Early development, cells and tissues of the plant body
Embryogenesis body plan

Apical-basal pattern

Seedling

- cotyledons
- shoot meristem
- hypocotyl
- root meristem
- root

Radial pattern

- Epidermis
- Ground Tissues
- Xylem
- Phloem
- Endodermis
The zygote is a polarized cell

- **Apical Region**: Chalazal (apical cell) → embryo
- **Basal Region**: micropylar (basal cell) → suspensor and part of the root apical meristem.
Summary: early development in flowering plants

First asymmetric cell division in embryo establishes apical-basal axis

Embryonic cell fate is determined by position

Shoot and root meristems of seedling give rise to all adult plant structures
Cell Division, Enlargement and Differentiation.

*Arabidopsis thaliana*. Embryo proper (yellow and green showing apical and basal embryo zones) and suspensor (blue) are marked.

Arabidopsis thaliana. Embryo proper (yellow and green showing apical and basal embryo zones) and suspensor (blue) are marked.
The cotyledons and the axis undergo extensive elongation to produce the TORPEDO stage.

Procambium is the origin of vascular tissues

Shoot Apical Meristem (SAM)

Root Apical Meristem (RAM).
Three essential features of the mature plant are established during embryogenesis:

• The Apical basal axial polarity is fixed.

• The apical and primary meristems arise.

• The radial pattern of the three primary meristems and tissues is established.
• Most cell division occurs

• Subsequent growth

• They stay same size, so cells continually leave it and begin to differentiate.

SC = stem cells

QC = quiescent centre
• The Protoderm produces the epidermis.

• The ground meristem produces ground tissues.

• The procambium produces vascular tissues.
The mature embryo of flowering plants consist of an axis bearing one or two cotyledons.

Monocotyledons are hypogeous.
The mature embryo of flowering plants consist of an axis bearing one or two cotyledons.

Dicotyledons are epigeous.
The two largest groups of angiosperms are **MONOCOTS** (Liliopsida) and **DICOTS** (Magnoliopsida). Here are the distinguishing features:

<table>
<thead>
<tr>
<th>MONOCOTS (Liliopsida)</th>
<th>DICOTS (Magnoliopsida)</th>
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</thead>
<tbody>
<tr>
<td>Embryo with single cotyledon</td>
<td>Embryo with two cotyledons</td>
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<tr>
<td>Pollen with single furrow or pore</td>
<td>Pollen with three furrows or pores</td>
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<tr>
<td>Flower parts in multiples of three</td>
<td>Flower parts in multiples of four or five</td>
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<tr>
<td>Major leaf veins parallel</td>
<td>Major leaf veins reticulated</td>
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<tr>
<td>Stem vascular bundles scattered</td>
<td>Stem vascular bundles in a ring</td>
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<tr>
<td>Roots are adventitious</td>
<td>Roots develop from radicle</td>
</tr>
<tr>
<td>Secondary growth absent</td>
<td>Secondary growth often present</td>
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</tbody>
</table>
Growth, morphogenesis and differentiation

Coleus

Vascular tissue

- leaf primordium
- procambium
- protoderm
- apical meristem
- bud primordium
- ground meristem
- bud primordium

Procambium → Xylem and phloem
**Tissue systems**

**Ground or fundamental**
- Parenchyma
- Collenchyma
- Sclerenchyma

**Vascular tissue system**
- Xylem
- Phloem

**Dermal tissue system**
- Epidermis
- Periderm
Xylem

Tracheary elements

1. Vessel elements
2. Tracheids
Phloem
- Sieve plate
- Albuminous cells
- Sieve-tube element
- Companion cell