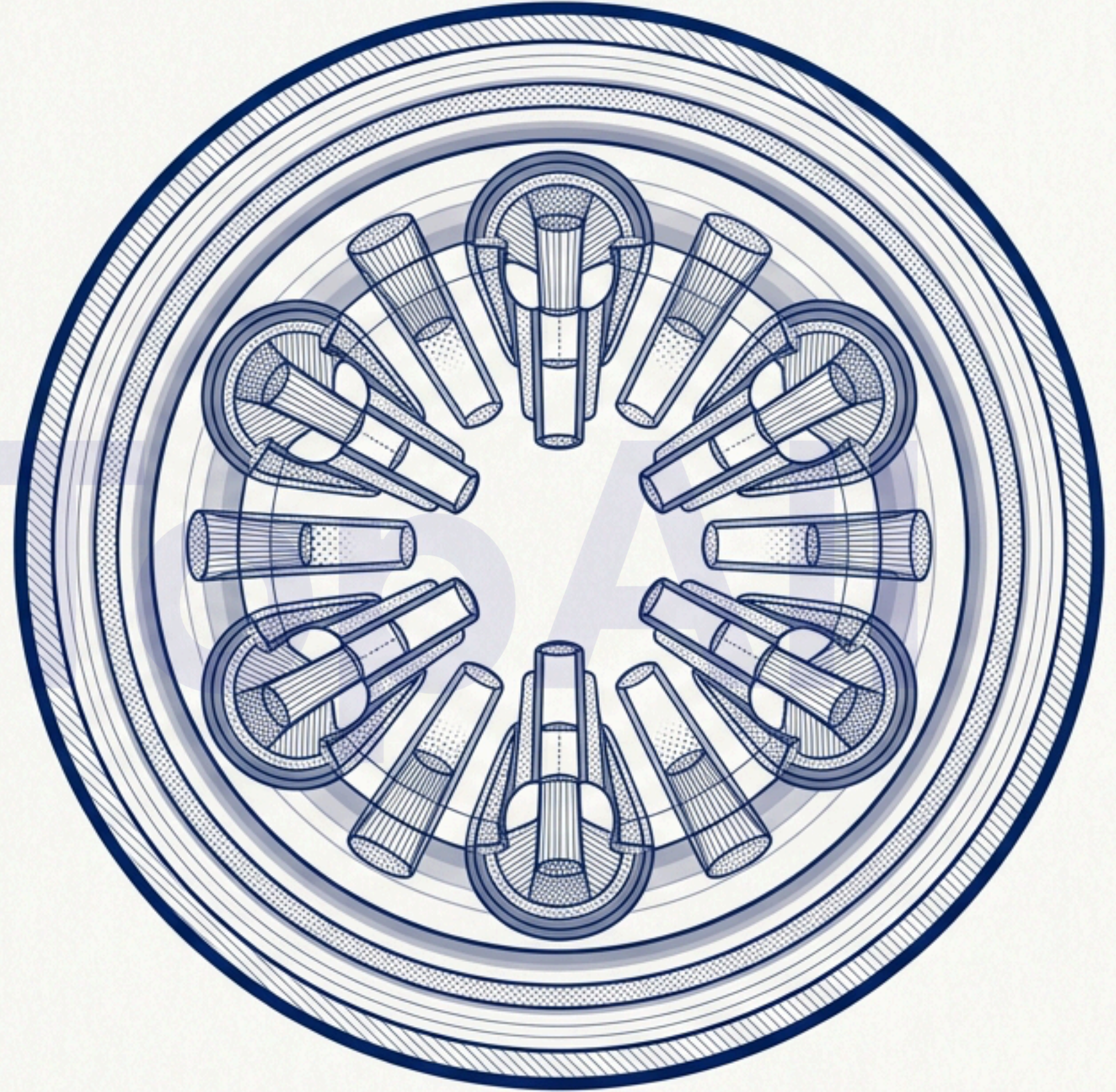


CHAPTER 6.1.3

Xylem, Phloem and Plant Transport

An Architectural Guide to the
Vascular Tissue System

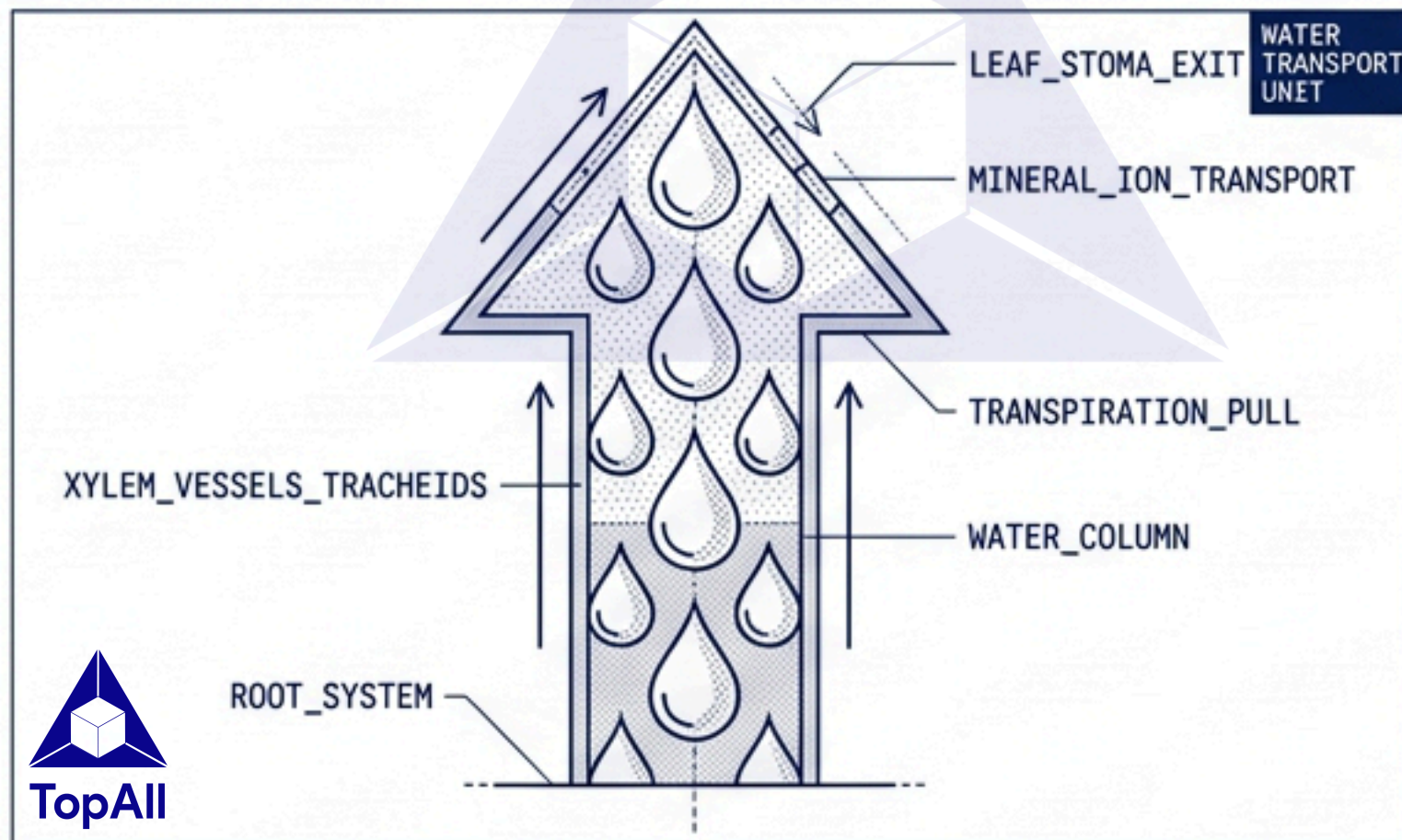


The Foundations of the Vascular System

Complex Tissues: Unlike simple tissues made of one cell type, xylem and phloem are intricate networks composed of multiple specialized cell types working together as a single transport unit.

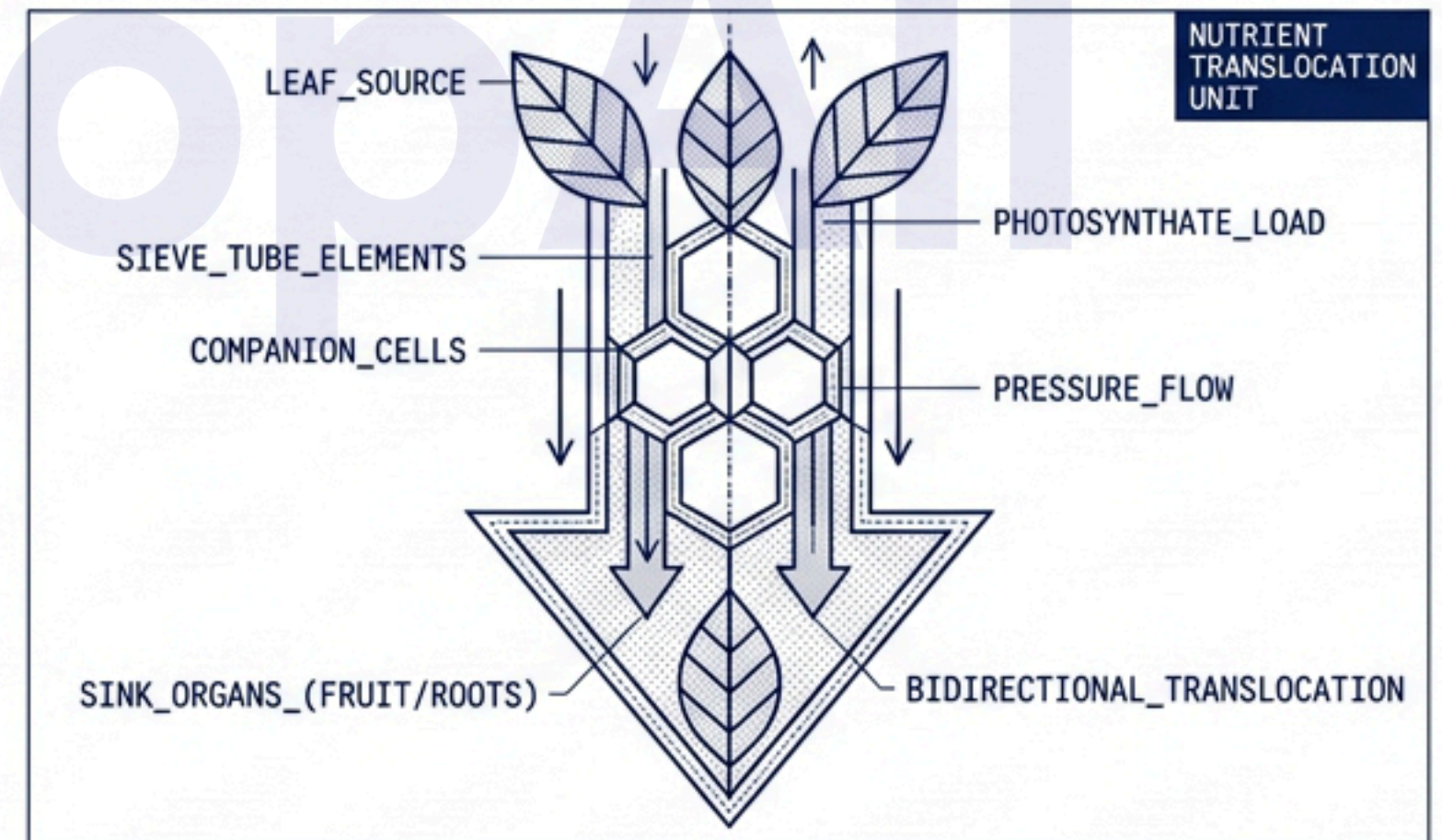
SYSTEM_01: XYLEM

The complex tissue responsible for conducting water and dissolved minerals upward from the roots to the rest of the plant.

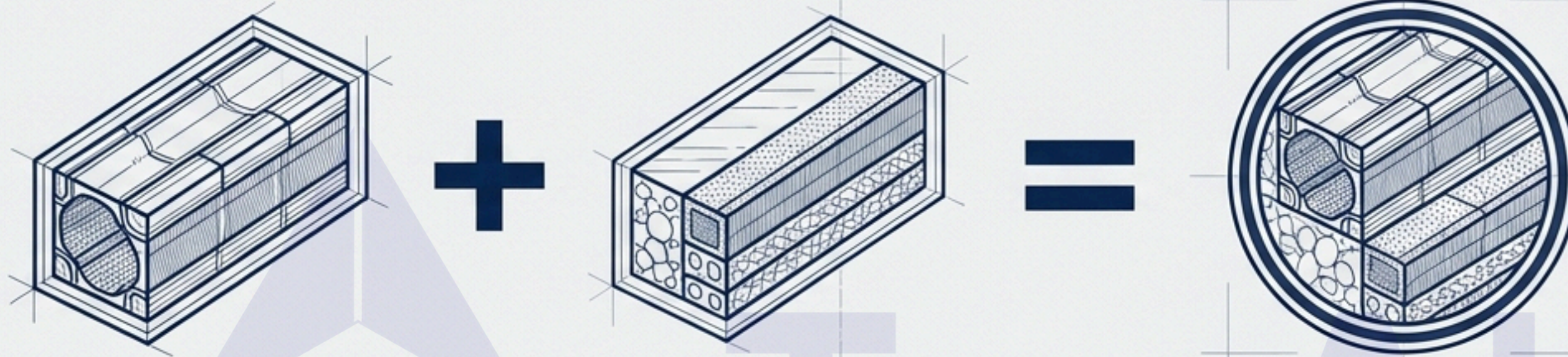


SYSTEM_02: PHLOEM

The complex tissue that translocates food materials (photosynthates) from the leaves to other parts of the plant.



The Vascular Bundle



[Xylem] + [Phloem] = [Vascular Bundle]

Location

Situated within the ground tissue system; physical layout varies drastically by organ (root, stem, leaf).

Function

Acts as the primary infrastructural highway for the plant, enabling continuous, bidirectional resource transport.

Variation

The arrangement and composition of these bundles define the structural capabilities of different plant groups.

Note: The specific architecture of the vascular bundle is a primary identifier in plant anatomy.



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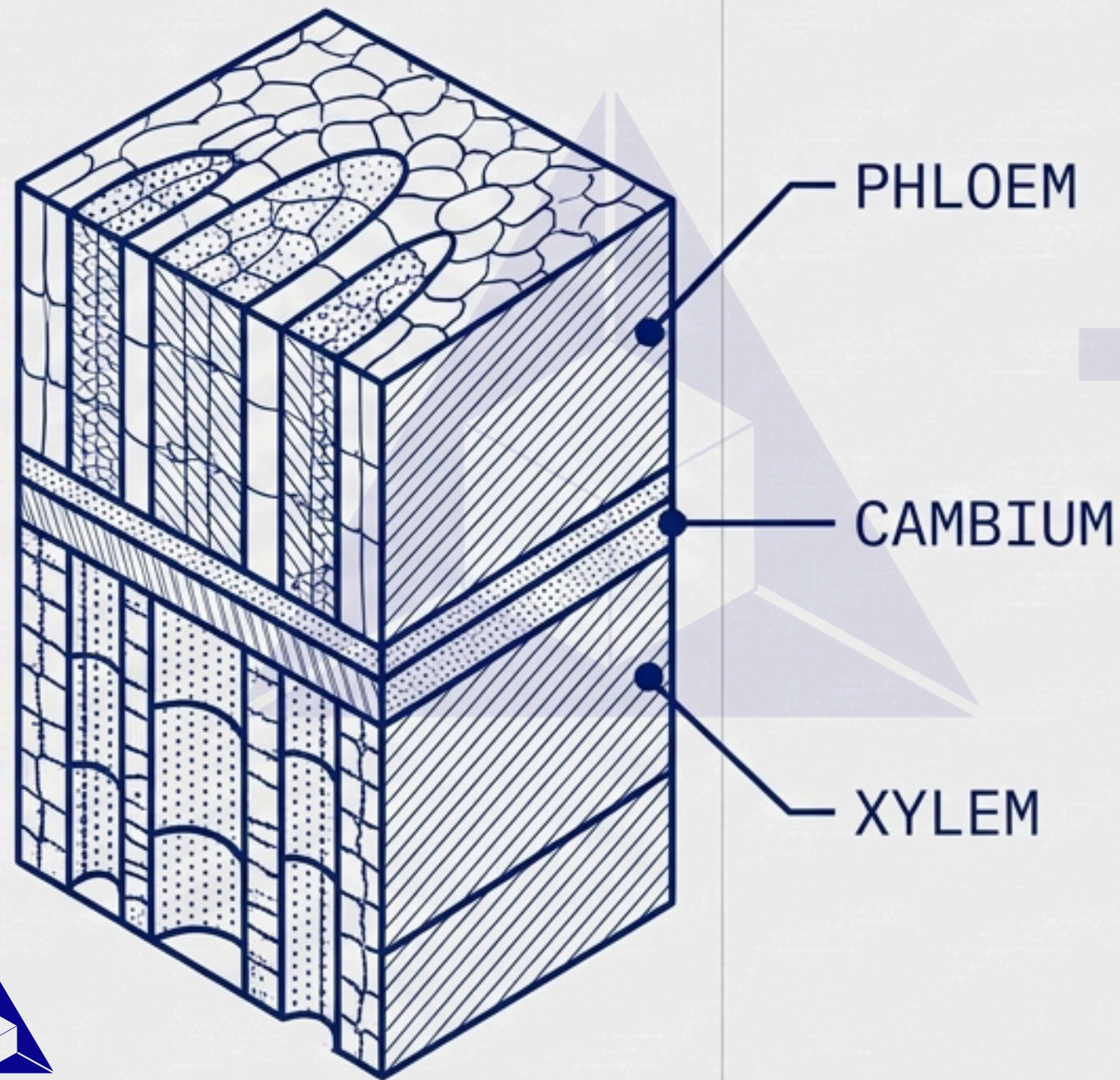
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Open Vascular Bundles

DICOTYLEDONOUS STEMS



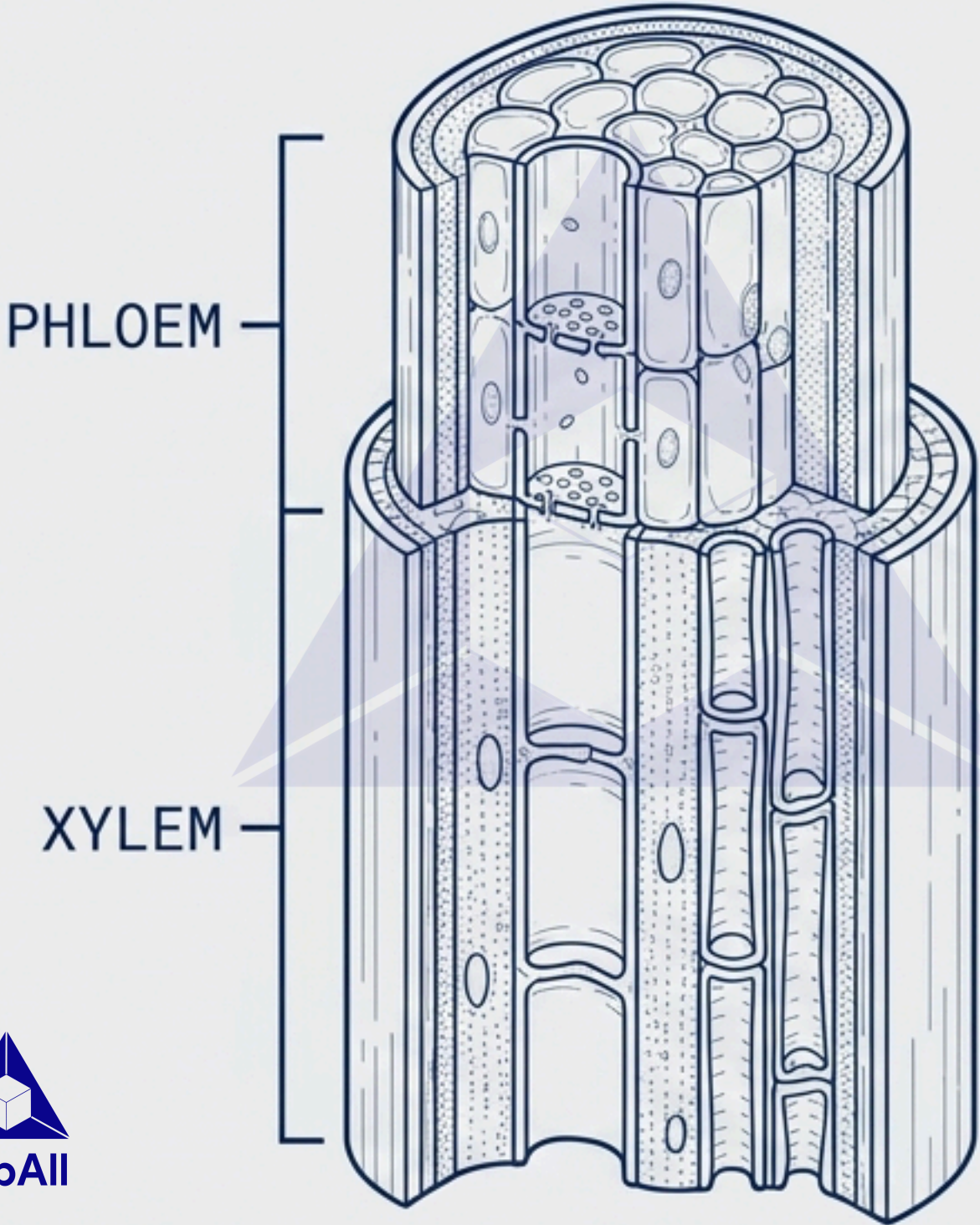
In open vascular bundles, a layer of cambium is present between the phloem and xylem.

This cambium acts as a lateral meristem, granting the bundle the critical ability to form secondary xylem and phloem tissues.

Because they possess cambium, these bundles are 'open' to secondary growth, allowing the plant stem to thicken and become woody over time.

Closed Vascular Bundles

MONOCOTYLEDONS



In closed vascular bundles, the cambium layer is absent.

Without cambium, these bundles are structurally fixed once formed and do not form secondary tissues.

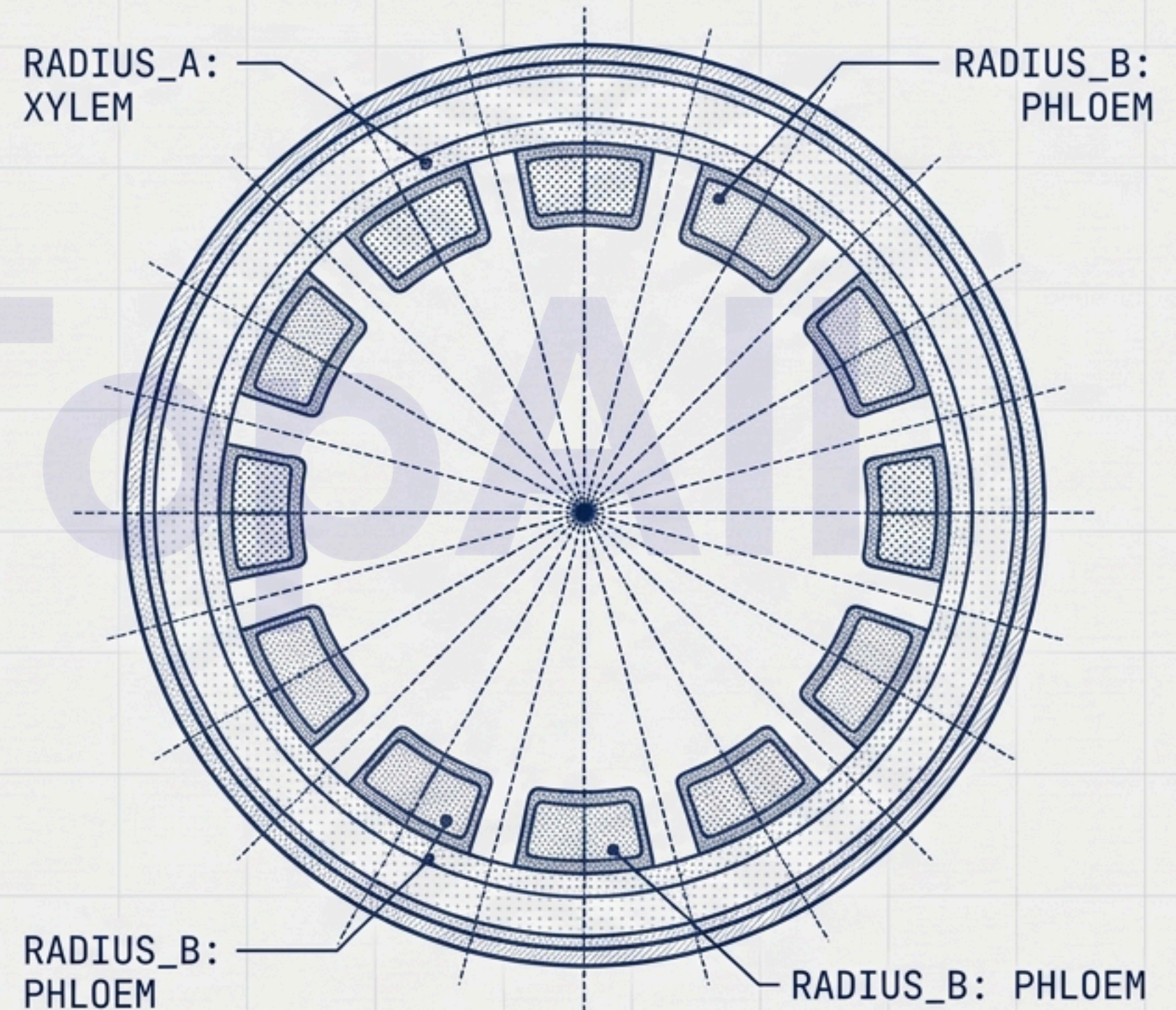
Feature	Open Bundle	Closed Bundle
Cambium	Present	Absent
Secondary Growth	Yes	No
Primary Location	Dicot Stems	Monocot Stems

Radial Arrangement

ROOT ANATOMY

The xylem and phloem are physically separated within the vascular cylinder. They are arranged in an alternate manner along completely different radii.

This alternating radial geometry is the hallmark characteristic of root systems in both monocots and dicots.

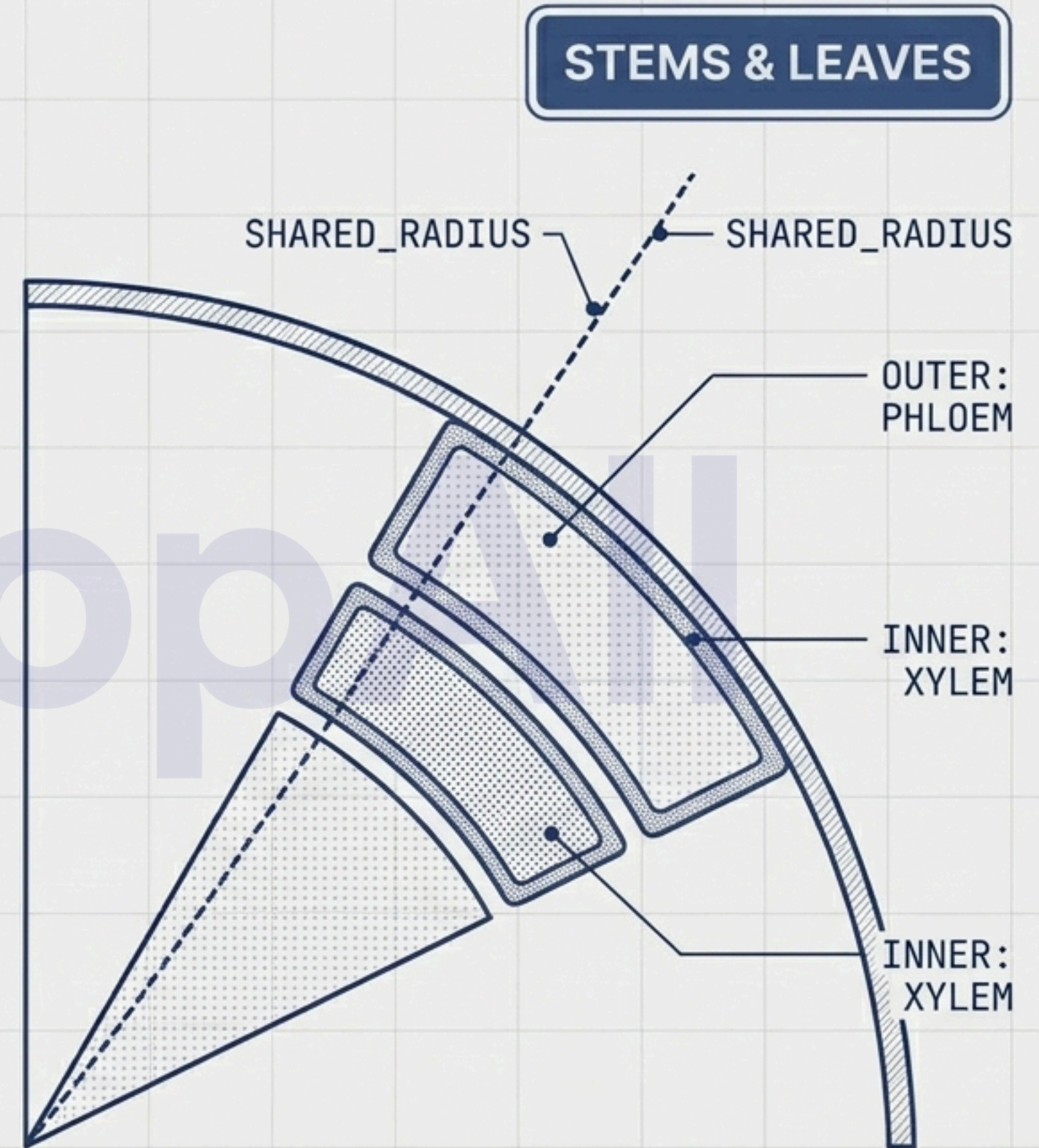


Conjoint Arrangement

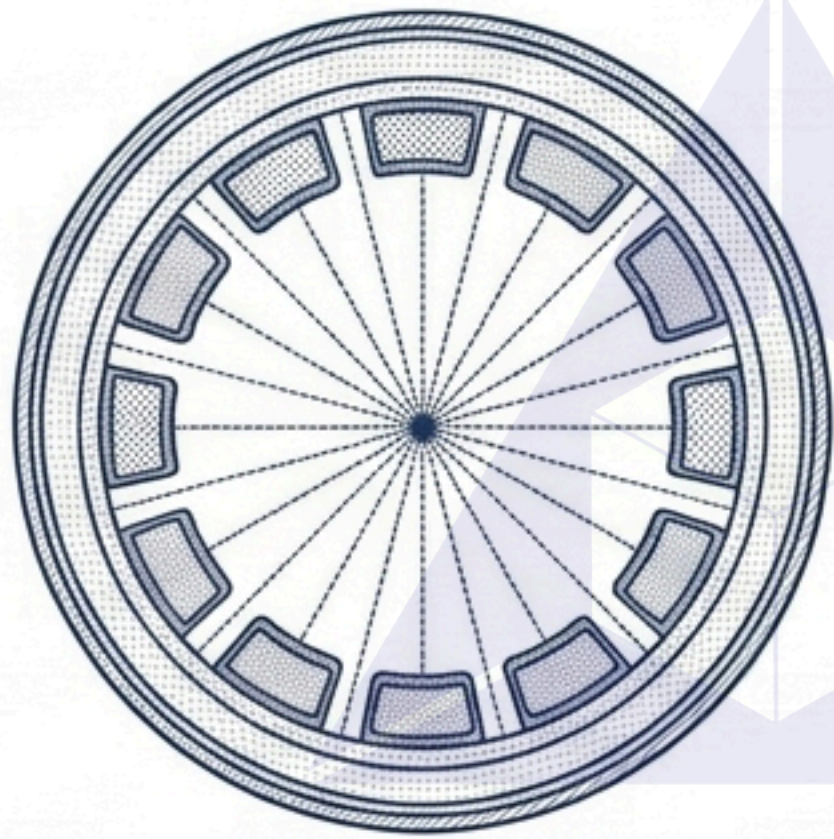
The xylem and phloem are jointly situated along the exact same radius.

In this standard arrangement, the phloem is usually located only on the outer side of the xylem.

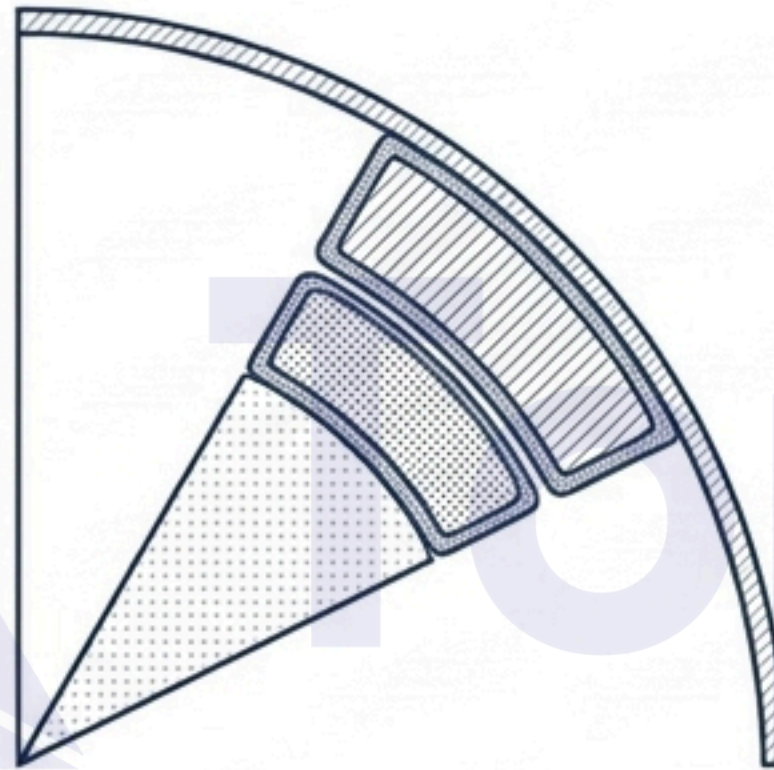
Note: Conjoint bundles can be either 'open' (with cambium) or 'closed' (without cambium).



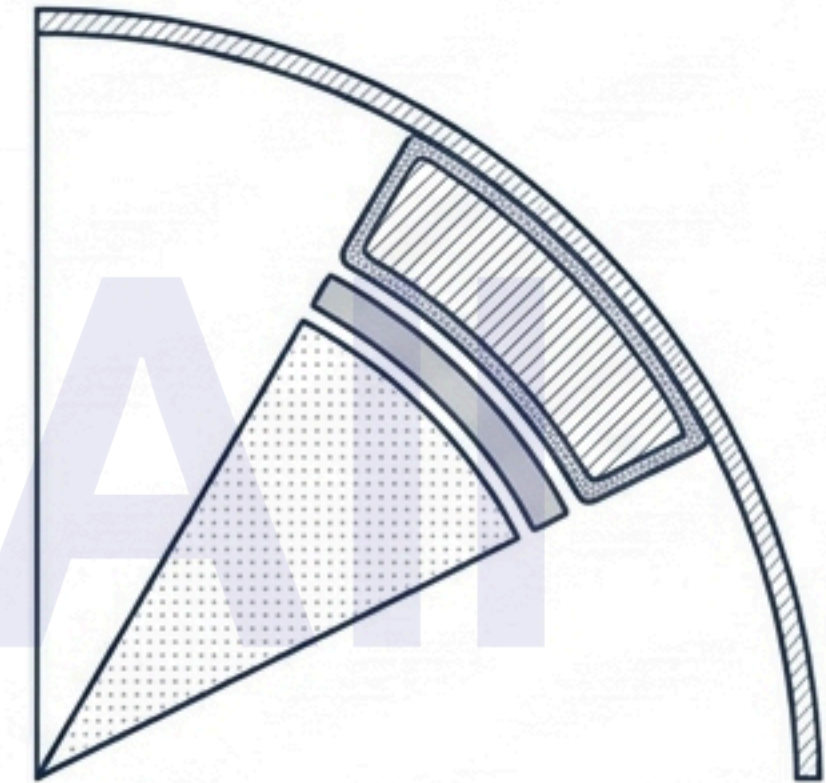
Architectural Variations of Vascular Bundles



FIG_A: RADIAL
Xylem and phloem on
alternating radii. Found in roots.



FIG_B: CONJOINT CLOSED
Shared radius. No cambium.
Found in monocots.



FIG_C: CONJOINT OPEN
Shared radius. Cambium
present. Found in dicot stems.

Structural identifier: Always locate the cambium strip and the radial axis to correctly diagnose the tissue sample.



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