Buck Lake toward Lake of the Woods, we came upon the Shasta Fir near the summit of the divide between these two lakes at an elevation of a little more than 5,000 feet. On the following day, traveling south-westward from the Lake of the Woods about two miles on the Dead Indian Road we found the tree again, on the summit of a divide of about the same altitude as the other, and probably continuous with it. These two localities, about twelve miles south-east of Mount Pitt, are situated near the point where the great Cascade Range breaks down, being separated from Mount Shasta, sixty miles to the south, by a broad gap through which the Klamath River flows oceanward from the elevated plains of the interior.

From these first localities we observed the tree northward along the Cascades at points of suitable elevation as far as the mountain immediately south of Davis Lake, one of the reservoir sources of the Deschutes River, about latitude forty-three degrees thirty-five minutes. The tree has been reported by Mr. Lemmon as occurring also westward from the Cascade-Shasta gap in various smaller ranges toward the sea, including Mount Eddy, the Trinity Mountains, Scott Mountains and the Siskiyou Mountains, all except the last lying wholly south of the Oregon-California line.

The individual localities at which we saw the tree in addition to the first two already cited, are in detail as follows: Springly about the base of Mount Pitt, in the vicinity of Four-mile Lake, and for three or four miles down the stream that forms its outlet; abundant along the upper part of Anna Creek Cañon to Crater Lake and down the Rogue River road on the western slope of the mountains to Whiskey

first, apparently, to bring this leaf distinction prominently before botanists, especially as a key to the difference between true *nobilis* and the Mount Shasta tree, that this leaf character had been advanced as early as 1875 (*Gardeners' Chronicle*, page 752) by Mr. Syme, the London nurseryman, as a means of distinguishing *nobilis* from *magnifica*. In the note, written by Andrew Murray, in which this character is announced there is an evident hesitation to assert its constancy. The note reads, . . . "There are a great many plants in this country (Great Britain) which have always been considered *Picea nobilis* (now *Abies nobilis*), which have been bought as *P. nobilis*, which have been raised from seed sent home to Great Britain as *P. nobilis* which yet have tetragonal leaves. I anticipate Mr. Syme's answer to this objection, that *P. magnifica* has been confounded with *P. nobilis* in its native country (the north-west coast of America), and that these plants with subtetragonal leaves are really *P. magnifica* raised from seed sent home as *P. nobilis* by mistake." This suggested solution of the difficulty is undoubtedly correct in the main, but the trees cultivated in Great Britain under the incorrect name *Abies nobilis*, having tetragonal or two-keeled leaves, may be not *magnifica* alone, but some of them *Shastensis*. The original importation of seeds by David Douglas in 1830, was, of course, true *nobilis*. John Jeffrey's importation, in 1851-53, was a failure, as none of his seeds grew. The seeds sent by William Murray and A. F. Beardsley a few years later reached Great Britain in good condition and were successfully grown, but none of these could have been *A. nobilis*, for that tree does not grow in the region in which they got their seeds. All the trees grown from this importation must be either *magnifica* or *Shastensis*.

* Engelmann, *Trans. St. Louis Acad.*, iii., 602 (1878).

† Engelmann in Brewer and Watson, *Bot. Cal.*, ii., 119 (1880).

‡ Engelmann, *Bot. Gazette*, vii., 4 (1882). I find that while Dr. Engelmann was the

Creek; abundant on Huckleberry Mountain; sparingly on a mountain spur between Crater Lake and Diamond Lake; abundant on the slopes of Mount Thielson and Old Bailey; occasionally along the trail from Diamond Lake northward into the headwaters of the Umpqua; abundant on the south slope of the Calapooia Mountains near their junction with the Cascades, and sparingly on their north slope; occasionally on the lower slopes of Diamond Peak, between Summit and Crescent lakes, and on the lower divide between the latter and Odell Lake; and lastly, on the mountain east of Odell Lake and south of Davis Lake. At this point we turned eastward away from the main mountain chain, but the tree doubtless occurs at least a few miles farther north.

In the Cascade Mountains the Shasta Fir belt has an elevation of from 5,000 to 7,000 feet and the tree is usually associated with *Tsuga Pattonii*, growing chiefly in the lower part of the *Pattonii* belt, but it often also crosses the *Pinus Murrayana* belt and sometimes overlaps on its lower side the uppermost edge of the *Pinus ponderosa* belt.

In its best development, as, for example, on Huckleberry Mountain and near the summit of the Fort Klamath-Rogue River Road, it is a superb tall tree of magnificent proportions, easily the queen of the forest. Its common height is from 150 to 200 feet and its trunk diameter three or four feet. The trunks of two large, but by no means extraordinary trees near the lower camping-ground at Crater Lake measured fifteen feet seven inches and fifteen feet eight inches in circumference about four feet from the ground. The crown of a mature tree is narrowly oblong in outline, usually equaling from one-half to two-thirds the total height of the tree, supported on a straight, only slightly tapering, branchless trunk, from forty to seventy-five feet in height. The bark is of a reddish gray color on the outside, is regularly and rather deeply fissured, and within has the color of Hemlock-bark in alternating layers of dark red and reddish brown. The branchlets are extremely symmetrical in their ultimate ramifications, so that one standing beneath a tree can always distinguish it by this feature alone from *A. lasiocarpa*, *concolor*, *grandis* or *amabilis*. The large cones, described in detail below, sit erect upon the branches, and are continually suggestive of little owls.

In general appearance trees of *Abies nobilis* and *Abies Shastensis* are to me indistinguishable, though a more intimate acquaintance with them might discover some gross differences. The cones of the two trees, though very similar, can always be distinguished by one familiar with both. The cone of *A. nobilis* is the slenderer of the two, measurements of the specimens of five collectors giving an average length of 133 millimeters, and an average thickness of fifty-seven millimeters, giving a ratio of 2.33—in short, a typical, well-developed cone is noticeably more than twice as long as broad. In *A. Shastensis*, cones from six different places give an average of 131 millimeters in length by seventy millimeters in breadth, a ratio of 1.87, indicating that they are usually a little less than twice as long as broad. The cone scales of *A. Shastensis* are usually from thirty to thirty-five millimeters broad and the seeds about thirteen millimeters long, these measurements in those of *A. nobilis* being about twenty to twenty-five millimeters and ten millimeters, respectively. In external appearance the cones differ also in another way. The exposed portion of the bract is usually longer and more inclined to be obcordate in *A. nobilis*, and is abruptly reflexed and appressed to the surface of the cone, thus usually completely covering the scales. The awns of the bracts, above the marginal serrations, are commonly five to seven millimeters long. In *A. Shastensis* the awn is two to three millimeters long, and the shorter exposed part of the bract, seldom retuse at the apex, is rather loosely recurved, so that a considerable portion of the surface of the cone is commonly visible.

Probably the best diagnostic character of the tree, however, is in the leaves. Unfortunately, good series of the lower leaves of the two species are not accessible, but those of the upper branches, broken dead twigs from which can

almost always be found underneath the trees, have been examined in quantity. In both species these leaves are thick, stiff, upwardly curved, keeled on the lower surface, and often, especially on cone-bearing branches, sharp-pointed. On the upper surface of the leaves of *A. nobilis* there is, however, a sharply defined, narrow groove, while in those of *A. Shastensis* the upper surface is keeled like the lower, the cross-section therefore being rhomboidal like that of a *Picea*. The groove in the leaf of *A. nobilis* does not always reach all the way to the apex, and sometimes in the leaves situated along the middle of the upper surface of the twig, and therefore without lateral curvature, it is entirely wanting, but in the outside leaves of the twig it is invariably present.

Abies nobilis is primarily a tree of the Cascade Mountains, the locality best and longest known for it being Mount Hood. It has been known for several years to extend as far north along the Cascades as Mount Ranier, and now it is reported by Mr. A. J. Johnson, of Astoria, Oregon, as occurring on Mount Baker in extreme northern Washington, close to the British boundary. Southward along the Cascades in Oregon we found it as far as Browder Ridge, on the northernmost headwaters of the Mackenzie, an affluent of the Willamette. This is about fifty miles north of the northernmost point at which we found *Abies Shastensis*. Our route between these two points lay wholly on the eastern slope of the Cascades, but examination of the western slope in this region will undoubtedly show that the range of the two species approaches much more closely, if they do not, indeed, actually meet. Mr. Johnson has also reported it from the coast mountains of south-western Washington.* The tree grows here, I am informed by Mr. B. E. Fernow, at an elevation of usually 1,500 to 3,000 feet, sometimes extending as low as 500 feet, as, for example, on the north slope of the divide between Grays River and Skamokawa River, about four miles from the sea.

By a strange misapplication of names, the history of which I do not know, the name Larch is applied by the lumbermen of Washington and Oregon to both *Abies nobilis* and *Abies Shastensis*, but I could find no evidence that the two are distinguished by them. Both are considered valuable for lumber, though from the high elevation at which they grow, and their consequent inaccessibility for the most part, neither has as yet come into the lumber market in large amount.

Though it is several years since I had the opportunity of observing *Abies magnifica* in the high Sierra Nevada of California, I recall it as a tree of the same magnificent proportions as *A. nobilis* and *A. Shastensis*, with the same deep red color of the bark within and the same geometrical regularity of the twigs. From an examination of abundant herbarium material I coincide with the view expressed by Dr. Engelmann and implied by Mr. Lemmon that it is with this tree rather than with *A. nobilis* that *A. Shastensis* is the more intimately related. Indeed, in size and relative dimensions of the cone, in the size of the scales and seeds, and in the character of the leaves the two seem to be indistinguishable, the only tangible character being the conspicuous one of protrusion or inclusion of the bracts on the cone-scales. Intergradation is not to be expected between *A. Shastensis* and *A. nobilis*, though it may hereafter be found between *A. Shastensis* and *A. magnifica*.

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Recent Publications.

Insect-Life: An Introduction to Nature-Study and a Guide for Teachers, Students and Others Interested in Out-of-door Life. By John Henry Comstock. New York: D. Appleton & Co. 1897.

In this admirable text-book the needs of the beginner in

* *Abies nobilis* was found in August, 1896, in the valley of the Solduc River on the northern slope of the Olympic Mountains in Washington, by Professor Sargent, and was also noticed by Dr. E. Hart Merriam during the past summer in the same locality.