**Meristem**: Specialized, undifferentiated tissue that has the capacity to produce differentiated tissues, including: flowers, vascular tissue, leaves, roots, and bark. **Shoot meristems** at the tip of every shoot and **root meristems** at the tip of every root. The **vascular cambium** is also a type of meristem that ensheaths the entire tree and is responsible for the increase in a tree’s girth over time through the production of vascular tissue (the *xylem* and *phloem*). Annual growth rings are a manifestation of cambial activity. The **cork cambium** is responsible for the production of a tree’s bark.

**Apical Meristem**: A meristem located at the tip of a growing root or shoot.

**Lateral Meristem**: A meristem located on the side of a root or shoot, below its tip.

**Proleptic Shoot**: A shoot that develops from a bud which has been dormant for some period of time. Scale leaves usually enclose the bud.

**Sylleptic Shoot**: A shoot that develops from a lateral bud with any period of dormancy. Scale leaves do not usually enclose the bud.

**Orthotropic Shoot**: A shoot that is more or less vertical in orientation, upon which the leaves are usually arranged radially around the stem.

**Plagiotropic Shoot**: A shoot that is more or less horizontal in orientation, and upon which the leaves are often arranged in one plane.

**Mixed Shoot**: A shoot that begins to grow vertically and then bends over to become horizontal. Leaf arrangement varies accordingly.

**Monopodial**: A trunk or branch formed by the uninterrupted growth of an *indeterminate* apical meristem.

**Symподial Truck**: A trunk or branch formed by the relay growth of a sequence of *determinate* lateral meristems.

**Indeterminate Growth**: Shoot growth that is not interrupted by the production of a reproductive structure or the programmed death of a meristem (*shoot tip abortion*).

**Determinate Growth**: Shoot growth that stops with the production of a reproductive structure or the programmed death of the meristem.

**Rhythmic Growth**: Growth of an axis determined by an internal rhythm which results in periodic shoot extension alternating with dormancy, typically characterized by the presence of bud scales on the shoots.

**Continuous Growth**: Growth of an axis without and external (morphological) signs of stopping, *i.e.* shoots lack bud scales. This type of growth is common in the tropics.

**Long Shoot**: A shoot in which there is discernible stem tissue between the leaf nodes, so that leaves are physically separated from one another.

**Short (Spur) Shoot**: A shoot in which there is no discernible stem tissue between the leaf nodes, creating a whorled arrangement of the leaves. These often produce cones (in gymnosperms) or flowers (in angiosperms); examples include *Ginkgo* and *Larix.*
**Node**: The segment of stem to which leaves and their associated buds are attached.  
**Internode**: The segment of stem in between two nodes.  
**Axil**: The angle between the upper surface of a leaf and the stem to which it is attached. Buds located above the leaf are said to be *axillary*.

**Topophesis**: A physiological phenomenon associated with aging, in which cuttings taken from one part of a tree (usually a plagiotropic branch) retain the physiological characteristics (i.e. orientation and leaf morphology) of that branch for an extended period of time.

**Decurrent Tree Form**: Tree form which develops when the lateral branches grow as fast, or faster, than the terminal shot. This results in a tree with a broad, spreading form and multiple trunks.  
**Excurrent Tree Form**: Tree form which develops when the leader outgrows the lateral branches. This results in a tree with a narrow, cone-shaped crown and clearly defined central trunk.

**Apical Control**: The regulation of the overall shape of a tree by an actively growing apical bud (meristem). This behavior is often associated with sylleptic branching and excurrent form.  
**Apical Dominance**: This refers to the inhibition of axillary bud growth by an actively growing apical bud (meristem).

**Genet**: A genetically uniform individual that is the product of sexual reproduction; over time it can produce multiple modular units (ramets) that can form large colonies or clones.  
**Ramet**: The basic unit of clonal growth arising from a seedling-derived plant (genet), usually a shoot arising from a root (i.e. a *sucker*) or a rhizome; it can follow an autonomous existence if separated from its parent, *i.e.* a unit of reiteration.

**Reiteration**: The development of a shoot with a seedling growth form from the trunk, branch or root of a mature tree. Reiteration can occur as a result of damage (*traumatic reiteration*) or spontaneously with as part of the normal aging process of the tree (*developmental reiteration*). In both case, reiteration results in the transformation of an individual specimen into a population of semi-autonomous sub-units.

**Architectural Model**: The generalized growth program which determines the development of form in trees. Twenty-three different architectural models have been described (out of a possible 24), based on the following four characteristics:

- position of the flowers: either terminal or lateral  
- orientation of the branches: either plagiotropic or orthotropic  
- mode of trunk construction: either sympodial or monopodial  
- cycle of growth: either continuous or rhythmic

**Module**: The basic unit of plant construction in architectural models that is repeated during the growth and development of the individual. Modules become smaller and more numerous with increasing age.
Adaptive Growth: The process whereby trees selectively add extra wood to reinforce those parts of the trunk which are structurally overloaded. Adaptive growth allows trees to optimize their trunks, branches and roots in order to reduce the chances of mechanical failure under conditions of extreme loading caused by wind, snow or ice.

Wood: Technically speaking, wood consists of xylem tissue produced by the vascular cambium. Xylem actively conducts water absorbed by the root system up to the leaves and typically remains functional for only a year or two, after which it dies. Dead xylem tissue provides the primary structural support system for the tree. In temperate trees, wood is laid down on a seasonal cycle marked by the production of distinct annual growth rings that can be used to determine age. In contrast, tropical trees produce a variable number of growth rings per year, making them ineffective for determining age.

Plant Growth is Orientated in Relation to Environmental Stimuli: Gravity is the primary force that determines tree form. The orientation of the trunk and branches must be in balance with the forces of gravity or the tree will fall down. Shoot growth is directional and highly responsive to light. There are two basic types of shoot growth, vertical shoots which reach toward the light and form the trunk (the axes of exploration); and horizontal shoots that harvest the light and form the crown (the axes of exploitation). Roots are opportunistic in their growth, and orient themselves in relationship to soil resources, especially water and mineral nutrients, which they absorb and transmit to the shoot system. The root system also serves to stabilize the shoot system of the tree in response to the mechanical stresses it experiences due to wind and gravity.

What is a tree (architecturally speaking)?

“A tree can be summarized as a many-celled plant of block construction, the prolonged apical growth of which raises into the air through the perception of gravity and light a branching shoot, and drives into the ground by gravitational direction a branching root. The absorbing and feeding parts are the leaves and the rootlets, both of limited duration. They are renewed at the growing tips, and these tips, as they diverge, are connected by the older parts of stem and root. Absorption and lengthening have stopped in these older parts, but secondary thickening develops them into the support and conducting channel, protected by bark. The tree is organized by the direction of its growing tips, the lignification [i.e. wood production] of the inner tissues, the upward flow of water in the lignified xylem, the downward passage of food in the phloem, and the continued growth of the cambium. It is kept alive, in spite of its increasing load of dead wood, by the activity of the skin of living cells.”


CONIFER Model (Massart)
1) trunk vertical (orthotropic), branches horizontal (plagiotropic);
2) trunk dominates branches, height growth favored over crown spread;
3) branches often possess a "fixed" orientation (topophysis);
4) firs, spruces, yews, ginkgo

DOGWOOD Model (Fagerlind)
1) trunk vertical, branches horizontal;
2) branches dominate trunk, crown spread favored over height growth;
3) often produces terminal flowers and "relay-type" branch growth;
4) dogwoods, azaleas, magnolias

MAPLE Model (Rauh)
1) trunk and branches vertical, functionally equivalent;
2) trunk built up by the activity of a single meristem (monopodium);
3) often produces lateral flowers which don't effect the branching pattern;
4) oaks, maples, ashes

LEGUME Model (Troll)
1) trunk and branches horizontal, functionally equivalent;
2) trunk built up by the activity of successive meristems (sympodium);
3) often shows shoot-tip abortion, resulting in reduced apical dominance;
4) legumes, elms, beeches

LILAC Model (Leeuwenberg)
1) trunk and branches vertical and equivalent;
2) trunk built up by the repetition of structurally identical modules
3) always produces a terminal inflorescence which regulates the branching process;
4) rhododendrons, sumacs, lilacs, viburnums

PETER DEL TREDICI, 1991
Fig. 73. A–F. Reiteration in the lower storeys of the forest.

Diagrammatic representation of morphological features visible in trees, regarded as examples of reiteration usually involving reactivation of latent meristems.

A. Reiteration on an arched trunk.
B. As stem suckers on an old tree.
C. As a mechanism for regeneration, "bayonet-joint" (arrow).
D. Same but twice, producing a fork (arrow).
E. From a cutting.
F. As root suckers.