continues the growth in spring. In ordinary trees, in which there is provision made for the formation of numerous lateral buds, any injury done to a few branches is easily repaired ; but in palms, which only form terminal buds, and have no provision for a lateral formation of them, an injury inflicted on the terminal bud is more likely to have a prejudicial effect on the future plant. In the trees of temperate and cold climates the buds which are developed during one season lie dormant during the winter, ready to burst out under the genial warmth of spring. They are generally protected by ex­ternal modified leaves in the form of *scales,* which frequently exhibit a firmer and coarser texture than the leaves themselves. They serve a temporary purpose, and usually fall off sooner or later, after the leaves are expanded. The bud is often pro­tected by a coating of resinous matter, as in the horse-chestnut and balsam poplar, or by a thick downy covering, as in the willow. Linnaeus called leaf-buds *hibernacula,* or the *winter quarters* of the young branch. In some plants, as in the plane, the buds destined to live through the winter are so completely surrounded by the base of the petiole as not to be visible until the leaf has fallen **off.** These are said to be *intrapetiolar.*

In the bud of a common tree, as the sycamore (fig. 5), there is seen the cicatrix or scar left by the leaf of the previous year *c,* then the scales *e, e,* arranged in alternate pairs and overlying each other in what is called an *imbricated* manner. On making a transverse section of the bud (fig. 6), the overlying scales *e, e, e, e,* are distinctly seen surrounding the leaves *f*, which are plaited or folded round the axis or growing-point. In plants of warm climates the buds are often formed by the ordinary leaves without any protecting append­ages; such buds are called *naked.* A bud may be removed in a young state from one plant and grafted upon another by the process of *budding,* so as to continue to form its different parts; and it may even be made to grow in the soil, in some instances, immediately after removal. In some trees of warm climates, as papawtree, palms and tree-ferns, growth by terminal buds is well seen. In these plants the elongation of the stem is generally regular and uniform, so that the age of the plant may be estimated by its height; as there is no great increase in the leaf area owing to absence of branching, there is no need for a great increase in the diameter of the stem.

Although provision is made for the regular formation of buds, there are often great irregularities in consequence of many being abortive or remaining in a dormant state. Such buds are called *latent,* and are capable of being developed in cases where the terminal bud, or any of the branches, have been injured or destroyed. In some instances, as in firs, the latent buds follow a regular system of alternation; and in plants with opposite leaves it frequently happens that the bud in the axil of one of the leaves only is developed, and the different buds so produced are situated alternately on opposite sides of the stem. Occasionally, after a partial develop­ment as branches, buds are arrested and form knots or nodules. The so-called embryo buds or woody nodules in the bark of the beech, elm, olive and other trees are of this nature. They are partially developed buds, in which the woody matter is pressed upon by the surrounding tissue, and thus acquires a very hard and firm texture. When a section is made, they present woody circles arranged around a central pith, and traversed by medullary rays. The nodules sometimes form *knots* on the surface of the stem, at other times they appear as large *excrescences,* and in some cases twigs and leaves are produced by them.

When the terminal bud is injured or arrested in its growth the elongation of the main axis stops, and the lateral branches often acquire increased activity. By continually cutting off the terminal buds a woody plant is made to assume a bushy appearance, and thus *pollard* trees are produced. Pruning has the effect of checking the growth of terminal shoots, and of causing lateral ones to push forth. The peculiar bird-nest appearance often presented by the branches of the common birch depends on an arrestment in the terminal buds, a shortening of the internodes, and a consequent clustering or fasciculation of the twigs. In some plants there is a natural arrestment of the main axis after a certain time, giving rise to peculiar shortened stems. Thus the crown of the root is a stem of this nature, forming buds and roots. Such is also the case in the stem of cyclamen, *Testudinaria,* and in the tuber of the potato. The production of lateral in place of terminal buds sometimes gives the stem a remarkable zigzag aspect.

The mode in which branches come off from the stems gives rise to various forms of trees, as pyramidal, spreading or weeping—the angles being more or less acute or obtuse. In the Italian poplar and cypress the branches are erect, forming acute angles with the upper part of the stem; in the oak and cedar they are spreading or patent, forming nearly a right angle ; in the weeping ash and elm they come off at an obtuse angle; while in the weeping willow and birch they are pendulous from their flexibility. The comparative length of the upper and under branches also gives rise to differences in the contour of trees, as seen in the conical form of spruce, and the umbrella-like form of the Italian or Stone pine *(Pinus Pinea).* The branching of some trees is. peculiar. In the Amazon district many Myristicaceae and Monimiaceae have whorled branches coming off in fives. This is also seen in the Chili pine.

Branches are sometimes long and slender, and run along the ground, producing buds with roots and leaves at their extremity. This is seen in the *runner (flagellum)* of the strawberry. In the house-leek *(Sempervivum)* there is a similar prostrate branch of a shorter and thicker nature, known as an *offset,* producing a bud at its extremity capable of independent existence. In many instances the branch decays, and the young plant assumes a separate existence. Gardeners propagate plants by the process of *layering,* which consists in bending a twig, fixing the central part of it into the ground, and, after the production of roots, cutting off its connexion with the parent. A *stolon* differs from these in being a branch which curves towards the ground, and, on reaching a moist spot, takes root and forms an upright stem, and ultimately a separate plant. This is a sort of natural layering, and the plant producing such branches is called *stoloniferous.* In the rose and mint a subterranean branch arises from the stem, which runs horizontally to a certain extent, and ultimately sends up an aerial stem, which becomes an inde­pendent plant. Such branches are denominated *suckers,* and the gardener divides the connexion between the sucker and the parent stem, in order to propagate these plants. In the case of asparagus and other plants which have a perennial stem below ground, subterranean buds are annually produced which appear above ground as shoots or branches covered with scales at first, and ultimately with true leaves. These branches are herbaceous and perish annually, while the true stem remains below ground ready to send up fresh shoots next season. In bananas and plantains the apparent aerial stem is a shoot sent up by an underground stem, and perishes after ripening fruit. Branches are sometimes arrested in their develop­ment, and, in place of forming leaves, become transformed into *spines* or *thorns,* as in the hawthorn. Plants which have spines in a wild state, as the apple and pear, often lose them when cultivated, in consequence of their being changed into branches; in some cases, as in the sloe *(Prunus spinosa)* (fig. 7), a branch bears leaves at its lower portion, and terminates in a spine. In some climbing plants some of the shoots are transformed into tendrils, which help the plant to climb by twining about a support, as in passion-flower and vine ; or, as in *Ampélopsis Veitchii,* by forming ad­hesive disks at the tips of their branchlets which enable them to cling to flat supports. In some cases branches become flat and leaf-like, taking the place in the plant economy of the leaves, which are reduced to small scales or spines, as in butcher’s broom; branches showing this modification are termed cladodes or phylloclades (fig. 8). In Cactaceae *(e.g. Opuntia,* prickly pear, fig. 9) and fleshy euphorbias, where the leaves are reduced to spines, the fleshy stems become green and perform the functions of leaves; they also serve as water reservoirs for the plants, which are natives of very dry countries.