

# **Plant Developmental Biology**

## **Germ cells are not set aside early in development.**

Germ line is developed very early in the development in most animal species. Plants do not develop germ line during early development.

• **Plants undergo extended morphogenesis.** Clusters of actively dividing cells called **meristems**, which are similar to stem cells in animals, persist long after maturity. Meristems allow for reiterative development and the formation of new structures throughout the life of the plant. Plants produce new tissues and structures throughout their life from **meristems**., located at the tips of organs, or between mature tissues. Thus, a living plant always has embryonic tissues.

A vascular plant begins from a single celled zygote, formed by fertilisation of an egg cell by a sperm cell. From that point, it begins to divide to form a plant embryo through the process of **embryogenesis**.

As this happens, the resulting cells will organize so that one end becomes the first root while the other end forms the tip of the shoot.

In seed plants, the embryo will develop one or more "seed leaves" (cotyledons).

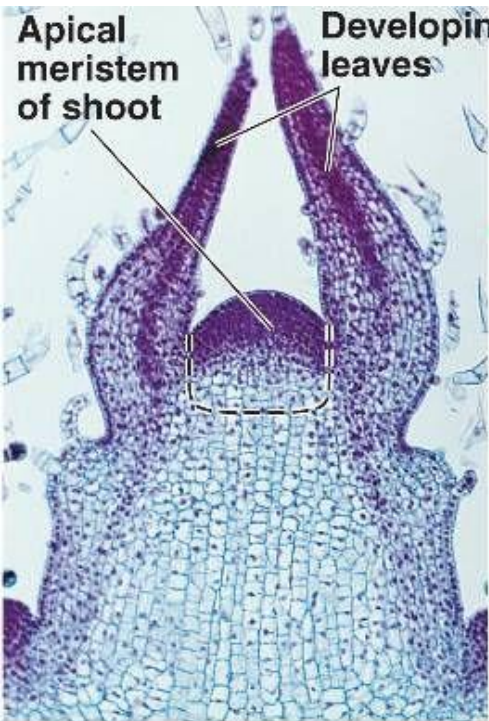
Once the embryo germinates from its seed or parent plant, it begins to produce additional organs (leaves, stems, and roots) through the process of **organogenesis**.

New roots grow from root [meristems](#) located at the tip of the root, and new stems and leaves grow from shoot [meristems](#) located at the tip of the shoot.

Branching occurs when small clumps of cells left behind by the meristem, and which have not yet undergone [cellular differentiation](#) to form a specialized tissue, begin to grow as the tip of a new root or shoot.

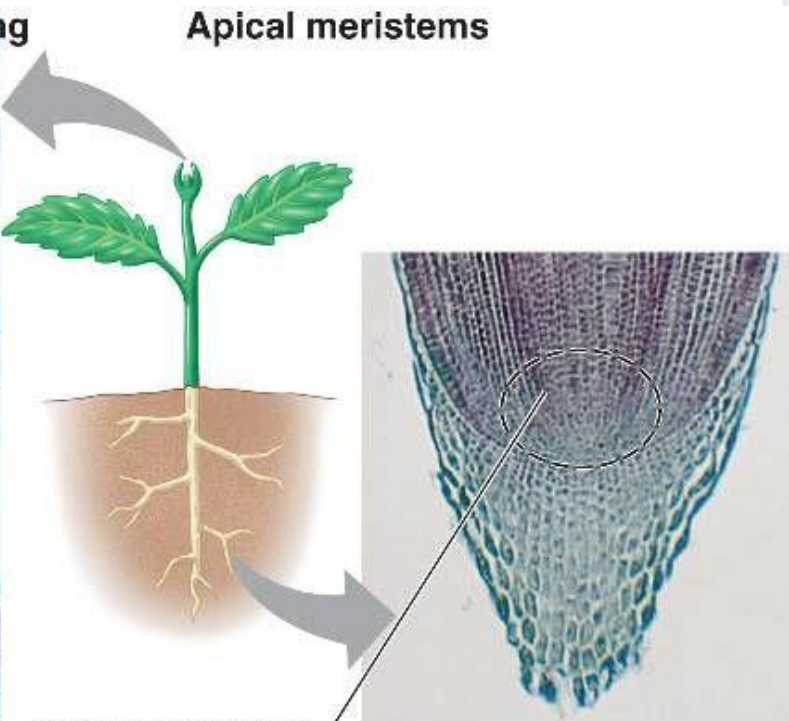
Growth from any such meristem at the tip of a root or shoot is termed [primary growth](#) and results in the lengthening of that root or shoot.

[Secondary growth](#) results in widening of a root or shoot from divisions of cells in a [cambium](#).



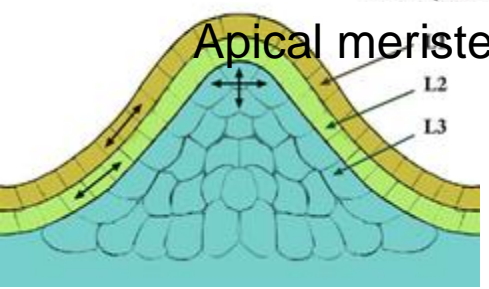
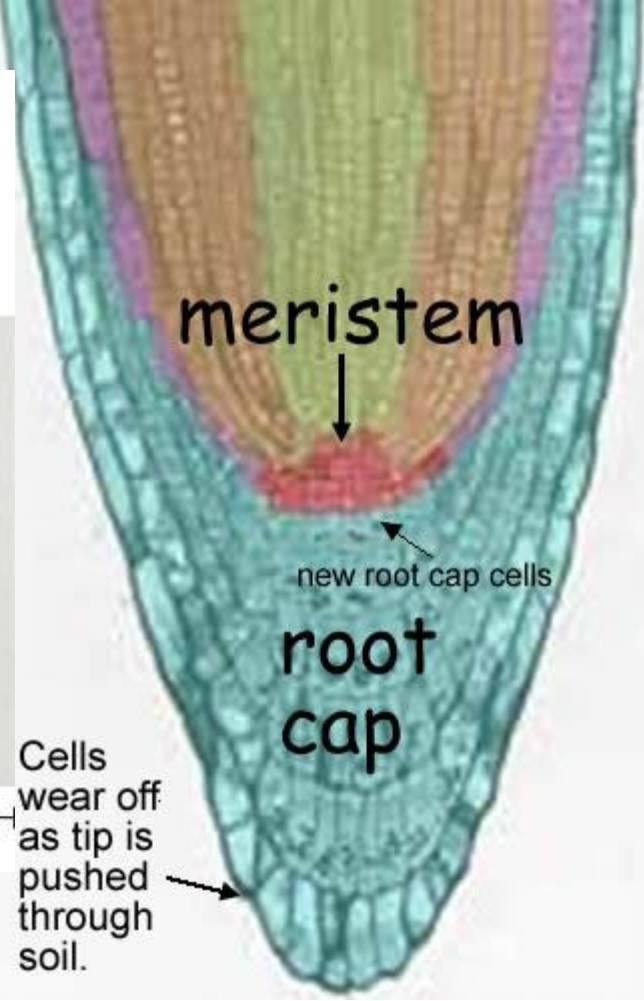
Shoot

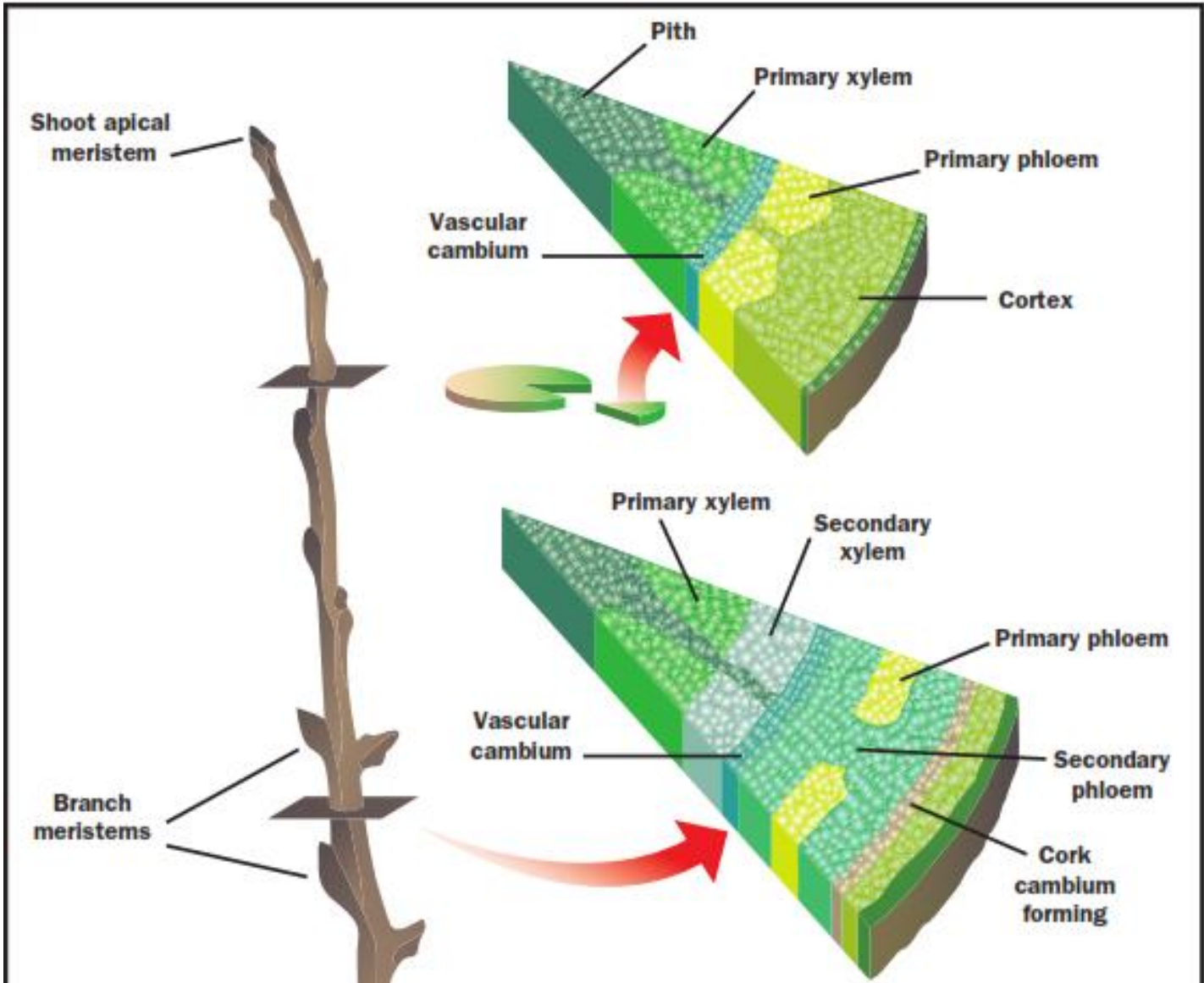
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Root

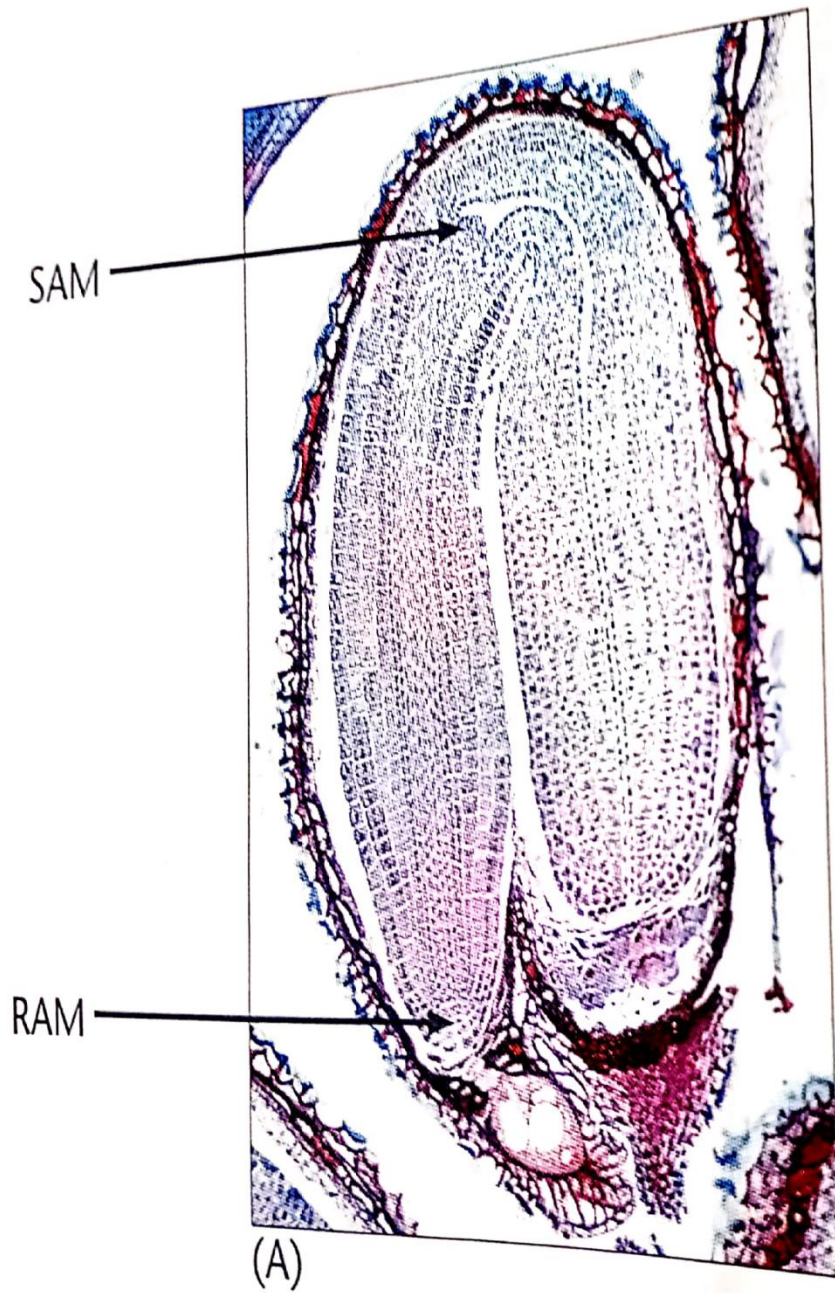
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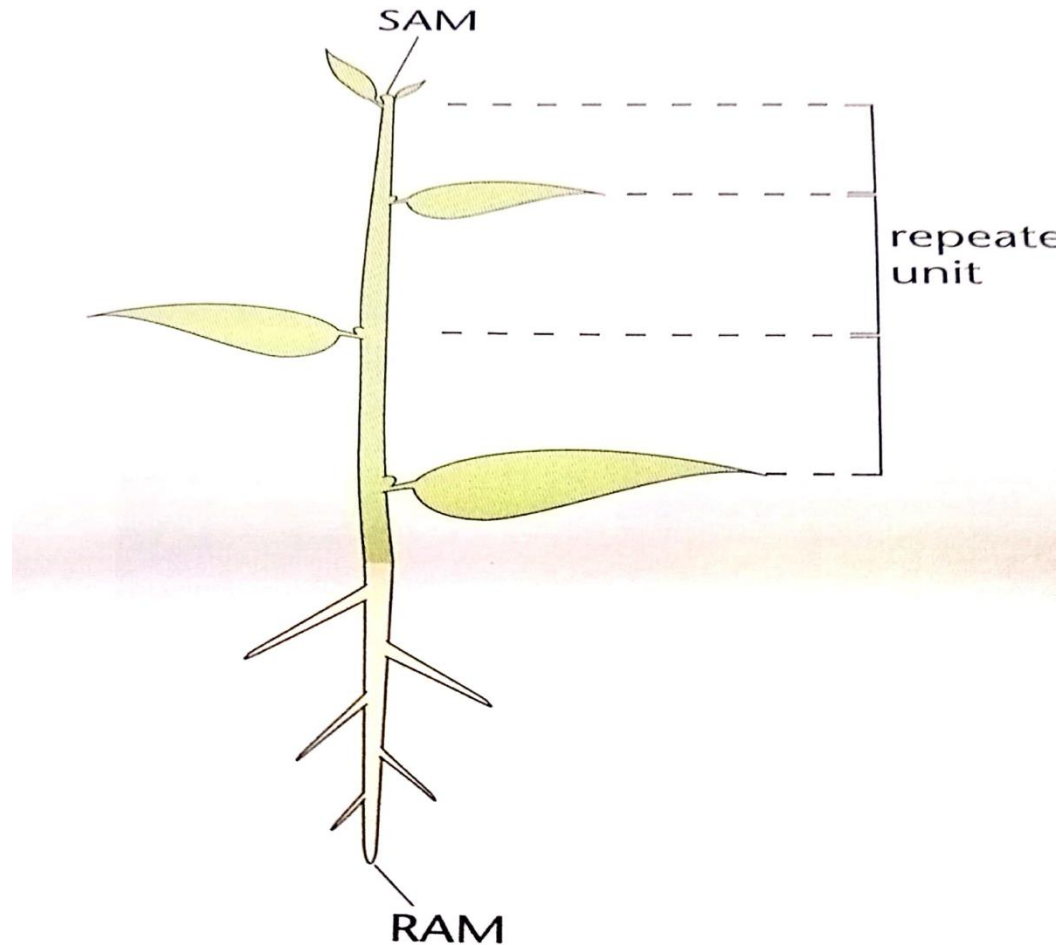
By contrast, an animal embryo will very early produce all of the body parts that it will ever have in its life. When the animal is born (or hatches from its egg), it has all its body parts and from that point will only grow larger and more mature. The properties of organization seen in a plant are emergent properties .







The production of new organs by the meristems results in the growth of shoot and root that are made up of repeated structural units or modules. A shoot module comprises of a leaf, a lateral meristem, and an internode. The way these modules develop is determined by the genetic program available in its genome.



**Plants have tremendous developmental plasticity.** Many plant cells are highly plastic. For example,

- if a shoot is grazed by herbivores, meristems in the leaf often grow out to replace the lost part. (This strategy has similarities to the regeneration seen in some animals.)
- In addition, a plant's form (including branching, height, and relative amounts of vegetative and reproductive structures) is greatly influenced by environmental factors such as **light**, **water** and temperature, **nutrient** and a wide range of morphologies can result from the same genotype. This amazing level of plasticity may help compensate for the plant's lack of mobility.