III

OCTOBER, 1860

(ÆT. 43)

Oct. 1. Remarkable frost and ice this morning; quite a wintry prospect. The leaves of trees stiff and white at 7 A. M. I hear it was 21° this morning early. I do not remember such cold at this season. This is about the full of the moon (it fulled at 9 P. M. the 29th) in clear, bright moonlight nights. We have fine and bright but cold days after it. One man tells me that he regretted that he had not taken his mittens with him when he went to his morning's work, — mowing in a meadow, — and when he went to a spring at 11 A. M., found the dipper with two inches of ice in it frozen solid.

P. M. — Rain again.

Button-bush balls were fairly reddened yesterday, and the *Andropogon scoparius* looked silvery in sun. Gossamer was pretty thick on the meadows, and noticed the round green leafy buds of the utricularia in the clear, cold, smooth water. Water was prepared for ice, and C. saw the first *Vanessa Antiopa* since spring.

Oct. 3. See *Vanessa Antiopa*.

The hard frost of September 28th, 29th, and 30th, and especially of October 1st, has suddenly killed, crisped, and caused to fall a great many leaves of ash, hickory, etc., etc. These (and the locusts, *generally*) look shrivelled and hoary, and of course they will not ripen or be bright. They are killed and withered green, — all the more tender leaves. Has killed all the burdock flowers and no doubt many others.

Sam Barrett says that last May he waded across the Assabet River on the old dam in front of his house without going over his india-rubber boots, which are sixteen and a half inches high. I do not believe you could have done better than this a hundred years ago, or before the canal dam was built.

Bay-wings about.

I have seen and heard sparrows in *flocks*, more as if flitting by, within a week, or since the frosts began.

Gathered to-day my apples at the Texas house. I set out the trees, fourteen of them fourteen years ago and five of them several years later, and I now get between ten and eleven barrels of apples from them.

Oct. 5. Rain, more or less, yesterday afternoon and this forenoon.

P. M. — To Walden.

The frosts have this year killed all of Stow's artichokes before one of them had blossomed, but those in Alcott's garden had bloomed probably a fortnight ago. This suggests that this plant could not have grown much further north than this. I see a great many young hickories fifteen feet high killed, turned brown, almost black, and withering in the woods, as I do not remember to have seen them before. Indeed, the woods have a strong decaying scent in consequence. Also much indigo-weed is killed and turned black and broken off, as well as

ferns generally. The butternut is also killed, turned dark-brown, and the leaves mostly fallen, — not turning yellow at all. The maples generally are what Gerard would have called an " over-worn " scarlet color.

About 4 P. M. it is fast clearing up, the clouds withdrawing, with a little dusky scud beyond their western edges against the blue. We came out on the east shore of Walden. The water is tolerably smooth. The smooth parts are dark and dimpled by many rising fishes. Where it is rippled it is light-colored, and the surface thus presents three or four alternate light and dark bars. I see a fish hawk, skimming low over it, suddenly dive or stoop for one of those little fishes that rise to the surface so abundantly at this season. He then sits on a bare limb over the water, ready to swoop down again on his finny prey, presenting, as he sits erect, a long white breast and belly and a white head. No doubt he well knows the habits of these little fishes which dimple the surface of Walden at this season, and I doubt if there is any better fishing-ground for him to resort to. He can easily find a perch overlooking the lake and discern his prey in the clear water.

The sporobolus grass in the meadows is now full of rain (as erst of dew) and would wet you through if you walked there.

Apparently all the celtis and horse-chestnut leaves are killed, turned dark-brown and withering, before changing or ripening, so severe has been the frost, and, looking from hills over huckleberry-fields, the sweet-fern patches are turned a dark brown, almost black (mulberry black) amid the crimson blueberry and huckleberry, so that the surface is parded black and scarlet from the same cause.

Oct. 6. P. M. — Over hill to Woodis Park.

I see not one hemlock cone of this year at the Hemlocks, but very many of last year holding on. Apparently they bore so abundantly last year that they do not bear at all this year.

I hear that the late cold of September 29 and 30 and October 1 froze all Bull's grapes (papers say some fifty bushels), the thermometer going down to 20°.

As I go over the hill, I see a large flock of crows on the dead white oak and on the ground under the living one. I find the ground strewn with white oak acorns, and many of these have just been broken in two, and their broken shells are strewn about, so that I suppose the crows have been eating them. Some are merely scratched, as if they had been pecked at without being pierced; also there are two of the large swamp white oak acorn-cups joined together dropped under this oak, perhaps by a crow, maybe a quarter of a mile from its tree, and that probably across the river. Probably a crow had transported one or more swamp white oak acorns this distance. They must have been too heavy for a jay.

The crow, methinks, is our only large bird that hovers and circles about in flocks in an irregular and straggling manner, filling the air over your head and sporting in it as if at home here. They often burst up above the woods where they were perching, like the black fragments of a powder-mill just exploded.

One crow lingers on a limb of the dead oak till I am

within a dozen rods. There is strong and blustering northwest wind, and when it launches off to follow its comrades it is blown up and backward still nearer to me, and it is obliged to tack four or five times just like a vessel, a dozen rods or more each way, very deliberately, first to the right, then to the left, before it can get off; for as often as it tries to fly directly forward against the wind, it is blown upward and backward within gunshot, and it only advances directly forward at last by stooping very low within a few feet of the ground where the trees keep off the wind. Yet the wind is not remarkably strong.

Horace Mann tells me that he saw a painted turtle in this town eating a unio, in our river, in the shell, it evidently having just caught and opened it. He has been collecting shells in Ohio recently, and was obliged to wade at least knee-deep into the streams for mussels, the hogs, which run at large there, having got them all in the shallower water.

Oct. 7. P. M. — To Hubbard's Bath and Grove.

Now and for a week the chip-birds in flocks; the withered grass and weeds, etc., alive with them.

Rice says that when a boy, playing with darts with his brother Israel, one of them sent up his dart when a flock of crows was going over. One of the crows followed it down to the earth, picked it up, and flew off with it a quarter of a mile before it dropped it. He has observed that young wood ducks swim faster than the old, which is a fortunate provision, for they can thus retreat and hide in the weeds while their parents fly off. He says

that you must shoot the little dipper as soon as it comes up, — before the water is fairly off its eyes, — else it will dive at the flash.

I see one small but spreading white oak full of acorns just falling and ready to fall. When I strike a limb, great numbers fall to the ground. They are a very dark hazel, looking black amid the still green leaves, — a singular contrast. Some that have fallen have already split and sprouted, an eighth of an inch. This when, on *some* trees, far the greater part have not yet fallen.

Probably the blueberry and huckleberry, amelanchier, and other bushes which spring up immediately when the woods are cut have been already planted and started annually, as the little oaks have. Nature thus keeps a supply of these plants in her nursery (*i. e.* under the larger wood), always ready for casualties, as fires, windfalls, and clearings by man. Birds and foxes, etc., are annually conveying the seed into the woods.

Rice reminds me that when the maples in a blueberry swamp have got up high, the blueberries die, and you have at length a maple wood clear of underwood.

Remarking to old Mr. B—— the other day on the abundance of the apples, "Yes," says he, "and fair as dollars too." That 's the kind of beauty they see in apples.

Looked over Hayden's farm and granary. He now takes pleasure in his field of corn just ready for harvesting, — the rather small ears fully filled out and rounded at the end, setting low and many on one stalk. He loves to estimate the number of bushels he will have; has already calculated the number of hills, — some forty

thousand in this field, — and he shows some one the ear in his granary. Also his rye in barrels and his seed-corn tucked into the mow as he was husking, — the larger and fuller ears picked out, with the husk on. But all this corn will be given to his pigs and other stock. Three great hogs weighing twelve hundredweight lie asleep under his barn already sold. Hears of one man who sold his fat hog for $75.00. He has two high and very spreading apple trees, looking like one, they are so close together, from which he gathered one year twenty-one barrels of sound Hubbardston's nonesuch and five barrels of windfalls, grafted on to it within a few years.

If we have not attended to the subject, we may think that the activity of the animals is not enough to account for the annual planting of such extensive tracts; just as we wonder where all the flies and other insects come from in the spring, because we have not followed them into their winter quarters and counted them there. Yet nature does preserve and multiply the race of flies while we are inattentive and sleeping.

Many people have a foolish way of talking about small things, and apologize for themselves or another having attended to a small thing, having neglected their ordinary business and amused or instructed themselves by attending to a small thing; when, if the truth were known, their ordinary business was the small thing, and almost their whole lives were misspent, but they were such fools as not to know it.

Oct. 8. P. M. — To Damon's wood-lot, part of the burnt district of the spring.

Am surprised to see how green the forest floor and the sprout-land north of Damon's lot are already again, though it was a very severe burn. In the wood-lot the trees are *apparently* killed for twenty feet up, especially the smaller, then six or ten feet of green top, while very vigorous sprouts have shot up from the base below the influence of the fire. This shows that they will die, I think. The top has merely lived for the season while the growth has been in their sprouts around the base. This is the case with oaks, maples, cherry, etc. Also the blueberry (*Vaccinium vacillans*) has sent up very abundant and vigorous shoots all over the wood from the now more open and cleaned ground. These are evidently from stocks which were comparatively puny before. The adjacent oak sprout-land has already sprung up so high that it makes on me about the same impression that it did before, though it [was] from six to ten feet high and was generally killed to the ground. The fresh shoots from the roots are very abundant and three to five feet high, or half as high as before. So vivacious are the roots and so rapidly does Nature recover herself. You see myriads of little shrub oaks and others in the woods which look as if they had just sprung from the seed, but on pulling one up you find it to spring from a long horizontal root which has survived perhaps several burnings or cuttings. Thus the stumps and roots of young oak, chestnut, hickory, maple, and many other trees retain their vitality a very long time and after many accidents, and produce thrifty trees at last.

In the midst of the wood, I noticed in some places, where the brush had been more completely burned and

the ground laid bare, some fire-weed (*Senecio*), golden-rods, and ferns.

Standing by a pigeon-place on the north edge [of] Damon's lot, I saw on the dead top of a white pine four or five rods off — which had been stripped for fifteen feet downward that it might die and afford with its branches a perch for the pigeons about the place, like the more artificial ones that were set up — two woodpeckers that were new to me. They uttered a peculiar sharp *kek kek* on alighting (not so sharp as that of the hairy or downy woodpecker) and appeared to be about the size of the hairy woodpecker, or between that and the golden-winged. I had a good view of them with my glass as long as I desired. With the back to me, they were clear black all above, as well as their feet and bills, and each had a yellow or orange (or possibly orange-scarlet?) front (the anterior part of the head at the base of the upper mandible). A long white line along the side of the head to the neck, with a black one below it. The breast, as near as I could see, was gray specked with white, and the under side of the wing expanded was also gray, with small white spots. The throat white and vent also white or whitish. Is this the arctic three-toed? [1] Probably many trees dying on this large burnt tract will attract many woodpeckers to it.

I find a great many white oak acorns already sprouted, although they are but half fallen, and can easily believe that they sometimes sprout before they fall. It is a good year for them. It is remarkable how soon and unaccountably they decay. Many which I cut open, though they look sound without, are discolored and decaying on one side or throughout within, though there is no worm in them. Perhaps they are very sensitive to moisture. Those which I see to-day are merely hazel and not nearly so black as what I saw yesterday. Trees that stand by themselves without the wood bear the most.

[1] *Not* of Nuttall. [The birds must have been arctic three-toed woodpeckers, though Thoreau misplaces the yellow crown-patch.]

The sugar maple seeds are now browned — the seed end as well as wing — and are ripe. The severe frosts about the first of the month ripened them.

Oct. 9. P. M. — Up Assabet.

See one crow chasing two marsh hawks over E. Hosmer's meadow. Occasionally a hawk dives at the crow, but the crow perseveres in pestering them. Can it *now* have anything to do with the hawk's habit of catching young birds? In like manner smaller birds pursue crows. The crow is at length joined by another.

See several squirrels' nests of leaves formed in the maples lately.

Though the red maples have not their common brilliancy on account of the very severe frost about the end of September, some are very interesting. You cannot judge a tree by seeing it from one side only. As you go round or away from it, it may overcome you with its mass of glowing scarlet or yellow light. You need to stand where the greatest number of leaves will transmit or reflect to you most favorably. The tree which looked comparatively lifeless, cold, and merely parti-colored, seen in a more favorable light as you are floating away

from it, may affect you wonderfully as a warm, glowing drapery. I now see one small red maple which is all a pure yellow within and a bright red scarlet on its outer surface and prominences. It is a remarkably distinct painting of scarlet on a yellow ground. It is an indescribably beautiful contrast of scarlet and yellow. Another is yellow and green where this was scarlet and yellow, and in this case the bright and liquid green, now getting to be rare, is by contrast as charming a color as the scarlet.

I met in the street afterward a young lady who rowed up the river after me, and I could tell exactly where she plucked the maple twig which she held in her hand. It was the one so conspicuous for a quarter of a mile in one reach of the river.

I wonder that the very cows and the dogs in the street do not manifest a recognition of the bright tints about and above them. I saw a terrier dog glance up and down the painted street before he turned in at his master's gate, and I wondered what he thought of those lit trees, — if they did not touch his philosophy or spirits, — but I fear he had only his common doggish thoughts after all. He trotted down the yard as if it were a matter of course after all, or else as if he deserved it all.

Wood ducks are about now, amid the painted leaves.

For two or more nights past we have had remarkable glittering golden sunsets as I came home from the post-office, it being cold and cloudy just above the horizon. There was the most intensely bright golden light in the west end of the street, extending under the elms, and the very dust a quarter of a mile off was like gold-dust. I

wondered how a child could stand quietly in that light, as if it had been a furnace.

This haste to kill a bird or quadruped and make a skeleton of it, which many young men and some old ones exhibit, reminds me of the fable of the man who killed the hen that laid golden eggs, and so got no more gold. It is a perfectly parallel case. Such is the knowledge which you may get from the anatomy as compared with the knowledge you get from the living creature. Every fowl lays golden eggs for him who can find them, or can detect alloy and base metal.

Oct. 10. In August, '55, I levelled for the artificial pond at Sleepy Hollow. They dug gradually for three or four years and completed the pond last year, '59. It is now about a dozen rods long by five or six wide and two or three deep, and is supplied by copious springs in the meadow. There is a long ditch leading into it, in which no water now flows, nor has since winter at least, and a short ditch leading out of it into the brook. It is about sixty rods from the very source of the brook. Well, in this pond thus dug in the midst of a meadow a year or two ago and supplied by springs in the meadow, I find to-day several small patches of the large yellow and the kalmiana lily already established. Thus in the midst of death we are in life. The water is otherwise apparently clear of weeds. The river, where these abound, is about half a mile distant down the little brook near which this pond lies, though there *may* be a few pads in the ditched part of it at half that distance. How, then, did the seed get here? I learned last winter (*vide* December 23, 1859)

that many small pouts and some sizable pickerel had been caught here, though the connection with the brook is a very slight and shallow ditch. I think, therefore, that the lily seeds have been conveyed into this pond from the river immediately, or perchance from the meadow between, either by fishes, reptiles, or birds which fed on them, and that the seeds were not lying dormant in the mud. You have only to dig a pond anywhere in the fields hereabouts, and you will soon have not only water-fowl, reptiles, and fishes in it, but also the usual water-plants, as lilies, etc. You will no sooner have got your pond dug than nature will begin to stock it. I suspect that turtles eat these seeds, for I often see them eating the decayed lily leaves. If there is any water communication, perhaps fishes arrive first, and then the water-plants for their food and shelter.

Horace Mann shows me the skeleton of a blue heron. The neck is remarkably strong, and the bill. The latter is 5 + inches long to the feathers above and $6\frac{1}{2}$ to the gape. A stake-driver which he has, freshly killed, has a bill 3 inches long above and $4\frac{1}{8}$ to the gape and between $\frac{5}{8}$ and $\frac{6}{8}$ deep vertically at the base. This bird weighs a little over two pounds, being quite large and fat. Its nails are longer and less curved than those of the heron. The sharp bill of the heron, like a stout pick, wielded by that long and stout neck, would be a very dangerous weapon to encounter. He has made a skeleton of the fish hawk which was brought to me within a month. I remark the great eye-sockets, and the claws, and perhaps the deep, sharp breast-bone. Including its strong hooked bill it is clawed at both ends, harpy-like.

P. M. — Went to a fire — or smoke — at Mrs. Hoar's. There is a slight blaze and more smoke. Two or three hundred men rush to the house, cut large holes in the roof, throw many hogsheads of water into it, — when a few pails full well directed would suffice, — and then they run off again, leaving your attic three inches deep with water, which is rapidly descending through the ceiling to the basement and spoiling all that can be spoiled, while a torrent is running down the stairways. They were very forward to put out the [fire], but they take no pains to put out the water, which does far more damage. The first was amusement; the last would be mere work and utility. Why is there not a little machine invented to throw the water out of a house?

They are hopelessly cockneys everywhere who learn to swim with a machine. They take neither disease nor health, nay, nor life itself, the natural way. I see dumb-bells in the minister's study, and some of their dumbness gets into his sermons. Some travellers carry them round the world in their carpetbags. Can he be said to travel who requires still this exercise? A party of school-children had a picnic at the Easterbrooks Country the other [day], and they carried bags of beans from their gymnasium to exercise with there. I cannot be interested in these extremely artificial amusements. The traveller is no longer a wayfarer, with his staff and pack and dusty coat. He is not a pilgrim, but he travels in a saloon, and carries dumb-bells to exercise with in the intervals of his journey.

Oct. (10 *and*) 11. P. M. — To Sleepy Hollow and north of M. Pratt's.

There is a remarkably abundant crop of white oak acorns this fall, also a fair crop of red oak acorns; but not of scarlet and black, very few of them. Which is as well for the squirrel. The acorns are now in the very midst of their fall. The white oak acorn is about the prettiest of ours. They are a glossy hazel (while the red and black are more or less downy at first) and of various forms, — some nearly spherical but commonly oblong and pointed, some more *slender* oval or elliptical; and of various shades of brown, — some almost black, but generally a wholesome hazel. Those which have fallen longest, and been exposed to the severe frosts on the ground, are partly bleached there. The white oak acorns are found chiefly on trees growing in the open or on the edge of the wood, and on the most exposed side of these trees. They grow either singly or in twos and threes.

This afternoon (11th) the strong wind which arose at noon has strewn the ground with them. I could gather many bushels in a short time. This year is as good for white oak acorns as for apples and pears. What pleasant picking on the firm, green pasture sod which is browned with this glossy fruit! The worms are already at work in them, — sometimes three or four in one, — and some are already decayed and decaying on the tree without a worm. The fibery [*sic*] inner bark of the nut appears to retain moisture and hasten rot, especially when the fruit has once been swollen by the wet. The best time to gather these nuts is now, when a strong wind has arisen suddenly in the day, before the squirrels have preceded you; and so of chestnuts.

Of red oak acorns, some are short and broad, others

longer. I see some pretty shrub oak acorns longitudinally striped. Chestnuts also are frequently striped, but before they have been exposed to the light, and are completely ripe.

The season is as favorable for pears as for apples. R. W. E.'s garden is strewn with them. They are not so handsome as apples, — are of more earthy and homely colors, — yet they are of a wholesome color enough. Many, inclining to a rough russet or even ferruginous, both to touch (rusty) and eye, look as if they were proof against frost. After all, the few varieties of wild pears here have more color and are handsomer than the many celebrated varieties that are cultivated. The cultivated are commonly of so dull a color that it is hard to distinguish them from the leaves, and if there are but two or three left you do not see them revealing themselves distinctly at a distance amid the leaves, as apples do, but I see that the gatherer has overlooked half a dozen large ones on this small tree, which were concealed by their perfect resemblance to the leaves, — a yellowish green, spotted with darker-green rust or fungi (?). Yet some have a fair cheek, and, generally, in their form they are true pendants, as if shaped expressly to hang from the trees.

They are a more aristocratic fruit. How much more attention they get from the proprietor! The hired man gathers the apples and barrels them. The proprietor plucks the pears at odd hours for a pastime, and his daughter wraps them each in its paper. They are, perchance, put up in the midst of a barrel of Baldwins as if something more precious than these. They are spread

on the floor of the best room. They are a gift to the most distinguished guest. Judges and ex-judges and honorables are connoisseurs of pears, and discourse of them at length between sessions. I hold in my hand a Bonne Louise which is covered with minute brown specks or dots one twelfth to one sixteenth [of an inch] apart, largest and most developed on the sunny side, quite regular and handsome, as if they were the termination or operculum of pores which had burst in the very thin pellicle of the fruit, producing a slight roughness to the touch. Each of these little ruptures, so to call them, is in form a perfect star with five rays; so that, if the apple is higher-colored, reflecting the sun, on the duller surface of this pear the whole firmament with its stars shines forth. They whisper of the happy stars under whose influence they have grown and matured. It is not the case with all of them, but only the more perfect specimens.

Pears, it is truly said, are less poetic than apples. They have neither the beauty nor the fragrance of apples, but their excellence is in their flavor, which speaks to a grosser sense. They are *glouts-morceaux*. Hence, while children dream of apples, ex-judges realize pears. They are named after emperors and kings and queens and dukes and duchesses. I fear I shall have to wait till we get to pears with American names, which a republican can swallow.

Looking through a more powerful glass, those little brown dots are stars with from four to six rays, — commonly five, — where a little wart-like prominence (perhaps the end of a pore or a thread) appears to have

burst through the very thin pellicle and burst it into so many rays.

Oct. 13. P. M. — Up river.

I find no new cones on Monroe's larch by the river, but many old ones (the same was the case with the hemlocks on Assabet), unless those imperfect ones with a twig growing from their extremity were this year's, — but I think they were last year's. Last year both white pine, hemlock, and larches bore abundantly and there were very few white oak acorns. This year, so far as I observe, there are scarcely any white pine cones (were there any?) or hemlock or larch, and a great abundance of white oak acorns in all parts of the town. So far as I have observed, if pines or oaks bear abundantly one year they bear little or nothing the next year. This is a white oak year, not a pine year. It is also an apple and a potato year. I should think that there might be a bushel or two of acorns on and under some single trees. There are but few in the woods. Those spreading trees that stand in open pastures fully exposed to the light and air are the most fertile ones. I rejoice when the white oaks bear an abundant crop. I speak of it to many whom I meet, but I find few to sympathize with me. They seem to care much more for potatoes. The Indians say that many acorns are a sign of a cold winter. It is a cold fall at any rate.

The shore at Clamshell is greened with pontederia seed which has floated up and been left there, with some button-bush seed and some of those slender bulbs of the lysimachia and those round green leaf-buds of the

Utricularia vulgaris. Thus, probably, are all these dispersed. I also see large masses of the last-named weed lodged against the bridges, etc., with the conspicuous greener leaf-buds attached. I find no yellow lily seeds, only a few white lily seed-pods. These are full of seeds the color of apple seeds and but a quarter as big. They sink in water as soon as the slimy matter which invests them is washed off. I see a white lily stem coiled up with many whorls like a wire spring. They are almost only white lily pads that are left now.

There is some of the fresh-water sponge in this the main stream too.

The *F. hyemalis* back, and I think I see and hear the shore larks.

The shrub oaks on J. Hosmer's hillside this side of Hollowell place have already passed the height of their beauty. Is it not early on account of frost?

At Holden Swamp. — Now, as soon as the frost strips the maples, and their leaves strew the swamp floor and conceal the pools, the note of the chickadee sounds cheerfully wintryish.

I see many pine and oak tree tops in the woods that were blown off last spring. They lie many rods from their trunks, so that I have to look a little while to tell where they came from. Moreover, the butt of the piece over which I stand looks so large compared with the broken shaft up there so high that I at first feel sure it did not come from there, — which [?] it did, — and so am puzzled to locate it.

The lentago fruit is quite sweet and reminds me of

dates in their somewhat mealy pulp. It has large flat black seeds, somewhat like watermelon seeds, but not so long.

The scientific differs from the poetic or lively description somewhat as the photographs, which we so weary of viewing, from paintings and sketches, though this comparison is too favorable to science. All science is only a makeshift, a means to an end which is never attained. After all, the truest description, and that by which another living man can most readily recognize a flower, is the unmeasured and eloquent one which the sight of it inspires. No scientific description will supply the want of this, though you should count and measure and analyze every atom that seems to compose it.

Surely poetry and eloquence are a more universal language than that Latin which is confessedly dead. In science, I should say, all description is postponed till we know the whole, but then science itself will be cast aside. But unconsidered expressions of our delight which any natural object draws from us are something complete and final in themselves, since all nature is to be regarded as it concerns man; and who knows how near to absolute truth such unconscious affirmations may come? Which are the truest, the sublime conceptions of Hebrew poets and *seers*, or the guarded statements of modern geologists, which we must modify or unlearn so fast?

As they who were present early at the discovery of gold in California, and observed the sudden fall in its value, have most truly described that state of things, so it is commonly the old naturalists who first received Amer-

ican plants that describe them best. A scientific description is such as you would get if you should send out the scholars of the polytechnic school with all sorts of metres made and patented to take the measures for you of any natural object. In a sense you have got nothing new thus, for every object that we see mechanically is mechanically daguerreotyped on our eyes, but a true description growing out [of] the perception and appreciation of it is itself a new fact, never to be daguerreotyped, indicating the highest quality of the plant, — its relation to man, — of far more importance than any merely medicinal quality that it may possess, or be thought to-day to possess. There is a certainty and permanence about this kind of observation, too, that does not belong to the other, for every flower and weed has its day in the medical pharmacopœia, but the beauty of flowers is perennial in the taste of men.

Truly this is a world of vain delights. We think that men have a substratum of common sense but sometimes are peculiarly frivolous. But consider what a value is seriously and permanently attached to gold and so-called precious stones almost universally. Day and night, summer and winter, sick or well, in war and in peace, men speak of and believe in gold as a great treasure. By a thousand comparisons they prove their devotion to it. If wise men or true philosophers bore any considerable proportion to the whole number of men, gold would be treated with no such distinction. Men seriously and, if possible, religiously believe in and worship gold. They hope to earn golden opinions, to celebrate their golden wedding. They dream of the golden

age. Now it is not its intrinsic beauty or value, but its rarity and arbitrarily attached value, that distinguishes gold. You would think it was the reign of shams.

The one description interests those chiefly who have not seen the thing; the other chiefly interests those who have seen it and are most familiar with it, and brings it home to the reader. We like to read a good description of no thing so well as of that which we already know the best, as our friend, or ourselves even. In proportion as we get and are near to our object, we do without the measured or scientific account, which is like the measure they take, or the description they write, of a man when he leaves his country, and insert in his passport for the use of the detective police of other countries. The men of science merely look at the object with sinister eye, to see if [it] corresponds with the passport, and merely visé or make some trifling additional mark on its passport and let it go; but the real acquaintances and friends which it may have in foreign parts do not ask to see nor think of its passport.

Gerard has not only heard of and seen and raised a plant, but felt and smelled and tasted it, applying all his senses to it. You are not distracted from the thing to the system or arrangement. In the true natural order the order or system is not insisted on. Each is first, and each last. That which presents itself to us this moment occupies the whole of the present and rests on the very topmost point of the sphere, under the zenith. The species and individuals of all the natural kingdoms ask our attention and admiration in a round robin. We make straight lines, putting a captain at their head and a

lieutenant at their tails, with sergeants and corporals all along the line and a flourish of trumpets near the beginning, insisting on a particular uniformity where Nature has made curves to which belongs their own sphere-music. It is indispensable for us to square her circles, and we offer our rewards to him who will do it.

Who [*sic*] describes the most familiar object with a zest and vividness of imagery as if he saw it for the first time, the novelty consisting not in the strangeness of the object, but in the new and clearer perception of it.

Oct. 14. This year, on account of the very severe frosts, the trees change and fall early, or fall before fairly changing. The willows have the bleached look of November. Consider how many leaves there are to fall each year and how much they must add to the soil. Coultas (in "What may be Learned from a Tree") finds that a single beech twig twenty-seven inches and three lines long and six years old was "the leaf-labor of one hundred and fifty-five leaves," and quotes from Asa Gray's "First Lessons in Botany" that "the Washington Elm at Cambridge — a tree of no extraordinary size — was some years ago estimated to produce a crop of seven millions of leaves, exposing a surface of 200,000 square feet, or about five acres, of foliage." Supposing this to be true, and that the horizontal spread of this (like other the largest elms) is one hundred feet, then, if all its leaves should be spread evenly on the ground directly under it, there would be about twenty-five thicknesses. An ordinary forest would probably cover the ground as thickly as this tree would. Supposing a

leaf to be of the same thickness with an ordinary sheet of letter-paper, and that the mass is compressed as much as paper packed in a ream, the twenty-five would be about one sixteenth of an inch thick. This is a rude calculation.

We have had a remarkably fertile year. Let us see now if we have a cold winter after it.

P. M. — Up Groton Turnpike.

If you examine a wood-lot after numerous fires and cuttings, you will be surprised to find how extremely vivacious are the roots of oaks, chestnuts, hickories, birches, cherries, etc. The little trees which look like seedlings of the year will be found commonly to spring from an older root or horizontal shoot or a stump. Those layers which you may have selected to transplant will be found to have too much of old stump and root underground to be removed. They have commonly met with accidents and seen a good deal of the world already. They have learned to endure and bide their time. When you see an oak fully grown and of fair proportions, you little suspect what difficulties it may have encountered in its early youth, what sores it has overgrown, how for years it was a feeble layer lurking under the leaves and scarcely daring to show its head above them, burnt and cut, and browsed by rabbits. Driven back to earth again twenty times, — as often as it aspires to the heavens. The soil of the forest is crowded with a mass of these old and tough fibres, annually sending up their shoots here and there. The underground part survives and holds its own, though the top meets with countless accidents; so that, although seeds were not to be supplied

for many years, there would still spring up shoots enough to stock it. So with the old and feeble huckleberry roots. Nay, even the sedge (*Carex Pennsylvanica*) is already rooted in most woods, and at once begins to spread and prevail when the wood is cut, especially if a frost or fire keeps down the new wood.

I examine the John Hosmer wood-lot (sprout-land) cut off last winter on the north side at Colburn Hill. Next to the conspicuous sprouts from the large stumps (of which the white birch have here grown the most, — commonly four or five feet) you notice an increased growth of weeds, as goldenrods (especially *S. puberula*), the two fire-weeds, asters, everlasting (fragrant), hawkweeds, yarrow, low blackberry, cinquefoil, etc. All of these, I believe, except the erechthites, are perennials, and those which blossomed this year (with this exception) must have sprung up before the wood was cut. The others were probably planted last fall or in the winter, unless their seed endures in the soil. I see, for example, what I consider seedling goldenrods, everlasting, and yarrow, *i. e.* mere radical leaves without any stem, which will bloom next year. The seedling trees of this year, of course, will be scarcely noticed among the sprouts and weeds. I chance to see none. I see, however, many young black cherry trees, three to six inches high, which are just three years old, with roots partly coiled up (as if they had met with difficulties in their upward growth) and much larger than their stems. These, then, were planted in the midst of this pine and oak and birch wood at least two years before it was cut, though the tree they came from is so far off that I know

not where it is, and they have not effectually risen above the surface till this year. If you look through a sprout-land you will find no tree, not strictly speaking a forest tree, and which at the same time did not attain to its growth there before, so common as these little black cherries, the birds having conveyed the stones into the midst of the woods and dropped them there; *i. e.* they are planted chiefly before the wood is cut. *These* cherry trees are, however, short-lived. They live a few years and bear large and pleasant-tasted fruit, but when the forest trees have grown up around them they die.

I see that a great part of the club-moss (*Lycopodium complanatum*) which was so abundant in the lower part of this wood has already been killed, and is completely withered and bleached white, probably by the cold last winter, if not also by exposure to the light and heat of the summer.

This lot is thickly covered with the rubbish or tops. I suspect that it is, on the whole, better to leave this than to clear the ground, — that when it is not too thick (as masses of pine-tops) it is an important protection to the seedling trees (gardeners find that seedling pines require shade in their nurseries), and of course the soil is enriched by its decay.

Under one white oak where, on the 8th, the ground was strewn with acorns, I find but a single sound one left to-day, and under another, though many acorns are left, all of them are decayed, so rapidly are they gathered by the squirrels. I take them from the tree already decayed without a worm in them. Far the greater part that you find destroyed (this does not include those

eaten by animals) have thus decayed, and I think that the cause was the severe frost of about October 1st, which especially injured those on the ground. It is surprising that any escape the winter. I am not sure that white oak acorns do (as I am that many scarlet and red oak, etc., do). These are not protected by any downiness, and their shoots and leaves I know are the most tender in the spring. Probably almost all the white oak acorns would be destroyed by frost if left on the surface in pastures, and so it may be that more escape because the squirrels carry them off and bury them, or leave them under the shelter of the woods and leaves, though they consume so many, than would if they were not disturbed. Also I find many full-grown worms in them, and the acorn all powder, on the tree.

Do I not see yellow-crowned warblers? Much yellow on shoulders or sides, and white in wings when they fly.[1]

Acorns that fall in open pastures decay so fast that you might wonder how any survived the winter, but the fact is that they are not suffered to lie long, but are picked up and carried off by animals, and either deposited in holes or buried under the leaves in the forest, or consumed; and so, probably, more of these survive than would if they were not carried off.

Oct. 16. P. M. — To White Pond and neighborhood.

As a consequence of the different manner in which trees which have winged seeds and those which have not are planted, — the [former] being blown together in one direction by the wind, the latter being dispersed ir-

[1] Yes. They fly up against the windows the next day.

regularly by animals, — I observe that the former, as pines (which (the white) are said in the primitive wood to grow in communities), white birches, red maples, alders, etc., often grow in more or less regular rounded or oval or conical patches, as the seeds fell, while oaks, chestnuts, hickories, etc., simply form woods of greater or less extent whether by themselves or mixed; *i. e.*, they do not naturally spring up in an oval form (or elliptical) unless they derive it from the pines under which they were planted.

For example, take this young white pine wood half a dozen years old, which has sprung up in a pasture adjacent to a wood of oaks and pines mixed. It has the form of a broad crescent, or half-moon, with its diameter resting on the old wood near where a large white pine stood. It is true most such groves are early squared by our plows and fences, for we square these circles every day in our rude practice. And in the same manner often they fall in a sprout-land amid oaks, and I, looking from a hilltop, can distinguish in distant old woods still, of pine and oak mixed, these more exclusive and regular communities of pine, a dozen or more rods wide, while it is the oak commonly that fills up the irregular crevices, beside occupying extensive spaces itself. So it happens that, as the pines themselves and their fruit have a more regularly conical outline than deciduous trees, the groves they form also have.

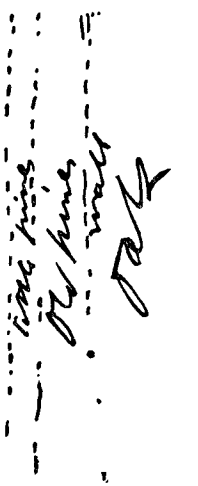
Our wood-lots, of course, have a history, and we may often recover it for a hundred years back, though we *do* not. A small pine lot may be a side of such an oval, or a half, or a square in the inside with all the curving sides

cut off by fences. Yet if we attended more to the history of our lots we should manage them more wisely.

Looking round, I observe at a distance an oak wood-lot some twenty years old, with a dense narrow edging of pitch pines about a rod and a half wide and twenty-five or thirty years old along its whole southern side, which is straight and thirty or forty rods long, and, next to it, an open field or pasture. It presents a very singular appearance, because the oak wood is broad and has no pines within it, while the narrow edging is perfectly straight and dense, and pure pine. It is the more remarkable at this season because the oak is all red and yellow and the pine all green. I understand it and read its history easily before I get to it. I find, as I expected, a fence separating the pines from the oaks, or that they belong to different owners. I also find, as I expected, that eighteen or twenty years ago a pitch pine wood had stood where the oaks are, and was then cut down, for there are their old stumps. But before they were cut, their seeds were blown into the neighbor's field, and the little pines came up all along its edge, and they grew so thickly and so fast that that neighbor refrained at last from plowing them up or cutting them off, for just this rod and a half in width, where they were thickest, and moreover, though there are no sizable oaks mixed with these pines, the whole surface even of this narrow strip is as usual completely stocked with little seedling oaks less than a foot high. But I ask, if the neighbor so often lets this narrow edging grow up, why not often, by the same rule, let them spread over the whole of his field? When at length he sees how they have grown, does he not often

regret that he did not do so? Or why be dependent, even to this extent, on these windfalls from our neighbors' trees, or an accident? Why not control our own woods and destiny more? (This was north from the lane beyond Conant's handsome wood.) There are many such problems in forest geometry to be solved.

Again, I read still further back a more varied story. Take the line between Rice and Conant (?) or Garfield (?). Here is a green strip of dense pitch and white pine some thirty or forty rods long by four wide and thirty years old. On the east side is a large red and yellow [*sic*] oak wood-lot, the nearest part of it some dozen or more years old, and on the west a strip three rods wide of little white and pitch pines four to ten feet high that have sprung up in the open land, and next to these is an open field occasionally cultivated. Given these facts, to find the wall. If you think a moment you will know without my telling you that it is between the pine wood and the oak. Some dozen or more years ago there was a large pine wood extending up to the wall on the west, and then an open field belonging to another man. But, as before, the pine seed had blown over the wall and taken so well that for four rods in width it was suffered to grow, or rather may be said to have defended itself and crowded the farmer back (no thanks to him). But when, some fifteen years ago, the old pine wood was cut by its owner, the other



was not ready to cut his younger one. This is now about thirty years old and for many years it has been endeavoring to spread into the open land by its side, as its parents did, but for a long time the proprietor, not taking the hint, blind to his own interests, plowed quite up to the edge of the wood, as I noticed, — and got a few beans for his pains. But the pines (which he did not plant) grew while he slept, and at length, one spring, he gave up the contest and concluded at last to plow only within three rods of the wood, the little pines were so thick and promising. He concluded not to cut his own fingers any more, *i. e.* not further than up to the last joint, and hence this second row of little pines. They would have covered the half or perhaps the whole of his barren field before this if he had let them.

I examined these pine lots. The strip of little pines contained also a little white birch, much sweet-fern, and thin open sod, but scarcely one oak, and that very small. The strip of large pines contained countless oaks of various kinds, — white, red, black, and shrub oak, — which had come from the young oak lot, many little pines of both kinds, and *little* wild cherry, — white [*sic*], — and some hazel and high blueberry. (It was rather elevated as well as dry soil.)

I dug up some of the little oaks to see how old they were and how they had fared. The largest in the lot were about one foot high. First, a red or scarlet oak, apparently four years old. The acorn was about one inch below the surface of the pine leaves. It rose five inches above the leaves, and the root extended about one foot below the surface. It had died down once.

The second was a black oak which rose six inches above the leaves (or eight, measured along the stem). It was apparently four years old. It was much branched, and its tops had been cut off by rabbits last year. The root ran straight down about one inch, then nearly horizontally five or six inches, and when I pulled it up it broke off where less than one eighth inch thick, at sixteen inches below the surface. This tree was one fourth of an inch in diameter at the surface and nearly three fourths of an inch in diameter at five inches below (along the root). At the same height above the surface it was hardly one fifth of an inch in diameter.

The third was a white oak ten inches high, apparently seven years old. It also had been browsed by a rabbit and put out a new shoot accordingly. Two years' growth was buried in the leaves. The root was very similar, both in direction and form, to the last, only not quite so thick.

Fourth, a shrub oak also quite similar, though less thick still and with two or more shoots from one stock.

In all these cases, or especially the first three [?], there was one main, and an unexpectedly great, fusiform root, altogether out of proportion to the top, you would say, tapering both ways, but of course largest and sharpest downward, with many fine stringy fibres extending on every side from it perhaps a foot. Just as a biennial plant devotes its energies the first year to producing a stock on which it can feed the next, so these little oaks in their earliest years are forming great fusiform vigorous roots on which they can draw when they are suddenly left to seek their fortunes in a sprout-land.

Thus this double forest was advancing to conquer new (or old) land, sending forward their children on the wings of the wind, while already the oak seedlings from the oak wood behind had established themselves beneath the old pines ready to supplant them. The pines were the vanguard. They stood up to fire with their children before them, while the little oaks kneeled behind and between them. The pine is the pioneer, the oak the more permanent settler who lays out his improvements. Pines are by some considered lower in the scale of trees — in the order of development — than oaks.

While the pines were blowing into the pasture from this narrow edging, the animals were planting the acorns under the pines. Even the small pine woods are thus perfectly equipped.

There was even under these dark, dense pines, thirty years old, a pretty thick bed of blueberry and huckleberry bushes next the wall, ten feet wide, the relics of a still denser and higher one that grew there when it was an open field. The former had thus been driven back three times, first by the blueberry hedge, then by the pines of thirty years ago, and lastly by the young pines that sprang from them. Thus a wood-lot had been forced upon him, and yet perhaps he will talk of it as a creation of his own.

I have come up here this afternoon to see ——'s dense white pine lot beyond the pond, that was cut off last winter, to know how the little oaks look in it. To my surprise and chagrin, I find that the fellow who calls himself its owner has burned it all over and sowed winter-rye here. He, no doubt, means to let it grow up again in a year or two, but he thought it would be clear gain if he could extract a little rye from it in the meanwhile. What a fool! Here nature had got everything ready for this emergency, and kept them ready for many years, — oaks half a dozen years old or more, with fusiform roots full charged and tops already pointing skyward, only waiting to be touched off by the sun, — and he thought he knew better, and would get a little rye out of it first, which he could feel at once between his fingers, and so he burned it, and dragged his harrow over it. As if oaks would bide *his* time or come at his bidding. Or as if he preferred to have a pine or a birch wood here possibly half a century hence — for the land is "pine sick" — rather than an oak wood at once. So he trifles with nature. I am chagrined for him. That he should call himself an agriculturalist! He needs to have a guardian placed over him. A forest-warden should be appointed by the town. Overseers of poor husbandmen.

He has got his dollars for the pine timber, and now he wishes to get his bushels of grain and finger the dollars that they will bring; and then, Nature, you may have your way again. Let us purchase a mass for his soul. A greediness that defeats its own ends.

I examined a little lot of his about a dozen rods square just this side, cut off last winter, apparently two thirds white pine and one third white oak. Last year the white pine seed was very abundant, but there was little or no white oak seed. Accordingly I noticed twenty or more seedling white pines of this year on the barest spots, but not a single seedling oak. This suggests how much the

species of the succeeding forest may depend on whether the trees were fertile the year before they were cut, or not.

I see a very large white oak acorn which has a double meat with a skin between. There is a very young grub in it.

They appear to be last year's hemlock and larch cones that still hold on in great numbers!

As time elapses, and the resources from which our forests have been supplied fail, we shall of necessity be more and more convinced of the significance of the seed.

I see in a thick pitch pine wood half a dozen stout pine twigs five eighths of an inch thick that have been gnawed off with their plumes. Why?

Hear the alder locust still. Robins apparently more numerous than a month ago. See grackles in cornfields in two places to-day.

It chanced that here were two proprietors within half a mile who had done exactly the same, *i. e.*, accepted part of a wood-lot that was forced on them, and I have no doubt that there are several more exactly similar cases within that half-mile diameter.

The history of a wood-lot is often, if not commonly, *here*, a history of cross-purposes, — of steady and consistent endeavor on the part of Nature, of interference and blundering with a glimmering of intelligence at the eleventh hour on the part of the proprietor. The proprietor of wood-lots commonly treats Nature as an Irishman drives a horse, — by standing before him and beating him in the face all the way across a field.

If I find any starved pasture in the midst of our woods, — and I remember many such, and they are

the least valuable tracts we have, — I know that it has commonly had such a history as this wood-lot (above). It was burned over when cut, and perhaps cultivated a year or two, often because the owner thought it was what the soil needed in order that it might produce trees. In some cases there may be sense in such a course if he can afford to wait a century instead of a third of that time for a crop. It depends on what the trees are, the locality, etc. But commonly the owner who adopts this course makes a move in the dark and in ninety-nine cases in a hundred [an indecipherable word] his own fingers.

The time will soon come, if it has not already, when we shall have to take special pains to secure and encourage the growth of white oaks, as we already must that of chestnuts for the most part. These oaks will become so scattered that there will be not seed enough to seed the ground rapidly and completely.

Horace Mann tells me that he found in the crop or inside of the stake-driver killed the other day one grasshopper, several thousand-legs one to one and a half inches long, and not much else.

It commonly happens in settled countries like this that the new community of pines, sprung from seeds blown off from an older one, is very youthful compared with the trees it sprang from because many successive crops of trees or seeds have been plowed up or cut before the owner allowed Nature to take her course. Naturally the pines spread more steadily and with no such abrupt descents. In the wildwood at least there are commonly only fires and insects or blight, and not the axe and plow and the cattle, to interrupt the regular progress of things.

Oct. 17. P. M. — To Walden Woods.

The trees which *with us* grow in masses, *i. e.* not merely scattering, are: —

1, 2. White and pitch pine
3. Oaks
4. White birch
5. Red maple
6. Chestnut
7. Hickory
Alder
Hemlock, spruce, and larch
Cedar (white and red)
Willow
Locust
Apple
Red cherry (in neighboring towns) W. [*sic*]
Sugar maple (rare)

Of these only white and pitch pine, oaks, white birch, and red maple are *now* both important and abundant. (Chestnut and hickory have become rare.)

It is an interesting inquiry what determines which species of these shall grow on a given tract. It is evident that the soil determines this to some extent, as of the oaks only the swamp white stands in our meadows, and, so far as these seven trees are concerned, swamps will be composed only of red maples, swamp white oaks, white birch, and white pine. By removing to upland we get rid of the swamp white oak and red maples in *masses*, and are reduced to white and pitch pine, oaks, and white birch only, *i. e.* of those that are abundant and important.

Secondly, ownership, and a corresponding difference

of treatment of the land as to time of cutting, etc., decides the species.

Third, age, as, if the trees are one hundred years old, they may be chestnut, but if sprout-land are less likely to be; etc., etc., etc.

The noblest trees and those which it took the longest to produce, and which are the longest-lived, as chestnuts, hickories (?), oaks, are the first to become extinct under our present system and the hardest to reproduce, and their place is taken by pines and birches, of feebler growth than the primitive pines and birches, for want of a change of soil.

There is many a tract now bearing a poor and decaying crop of birches, or perhaps of oaks, dying when a quarter grown and covered with fungi and excrescences, where two hundred years ago grew oaks or chestnuts of the largest size.

I look through a lot of young oaks twenty or twenty-five years old (Warren's, east of the Deep Cut, exclusively oak, the eastern part). There are plenty of little oaks from a few inches to a foot in height, but on examination I find fewer seedlings in proportion to the whole (*i. e.* manifestly seedlings) and they have much older and larger and poorer or more decayed roots than the oaks in dense pine woods. Oftenest they are shoots from the end of a horizontal twig running several feet under the leaves and leading to an old stump [?] under the surface. But I must examine again and further.

Looking through this wood and seeking very carefully for oak seedlings and anything else of the kind, I am surprised to see where the wood was chiefly oak a

cluster of little chestnuts six inches high and close together. Working my hand underneath, I easily lift them up with all their roots, — four little chestnuts two years old, which partially died down the first year, — and to my surprise I find still attached four great chestnuts from which they sprang and four acorns which have also sent up puny little trees beneath the chestnuts. These eight nuts all lay within a diameter of two inches about an inch and a half beneath the present leafy surface, in a very loose soil of but [?] half decayed leaves in the midst of this young oak wood. If I had not been looking for something of the kind, I should never have seen either the oaks or the chestnuts. Such is the difference between looking for a thing and waiting for it to attract your attention. In the last case you will probably never see it [at] all. They were evidently planted there two or three years ago by a squirrel or mouse. I was surprised at the sight of these chestnuts, for there are not *to my knowledge* any chestnut trees — none, at least, nearly large enough to bear nuts — within about half a mile of that spot, and I should about as soon have expected to find chestnuts in the artificial pine grove in my yard. The chestnut trees old enough to bear fruit are near the Lincoln line about half a mile east of this through the woods and over hill and dale. No one acquainted with these woods — not the proprietor — would have believed that a chestnut lay under the leaves in that wood or within a quarter of a mile of it, and yet from what I saw then and afterward I have no doubt that there were hundreds, which were placed there by quadrupeds and birds. This wood lies on the south of

the village, separated from it by a mile of open fields and meadows. It is the northern part of an extensive pine and oak forest which half a mile eastward, near the Lincoln line, begins to contain a few chestnuts. These little chestnuts were growing well, but the oaks appeared to be dead and dying.[1]

It is well known that the chestnut timber of this vicinity has rapidly disappeared within fifteen years, having been used for railroad sleepers, for rails, and for planks, so that there is danger that this part of our forest will become extinct.

The last chestnut tracts of any size were on the side of Lincoln. As I advanced further through the woods toward Lincoln, I was surprised to see how many little chestnuts there were, mostly two or three years old and some even ten feet high, scattered through them and also under the dense pines, as oaks are. I should say there was one every half-dozen rods, made more distinct by their yellow leaves on the brown ground, which surprised me because I had not attended to the spread of the chestnut, and it is certain that every one of these came from a chestnut placed there by a quadruped or bird which had brought it from further east, where alone it grew.

You would say that the squirrels, etc., went further for chestnuts than for acorns in proportion as they were a greater rarity. I suspect that a squirrel may convey them sometimes a quarter or a half a mile even, and no doubt as soon as a young chestnut fifteen or twenty feet

[1] I dug up three or four more a few days after, and found that they had not the very large roots that young oaks have.

high, far advanced beyond the chestnut woods, bears a single bur, which no man discovers, a squirrel or bird is almost sure to gather it and plant it in that neighborhood or still further forward. A squirrel goes a-chestnutting perhaps as far as the boys do, and when he gets there he does not have to shake or club the tree or wait for frost to open the burs; he walks [?] up to the bur and cuts it off, and strews the ground with them before they have opened. And the fewer they are in the wood the more certain it is that he will appropriate every one, for it is no transient afternoon's picnic with him, but the pursuit of his life, a harvest that he gets as surely as the farmer his corn.

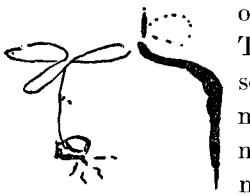
Now it is important that the owners of these wood-lots should know what is going on here and treat them and the squirrels accordingly. They little dream of what the squirrels are about; know only that they get their seed-corn in the adjacent fields, and encourage their boys to shoot them every day, supplying them with powder and shot for this purpose. In newer parts of the country they have squirrel-hunts on a large scale and kill many thousands in a few hours, and all the neighborhood rejoices.

Thus it appears that by a judicious letting Nature alone merely we might recover our chestnut wood in the course of a century.

This also suggests that you cannot raise one kind of wood alone in a country unless you are willing to plant it yourself. If no oaks grow within miles of your pines, the ground under the pines will not be filled with little oaks, and you will have to plant them. Better have

your wood of different kinds in narrow lots of fifty acres, and not one kind covering a township.

I took up a red oak seedling of this year five inches high. In this case the top is larger, putting length and breadth together, than the root, and the great acorn is still perfectly sound, lying on its side, and the plant this first year evidently derives a great part of its nourishment from it. The root is abruptly curved back under the acorn, and I find that seedling or young oaks generally have roots which slant off more or less horizontally from where the acorn lay two to five or six inches, and then, having acquired their greatest thickness, descend straight downward. To this irregularity is sometimes added a half-turn or spiral in the upper part of the root:



or, looking down on it:

The acorn is still so sound that I think it must continue to furnish nourishment to the plant a part of next year.

Apparently the pine woods are a natural nursery of oaks, from whence we might easily transplant them to our grounds, and thus save some of those which annually decay, while we let the pines stand. Experience has proved, at any rate, that these oaks will bear exposure to the light. It is remarkable that for the most part there are no seedling oaks in the open grassy fields and pastures. The acorns are little likely to succeed if dropped there. Those springing up in such places appear to have been dropped or buried by animals when on their way with them to another covert.

I examine under the pitch pines by Thrush Alley to see how long the oaks live under dense pines. The oldest oaks there are about eight or ten years old. I see none older under these and other dense pines, even when the pines are thirty or more years old, though I have no doubt that oaks began to grow there more than twenty years ago. Hence they must have died, and I suppose I could find their great roots in the soil if I should dig for them. I should say that they survived under a very dense pine wood only from six to ten years. This corresponds exactly with the experience of the English planters, who begin to shred the branches of the nursing pines when the oaks are six or seven years old and to remove the pines altogether when the oaks are eight to ten years old.

But in openings amid the pines, though only a rod in diameter, or where the pines are thin, and also on their edges, the oaks shoot up higher and become trees, and this shows how mixed woods of pine and oak are produced. If the pines are quite small or grow but thinly, fewer acorns will be planted amid them, it is true, but more will come to trees, and so you have a mixed wood. Or when you thin out a pine wood, the oaks spring up here and there; or when you thin an oak wood, the pines plant themselves and grow up in like manner.

It is surprising how many accidents these seedling oaks will survive. We have seen [?] that they commonly survive six to ten years under the thickest pines and acquire stout and succulent roots. Not only they bear the sudden exposure to the light when the pines are cut,

but, in case of a more natural succession, when a fire runs over the lot and kills pines and birches and maples, and oaks twenty feet high, these little oaks are scarcely injured at all, and they will still be just as high the next year, if not in the fall of the same year if the fire happens early in the spring. Or if in the natural course of events a fire does not occur nor a hurricane, the soil may at last be exhausted for pines, but there are always the oaks ready to take advantage of the least feebleness and yielding of the pines.

Hereabouts a pine wood, or even a birch wood, is no sooner established than the squirrels and birds begin to plant acorns in it. First the pines, then the oaks; and coniferous trees, geologists tell us, are older, as they are lower in the order of development, — were created before oaks.

I observe to-day a great many pitch pine plumes cut off by squirrels and strewn under the trees, as I did yesterday.[1]

I count the rings of a great white pine sawed off in Laurel Glen a few years ago, —about one hundred and thirty. This, probably, was really of the second growth, at least, but probably now even the second growth is all gone in this town. We may presume that any forest tree here a hundred and thirty years old belongs to the second growth, at least. We may say that all pines and oaks of this age or *growth* are now extinct in this town,

[1] The next day (18th) I see twenty pine twigs, some three-plumed, at Beck Stow's, recently gnawed off and lying under one tree. This is to be seen now on all sides of the town. Why so? Saw the same last fall and before.

and the present generation are not acquainted with large trees of these species.

A month ago I saw the smoke of many burnings in the horizon (even now see one occasionally), and now in my walks I occasionally come to a field of winter-rye already greening the ground in the woods where such a fire was then kindled.

If any one presumes that, after all, there cannot be so many nuts planted as we see oaks spring up at once when the pines are cut, he must consider that *according to the above calculation* (two pages back) there are some ten years for the animals to plant the oak wood in; so that, if the tract is ten rods square or contains one hundred square rods, it would only be necessary that they should plant ten acorns in a year which should not be disturbed, in order that there might be one oak to every square rod at the end of ten years.[1] This, or anything like this, does not imply any very great activity among the squirrels. A striped squirrel could carry enough in his cheeks at one trip.

While the man that killed my lynx (and many others) thinks it came out of a menagerie, and the naturalists call it the Canada lynx, and at the White Mountains they call it the Siberian lynx,— in each case forgetting, or ignoring, that it belongs here,—I call it the Concord lynx.

Oct. 18. P. M. — To Merriam's white pine grove.

I often see amid or beside a pitch or white pine grove, though thirty years old, a few yet larger and older trees,

[1] But some English planters plant only an acorn to two or three rods, others four or five times as many.

from which they came, rising above them, like patriarchs surrounded by their children.

Early cinquefoil again.

I find fair-looking white oak acorns, which abound on the trees near Beck Stow's, to be decayed on the tree. Wishing to see what proportion were decayed I pull down a bough, and pluck forty-one acorns, which I cut open successively with my knife. Every one is soft and spoiled, turned black or dark-brown within, though there is not a single worm in them. Indeed, abundant and beautiful as the crop is, they are all decayed on that and the neighboring trees, and I only find one sound one after long search. This is probably the reason why they hold on still so numerously, and beside the squirrels do not disturb them. I suspect that they were killed by the severe frost of about October 1st. Abundant as the crop is, perhaps half of them have already been destroyed thus. Those that were touched first and most severely are paler-brown on one or both sides. Here, or on *these* trees, is a whole crop destroyed before it fell, though remarkably abundant. How many thousand bushels there must be in this state in this town!

See how an acorn is planted by a squirrel, just under a loose covering of moist leaves where it is shaded and concealed, and lies on its side on the soil, ready to send down its radicle next year.

If there are not so many oak seedlings in a deciduous wood as in a pine one, it may be because both oaks (and acorns) and squirrels love warmth. The ground does not freeze nearly so hard under dense pines as in a deciduous wood.

Look through an oak wood, say twenty-five or thirty years old, north of the Sherman grove on the road. It appeared to me that there were fewer seedling oaks under this than under pines, and the roots of the other little ones that looked like seedlings were old and decaying, and the shoots slender, feeble, and more or less prostrate under the leaves. You will find seedling oaks under oaks, it is true, but I think that you will not find a great many of them. You will not find, as under pines, a great many of these little oaks one to eight or ten years old, with great fat, or fusiform, roots, all ready to spring up when the pines are cut.

If it were true that the little oaks under oaks steadily grew and came to trees there, then even that would be a reason why the soil would not be so well stocked with them when the wood was cut as when a pine wood is cut, for there would be only ten trees in the first case to one hundred in the last (according to our calculation before).

Most of the little oaks here were little or dwarfed, apparently because they were shoots from poor and diseased rootstocks, which were common in the ground.

But I think that neither pines nor oaks do well under older trees.

Methinks you do not see numerous oaks of all ages and sizes in an old oak wood, but commonly large trees of about the same age and little ones like huckleberry bushes under your feet; and so commonly with pine woods. In either case, if the woods are well grown and dense, all the trees in them appear to have been planted at the same time.

For aught that I know, I would much rather have a young oak wood which has succeeded to pines than one that has succeeded to oaks, for they will make better trees, not only because the soil is new to them, but because they are all seedlings, while in the other case far the greater part are sprouts; just as I would prefer apple trees five or six years from the seed for my orchard to suckers from those which have come to maturity or decayed. Otherwise your young oaks will soon, when half grown, have the diseases of old trees, — warts and decay.

I find that Merriam's white pine grove is on the site of an oak wood, the old oak stumps being still very common. The pines appear to be some forty years old. The soil of pine leaves is an inch to an inch and a half thick. The oldest little oaks here are five years old and six inches high.

Am surprised to see that the pasture west of this, where the little pitch pines were cut down last year, is now even more generally green with pines than two years ago.

What shall we say to that management that halts between two courses, — does neither this nor that, but botches both? I see many a pasture on which the pitch or white pines are spreading, where the bush-whack is from time to time used with a show of vigor, and I despair of my trees, — I say mine, for the farmer evidently does not mean they shall be his, — and yet this questionable work is so poorly done that those very fields grow steadily greener and more forest-like from year to year in spite of cows and bush-whack, till

at length the farmer gives up the contest from sheer weariness, and finds himself the owner of a wood-lot. Now whether wood-lots or pastures are most profitable for him I will not undertake to say, but I am certain that a wood-lot and pasture combined is not profitable.

I see spatter-dock pads and pontederia in that little pool at south end of Beck Stow's. How did they get there? There is no stream in this case? It was perhaps rather reptiles and birds than fishes, then. Indeed we might as well ask how they got anywhere, for all the pools and fields have been stocked thus, and we are not to suppose as many new creations as pools. This suggests to inquire how any plant came where it is, — how, for instance, the pools which were stocked with lilies before we were born or this town was settled, and ages ago, were so stocked, as well as those which we dug. I think that we are warranted only in supposing that the former was stocked in the same way as the latter, and that there was not a sudden new creation, — at least since the first; yet I have no doubt that peculiarities more or less considerable have thus been gradually produced in the lilies thus planted in various pools, in consequence of their various conditions, though they all came originally from one seed.

We find ourselves in a world that is already planted, but is also still being planted as at first. We say of some plants that they grow in wet places and of others that they grow in desert places. The truth is that their seeds are scattered almost everywhere, but here only do they succeed. Unless you can show me the pool where the lily was created, I shall believe that the oldest fossil

lilies which the geologist has detected (if this is found fossil) originated in that locality in a similar manner to these of Beck Stow's. We see thus how the fossil lilies which the geologist has detected are dispersed, as well as these which we carry in our hands to church.

The development theory implies a greater vital force in nature, because it is more flexible and accommodating, and equivalent to a sort of constant *new* creation.

Mr. Alcott tells me that the red squirrels which live in his elms go off to the woods (pitch pines behind his house) about June, and return in September, when the butternuts, etc., are ripe. Do they not go off for hazelnuts and pine seed? No doubt they are to be found where their food is.

Young oaks, especially white oaks, in open woodland hollows and on plains [are] almost annually killed down by frost, they are so tender. Large tracts in this town are bare for this reason. Hence it is very important that the little oaks, when they are tenderest, should have the shelter of pines and other trees as long as they can bear it, or perhaps till they get above the level of the frosts. I know of extensive open areas in the woods where it would be of no use to sow acorns or to set seedling oaks, for every one would be killed by the frost, as they have already been; but if you were to plant pines thinly there, or thickly at first and then thin them out, you could easily raise oaks, for often you have only got to protect them till they are five or six feet high, that they may be out of the way of ordinary frosts, whose surface is as level as that of a lake.

According to Loudon (*vide* Emerson on oaks), the

best authorities say plant some two hundred and fifty acorns to an acre (*i. e.* some from three hundred to five hundred, others from sixty to one hundred), or about one and one half acorns to a rod, or two hundred and forty to an acre.

In my walk in Walden Woods yesterday I found that the seedling oaks and chestnuts were most common under the fullest and densest white pines, as that of Brister Spring.

Oct. 19. P. M. — To Conantum.

Indian-summer-like and gossamer.

That white oak in Hubbard Grove which on the 7th was full of those glossy black acorns is still hanging full, to my surprise. Suspecting the cause, I proceed to cut them open, and find that they are all decayed or decaying. Even if not black within, they are already sour and softened. Yet Rice told me that he collected from this tree about a week ago some thousands of acorns and planted them in Sudbury. I can tell him that probably not more than half a dozen of them were alive, though they may then have looked well, as they do now externally. First, then, I was surprised at the abundance of the crop this year. Secondly, by the time I had got accustomed to that fact I was surprised at the vast proportion that were killed, apparently by frost. The squirrels are wiser than to gather these, but I see where they have gathered many black oak acorns, the ground beneath being strewn with their cups, which have each a piece bitten out in order to get out the acorn. I suspect that black and red oak acorns are not so easily injured

by frost. Indeed, I find this to be the case as far as I look.

Sophia tells me that the large swamp white oak acorns in their cups, which she gathered a fortnight ago, are now all mouldy about the cups, or base of the acorn.

It is a remarkable fact, and looks like a glaring imperfection in Nature, that the labor of the oaks for the year should be lost to this extent. The softening or freezing of cranberries, the rotting of potatoes, etc., etc., seem trifling in comparison. The pigeons, jays, squirrels, and woodlands are thus impoverished. It is hard to say what great purpose is served by this seeming waste.

I frequently see an old and tall pine wood standing in the midst of a younger but more extensive oak wood, it being merely a remnant of an extensive pine wood which once occupied the whole tract, but, having a different owner, or for some other reason, it has not been cut. Sometimes, also, I see these pines of the same age reappear at half a mile distant, the intermediate pines having been cut for thirty or forty years, and oaks having taken their place. Or the distant second growth of pines, especially if they stand on the land of another than he who owns the oaks, may, as we have seen, be a generation smaller and have sprung from the pines that stood where the oaks do. Two or three pines will run swiftly forward a quarter of a mile into a plain, which is their favorite field of battle, taking advantage of the least shelter, as a rock, or fence, that may be there, and intrench themselves behind it, and if you look sharp, you may see their plumes waving there. Or, as I have said, they will cross a broad river without a bridge, and as

swiftly climb and permanently occupy a steep hill beyond.

At this season of the year, when each leaf acquires its peculiar color, Nature prints this history distinctly, as it were an illuminated edition. Every oak and hickory and birch and aspen sprinkled amid the pines tells its tale a mile off, and you have not to go laboriously through the wood examining the bark and leaves. These facts would be best illustrated by colors, — green, yellow, red, etc.

Pines take the first and longest strides. Oaks march deliberately in the rear.

The pines are the light infantry, *voltigeurs*, supplying the scouts and skirmishers; the oaks are the grenadiers, heavy-paced and strong, that form the solid phalanx.

It is evident to any who attend to the matter that pines are here the natural nurses of the oaks, and therefore they grow together. By the way, how nearly identical is the range of our pines with the range of our oaks? Perhaps oaks extend beyond them southward, where there is less danger of frost.

The *new* woodlands, *i. e.*, forests that spring up where there were no trees before, are pine (or birch or maple), and accordingly you may see spaces of bare pasture sod between the trees for many years. But oaks, in masses, are not seen springing up thus with old sod between them. They form a sprout-land, or stand amid the stumps of a recent pine lot.

It will be worth the while to compare seedling oaks with sprout-lands, to see which thrive best.

I see, on the side of Fair Haven Hill, pines which

have spread, apparently from the north, one hundred rods, and the hillside begins to wear the appearance of woodland, though there are many cows feeding amid the pines. The custom with us is to let the pines spread thus into the pasture, and at the same time to let the cattle wander there and contend with the former for the possession of the ground, from time to time coming to the aid of the cattle with a bush-whack. But when, after some fifteen or twenty years, the pines have fairly prevailed over us both, though they have suffered terribly and the ground is strewn with their dead, we then suddenly turn about, coming to the aid of the pines with a whip, and drive the cattle out. They shall no longer be allowed to scratch their heads on them, and we fence them in. This is the actual history of a great many of our wood-lots. While the English have taken great pains to learn how to create forests, this is peculiarly our mode. It is plain that we have thus both poor pastures and poor forests.

I examine that oak lot of Rice's next to the pine strip of the 16th. The oaks (at the southern end) are about a dozen [1] years old. As I expected, I find the stumps of the pines which stood there before quite fresh and distinct, not much decayed, and I find by their rings that they were about forty years old when cut, while the pines which sprang from [them] are now about twenty-five or thirty. But further, and unexpectedly, I find the stumps, in great numbers, now much decayed, of an oak wood which stood there more than sixty years ago. They are mostly shells, the sap-wood rotted off and the inside

[1] Oct. 31, count ten rings on one sprout.

turned to mould. Thus I distinguished four successions of trees.

Thus I can easily find in countless numbers in our forests, frequently in the third succession, the stumps of the oaks which were cut near the end of the last century. Perhaps I can recover thus generally the oak woods of the beginning of the last century, if the land has remained woodland. I have an advantage over the geologist, for I can not only detect the order of events but the time during which they elapsed, by counting the rings on the stumps. Thus you can unroll the rotten papyrus on which the history of the Concord forest is written.

It is easier far to recover the history of the trees which stood here a century or more ago than it is to recover the history of the men who walked beneath them. How much do we know — how little more can we know — of these two centuries of Concord life?

Go into a young oak wood, and commonly, if the oaks are not sprouts, then they were preceded by pines.

Of course, the gradual manner in which many woodlots are cut — often only thinned out — must affect the truth of my statements in numerous instances. The regularity of the succession will be interfered with, and what is true of one end of a lot will not be true of the other.

If the ground chances to be broken or burned over or cleared the same year that a good crop of pine seed falls, then expect pines; not otherwise.

I examined the huckleberry bushes next the wall in that same dense pitch and white pine strip. I found

that the oldest bushes were about two feet high and some eight or ten years old, and digging with spade and hands, I found that their roots did not go deep, but that they spread by a vigorous shoot which forked several times, running just under the leaves or in the surface soil, so that they could be easily pulled up. One ran seven feet before it broke, and was probably ten feet or more in length. And three or four bushes stood on this shoot, and though these bushes after a few years did not grow more than an inch in a year, these subterranean shoots had grown six to twelve inches at the end, and there seemed to be all the vigor of the plant. The largest bushes preserved still a trace of their origin from a subterranean shoot, the limbs being one-sided and the brash aslant. It is very likely, then, if not certain, that these roots are as old as the pine wood which overshadows them; or it is so long since the seedling huckleberry came up there. The pines were thirty years old, but some of the separate huckleberry bushes were ten, and were sending up new vigorous shoots still. The same was the case with the *Vaccinium vacillans* and the *Pennsylvanicum*, the last one, of course, on a smaller scale. You could see the *V. vacillans* growing in rows for several feet above the subterranean shoots, indicating where it was. The shoot turns up to make a bush thus:

Thus the roots of huckleberries may survive till the woods are cut again. They certainly will here. A huckleberry bush is apparently in its prime at five to seven

years, and the oldest are ten to twelve years. Plants of this order (*Ericaceæ*) are said to be among the earlier ones among fossil plants, and they are likely to be among the last.

The oldest oak, fairly speaking, in this wood was a black, thirteen years old. Its root, as usual, ran not straight down but with a half-turn or twist (as well as to one side), which would make it harder to pull up at any rate.

The white oak acorn has very little bitterness and is quite agreeable to eat. When chestnuts are away I am inclined to think them as good as they. At any rate it braces my thought more, and does me more good to eat them, than it does to eat chestnuts. I feel the stronger even before I have swallowed one. It gives me heart and back of oak.

I found that the squirrels, or *possibly* mice, which have their holes about those old oak stumps ran along in various directions through the roots, whose insides are rotted away, leaving a wall of thin bark which prevents the earth falling in. Such are their highways underground. The holes above led to them.

On the monuments of the old settlers of this town, if they can be found, are recorded their names and ages and the time of their death, and so much can be read on these monuments of the oaks, with some additional reliable information, as where they lived, and how healthily, and what trees succeeded them, etc., etc.

Looking at Sophia's large collection of acorns from Sleepy Hollow and elsewhere, I cannot find a sound white oak one (*i. e.* not decayed and blackened), but

the black and shrub oaks at least are sound. This suggests that the very fertile shrub oaks are more sure of succeeding and spreading, while the noblest oak of all may fail.

First, by examining the twigs (*vide* Coultas) you tell the age and the number of shoots and the leaves and the various accidents of the tree for half a dozen years past, — can read its history very minutely; and at length, when it is cut down, you read its ancient and general history on its stump.

If you would know the age of a young oak lot, look round for a sprout, — for there will commonly be some to be found even in a seedling wood, — cut, and count the rings. But if you have to count the rings of a seedling, begin about six inches from the ground, for it was probably so high when the previous wood was cut.

Oct. 20. E. Hosmer tells me to-day that while digging mud at the Pokelogan the other day he found several fresh acorns planted an inch or two deep under the grass just outside the oaks and bushes there. Almost every observant farmer finds one such deposit each year.

If that Merriam lot is fifteen rods square, then, instead of there being no oaks in it, there are some twenty-five hundred oaks in it, or far more oaks than pines, — say five times as many, for there are probably not nearly five hundred pines in the lot. This is only one of the thousand cases in which the proprietor and woodchopper tell you that there is not a single oak in the lot. So the tables were turned, and, so far as numbers were con-

cerned, it would have been truer to say that this was an exclusively oak wood and that there were no pines in it. Truly appearances are deceptive.

P. M. — To Walden Woods to examine old stumps.

In Trillium Wood the trees are chiefly pine, and I judge them to be forty to fifty years old, though there are not a few oaks, etc. Beneath them I find some old pitch pine stumps and one white pine. They would not be seen by a careless observer; they are indistinct mounds and preserve no form nor marks of the axe. This is low ground. Part of the cores, etc., of the stumps are, nevertheless, preserved by fat.

I then look at Farrar's [?] hill lot east of the Deep Cut. This is oak, cut, as I remember, some twenty-five years ago, the trees say five to eight inches [in] diameter. I find beneath the oaks innumerable pitch pine stumps, well preserved, or rather, distinct, some of them two feet and more in diameter, with bark nearly three inches thick at the ground, but generally fifteen inches in diameter. Though apparently thoroughly rotten and of a rough (crumbly) conical form and more or less covered with fine moss (hypnum), they were firm within on account of the fat in flakes on the whole core, and frequently showed the trace of the axe in the middle. I could get cartloads of fat pine there now, often lifting out with my hands the whole core, a clear mass of yellow fat. When the stump was almost a mere mound mossed over, breaking off an inch or two deep of the crust, with the moss, I could still trace on one side the straight edge made by the axe. There were also, especially on the lower, or northern, side, some large oak stumps, no doubt of the same age.

These were much better preserved than the pines, — at least the part above ground. The whole shape and almost every stroke of the axe apparent sometimes, as in a fresh stump. I counted from seventy to seventy-five rings on one. The present wood appears to be chiefly from the seed, with some sprouts. The latter two or more close together, with the old stump more or less overgrown. The sprouts, I think, were from small trees. (Methinks you do not see trees which have sprouted from old or large stumps two or three feet in diameter. I doubt if a very old wood, like E. Hubbard's, would send up sprouts from the stump.) I saw one large oak stump so much decayed that it may have belonged to a generation further back.

I next examined Ebby Hubbard's old oak and pine wood. The trees may be a hundred years old. The older or decaying trees have been cut out from time to time, neglecting these more recent stumps. The very oldest evidences of a tree were a hollow three or four feet across, in which you often slumped, — a hollow place in which squirrels have their holes covered with many layers of leaves, and perhaps with young oaks springing up in it, for the acorns rolled into it. But if you dug there, from under the moss (there was commonly a little green moss around it) and leaves and soil, in the midst of the virgin mould which the tree had turned to, you pulled up flakes and shoulder-blades of wood that might still be recognized for oak, portions preserved by some quality which they concentrated, like the fat leaves or veins of the pine, — the oak of oak. But for the most part it was but the mould and mildew

of the grave, — the grave of a tree which was cut or died eighty or a hundred years ago there. It is with the graves of trees as with those of men, — at first an upright stump (for a monument), in course of time a mere mound, and finally, when the corpse has decayed and shrunk, a depression in the soil. In such a hollow it is better to plant a pine than an oak. The only other ancient traces of trees were perhaps the semiconical mounds which had been heaved up by trees which fell in some hurricane.

I saw where Ebby had tried a pitch pine with his axe, though there was not a green twig on it, and the woodpeckers had bored it from top to bottom, — effectually proved it, if he had not been blind.

Looked at that pitch and white pine wood just east of Close at Brister Spring, which I remember as pasture some thirty years ago. The pasture is still betrayed under the pines by the firmer, sward-like surface, there being fewer leaves and less of leafy mould formed, — less virgin soil, — and by the patches of green (*pine*) moss and white cladonia peeping out here and there.

Young chestnuts (I dig up three or four) have not the large roots that oaks have.

I see the acorn after the tree is five or six years old.

Brassica Napus, or rape, a second crop, is blooming now, especially where grain has been cut and the field laid down to grass and clover. It has there little slender plants: rough, or bristly, lower leaves.

1st. There is the primitive wood, woodland which was woodland when the township was settled, and which has not been cut at all. Of this I know of none in Concord. Where is the nearest? There is, perhaps, a large tract in Winchendon.

2d. Second growth, the woodland which has been cut but once, — true second growth. This country has been so recently settled that a large part of the older States is covered now with this second growth, and the same name is occasionally still applied, though falsely, to those wood-lots which have been cut twice or many more times. Of this second growth I think that we have considerable left, and I remember much more. These are our forests which contain the largest and oldest trees, — shingle pines (very few indeed left) and oak timber.

3d. Primitive woodland, *i. e.*, which has always been woodland, never cultivated or converted into pasture or grain-field, nor burned over intentionally. Of two kinds, first, that which has only been thinned from time to time, and secondly, that which has been cut clean many times over. A larger *copsewood.*

4th. Woodland which has been cleared one or more times, enough to raise a crop of grain on it, burned over and perhaps harrowed or even plowed, and suffered to grow up again in a year or two. Call this "interrupted woodland" or "tamed."

5th. *New woods*, or which have sprung up *de novo* on land which has been cultivated or cleared long enough to kill all the roots in it. (The 3d, 4th, and 5th are a kind of copsewood.)

6th. Artificial woods, or those which have been set out or raised from the seed, artificially.

It happens that we have not begun to set out and plant till all the primitive wood is gone. All the *new woods* (or

5th kind) whose beginning I can (now) remember are pine or birch (maple, etc., I have not noticed enough). I suspect that the greater part (?) of our woodland is the 3d kind, or primitive woodland, never burned over intentionally nor plowed, though much of it is the 4th kind. Probably almost all the large wood cut ten or fifteen years ago (and since) here was second growth, and most that we had left was cut then.

Of the new woods I remember the beginning of E. Hubbard's east of Brister Spring; Bear Garden, pitch pine; Wheeler's pigeon-place, pitch pine; also his blackberry-field, pitch pine and a few white; West Fair Haven Spring woods, pitch pine and white; E. Hubbard's Close Mound, pitch pine; Conantum-top, pitch pine; Mason's pasture (?), white pine; behind Baker's (?), pitch pine; my field at Walden, pitch pine; Kettle Hill, pitch pine; Moore's corn-hill, pitch pine, cut say '59; behind Moore's house (??), pitch pine (was it new?); front of Sleepy Hollow, poplars, pitch pine; E. Wood's, front of Colburn place (??), pitch pine, not new wood; John Hosmer's, beyond house (?), pitch pine; Fair Haven Hill-side, white pine, just begun; Merriam's pasture, beyond Beck Stow's, just begun, pitch pine; old coast behind Heywood's, pitch pine; Conant's white pine crescent in front of W. Wheeler's; J. P. Brown pasture, white pine; at Hemlocks, pitch pine; northwest of Assabet stone bridge, pitch pine; Tarbell's pitch pines; Baker's, above beech, pitch pine; Henry Shattuck's, pitch pine; northwest of Farmer's, pitch pine; William Brown's, pitch pine; north of H. Shattuck's, pitch pine; white

and pitch pine south of Rice's lot; pitch pine northwest of old Corner schoolhouse, pitch pine southeast of new Corner schoolhouse; large pitch pine hill behind Hagar's in Lincoln.

In several of these new woods — pitch pine and birches — can see the old corn-hills still.

The woods within my recollection have gradually withdrawn further from the village, and woody capes which jutted from the forest toward the town are now cut off and separated by cleared land behind. The Irish have also made irruptions into our woods in several places, and cleared land.

Edmund Hosmer tells me of a gray squirrel which he kept in his old (Everett) house; that he would go off to the woods every summer, and in the winter come back and into his cage, where he whirled the wire cylinder. He would be surprised to see it take a whole and large ear of corn and run out a broken window and up over the roof of the corn-barn with it, and also up the elms.

We have a kitten a third grown which often carries its tail almost flat on its back like a squirrel.

Oct. 22. P. M. — To Walden Woods.

See in the yard many chip-birds, but methinks the chestnut crown is not so distinct as in the spring, — has a pale line in middle of it, — and many, maybe females or young, have no chestnut at all. I do not find them so described.

Are not maples inclined to die in a white pine wood? There was the one in Merriam's grove and the sickly ones in our grove in the yard.

I notice that the first shrubs and trees to spring up in the sand on railroad cuts in the woods are sweet-fern, birches, willows, and aspens, and pines, white and pitch; but all but the last two chiefly disappear in the thick wood that follows. The former are the pioneers. Such sandy places, the edges of meadows, and sprout-lands are almost the only localities of willows with us.

In the Deep Cut big wood (Stow's), pines and oaks, there are thousands of little white pines as well as many oaks. After a mixed wood like this you may have a mixed wood, but after dense pines, commonly oak chiefly, yet not always; for, to my surprise, I find that in the pretty dense pitch pine wood of Wheeler's blackberry-field, where there are only several white pines old enough to bear, and accordingly more than a thousand pitch pine seeds to one white pine one, yet there are countless white pines springing up under the pitch pines (as well as many oaks), and very few or scarcely any little pitch pines, and they sickly, or a thousand white pine seedlings to one pitch pine, — the same proportion reversed (in inverse proportion). It is the same in the pigeon-place lot east of this. So if you should cut these pitch pines you would have next a white pine wood with some oaks in it, the pines taking the lead. Indeed, these white pines bid fair to supplant the pitch pines at last, for they grow well and steadily. This reminds me that, though I often see little white pines under pines and under oaks, I rarely if ever (unless I am mistaken) see many young pitch pines there. How is it? Do the pitch pines require more light and air?

You may conveniently tell the age of a pine, especially

white pine, by cutting off the lowest branch that is still growing and counting its rings. Then estimate or count the rings of a pine growing near *in an opening*, of the same height as to that branch, and add the two sums together.

I found in the midst of this pitch pine wood a white oak some eight feet high and an inch and a half thick at ground, which had borne a great many — say sixty or a hundred — large oak-balls, and the ground beneath and near by was strewn with the fragments of fifty of them, which some creature, probably a squirrel, — for a bird could hardly have opened the hard nut-like kernel within, — had opened, no doubt for their living contents, and all the inside was gone. They looked like egg-shells strewn about. Opening one, I found within the hard kernel a humpbacked black fly nearly half an inch long, body and wings, with a very large or full shining black abdomen and two small black spots on each wing. The only two that I open have flies in them. Harris says that this fly is the *Cynips confluens*, and that the grub becomes a chrysalis in the autumn and not, commonly, a fly till spring, though he has known this gall-fly to come out in October. It must have been squirrels (or mice) that opened them, for birds could not break into the hard kernel.

Counted the rings of a white pine stump in Hubbard's owl wood by railroad. Ninety-four years. So this was probably second growth.

Swamps are, of course, least changed with us, — are nearest to their primitive state of any woodland. Commonly they have only been cut, not redeemed.

I see how meadows were primitively kept in the state of meadow by the aid of water, — and even fire and wind. For example, Heywood's meadow, though it may have been flowed a hundred years ago by the dam below, has been bare almost ever since in the midst of the wood. Trees have not grown over it. Maples, alders, birches, pitch and white pines are slow to spread into it. I have named them in the order of their slowness. The last are the foremost, — furthest into the meadow, — but they are sickly-looking. You may say that it takes a geological change to make a wood-lot there.

Looked at stumps in J. Hosmer's lot, hillside south of first Heywood meadow, cut eleven (?) years ago. One white pine perfect in shape, forty-one rings; two large oak stumps, each one hundred and nine rings; and a large pitch pine, probably same age. These stumps are all well preserved. The whole outline and the rings can for most part be counted; but they are successive ridges, and the bark is ready to fall off, and they are more or less mossed over with cockscomb moss. The main part of this lot north of this hole is apparently oak sprouts next railroad.

I next look through Emerson's lot (half-burned and cut last spring). The last year's growth (and present) chiefly oak, with a little pine. The stumps are chiefly oak and pitch pine, with apparently some hemlock (?) and chestnut and a little white pine. (So it seems the pitch pine and hemlock did not survive the old cutting; the pitch pine did not come up under itself.) The pitch pine stumps are all decayed but the core and the bark,

and hardly in any instance show a trace of the axe. They are low rounded mounds, yet the inmost parts are solid fat, and the bark edge is very plain. The oak stumps are very much better preserved, — have half or two thirds their form, and show that proportion of the cutting, — yet the sap-wood is often gone (with the bark), and as often the inmost heart. You can partially count rings even. Yet some of these are as decayed as the pines, and all flaky, and, turned up, look like stumps of old teeth with their prongs. They (the oaks) are all loose to the foot, yet you will see the white bark lying about a white oak stump when all the rest is about gone. Most of the old stumps, both oaks and pines, can easily be found now, but the rings of not one oak even can be wholly counted, or nearly. I could not be sure about the hemlock and chestnut, only that there was *some* of both. There was little moss on these stumps, either pine or oak; the latter too crumbly.

The southeast part of this lot, beyond the deep cove, is apparently an oak sprout-land and good part pine. I see what were sprouts from a scarlet oak stump eighteen or more inches in diameter and from white oaks one foot in diameter; yet in the other lot, though there were so many large oak stumps, I did not notice that trees had ever sprung from them. You find plenty of old oak stumps without their trees in the woods, which (if nothing else) shows that there is an end to this mode of propagation.

I could tell a white pine here when it was for the most part a mere rotten mound, by the regularity crosswise of the long knots a foot from the ground in the top of

the rotten core, representing the peculiarly regular branches of the little white pine and the best preserved as the hardest and pitchiest part.

It is apparent that fires often hasten the destruction of these stumps. They are very apt to be charred.

I dug in the hollow where an oak had been, and though it was so completely decayed that I found not a particle that looked like decayed wood or even bark and my spade met with no resistance, yet there were perfectly open channels raying out from this hollow with the pellicle of the root for a wall still, which for a hundred years the earth had learned to respect. Indeed, these stumps, both of this age and more recent, are the very metropolis of the squirrels and mice. Such are their runways.

Yet what is the character of our gratitude to these squirrels, these planters of forests? We regard them as vermin, and annually shoot and destroy them in great numbers, because — if we have any excuse — they sometimes devour a little of our Indian corn, while, perhaps, they are planting the nobler oak-corn (acorn) in its place. In various parts of the country an army of grown-up boys assembles for a squirrel hunt. They choose sides, and the side that kills the greatest number of thousands enjoys a supper at the expense of the other side, and the whole neighborhood rejoices. Would it [not] be far more civilized and humane, not to say godlike, to recognize once in the year by some significant symbolical ceremony the part which the squirrel plays, the great service it performs, in the economy of the universe?

The Walden side of Emerson's main wood-lot is oak (except a few pines in the oaks at the northwest or railroad end), and the oaks are chiefly sprouts, some thirty years old. Yet, not to mention the pitch pine stumps, there are a great many oak stumps without sprouts, and yet not larger stumps than the others. How does this happen? They are all of the same age, *i. e.* cut at the same time.

Sometimes, evidently, when you see oak stumps from which no trees have sprung in the midst of a pine or birch wood, it may be because the land was cleared and burned over and cultivated after the oaks were cut.

Oct. 23. Anthony Wright tells me that he cut a pitch pine on Damon's land between the Peter Haynes road and his old farm, about '41, in which he counted two hundred and seventeen rings, which was therefore older than Concord, and one of the primitive forest. He tells me of a noted large and so-called primitive wood, Inches Wood, between the Harvard turnpike and Stow, sometimes called Stow Woods, in Boxboro and Stow. Also speaks of the wood north of Wetherbee's mill near Annursnack and belonging to W., as large and old, if not cut.

Melvin thinks that a fox would not on an average weigh more than ten pounds. Says that he saw a flock of brant yesterday by day. (Rarely seen by day or even by night here.) He says that Hildreth collects moss (probably cladonia) from the rocks for kindling.

There is no such mortality in nobler seeds — seeds of living creatures, as eggs of birds, for instance — as I

have noticed in white oak acorns. What if the eggs of any species of bird should be addled to this extent, so that it should be hard to find a sound one? In Egypt, where they hatch eggs artificially in an oven, they can afford to return one chicken for every two eggs they receive (and do so) and yet find it profitable. It is true one third of human infants are said to die before they are five years old, but even this is a far less mortality than that of the acorns. The oak is a scarce bearer, yet it lasts a good while.

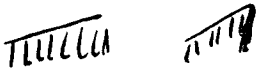
More or less rain to-day and yesterday.

Oct. 24. P. M. — To Walden Woods.

See three little checkered adders lying in the sun by a stump on the sandy slope of the Deep Cut; yet sluggish. They are seven or eight inches long. The dark blotches or checkers are not so brown as in large ones. There is a transverse dark mark on the snout  and a forked light space  on the back part [of] the head.

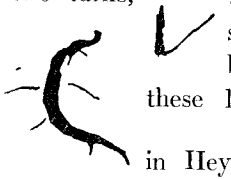
Examine again Emerson's pond lot, to learn its age by the stumps cut last spring. I judge from them that they were some five (?) years cutting over the part next the water, for I count the rings of many stumps and they vary in number from twenty-four or five to thirty, though twenty-six, seven, and eight are commonest, as near as I can count. It is hard to distinguish the very first ring, and often one or more beside before you reach the circumference. But, these being almost all sprouts, I know that they were pretty large the first year. I repeatedly see beside the new

tree (cut last spring) the now well-rotted stump from which it sprang. But I do not see the stump from which the last sprang. I should like to know how long they may continue to spring from the stump. Here are shoots of this year which have sprung vigorously from stumps cut in the spring, which had sprung in like manner some twenty-eight or thirty years ago from a stump which is still very plain by their sides. I see that some of these thirty-year trees are sprouts from a white oak stump twenty inches in diameter, — four from one in one case. Sometimes, when a white pine stump is all crumbling beside, there is a broad shingle-like flake left from the centre to the circumference, the old ridge of the stump, only a quarter of an inch thick, and this betrays the axe in a straight inclined surface.



The southeast part of Emerson's lot, next the pond, is yet more exclusively oak sprouts, or oak from oak, with fewer pine stumps. I examine an oak seedling in this. There are two very slender shoots rising ten or more inches above the ground, which, traced downward, conduct to a little stub, which I mistook for a very old root or part of a larger tree, but, digging it up, I found it to be a true seedling. This seedling had died down to the ground six years ago, and then these two slender shoots, such as you commonly see in oak woods, had started. The root was a regular seedling root (fusiform if *straightened*), at least seven eighths of an inch thick, while the largest shoot was only one eighth of an inch thick, though six years old and ten inches high.

The root was probably ten years old when the seedling first died down, and is now some sixteen years old. Yet, as I say, the oak is only ten inches high. This shows how it endures and gradually pines and dies. As you look down on it, it has two turns, and three as you look from the side, so firmly is it rooted. Any one will be surprised on digging up some of these lusty oaken carrots.



Look at stumps in Heywood's lot, southeast side pond, from Emerson's to the swimming-place. They are white pine, oak, pitch pine, etc. I count rings of three white pine (from sixty to seventy). There are a few quite large white pine stumps; on one, ninety rings. One oak gives one hundred and sixteen rings. A pitch pine some fifteen or sixteen inches over gives about one hundred and thirty-five. All these are very easy, if not easier than ever, to count. The pores of the pines are distinct ridges, and the pitch is worn off. (Many white and pitch pines elsewhere cut this year cannot be counted, they are so covered with pitch.) I remember this as a particularly dense and good-sized wood, mixed pine and oak.

Mrs. Heywood's pitch pines by the shore, judging from some cut two or three years ago, are about eighty-five years old. As far as I have noticed, the pitch pine is the slowest-growing tree (of pines and oaks) and gives the most rings in the smallest diameter.

Then there are the countless downy seeds (thistle-like) of the goldenrods, so fine that we do not

notice them in the air. They cover our clothes like dust. No wonder they spread over all fields and far into the woods.

I see those narrow pointed yellow buds now laid bare so thickly along the slender twigs of the *Salix discolor*, which is almost bare of leaves.

Oct. 25. P. M. — To Eb. Hubbard's wood and Sleepy Hollow.

See a little reddish-brown snake (bright-red beneath) in the path; probably *Coluber amœnus*.

Cut one of the largest of the lilacs at the Nutting wall, eighteen inches from the ground. It there measures one and five sixteenths inches and has twenty distinct rings from centre, then about twelve very fine, not thicker than previous three; equals thirty-two in all. It evidently dies down many times, and yet lives and sends up fresh shoots from the root.

Jarvis's hill lot is oak, pitch pine, and some white, and quite old. There are a great many little white pines springing up under it, but I see no pitch. Yet the large pitch are much more common than the large white. Nevertheless the small white have come on much faster and more densely in the hollows just outside the large wood on the south.

E. Hubbard's mound of pitch pines contains not one seed-bearing white pine, yet there are under these pines many little white pines (whose seed must have blown some distance), but scarcely one pitch pine. The latter, however, are seen along its edge and in the larger openings. So at Moore's pitch pine promontory

south of the Foley house, cut off lately by Walcott. Where the large pines had stood are no little ones, but in the open pasture northward quite a little grove, which had spread from them. Yet from a hasty look at the south end of the Sleepy Hollow Cut pitch pines, it appeared that small pitch pines were abundant under them. *Vide* again.

I have seen an abundance of white oak acorns this year, and, as far as I looked, swamp white oak acorns were pretty numerous. Red oak acorns are also pretty common. Black and scarlet oak I find also, but not very abundant. I have seen but few shrub oak, comparatively. Of the above, only the white oak have decayed so remarkably. The others are generally sound, or a few wormy. The red oak, as far as I notice, are remarkably sound. The scarlet oak I cut this afternoon are *some* of them decaying, but not like the white oak. Only the white have sprouted at all, as far as I perceive.

I find some scarlet oak acorns on the back side northeast end of Sleepy Hollow which are rounder than usual, considerably like a filbert out of the shell. They are indistinctly marked with meridional lines and thus betray a relation to the black and black shrub oak.[1]

I see an immense quantity of asparagus seed in the mist of its dead branches, on Moore's great field of it, near Hawthorne's. There must be a great many bushels of the seed, and the sight suggested how extensively the birds must spread it. I saw, accordingly, on Hawthorne's hillside, a dozen rods north of it, many plants

[1] *Vide* swamp white oak, p. [180].

(with their own seed) two or three feet high. It is planted in the remotest swamps in the town.

Saw in E. Hubbard's clintonia swamp a large spider with a great golden-colored abdomen as big as a hazelnut, on the wet leaves. There was a figure in brown lines on the back, in the form of a pagoda with its stories successively smaller. The legs were pale or whitish, with dark or brown bars.

Find many of those pale-brown roughish fungi (it looks like Loudon's plate of *Scleroderma*, perhaps *verrucosum*), two to three inches in diameter. Those which are ripe are so softened at the top as to admit the rain through the skin (as well as after it opens), and the interior is shaking like a jelly, and if you open it you see what looks like a yellowish gum or jelly amid the dark fuscous dust, but it is this water colored by the dust; yet when they are half full of water they emit dust nevertheless. They are in various states, from a firm, hard and dry unopen[ed] to a half-empty and flabby moist cup.

See the yellow butterfly still and great devil's-needles.

Dug up and brought home last night three English cherry trees from Heywood's Peak by Walden. There are a dozen or more there, and several are as handsome as any that you will find in a nursery. They remind me of some much larger which used to stand above the cliffs. This species too comes up in sprout-lands like the wild rum cherry. The amount of it is that such a tree, whose fruit is a favorite with birds, will spring up far and wide and wherever the earth is bared of trees, but since the forest overpowers and destroys

them, and also cultivation, they are only found young in sprout-lands or grown up along fences. It looks as if this species preferred a hilltop. Whether the birds are more inclined to convey the seeds there or they find the light and exposure and the soil there which they prefer. These have each one great root, somewhat like a long straight horn, making a right angle with the stem and running far off one side close to the surface.

The thistles which I now see have their heads recurved, which at least saves their down from so great a soaking. But when I pull out the down, the seed is for the most part left in the receptacle (?), in regular order there, like the pricks in a thimble. A slightly convex surface. The seeds set like cartridges in a circular cartridge-box, in hollow cylinders which look like circles *crowded* into more or less of a diamond, pentagonal, or hexagonal form. The perfectly dry and bristly involucre which hedges them round, so repulsive externally, is very neat and attractive within, — as smooth and tender toward its charge as it is rough and prickly externally toward the foes that might do it injury. It is a hedge of imbricated thin and narrow leafets of a light-brown color, beautifully glossy like silk, a most fit receptacle for the delicate downy parachutes of the seed, a cradle lined with silk or satin. The latter are kept dry under this unsuspected silky or satiny ceiling, whose old and weather-worn and rough outside alone we see, like a mossy roof, little suspecting the delicate and glossy lining. I know of no object more unsightly to a careless glance than an empty thistle-head, yet, if you examine it closely, it may remind you of the silk-lined cradle in which a prince was rocked. Thus that which seemed a mere brown and worn-out relic of the summer, sinking into the earth by the roadside, turns out to be a precious casket.

I notice in the pitch pine wood behind Moore's the common pinweed (*Lechea major* or the next) growing on the top of a pitch pine stump which is yet quite in shape and firm, one foot from the ground, with its roots firmly set in it, reaching an inch or two deep. Probably the seed was blown there, perhaps over the snow when it was on a level with the stump.

Oct. 26. P. M. — To Baker's old chestnut lot near Flint's Pond.

As I go through what was formerly the dense pitch pine lot on Thrush Alley (G. Hubbard's), I observe that the present growth is scrub oak, birch, oaks of various kinds, white pines, pitch pines, willows, and poplars. Apparently, the birch, oaks, and pitch pines are the oldest of the *trees*. From the number of small white pines in the neighboring pitch pine wood, I should have expected to find larger and also more white pines here. It will finally become a mixed wood of oak and white and pitch pine. There is much cladonia in the lot.

Observed yesterday that the row of white pines set along the fence on the west side of Sleepy Hollow had grown very fast, apparently from about the time they were set out, or the last three years. Several had made about seven feet within the three years. Do they not

grow the fastest at just this age, or after they get to be about five feet high?

I see to-day sprouts from chestnut stumps which are two and a half feet in diameter (*i. e.* the stumps). One of these large stumps is cut quite low and hollowing, so as to hold water as well as leaves, and the leaves prevent the water from drying up. It is evident that in such a case the stump rots sooner than if high and roof-like.

I remember that there were a great many hickories with R. W. E.'s pitch pines when I lived there, but now there are but few comparatively, and they appear to have died down several times and come up again from the root. I suppose it is mainly on account of frosts, though perhaps the fires have done part of it. Are not hickories most commonly found on hills? There are a few hickories in the open land which I once cultivated there, and these may have been planted there by birds or squirrels. It must be more than thirty-five years since there was wood there.

I find little white pines under the pitch pines (of E.), near the pond end, and few or no little pitch pines, but between here and the road about as many of one as of the other, but the old pines are much less dense that way, or not dense at all.

This is the season of the fall when the leaves are whirled through the air like flocks of birds, the season of birch spangles, when you see afar a few clear-yellow leaves left on the tops of the birches.

It was a mistake for Britton to treat that Fox Hollow lot as he did. I remember a large old pine and chestnut

wood there some twenty years ago. He came and cut it off and burned it over, and ever since it has been good for nothing. I mean that acre at the bottom of the hollow. It is now one of those frosty hollows so common in Walden Woods, where little grows, sheep's fescue grass, sweet-fern, hazelnut bushes, and oak scrubs whose dead tops are two or three feet high, while the still living shoots are not more than half as high at their base. They have lingered so long and died down annually. At length I see a few birches and pines creeping into it, which at this rate in the course of a dozen years more will *suggest* a forest there. Was this wise?

Examined the stumps in the Baker chestnut lot which was cut when I surveyed it in the spring of '52. They were when cut commonly from fifty to sixty years old (some older, some younger). The sprouts from them are from three to six inches thick, and may average — the largest — four inches, and eighteen feet high. The wood is perhaps near half oak sprouts, and these are one and a half to four inches thick, or average two and a half, and not so high as the chestnut. Some of the largest chestnut stumps have sent up no sprout, yet others equally large and very much more decayed have sent up sprouts. Can this be owing to the different time when they were cut? The cutting was after April. The largest sprouts I chanced to notice were from a small stump in low ground. Some hemlock stumps there had a hundred rings.

Was overtaken by a sudden thunder-shower.

Cut a chestnut sprout two years old. It grew about

five and a half feet the first year and three and a half the next, and was an inch in diameter. The tops of these sprouts, the last few inches, had died in the winter, so that a side bud continued them, and this made a slight curve in the sprout, thus:  There was on a cross-section, of course, but one ring of pores within the wood, just outside the large pith, the diameter of the first year's growth being just half an inch, radius a fourth of an inch. The thickness of the second year's growth was the same, or one fourth, but it was distinctly marked to the naked eye with about seven concentric lighter lines, which, I suppose, marked so many successive growths or waves of growth, or seasons in its year. These were not visible through a microscope of considerable power, but best to the naked eye. Probably you could tell a seedling chestnut from a vigorous sprout, however old or large, provided the heart were perfectly sound to the pith, by the much more rapid growth of the last the first half-dozen years of its existence.

There are scarcely any chestnuts this year near Britton's, but I find as many as usual east of Flint's Pond.

Oct. 27. Emerson planted his lot with acorns (chiefly white oak) pretty generally the other day. There were a few scarlet oak acorns planted there on the south side in spring of '59. There is on the Lee farm, west of hill, a small wood-lot of oak and hickory, the south end chiefly hickory.

I have come out this afternoon to get ten seedling oaks out of a purely oak wood, and as many out of a purely pine wood, and then compare them. I look for trees one foot or less in height, and convenient to dig up. I could not find one in the last-named wood. I then searched in the large Woodis Park, the most oaken parts of it, wood some twenty-five or thirty years old, but I found only three. There were many shrub oaks and others three or four feet high, but no more of the kind described. Two of these three had singularly old large and irregular roots, mere gnarled oblong knobs, as it were, with slender shoots, having died down many times. After searching here more than half an hour I went into the new pitch and white pine lot just southwest, toward the old Lee cellar, and there were thousands of the seedling oaks only a foot high and less, quite reddening the ground now in some places, and these had perfectly good roots, though not so large as those near the Corner Spring (next to Rice's wall).

Here is a new but quite open pitch and white pine wood (with birches on south) on cladonia ground. It is so open that many pitch pines are springing up.

E. Wood's dense pitch (and white) pine wood in front of Lee house site conforms to the rule of few or no little pitch pines within it, but many white pines (though not many far within), while the pitch pines are springing up with white pines on the edge and even further toward the road.

The white pine wood southeast of this and not far north of railroad, against Wood's open land, is a *new* wood.

As I am coming out of this, looking for seedling oaks, I see a jay, which was screaming at me, fly to a white oak eight or ten rods from the wood in the pasture and directly alight on the ground, pick up an acorn, and fly back into the woods with it. This was one, perhaps the most effectual, way in which this wood was stocked with the numerous little oaks which I saw under that dense white pine grove. Where will you look for a jay sooner than in a dense pine thicket? It is there they commonly live, and build.

By looking to see what oaks grow in the open land near by or along the edge where the wood is extensively pine, I can tell surely what kinds of oaks I shall find under the pines.

What if the oaks are far off? Think how quickly a jay can come and go, and how many times in a day![1]

Swamp white oak acorns are pretty thick on the ground by the bridge, and all sound that I try. They have no more bitterness than the white oak acorns.

I have now examined many dense pine woods, both pitch and white, and several oak woods, in order to see how many and what kind of oak seedlings there were springing up in them, and I do not hesitate to say that seedlings under one foot high are *very* much more abundant under the pines than under the oaks. They prevail and are countless under the pines, while they are hard to find under the oaks, and what you do find have commonly — for whatever reason — very old and decayed roots and feeble shoots from them.

If you expect oaks to succeed a dense and purely oak

[1] *Vide* [p. 188].

wood you must depend almost entirely on sprouts, but they will succeed abundantly to pine where there is not an oak stump for them to sprout from. Notwithstanding that the acorns are produced only by oaks and not by pines, the fact is that there are comparatively few seedling oaks a foot or less in height under the oaks but thousands under the pines. I would not undertake to get a hundred oaks of this size suitable to transplant under a dense and pure oak wood, but I could easily get thousands from under pines. What are the reasons for this? First it is certain that, generally speaking, the soil under old oaks is more exhausted for oaks than under old pines. Second, seedling oaks under oaks would be less protected from frosts in the spring just after leafing, yet the sprouts prevail. Third, squirrels and jays resort to evergreens with their forage, and the oaks may not bear so many acorns but that the squirrels may carry off nearly all the sound ones. These are some of the reasons that occur to me.

To be more minute:—

I dug up three oak seedlings in the Woodis Park oaks, nine in the small open pitch and white pine and adjoining on southwest, and ten in the pitch and white pine of wood between road and railroad.

Woodis Park is oak and pine some twenty-five years old (the oak). I chose the oaken parts, but there was always a pine within a rod or two. I looked here till I was discouraged, finding only three in three quarters of an hour. One was like those in pine woods; the other two had singular gnarled and twisted great roots. You would think you had come upon a dead but buried

stump. The largest, for instance, was perhaps a red oak nine inches high by one eighth inch at ground and apparently three years old, a slender shoot. The root broke off at about eighteen inches depth, where it was one eighth inch thick, and at three inches below the surface it was one and three eighths inches thick by one inch (being flattish). Two or three of the side or horizontal fibres had developed into stout roots which ran quite horizontally twenty inches and then broke off, and were apparently as long as the tap-root. One of these at three inches below surface was about half an inch thick and perfectly horizontal. It was thus fixed very firmly in the ground. I counted the dead bases or stubs of shoots (beside the present one) and several two or three times as large as this, which had formerly died down, being now perfectly decayed. If there was but one at a time and they decayed successively after living each three years only, — and they probably lived twice as long, — then the root would be thirty years old. But supposing there were one and a half shoots at a time, it would then be some twenty years old. I think that this root may be as old as the large oaks around, or some twenty-five years, more or less.

My next nine oaks, from the pines southwest, may be put with the ten from the E. Wood pines (leaving out one which was twice the required height). Their average age, *i. e.* of the present shoot, was four years, and average height seven inches. (This includes white oak, shrub oak, black, and apparently red oak.) The roots averaged about ten inches long by three eighths thick at thickest part. Quite a number were shrub oak,

which partly accounts for their slenderness. But the rest were not so thick as those near Rice's wall. Of all the above roots, or the whole twenty-two, none ran directly and perpendicularly downward, but they turned to one side (just under the acorn) and ran more or less horizontally or aslant one to five inches, or say three inches on an average.

Of the last nineteen, more than half had died down once at least, so that they were really considerably older than at first appeared. There are, in all cases, at the surface of the ground or head of the root, a ring of dormant buds, ready to shoot up when an injury happens to the original shoot. One shoot at least had been cut off, and so killed, by a rabbit.

See a very large flock of crows.

To speak from recollection of pines and oaks, I should say that our woods were chiefly pine and oak mixed, but we have also (to speak of the large growth, or trees) pure pine and pure oak woods. How are these three produced? Are not the pure pine woods commonly new woods, *i. e.* pioneers? After oaks have once got established, it must be hard to get them out without clearing the land. A pure oak wood may be obtained by cutting off at once and clean a pure and dense pine wood, and again sometimes by cutting the same oak wood. But pines are continually stealing into oaks, and oaks into pines, where respectively they are not too dense, as where they are burned or otherwise thinned, and so mixed woods may arise.

Oct. 28. In a pine wood are the little oak seedlings

which I have described, also, in the more open parts, little oaks three to six feet high, but unnoticed, and perhaps some other hardwood trees. The pines are cut, and the oaks, etc., soon fill the space, for there is nothing else ready to grow there.

Are not the most exclusively pine woods new woods, *i. e.*, those which have recently sprung up in open land, where oaks do not begin a forest? It may be that where evergreens most prevail in *our* woods, there at the date of their springing up the earth was most bare.

P. M. — To Lincoln.

Do I not see tree sparrows?

I see little larches two to six feet high in the meadow on the north side the Turnpike, six to twelve rods from Everett's seed-bearing ones. The seed was evidently blown from these.

There is quite a dense birch wood in the field north of the Cut on the Turnpike hill.

See much cat-tail whose down has recently burst and shows white on the south side of the heads. The *Polygonum aviculare* is in bloom as freshly and abundantly in some places as ever I saw it. Those great tufts of sedge in the meadows are quite brown and withered. I suppose they have been so since the beginning of the month.

Smith's black walnuts are about half of them fallen.

Measure the chestnut stump near the brook northeast of the old Brooks Tavern on Asa White's land. Its height from the ground will average but twenty inches. Measured one way, its diameter is six feet nine inches, and at right angles with this, eight feet five inches. Its

average diameter seven feet seven inches. You might add three to four feet more for the whole stump above ground. Beginning at the outside, I count one hundred and two rings distinctly and am then fifteen inches from the apparent centre of the tree, for the middle is mostly rotted and gone. Measuring back fifteen inches and counting the rings, I get thirty-nine, which, added to one hundred and two, equals one hundred and forty-one for the probable age of the tree. This tree had grown very fast till the last fifty years of its existence, but since comparatively slowly. It had grown nine inches in the last forty-nine years, or one seventh [*sic*] of an inch in a year, but fifteen inches in the previous forty, or three eighths of an inch in a year. There may possibly have been two shoots or trees grown together, yet I think not. I measured this June 1st, 1852, and it had then been cut, as I remember, but a short time, — a winter, perhaps two winters, before. This would carry its origin back to about 1710. Probably chestnuts did not grow so large in the primitive woods, and this was a forest tree, which, as it stood near the edge of the meadow, was left standing. Another much smaller was cut apparently at the same time near by. Having light and air and room, it grew larger than it would have done if its neighbors had not been cut.

I also measured the stumps of the two great chestnuts which were cut on Weston's land south of the pond some five or six years ago.

They are cut low, some eight or nine inches above ground. The southeasternmost one measures four feet in diameter and has about eighty rings only (I estimate

the first five or six, the heart or core being gone). The other is four and five twelfths feet in diameter and has seventy-three rings only. Or, putting both together, you have an average growth of about a third of an inch in a year. These were as large as any I know standing hereabouts except the Strawberry Hill one, and yet it seems they [were] only some eighty years old. Another, half a mile east of there, cut perhaps some dozen years ago, was twenty-three inches in diameter and had sixty-three rings, and I saw one which had grown faster than any of the above. Yet another stump near the last on the high woodland near the pond was but just two feet in diameter and had one hundred and one rings distinct to the very core, and so fine there I think it was a seedling. From this sprouts had grown some fifteen years ago and [had been] cut last winter on account of a fire, and fresh shoots several feet high had put out from the last. The one that had grown slowly was soundest at the core. None of the three largest stumps described had sprouts from them. Is not the very rapid growth and the hollow or rotten core one sign of a sprout? We make a great noise going through the fallen leaves in the woods and wood-paths now, so that we cannot hear other sounds, as of birds or other people. It reminds me of the tumult of the waves dashing against each other or your boat. This is the dash we hear as we sail the woods.

Cut a limb of a cedar (near the Irishman's shanty-site at Flint's Pond) some two inches thick and three and a half feet from the ground. It had about forty-one rings. Adding ten, you have say fifty years for the age of the tree. It was one foot in diameter at one foot above ground and twenty or more feet high, standing in the young wood. A little cedar five feet high near it had some fifteen to seventeen rings. See a great many chestnut sprouts full six feet high and more and an inch or more thick the first year.

Aaron's-rod has minute chaffy seeds, now ripe, which by their very lightness could be blown along the highways.

Oct. 29. P. M. — To Eb. Hubbard's old black birch hill.

Henry Shattuck's is a *new* pitch pine wood, say thirty years old. The western, or greater, part contains not a single seed-bearing white pine. It is a remarkable proof of my theory, for it contains thousands of little white pines but scarcely one little pitch pine. It is also well stocked with minute oak seedlings. It is a dense wood, say a dozen rods wide by three or four times as long, running east and west, with an oak wood on the north, from which the squirrels brought the acorns. A strip of nearly the same width of the pitch pine was cut apparently within a year on the south (a part of the above), and has just been harrowed and sown with rye, and still it is all dotted over with the little oak seedlings between the [stumps], which are perhaps unnoticed by Shattuck, but if he would keep his plow and fire out he would still have a pretty green patch there by next fall. A thousand little red flags (changed oak leaves) already wave over the green rye amid the stumps. The farmer stumbles over these in his walk, and sweats while he endeavors to clear the land of them, and yet wonders

how oaks ever succeed to pines, as if he did not consider what *these* are. Where these pines are dense they are slender and tall. On the edge or in open land they are more stout and spreading.

Again, as day before yesterday, sitting on the edge of a pine wood, I see a jay fly to a white oak half a dozen rods off in the pasture, and, gathering an acorn from the ground, hammer away at it under its foot on a limb of the oak, with an awkward and rapid seesaw or teetering motion, it has to lift its head so high to acquire the requisite momentum. The jays scold about almost every white oak tree, since we hinder their coming to it.

At some of the white oaks visited on the 11th, where the acorns were so thick on the ground and trees, I now find them perhaps nearly half picked up, yet perhaps little more than two thirds spoiled. The good appear to be all sprouted now. There are certainly many more sound ones here than at Beck Stow's and Hubbard's Grove, and it looks as if the injury had been done by frost, but perhaps some of it was done by the very heavy rains of September alone.

Yesterday and to-day I have walked rapidly through extensive chestnut woods without seeing what I thought was a seedling chestnut, yet I can soon find them in our Concord pines a quarter or half a mile from the chestnut woods. Several have expressed their surprise to me that they cannot find a seedling chestnut to transplant. I think that [it] is with them precisely as with the oaks; not only a seedling is more difficult to distinguish in a chestnut wood, but it is really far more rare there than in the adjacent pine, mixed, and oak woods. After considerable experience in searching for these and seedling oaks, I have learned to neglect the chestnut and oak woods and go only to the neighboring woods of a different species for them. Only that course will pay.

On the side of E. Hubbard's hill I see an old chestnut stump some two feet in diameter and nearly two feet high, and its outside and form well kept, yet all the inside gone; and from this shot up four sprouts in a square around it, which were cut down seven or eight years ago. Their rings number forty-six, and they are quite sound, so that the old stump was cut some fifty-three years ago. This is the oldest stump of whose age I am certain. Hence I have no doubt that there are many stumps left in this town which were cut in the last century. I am surprised to find on this hill (cut some seven or eight years ago) many remarkably old stumps wonderfully preserved, especially on the north side the hill, — walnuts, white oak and other oaks, and black birch. One white oak is eighteen and a half inches in diameter and has one hundred and forty-three rings. This is very one-sided in its growth, the centre being just four inches from the north side, or thirty-six rings to an inch. Of course I counted the other side. Another, close by, gave one hundred and forty-one rings, another white oak fifteen and a half inches in diameter had one hundred and fifty-five rings. It has so smooth (sawed off) and solid, almost a polished or marble-like, surface that I could not at first tell what kind of wood it was.[1] Another white oak the same as last in rings, *i. e.* one hundred and fifty-five, twenty-four inches [in]

[1] Was it not a walnut?

diameter. All these were sound to the very core, so that I could see the first circles, and I suspect that they were seedlings.

The smaller, but oldest ones had grown very slowly at first, and yet more slowly at last, but after some sixty-five years they had then grown much faster for about fifteen years, and then grew slower and slower to the last. The rings were exceedingly close together near the outside, yet not proportionably difficult to count. For aught that appeared, they might have continued to grow a century longer. The stumps are far apart, so that this formed an open grove, and that probably made the wood sounder and more durable. On the south slope many white pines had been cut about forty-six years ago, or when the chestnut was, amid the oaks. I suppose that these were seedlings, and perhaps the hill was cleared soon after the settlement of the town, and after a while pines sprang up in the open land, and seedling oaks under the pines, and, the latter being cut near the end of the seventeenth century, those oaks sprang up, with or without pines, but all but these were cut down when they were about sixty years old.

If these are seedlings, then seedlings make much the best timber. I should say that the pasture oaks *generally* must be seedlings on account of their age, being part of the primitive wood.

I suspect that sprouts, like the chestnut, for example, may grow very rapidly, and make large trees in comparatively few years, but they will be decaying [?] as fast at the core as they are growing at the circumference. The stumps of chestnuts, especially sprouts, are very

shaky. It is with men as with trees; you must grow slowly to last long. The oldest of these oaks began their existence about 1697.

I doubt if there were any as old trees in our primitive wood as stood in this town fifty years ago. The healthiest of the primitive wood, having at length more room, light, and air, probably grew larger than its ancestors.

Some of the black birch stumps gave about one hundred rings.

The pasture oak which Sted Buttrick cut some seven or eight years ago, northeast of this, was, as near as I could tell, — one third was calculation, — some one hundred years old only, though larger than any of these.

The fine chips which are left on the centre of a large stump preserve it moist there, and rapidly hasten its decay.

The site of the last-named pasture oak was easily discovered, by a very large open grass-sward where no sweet-fern, lambkill, huckleberry, and brakes grew, as they did almost everywhere else. This may be because of the cattle assembling under the oak, and so killing the bushes and at the same time manuring the ground for grass.

There is more chestnut in the northern part of the town than I was aware of. The first large wood north of Ponkawtasset is oak and chestnut. East of my house.

Oct. 30. P. M. — To Tarbell pitch pines, etc.

Quite a sultry, cloudy afternoon, — hot walking in woods and lowland where there is no air.

J. Hosmer cut off the northernmost part of his

pitch pine between roads, *i. e.* next the factory road, last winter. Here was a remarkable example of little white pines under pitch pines with scarcely any little pitch pines. He has accordingly cut off all the pitch pines — and they are some thirty-five years old — and left the white pines, now on an average five to eight feet high and forming already a pretty dense wood (E. Wood is doing the same thing now opposite the Colburn place), a valuable and salable woodland, while a great many little oaks, birches, black cherries, etc., are springing up in their midst; so that it may finally be a mixed wood, if the pines do not overshadow it too quickly. Yet there were only three or four seed-bearing white pines in the grove, — or as big as the pitch pines were. The white pines left are as thick as the pitch pines were under which they sprang up; quite dense enough to grow. I am more and more struck by the commonness of this phenomenon of seedling white pines under older pitch pines and the rareness with which pitch pines spring up under older pitch pines. Yet, going to the open land on east side of the wood, I find that it is mainly the little pitch pines that are spreading into the field there and extending the wood, some a dozen rods from its edge in the grass; and their relative proportion is reversed, *i. e.*, there are fifty to one hundred little pitch pines here to one white pine. He had also cut off some, a few, birches, and their sprouts had come up, as well as seedlings.

The oak seedlings between the young pitch pines were manifestly springing up with new vigor, though many may finally be choked by the white pines. Omitting such as were of the character of sprouts, though not cut (*i. e.*, had shot up from old roots to three feet high merely on account of the influx of light and air), I measured this year's growth of the first four which were under a foot high, here where the pitch pines had been cut, and found it to average five and a half inches. The growth of [the] first four in the adjacent pitch pine wood not cut averaged seven and a half. As may be seen, this was not nearly fair enough to the partially cleared part, for I should have included the higher shoots.

The higher parts of this lot are cladonia land. I measured the diameter of several of the pitch pine stumps and counted the rings, with this result: —

Diameter (exclusive of bark)	Rings
$7\frac{1}{4}$ inches	29
$7\frac{1}{2}$	33
6	40
$6\frac{1}{2}$	33
6	40
$8\frac{1}{2}$	35
7	30
$7)48\frac{3}{4}$	7)240
7	34

That is, they averaged seven inches in diameter (or eight with bark) and were thirty-four years old. Had grown (68)7.0(.10) about one tenth of an inch a year from the centre.

White pines will find their way up between pitch pines if they are not very large and exceedingly dense, but pitch pines will not grow up under pitch pines.

I see nowadays in the pitch pine woods countless

white toadstools which have recently been devoured and broken in pieces and left on the ground and occasionally on the branches or forks of trees, no doubt by the squirrels. They appear to make a considerable part of their food at this season.

See a small copper butterfly.

In what I have called the Loring lot, next west of Hosmer's pitch pine on the back road, though far the greater part numerically is still shrub oak, there is now a considerable growth of young oaks rising above the shrub oaks. These oaks, as far as I observe, are almost, if not quite, all sprouts from small stumps which were unnoticed at first, and there are also a very few seedling white and other oaks no higher than the shrub oaks; *i. e.*, though you may think his oak sprout-land all shrub oak, it probably is not, as will appear when the other kinds rise above the shrubs. Probably the shrub oaks can bear exposure when young better than the nobler oaks, and if the squirrels plant other acorns under them, — which may be doubted, — then it will turn out that they serve as nurses to the others.

I measure amid these young oaks a white pine stump.

Diameter (exclusive of bark)	Rings
13½ inches	35
Another 28	52
24	46
3)65½	133
22	44

Average growth one half inch a year at the level at which stumps are sawed.

This lot is now as exclusively oak as it was pines

before. You must search to find a few little white pines scattered in it. But why, if there are so many little white pines under the adjacent pitch pines, which are left when the pitch pines are cut, were there no more to be left under the pitch pine part (along the road) of this lot? I think of no reason, unless the pitch pines on this lot were too old and dense. Again, I notice that Hosmer's pitch pines have not spread west at all into this clearing, but only east into the grass ground.

Into this Loring lot years ago the squirrels brought acorns, and hence the oaks which now cover it. Also the wind blew its own seeds into an open strip across the road, and a dense pitch and white pine wood sprang up there. Already, the Loring lot having been cut seven or eight years, the squirrels are carrying the shrub oak acorns from it into that pine strip, and the pine seed from the most forward of that strip is blowing back into the shrub oak land.

Another advantage the shrub oak has over other oaks [is] that it gets to fruit so quickly — certainly in three or four years after the pines are cut — and then bears so profusely.

See a great flock of blackbirds, probably grackles.

Examine Tarbell's pitch pine grove. This is all of one age and very dense. The largest trees on the north side, as estimated by sawing a branch, are twenty-eight to thirty years old. Tarbell says this grove came up in 1826 on land which had been burnt over, — in fact open land. It is so dense that, though it has been thoroughly trimmed up and is only a dozen or fifteen rods wide, you cannot see through it in some directions.

About as dense a pitch pine grove as I know. It is twenty rods from the nearest wood on one side and five times as far from any other, and yet it is well planted with seedling oaks. Looking hastily to where they are most numerous, I counted ten within fifteen square feet, but only five pitch pines within any equal area; *i. e.* there were twice as many oaks as large pines there.

This wood also proves my theory of little white pines in large pitch pines. There is not a seed-bearing white pine, or one six feet high, in the wood, nor less than twenty rods from it, and yet there is a thriving little white pine some two feet high at every rod or two within this wood, and though not *very* numerous, they are conspicuously more numerous and thriving than the pitch pines, yet on the edge the little pitch pines were as much more numerous than the white.

Having seen this fall a great many pitch pine twigs which had been cut off and dropped under the trees by squirrels, I tried the other night while in bed to account for it. I began by referring it to their necessities, and, remembering my own experience, I said then it was done either for food, shelter, clothing, or fuel, but throwing out the last two, which they do not use, it was either for food or shelter. But I never see these twigs used in their nests. Hence I presume it was for food, and as all that I know them to eat on the pitch pine is its seeds, my swift conclusion was that they cut off these twigs in order to come at the cones and also to make them more portable. I am to-day convinced of this, — for I have been looking after it for a day or two. As usual, the ground under this grove is quite strewn

with the twigs, but here is one eleven inches long and nearly half an inch thick cut off close below two closed cones, one cone-stem also being partly cut. Also, three or four rods west from this grove, in open land, I see three twigs which have been dropped close together. One is just two feet long and cut off where half an inch thick and more than one foot below three cones (two on one branch and one on another), and the cones are left. Another is still larger, and the other smaller, but their cones are gone. The greater part of the twigs have been cut off above the cones, — mere plumes.

So even the squirrels carry and spread the pine seed far over the fields. I suspect that they bury these cones like nuts. I have seen the cones collected ready to be carried off, where they did not live. It is remarkable to consider how rudely they strip and spoil the trees. It is remarkable how they carried some of these great twigs with their burden of cones.[1]

The fact that the lower limbs of pines growing within a wood always die shows how much they depend on light and air. They are only a green spiring top.

Measure one of Tarbell's black birch stumps: 23 inches [in] diameter (exclusive of bark), 60 rings. A log from a different one: 21 inches, 71 (?) rings. A white oak stump near by: 15 inches, 90 rings (on brow of bank). A black (?) oak stump: 32 inches [in] diameter, 84 rings.

Examine a dozen white pines in a field, and conclude from these that they begin to grow faster the fifth or sixth year, counting by the whorls of branches.

[1] *Vide* Hosmer's gray squirrel.

J. Hosmer cut off his little pitch pine grove west of Clamshell, and left the single large old pine which seeded it to do him the same service again; and here now, where for the second time (since) he has sown winter-rye, I see the ineffectual oak sprouts uplifting a few colored leaves still and blushing for him.

The squirrels have no notion of starving in a hard winter, and therefore they are unceasingly employed in the fall in foraging. Every thick wood, especially evergreens, is their storehouse against necessity, and they pack it as thickly as they can with nuts and seeds of all kinds. The squirrel which you see at this season running so glibly along the fence with his tail waving over his head, with frequent pauses on a post or stone, which you watch, perhaps, for twenty or thirty rods, has probably a nut or two in his mouth which he is conveying to yonder thicket.

Evidently a great deal depends on the locality and other conditions of a stump to affect its durability. The oak stump at Clamshell cut some twenty years since barely shows a trace of the axe, while the chestnut stump on Hubbard's hill, cut more than fifty years ago, is much better preserved.

Oct. 31. P. M. — To Wheeler's artificial pine wood.

Exclusive and dense white pine woods are not nearly so common in this town as the same kind of pitch pine woods. They are more likely to have oaks in them. There is a dense birch wood in Witherell Vale.

Among old stumps I have not named those white pine ones used as fences with their roots. I think that some

of these must be older than any left in the ground. I remember some on the Corner road, which apparently have not changed for more than thirty years, and are said to be ninety years old. Lying thus high and dry, they are almost indestructible, and I can still easily count the rings of many of these. I count one hundred and twenty-six rings on one this afternoon, and who knows but it is a hundred years since it was cut? They decay much faster left upright in the ground than lying on their sides on the surface, supposing it open land in both cases.

Perhaps these great pine roots which grew in a swamp were provided with some peculiar quality by which to resist the influence of moisture and so endure the changes of the weather.

Yes, these dense and stretching oak forests, whose withered leaves now redden and rustle on the hills for many a New England mile, were all planted by the labor of animals. For after some weeks of close scrutiny I cannot avoid the conclusion that our modern oak woods sooner or later spring up from an acorn, not where it has fallen from its tree, for that is the exception, but where it has been dropped or placed by an animal. Consider what a vast work these forest-planters are doing!

I do not state the facts exactly in the order in which they were observed, but select out of very numerous observations extended over a series of years the most important ones, and describe them in their natural order.[1]

[1] [Evidently written for his lecture on the Succession of Forest Trees.]

So far as our noblest hardwood forests are concerned, the animals, especially squirrels and jays, are our greatest and almost only benefactors. It is to them that we owe this gift. It is not in vain that the squirrels live in or about every forest tree, or hollow log, and every wall and heap of stones.

Looked at the white pine grove set out by the father of Francis Wheeler some twenty-two or three years ago southwest of his house. They are in three or four irregular rows some eighteen rods long by four wide, — some one hundred trees, covering half an acre of sandy hillside. Probably not so many trees as Emerson's, but making more show. They are trimmed up. There are neither small white nor pitch pines beneath them, but I see that the seeds of the pitch pines which grow below them have been blown *through* this grove and come up thickly along its outer edge.

Look at a pure strip of old white pine wood on the hillside west of this. There are no little white pines coming up under them, but plenty of them in the open hollows around and under its edge. This I commonly notice. White pines, it is true, may come up in the more open parts of any wood, whether a pine or oak or mixed wood, in more open places caused by cutting, for instance; but the pitch pine requires much more of an opening.

I see by the road east of White Pond a large white pine wood with some oaks in it. There are no little white pines where it is dense, but one rod off across the road eastward there is a dense row concealing the lower rail (many quite under it) for many rods, — the only place where they are allowed to grow there.

Many a man's field has a dense border of pitch pines which strayed into it when the adjacent woods were of that species, though they are now hardwood.

Consider what a demand for arrowheads there must be, that the surface of the earth should be thus sprinkled with them, — the arrowhead and all the disposition it implies toward both man and brute. There they lie, pointed still, making part of the sands of almost every field.

I cut two shrub oaks (in different places) which have respectively ten and twenty rings. The last was a large and old one in a hedge.[1]

I first noticed the pitch pine twigs cut off by squirrels the 16th. Think how busy they were about that time in every pitch pine grove all over the State, cutting off the twigs and collecting the cones! While the farmer is digging his potatoes and gathering his corn he little thinks of this harvest of pine cones which the squirrel is gathering in the neighboring woods still more sedulously than himself.

I saw on the 28th, close by the stump of the easternmost big chestnut at Flint's Pond, the *Phallus impudicus*.

I hear the sound of the flail in M. Miles's barn, and gradually draw near to it from the woods, thinking many things. I find that the thresher is a Haynes of Sudbury, and he complains of the hard work and a lame back. Indeed, he cannot stand up straight. So all is not gold that glitters. This sound is not so musical after I have withdrawn. It was as well to have heard this music afar off. He complains also that the weather is not fit for his

[1] *Vide* [p. 208].

work, — that it is so muggy that he cannot dry the sheaves, and the grain will not fly out when struck. The floor, too, is uneven, and he pointed out one board more prominent on which he had broken two or three swingles.

He thought that there were larger trees in Sudbury, on what was John Hunt's land, now occupied by Thompson, near the old store, than in Inches Woods. Said there was a tree by the roadside on the farm of the late William Read in West Acton which nobody thereabouts knew the name of, but he had been South, and knew it to be a China-berry tree planted by a robin, for they are very fond of its fruit.