



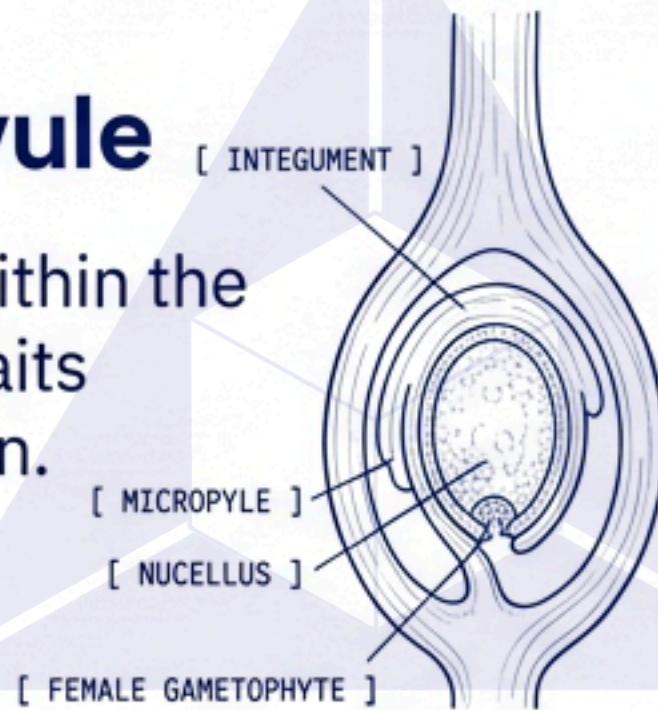
The Future Plant Inside a Coat

The architectural blueprint, development, and anatomy of the biological seed.

Ovules Develop Into Seeds

The Ovule

Resides within the ovary; awaits fertilization.



[INTEGUMENT]

[MICROPYLE]

[NUCELLUS]

[FEMALE GAMETOPHYTE]

[INTEGUMENT]

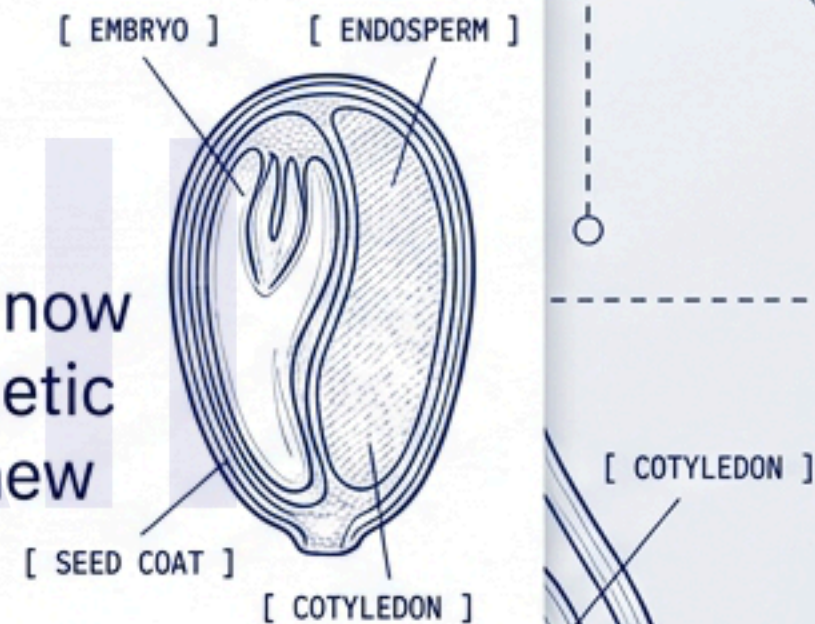
[NUCELLUS]

[FEMALE GAMETOPHYTE]

[FERTILIZATION EVENT]

The Seed

The matured, fertilized ovule, now packing the genetic blueprint for a new generation.



[EMBRYO]

[ENDOSPERM]

[SEED COAT]

[COTYLEDON]

[COTYLEDON]

[OVARY]

Biological Context: While the ovule transitions into the seed, the surrounding ovary matures and ripens to become the fruit.



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Key Highlights

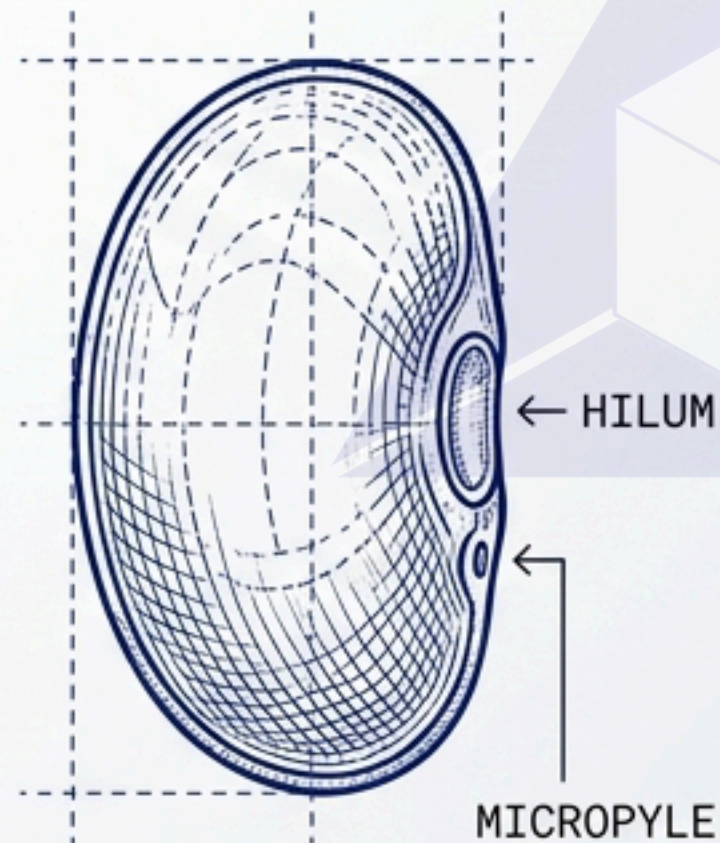
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Seed Coat + Embryo

Every seed is fundamentally composed of two distinct components: a **protective exterior** and a **generative interior**.

The Seed Coat (Protection)



- **Outer Testa & Inner Tegmen:** A double-layered outer defense system.
- **Hilum:** The physical scar on the coat where the developing seed was attached to the fruit.
- **Micropyle:** A microscopic pore situated directly above the hilum, facilitating crucial water absorption during germination.

The Embryo (Potential)

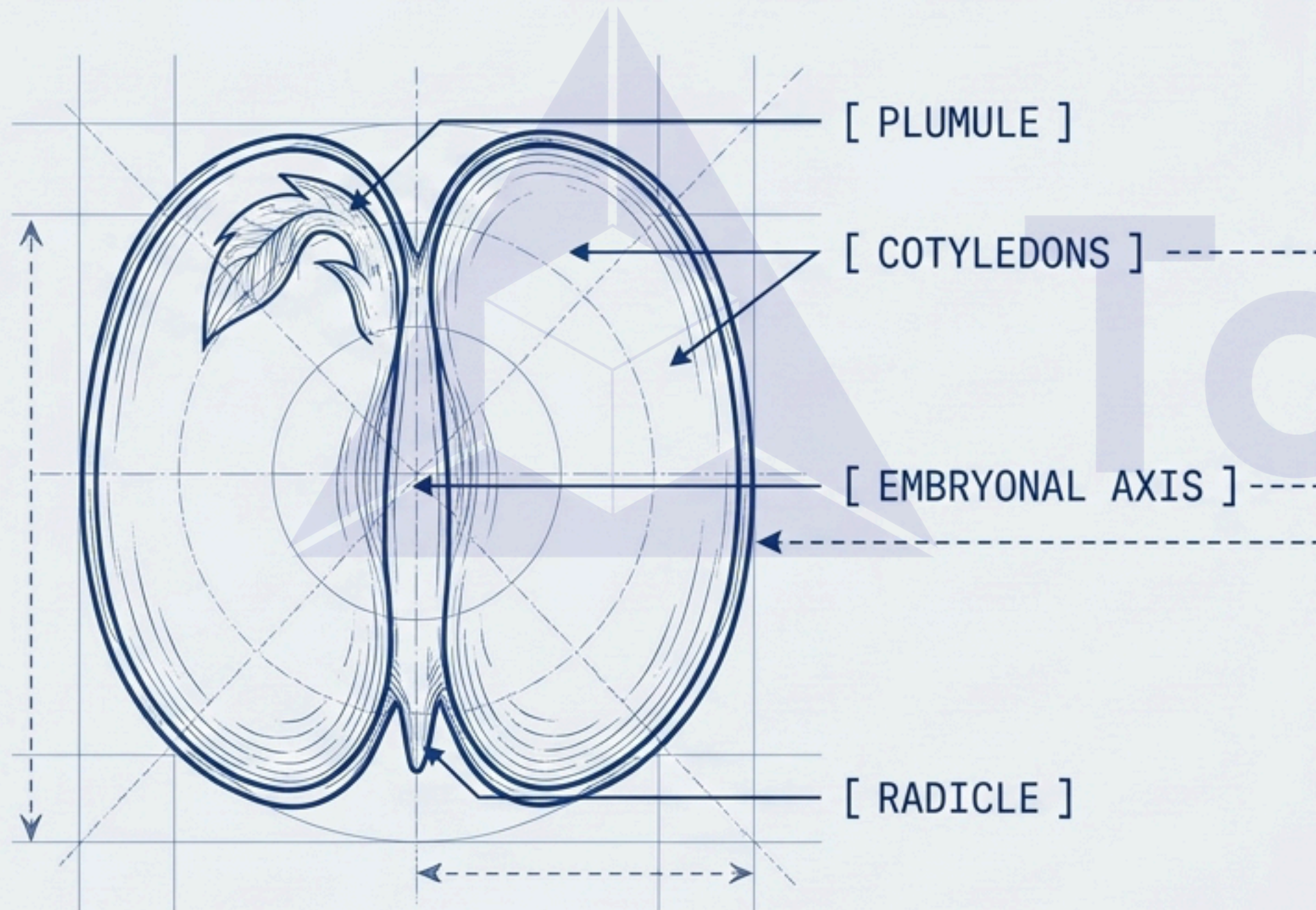


- The living miniature plant safely encased within the seed coat.
- Waits in a dormant state for optimal environmental conditions to begin active growth.



Anatomy of the Embryo

Unpacking the embryonal axis and its crucial appendages.



The Extremities

- [PLUMULE]
Located at the upper end of the axis; develops into the future shoot system.
- [RADICLE]
Located at the lower end of the axis; develops into the future root system.

The Core

- [EMBRYONAL AXIS]
The central structural trunk firmly connecting the radicle and the plumule.

The Reserves

- [COTYLEDONS]
Fleshy, leaf-like structures attached to the axis (one or two depending on the plant class). They are packed with reserve food materials to fuel the initial stages of germination.

Monocot vs. Dicot Seeds

	 Dicotyledonous (e.g., Pea, Gram)	 Monocotyledonous (e.g., Maize)
Cotyledons	Two fleshy cotyledons.	One large, shield-shaped cotyledon known as the scutellum.
Endosperm (Food Storage)	Often absent in mature seeds (non-endospermous), absorbed by cotyledons. Sometimes present (e.g., castor).	Usually bulky and endospermic, separated from the embryo by a proteinous aleurone layer.
Protective Sheaths	Absent.	Plumule is enclosed in a coleoptile; radicle is enclosed in a coleorhiza.

The Evolutionary Triumph: Whether a simple dicot or a complex monocot, the seed represents the ultimate survival vehicle—protecting the fragile plant embryo and providing it with the exact nutrients needed to establish a new life.



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