

**VASCULAR PLANT
SYMBIONT
PROVIDES
GLUCOSE**

**MYCORRHIZAE
SYMBIONT
PROVIDES
WATER & NUTRIENTS**

MUTUALISTIC SYMBIOTIC RELATIONSHIP



MYCORRHIZAE

TYPES

MYCORRHIZAE TYPES

ECTOMYCORRHIZAE

MYCORRHIZAE TYPES



MYCORRHIZAE

TYPES

ECTOMYCORRHIZAE
ENDOMYCORRHIZAE

MYCORRHIZAE

TYPES

ECTOMYCORRHIZAE

ECTOMYCORRHIZAE



MYCORRHIZAE
ECTOMYCORRHIZAE

HYPHAE ENCASE ROOT CELLS

MYCORRHIZAE
ECTOMYCORRHIZAE

A

ROOT HAIR CELL

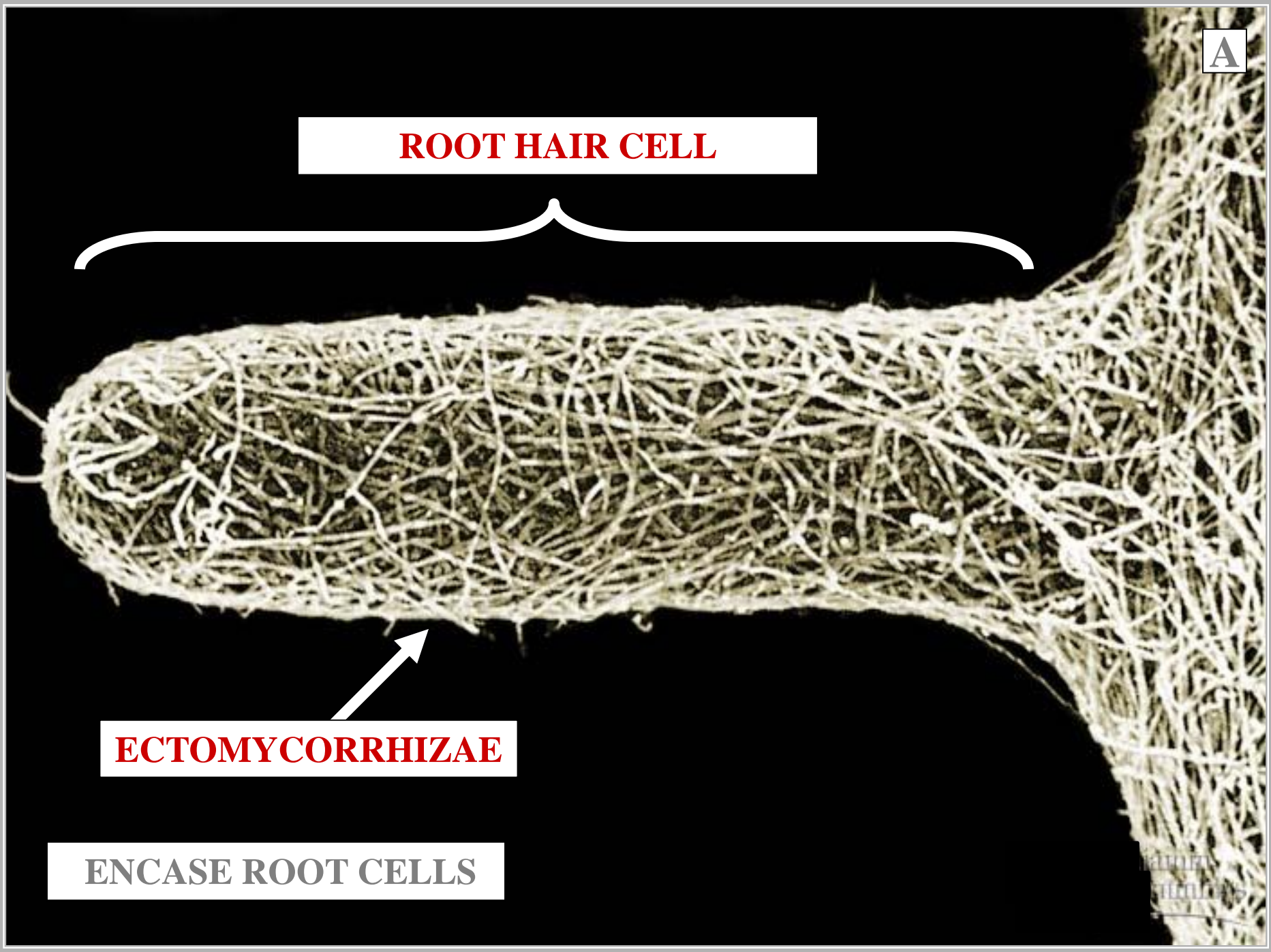


ECTOMYCORRHIZAE



ENCASE ROOT CELLS

BRUNNEN
MEDICAL



AF

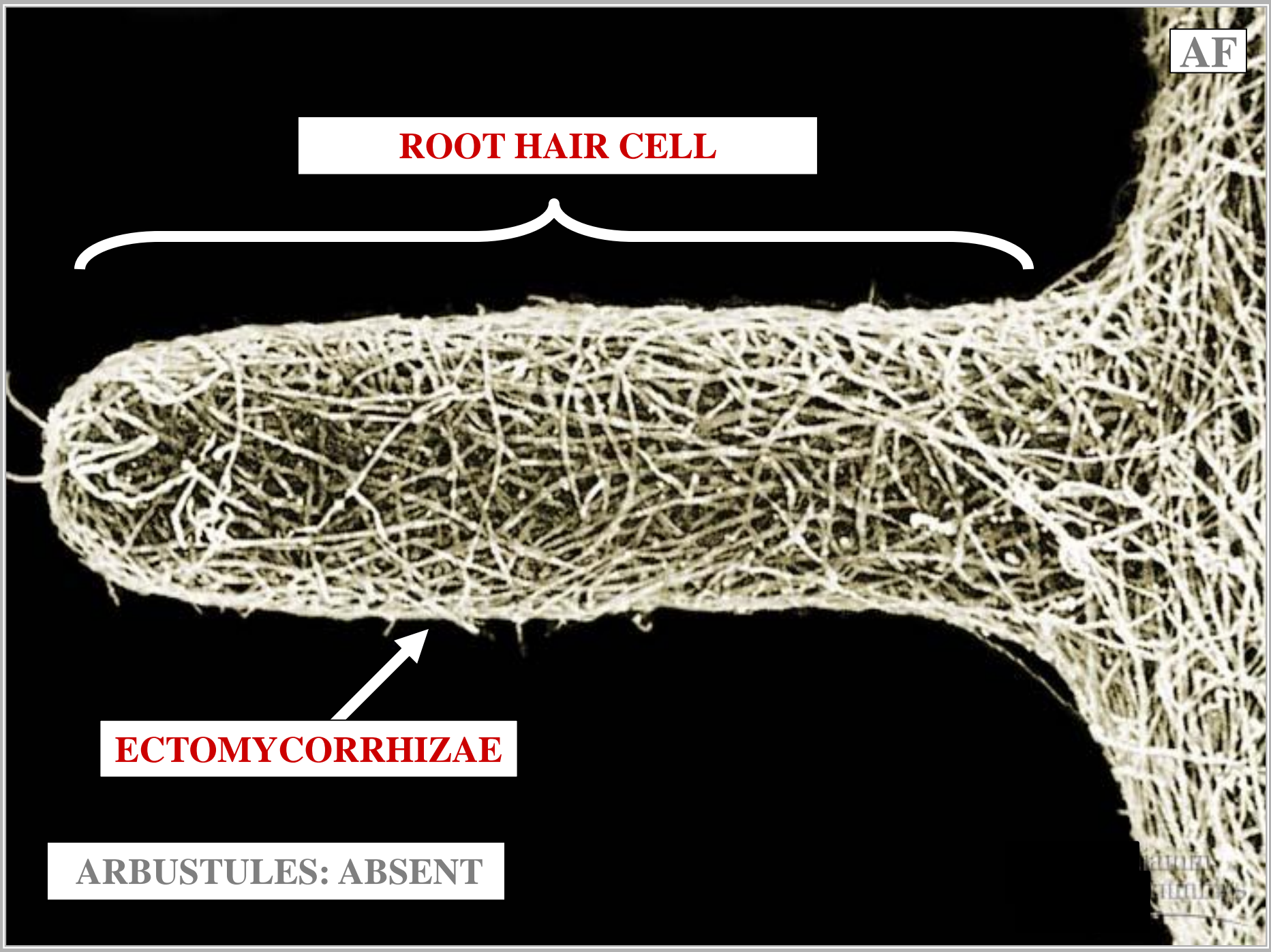
ROOT HAIR CELL



ECTOMYCORRHIZAE



ARBUSTULES: ABSENT



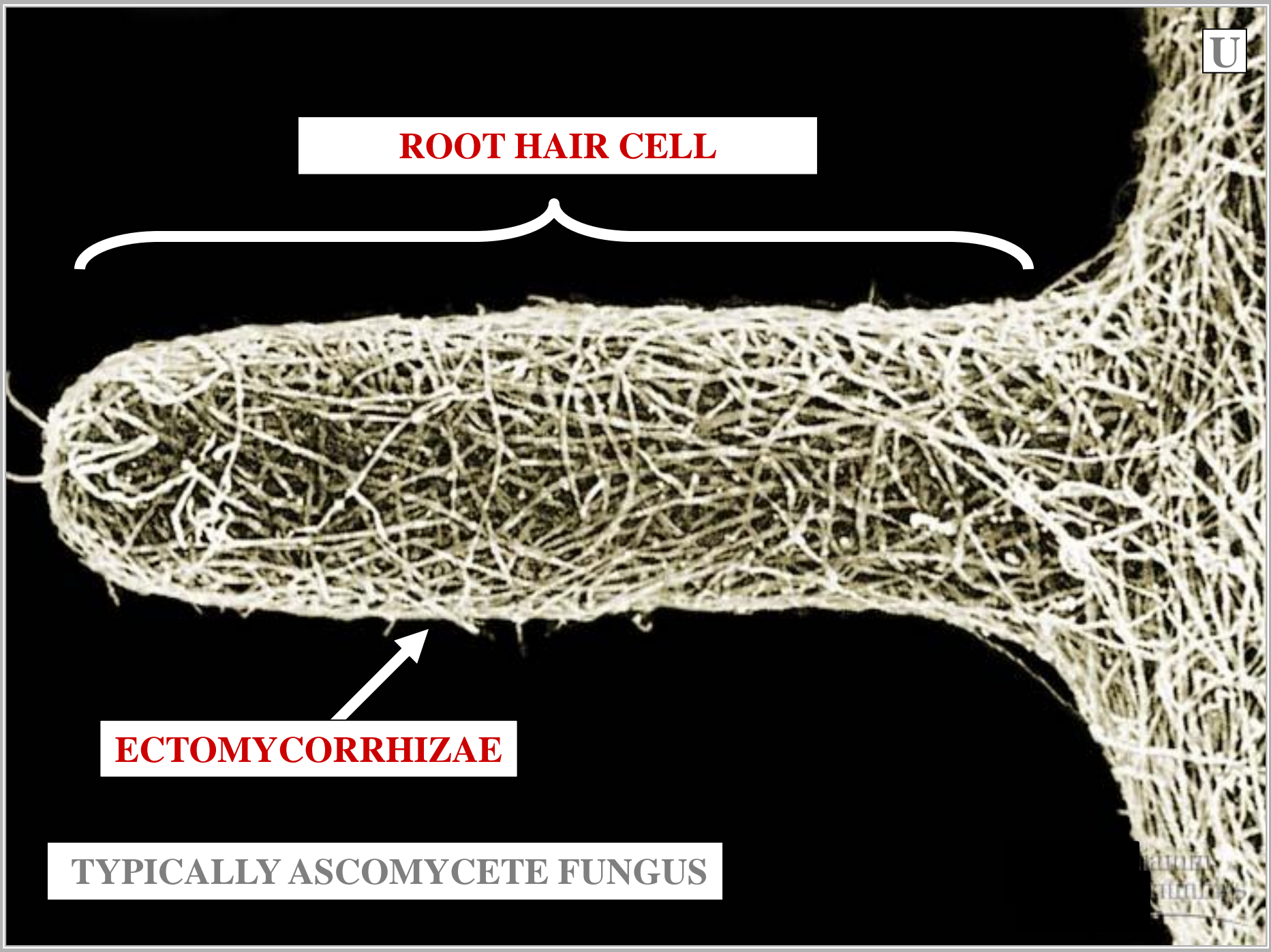
ROOT HAIR CELL



ECTOMYCORRHIZAE



TYPICALLY ASCOMYCETE FUNGUS





ROOT HAIR CELL

A scanning electron micrograph (SEM) of a root tip. The root is covered in a dense, intricate network of fine, hair-like structures. A white bracket above the root tip points to a specific region, and a white arrow below points to another region. The background is black.

ECTOMYCORRHIZAE

UNCOMMON

ENDOMYCORRHIZAE

ENDOMYCORRHIZAE



MYCORRHIZAE

ENDOMYCORRHIZAE

HYPHAE ENCASE

AND

PENETRATE ROOT CELLS

MYCORRHIZAE

ENDOMYCORRHIZAE

A

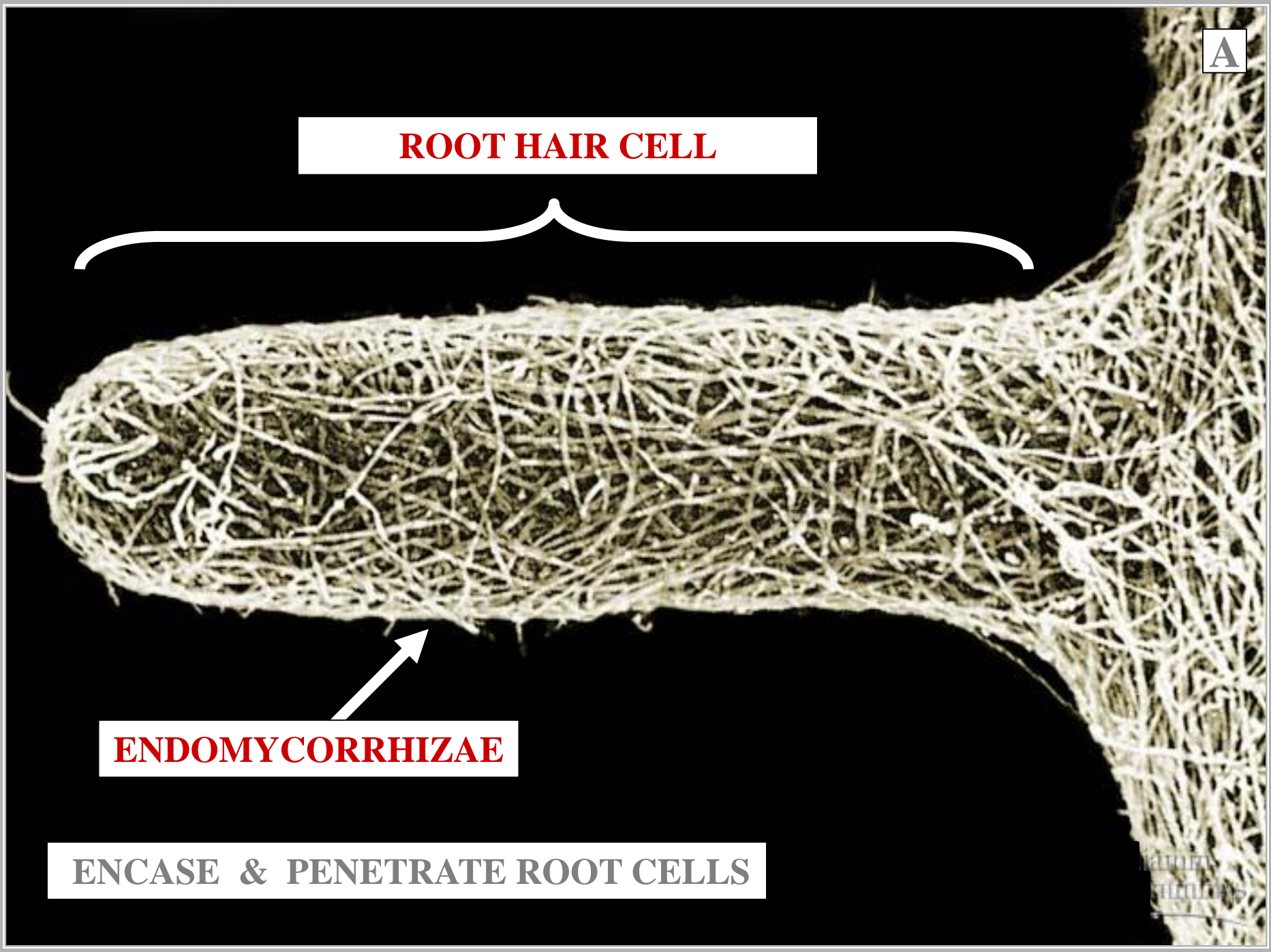
ROOT HAIR CELL



ENDOMYCORRHIZAE

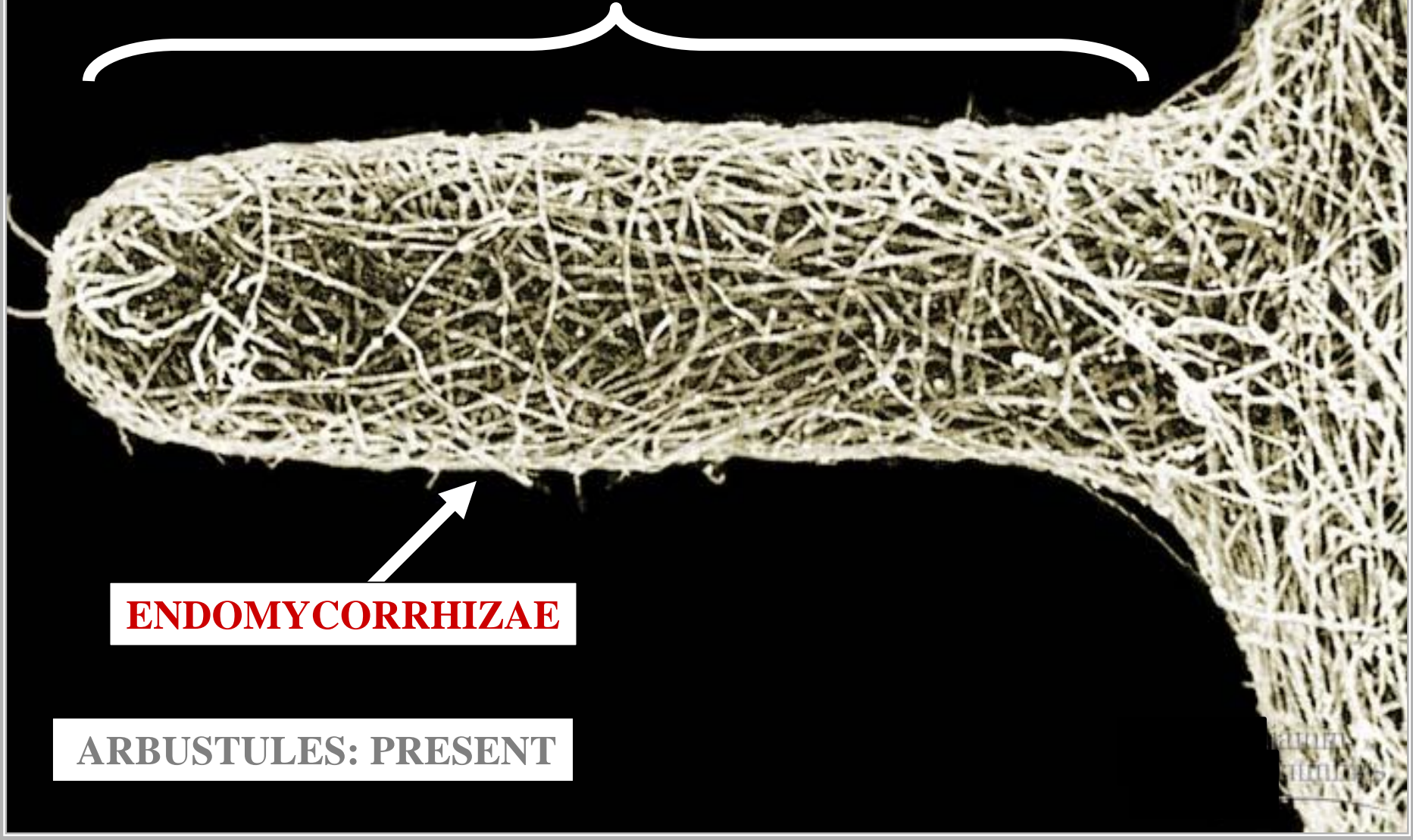


ENCASE & PENETRATE ROOT CELLS



A

ROOT HAIR CELL



ENDOMYCORRHIZAE



ARBUSTULES: PRESENT

ARBUSTULES

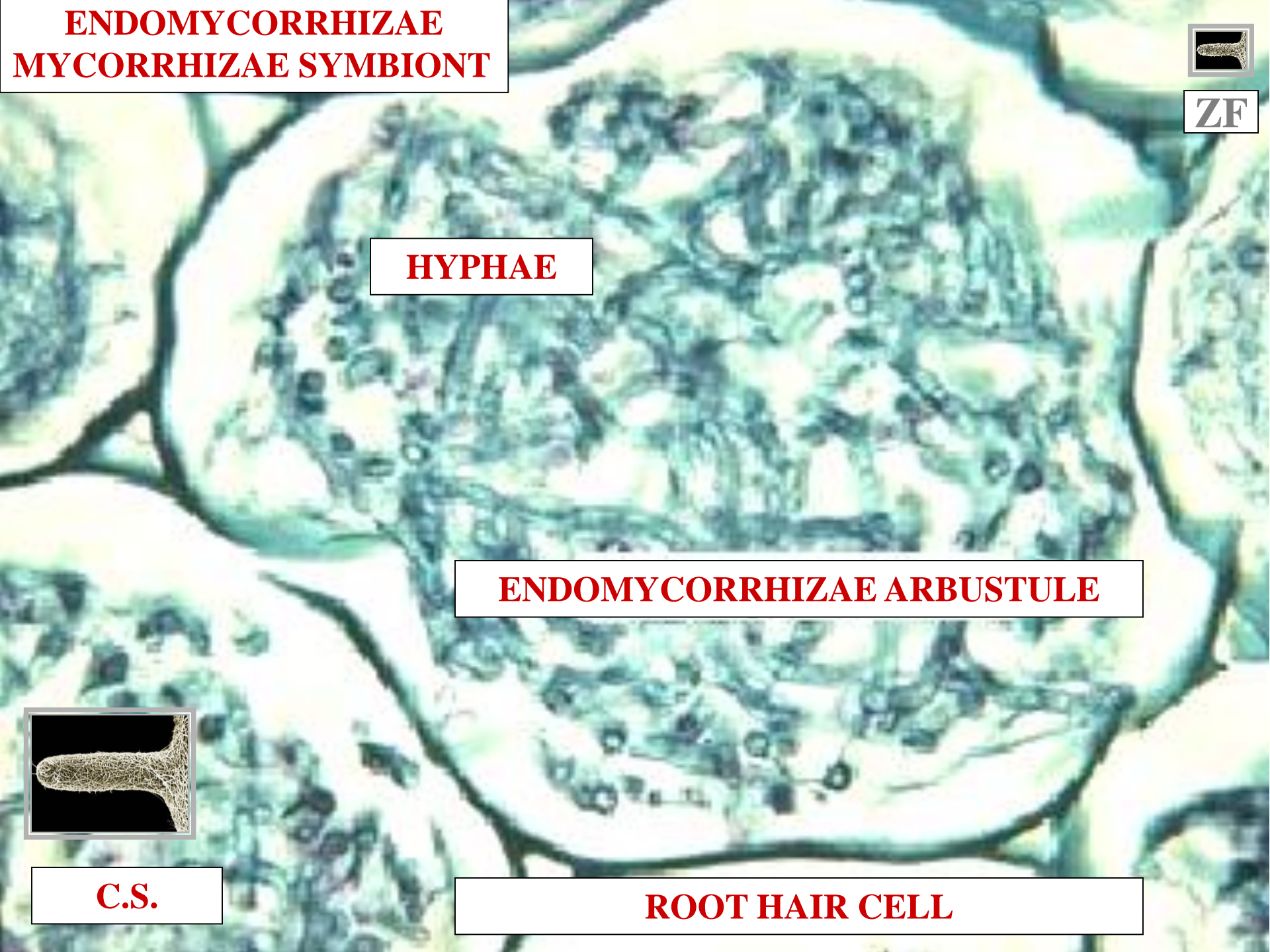


ENDOMYCORRHIZAE
ARBUSTULES

HYPHAE PENETRATE
WITHIN
ROOT CELL

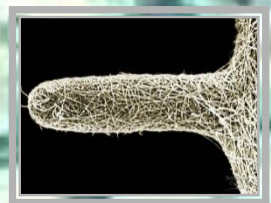
ENDOMYCORRHIZAE
ARBUSTULES

**ENDOMYCORRHIZAE
MYCORRHIZAE SYMBIONT**



HYPHAE

ENDOMYCORRHIZAE ARBUSTULE

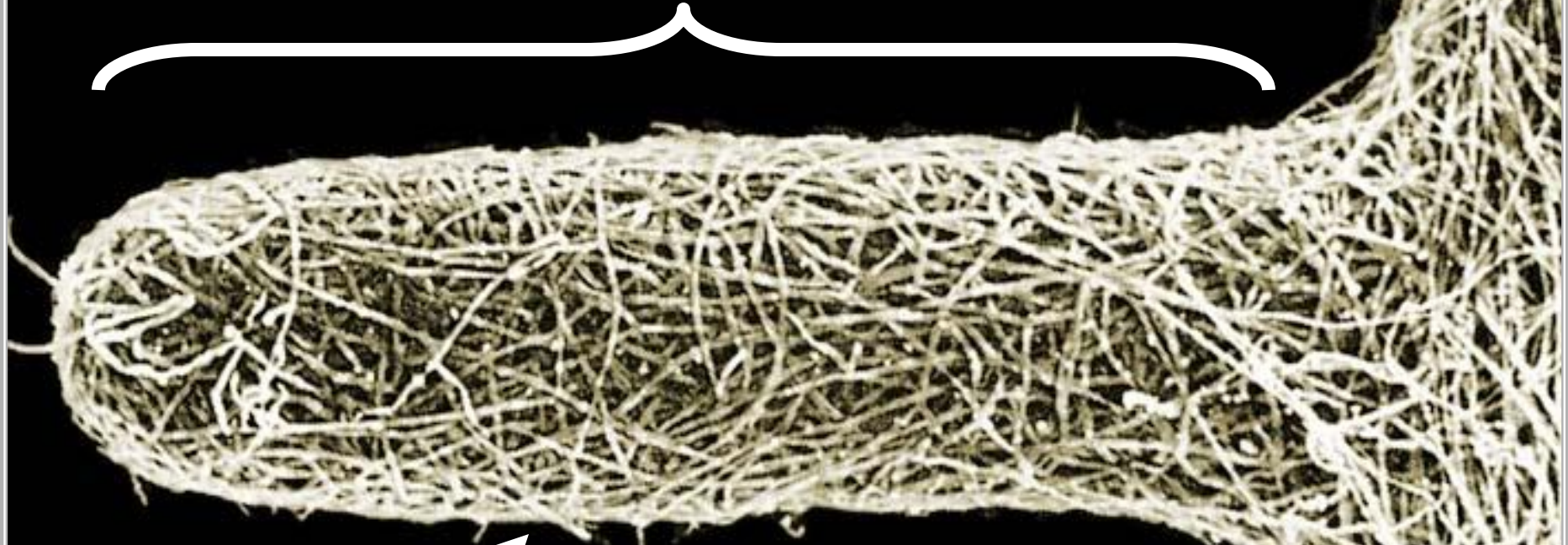


C.S.

ROOT HAIR CELL

C

ROOT HAIR CELL



ENDOMYCORRHIZAE



TYPICALLY ZYGOMYCETE FUNGUS

A scanning electron micrograph (SEM) of a root tip. The root is covered in a dense network of fine, hair-like structures. A white bracket above the root tip points to a specific cell, labeled 'ROOT HAIR CELL'. A white arrow points to a cluster of fine, branching structures within the root, labeled 'ENDOMYCORRHIZAE'. The word 'COMMON' is written in a box at the bottom left. A small grey box with an upward-pointing arrow is in the top right corner.

ROOT HAIR CELL

ENDOMYCORRHIZAE

COMMON



MODIFIED ROOTS



**MODIFIED ROOTS
PROVIDE
SPECIAL FUNCTION**

MODIFIED ROOT TYPES

MODIFIED ROOT TYPES

PROP ROOT

MODIFIED ROOT TYPES

MODIFIED ROOT TYPES

PROP ROOT

PNEUMATOPHORE ROOT

MODIFIED ROOT TYPES



MODIFIED ROOT TYPES

PROP ROOT

PNEUMATOPHORE ROOT

AERIAL ROOT

MODIFIED ROOT TYPES



PROP ROOT

SR

PROP ROOT



CORN

PROP ROOT
SUPPORT ROOT



CORN



PROP ROOT
SUPPORT ROOT
LARGE HERB



CORN

**PROP ROOT
SUPPORT ROOT
LARGE HERB**

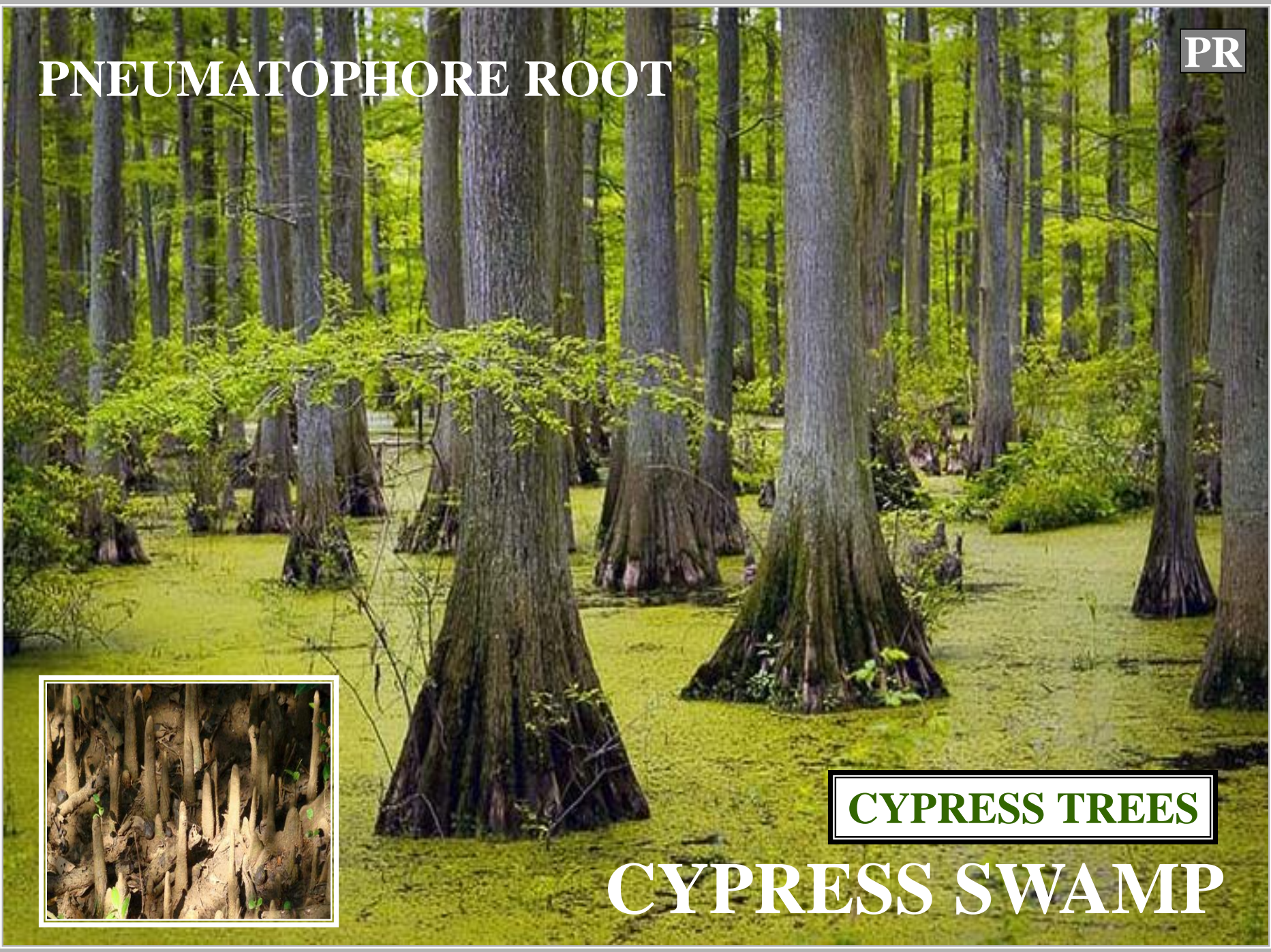


CORN



PNEUMATOPHORE ROOT

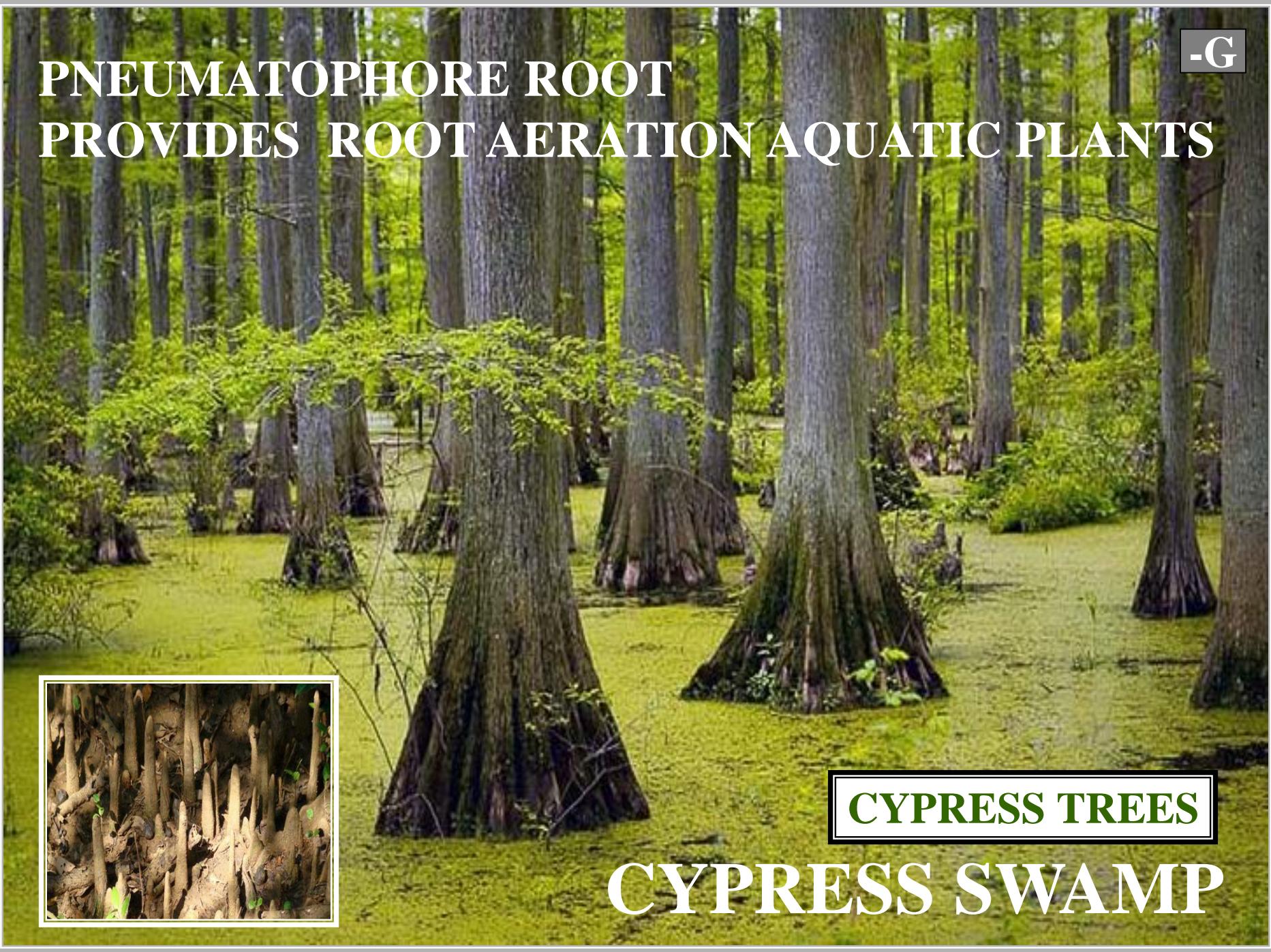
PNEUMATOPHORE ROOT



CYPRESS TREES

CYPRESS SWAMP

PNEUMATOPHORE ROOT PROVIDES ROOT AERATION AQUATIC PLANTS



CYPRESS TREES

CYPRESS SWAMP

PNEUMATOPHORE ROOT
PROVIDES ROOT AERATION AQUATIC PLANTS
NEGATIVELY GEOTROPIC ROOT



CYPRESS TREES

CYPRESS SWAMP



E

AERIAL ROOT



**TROPICAL
RAINFOREST**

EPIPHYTES

**AERIAL ROOT
ASSOCIATED WITH EPIPHTYES**

EPIPHYTE



AR

EPIPHYTE

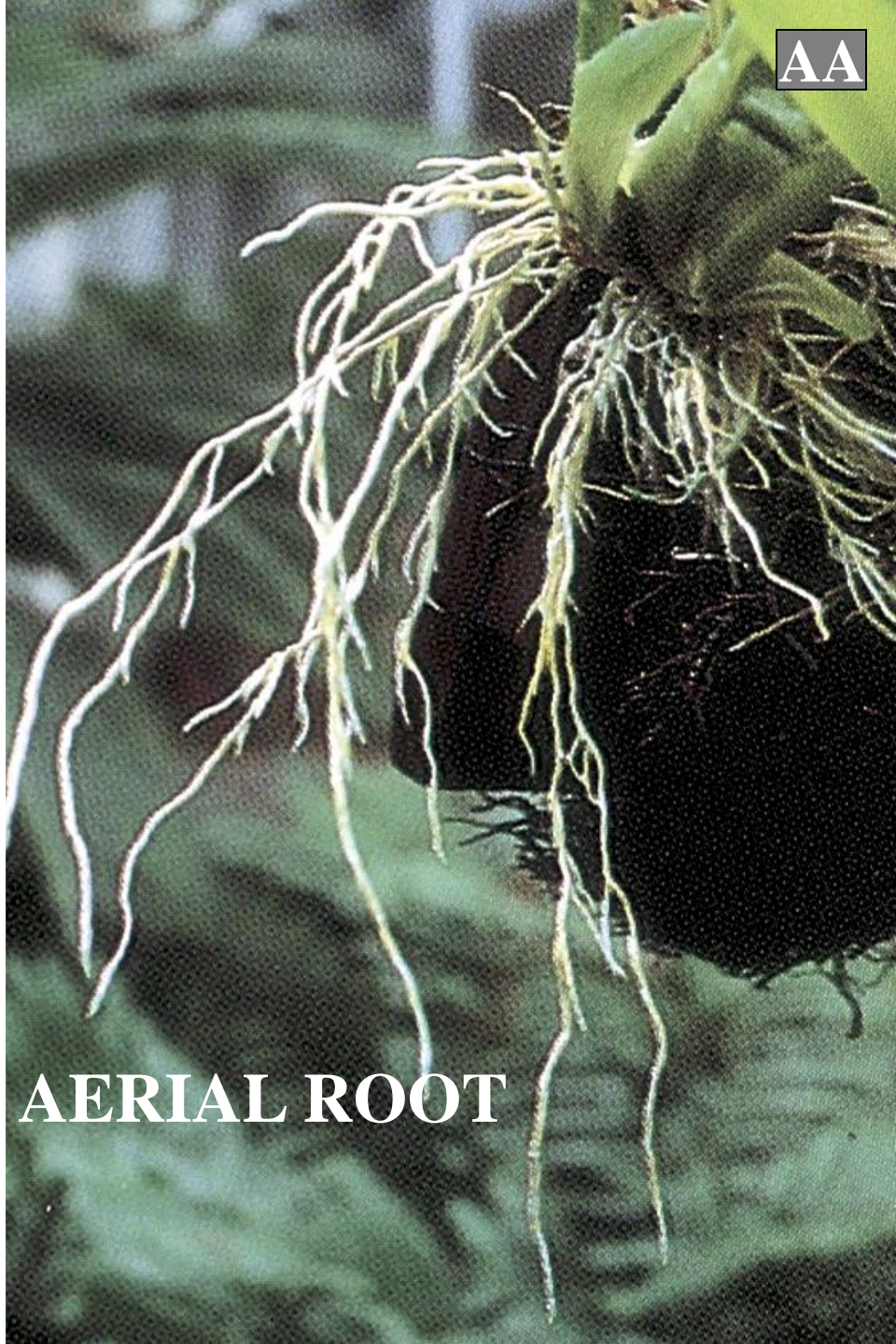
**PLANT GROWS UPON
SECOND PLANT**

EPIPHYTE



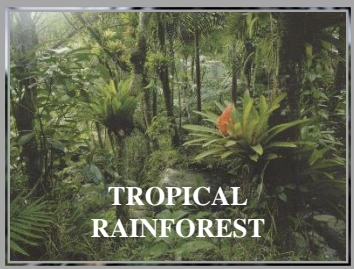
TROPICAL
RAINFOREST

ORCHID



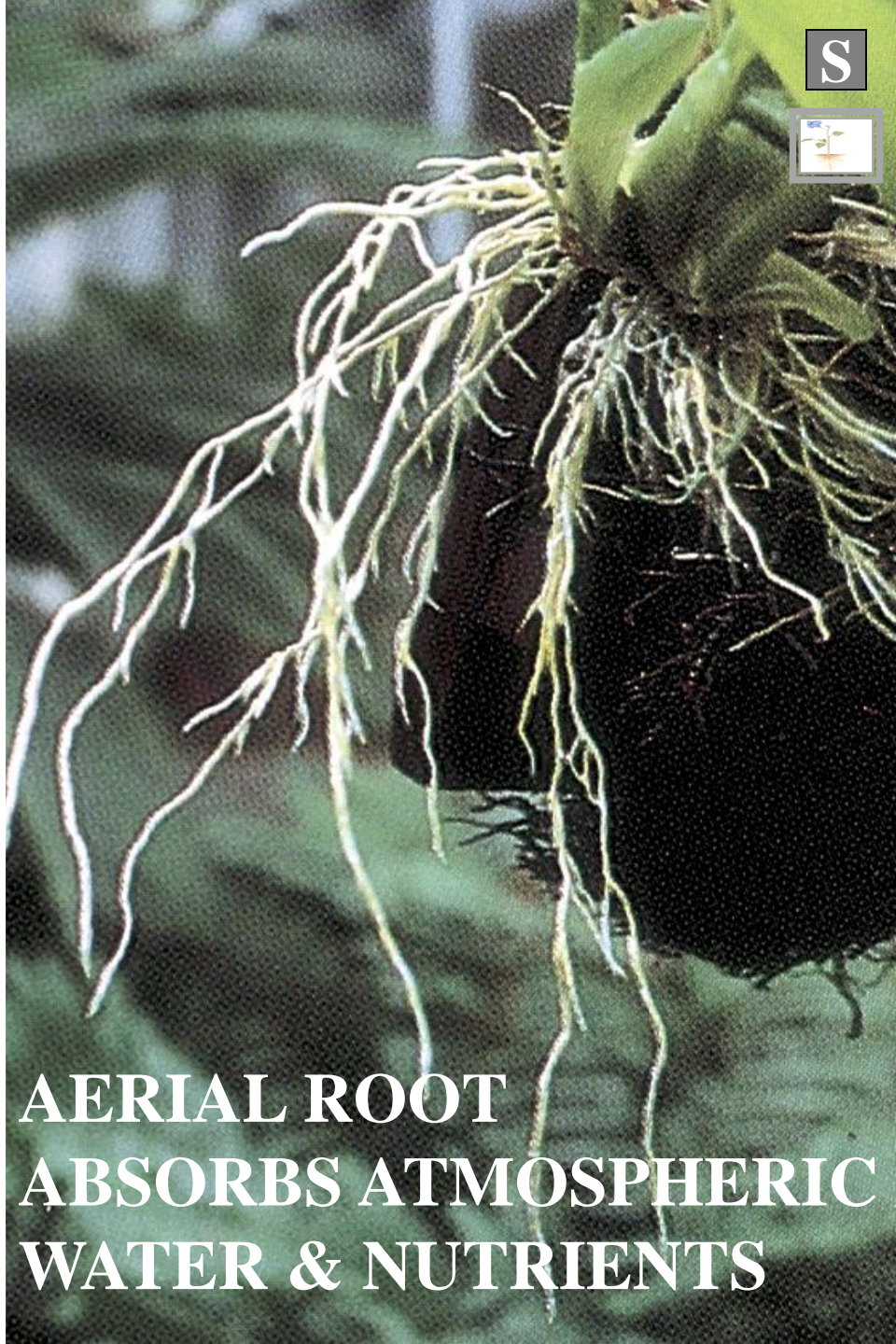
AA

AERIAL ROOT



TROPICAL
RAINFOREST

ORCHID



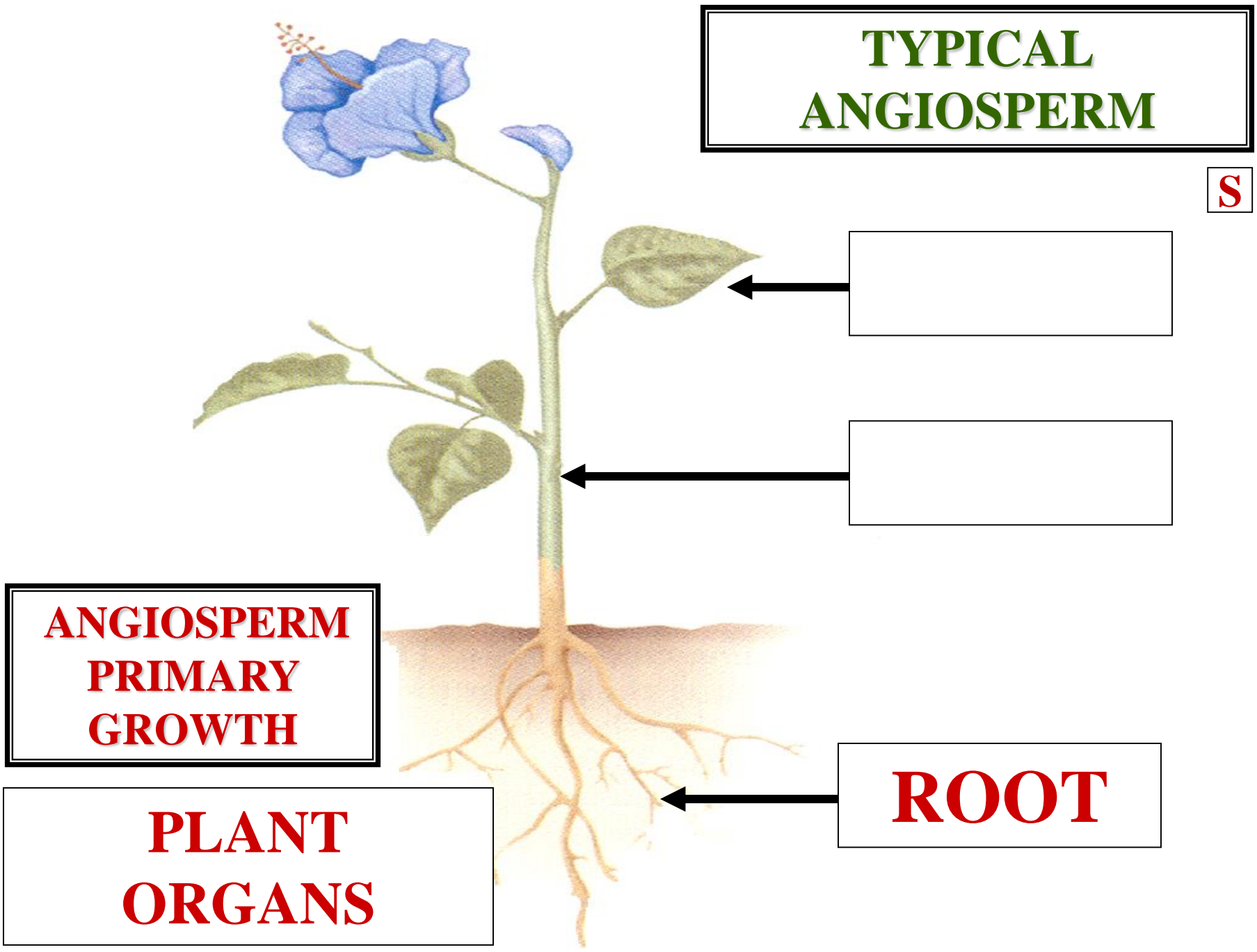
S



**AERIAL ROOT
ABSORBS ATMOSPHERIC
WATER & NUTRIENTS**

TYPICAL ANGIOSPERM

S



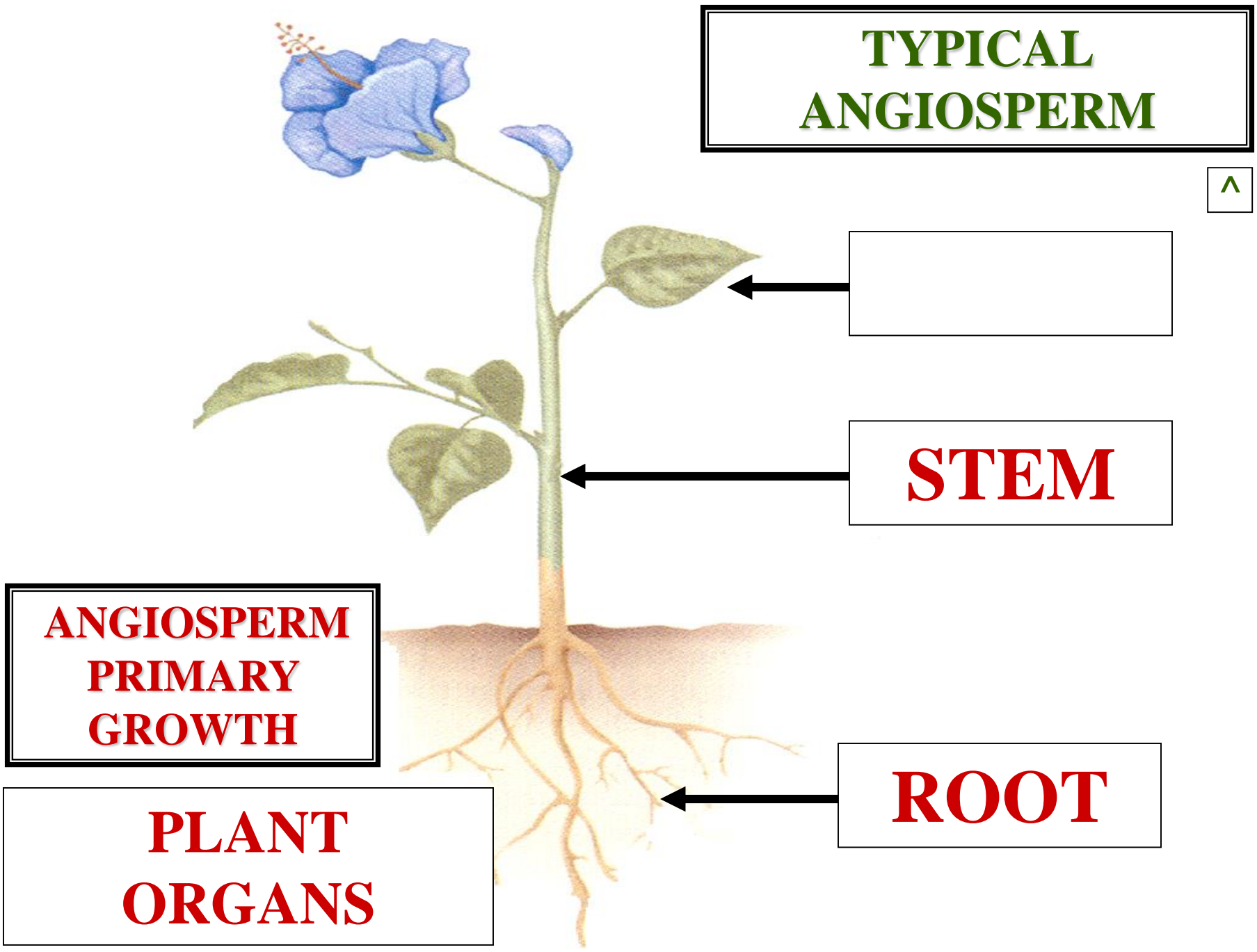
**ANGIOSPERM
PRIMARY
GROWTH**

**PLANT
ORGANS**

ROOT

TYPICAL ANGIOSPERM

^



[Empty box]

STEM

**ANGIOSPERM
PRIMARY
GROWTH**

**PLANT
ORGANS**

ROOT

STEM

STEM

PLANT ORGANS

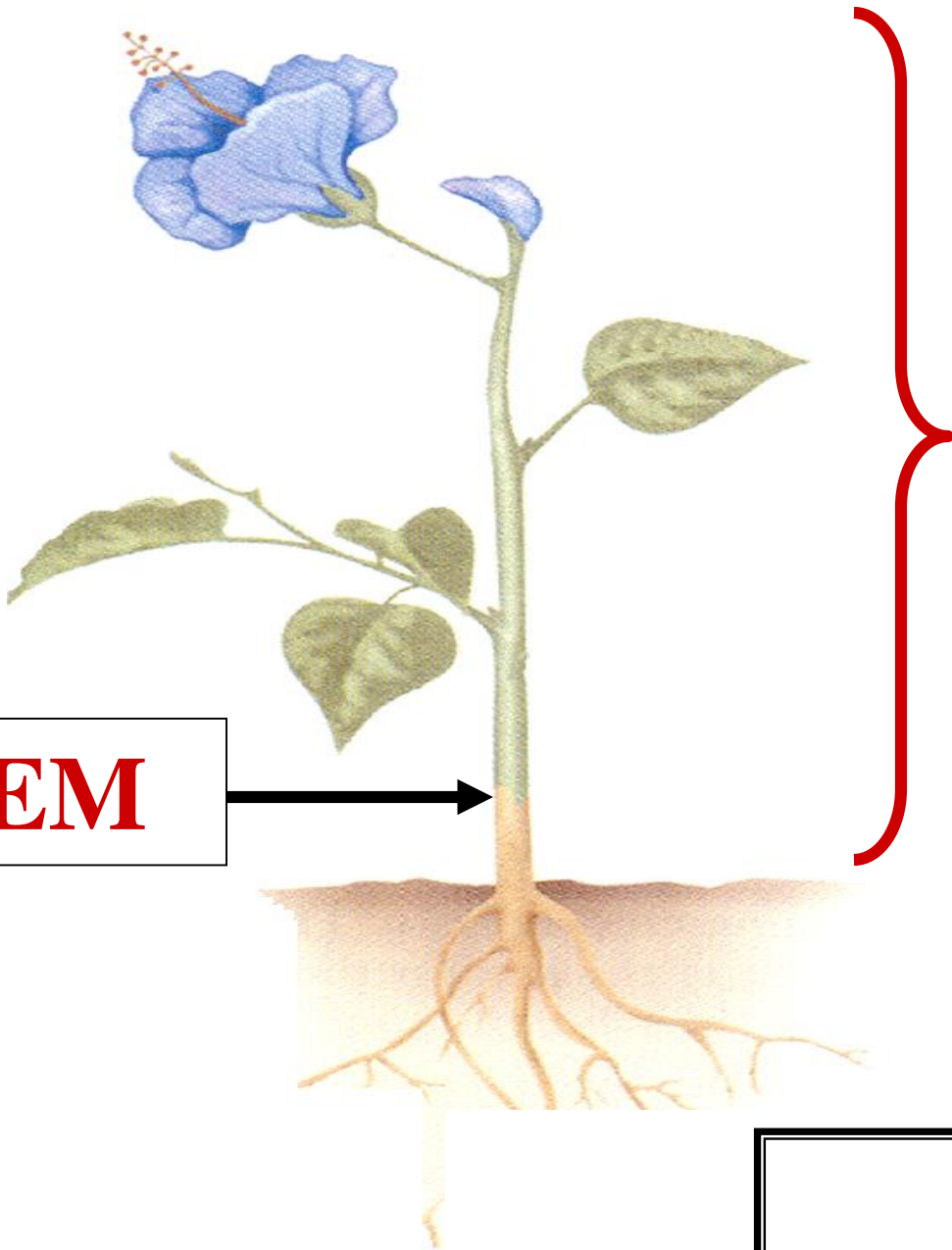
ROOT



ASCENDING PLANT AXIS

PLANT ORGANS

ROOT



STEM

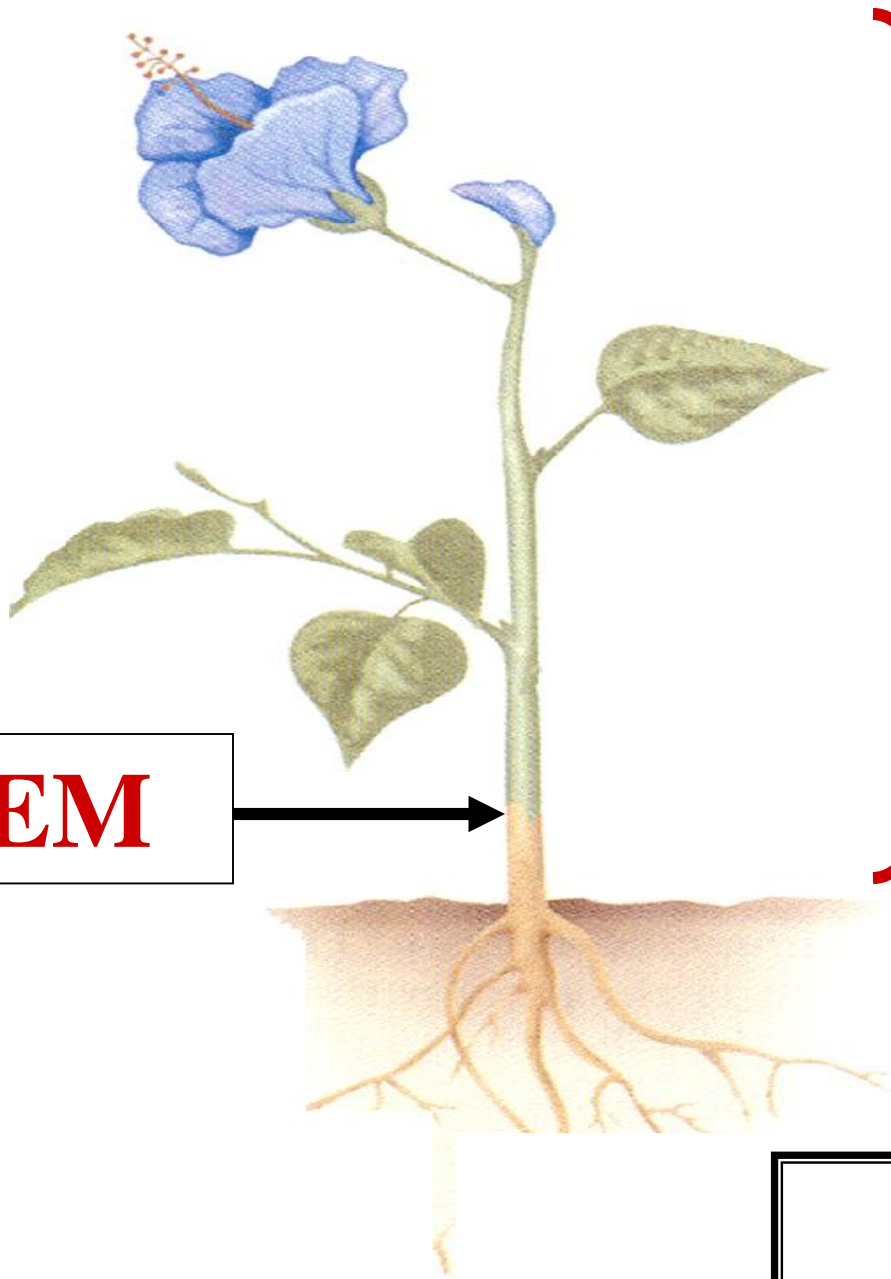
**ASCENDING
PLANT
AXIS**

**TYPICAL
ANGIOSPERM**



EL

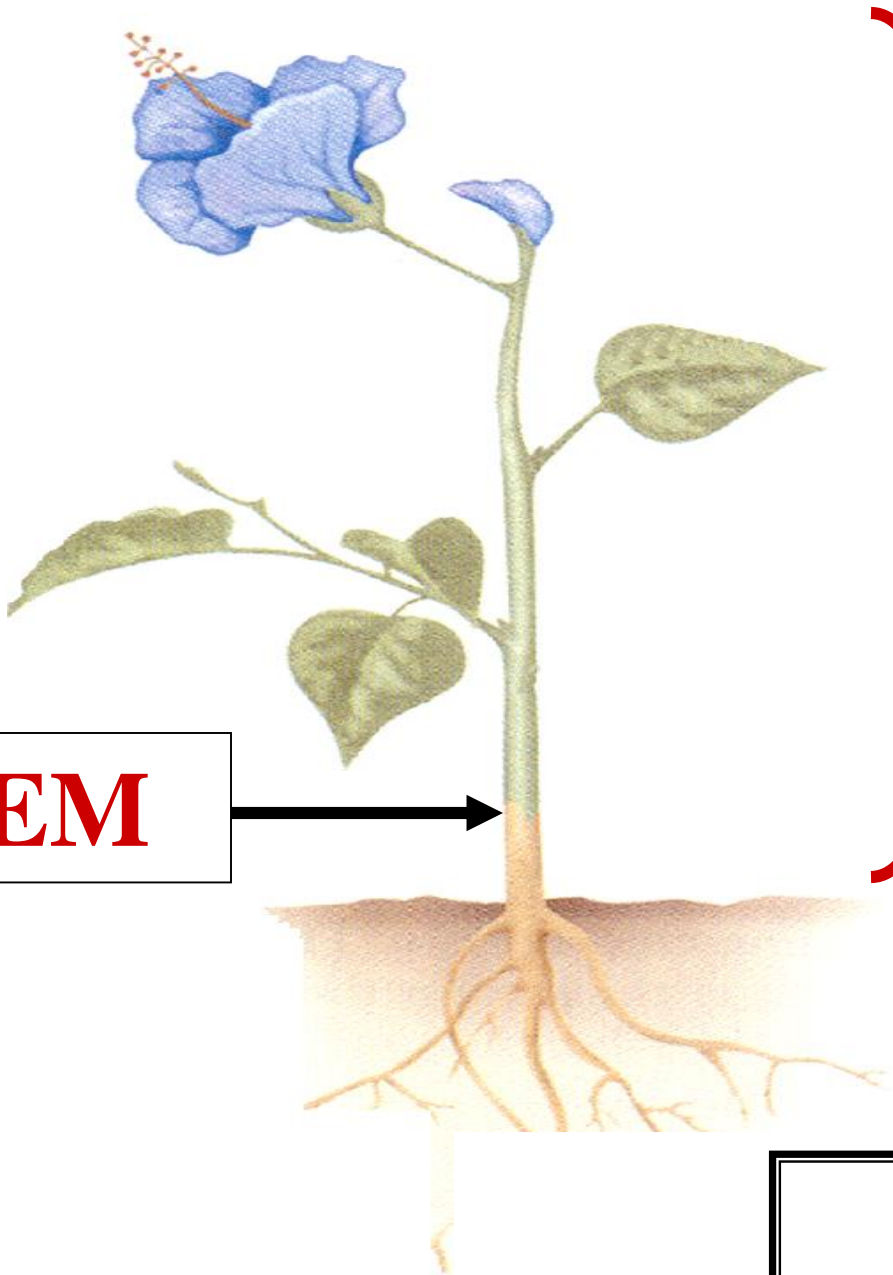
STEM FUNCTION



STEM

**ELEVATE
LEAVES**

**TYPICAL
ANGIOSPERM**



STEM



TRANSPORT

**TYPICAL
ANGIOSPERM**



**STEM
MORPHOLOGY
&
STEM
ANATOMY**



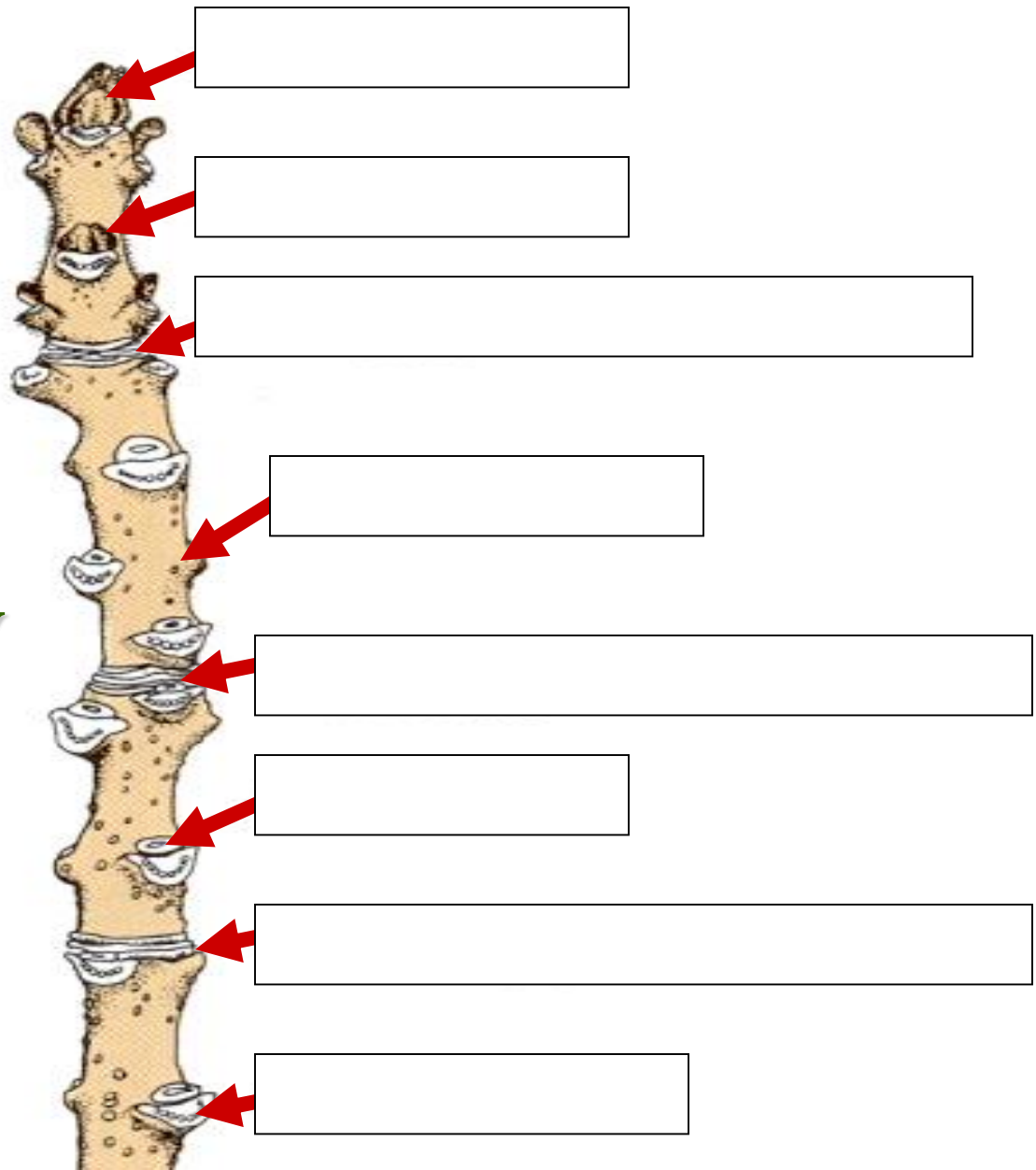
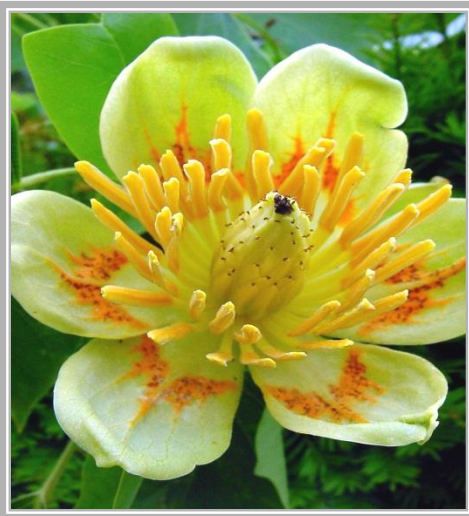
STEM MORPHOLOGY



DICOT STEM MORPHOLOGY



DICOT STEM MORPHOLOGY



TERMINAL BUD

DICOT STEM MORPHOLOGY

TERMINAL BUD



APICAL BUD

DICOT STEM MORPHOLOGY

TERMINAL BUD

TERMINAL BUD



LATERAL BUD

DICOT STEM MORPHOLOGY

LATERAL BUD



L

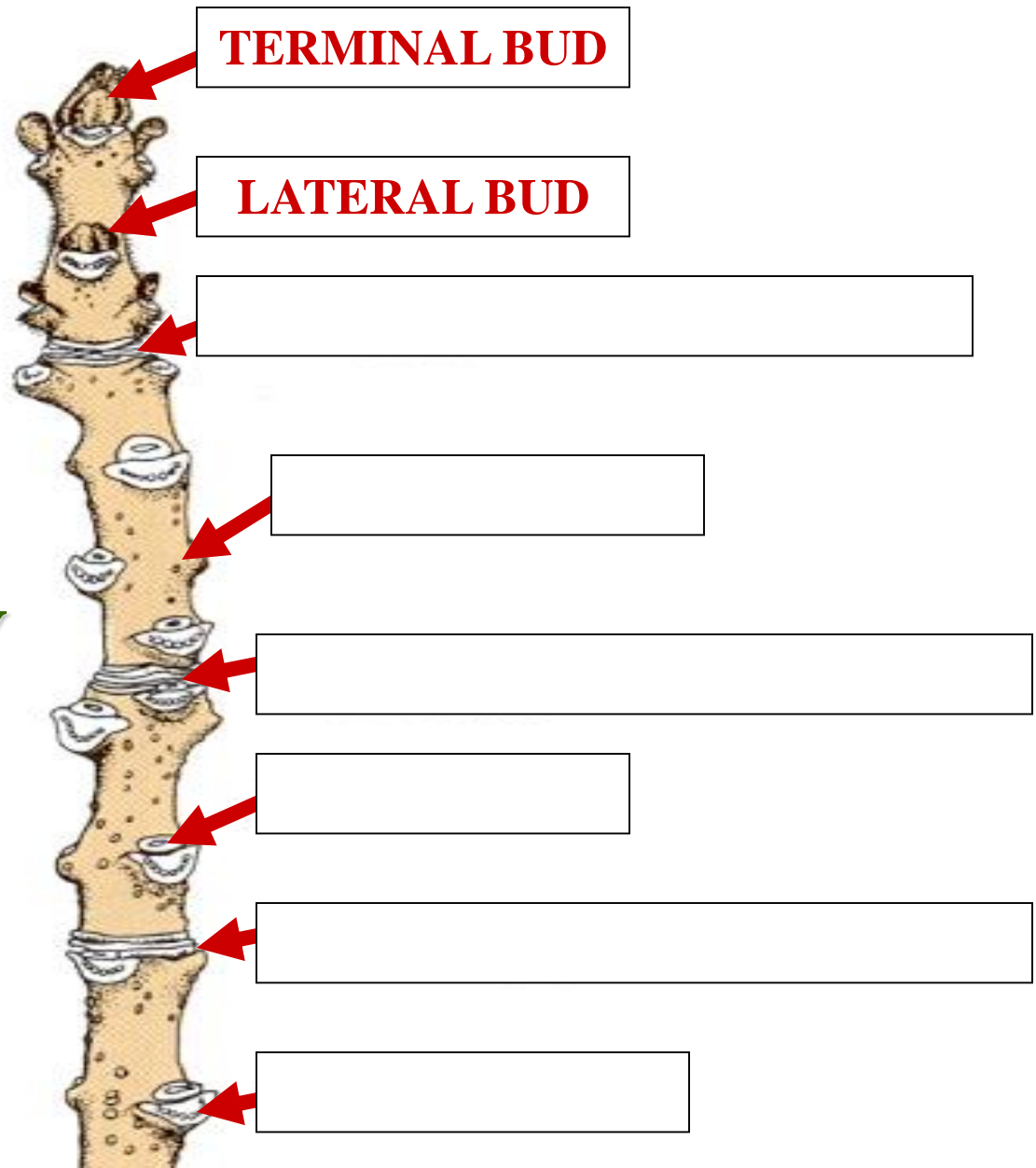
NON-APICAL BUD

DICOT STEM MORPHOLOGY

LATERAL BUD



DICOT STEM MORPHOLOGY



TERMINAL BUD

LATERAL BUD



LENTICEL

DICOT STEM MORPHOLOGY

LENTICEL



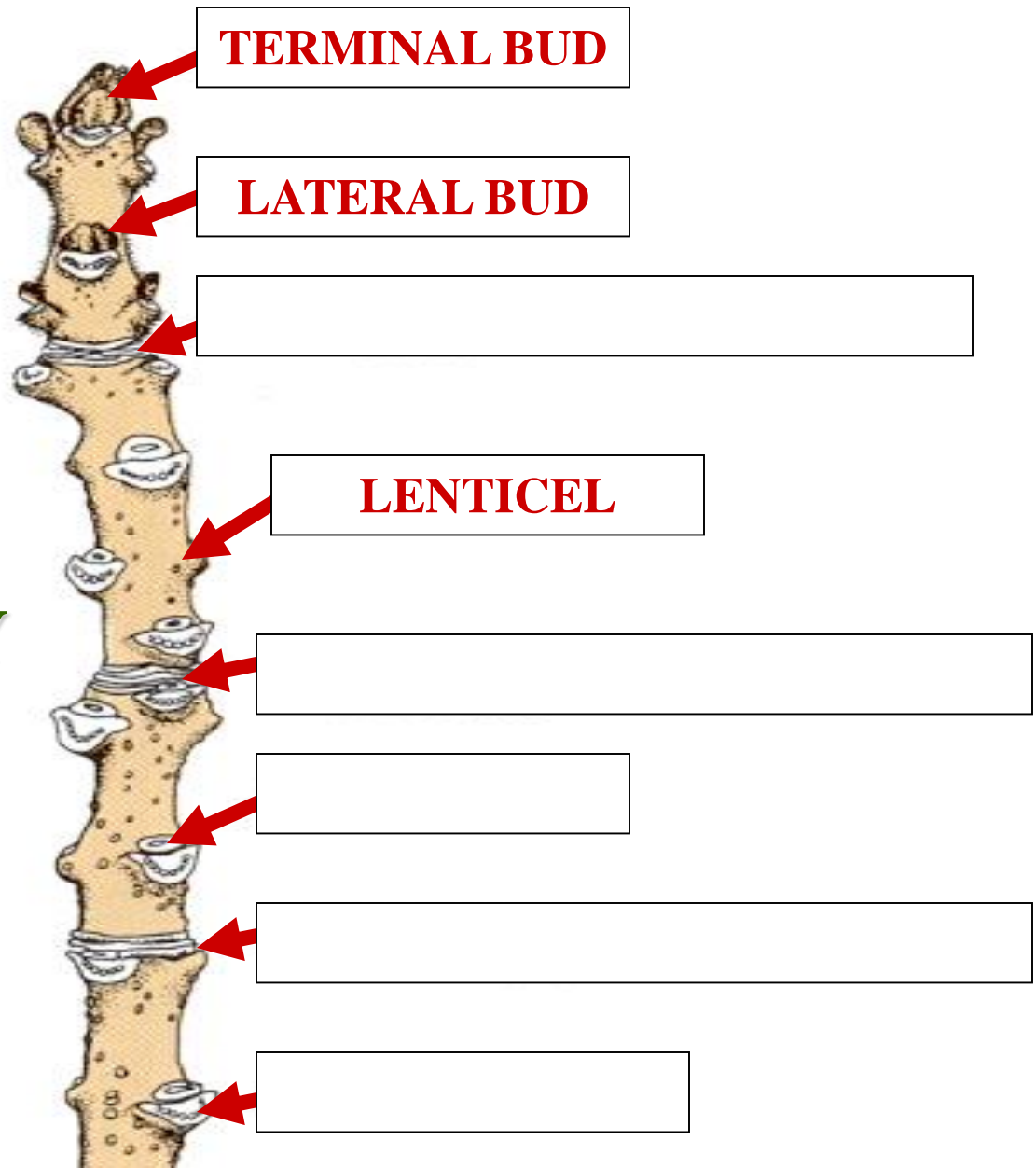
STEM GAS EXCHANGE

DICOT STEM MORPHOLOGY

LENTICEL



DICOT STEM MORPHOLOGY

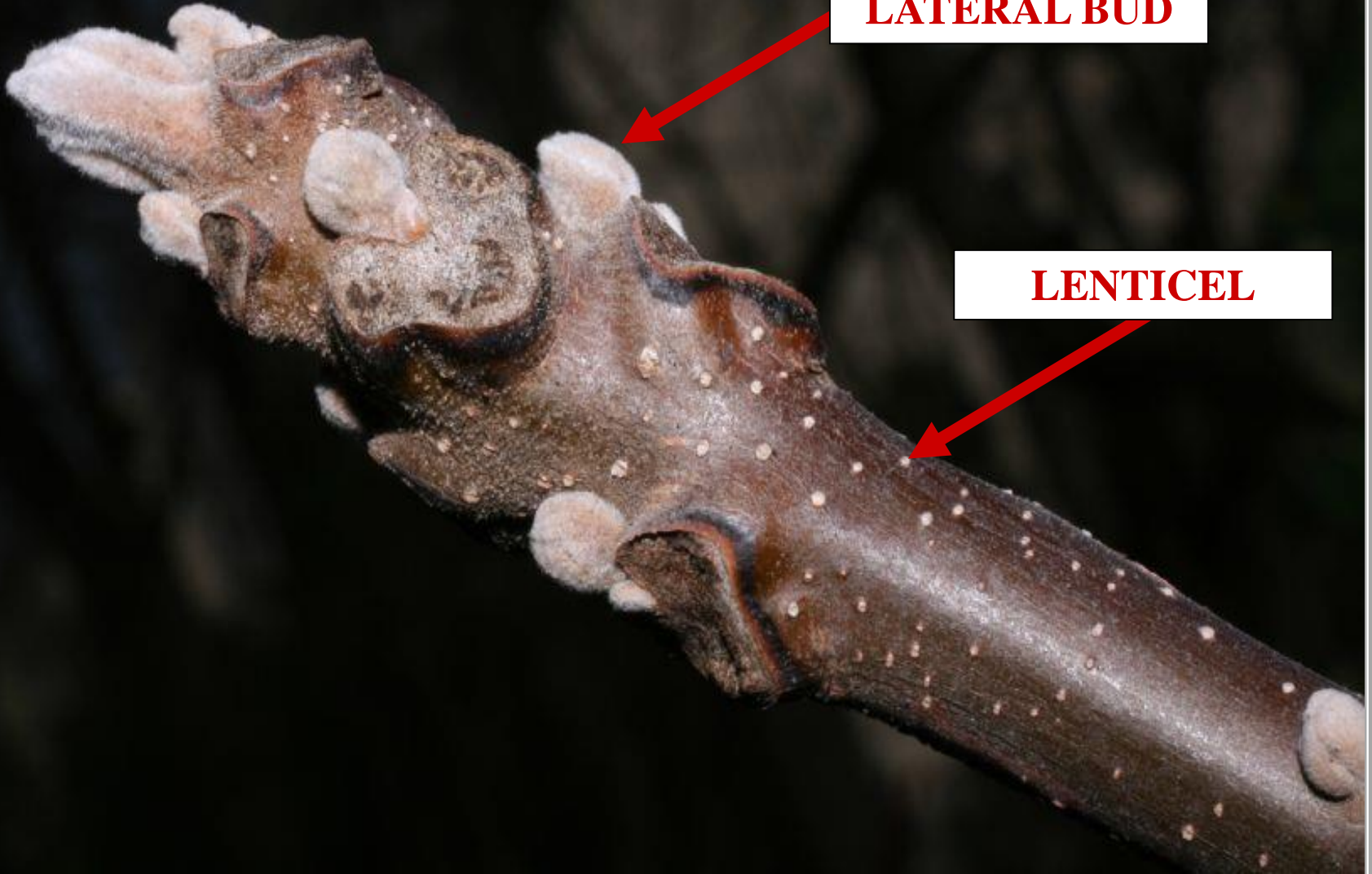


N

TERMINAL BUD

LATERAL BUD

LENTICEL



NODE

DICOT STEM MORPHOLOGY

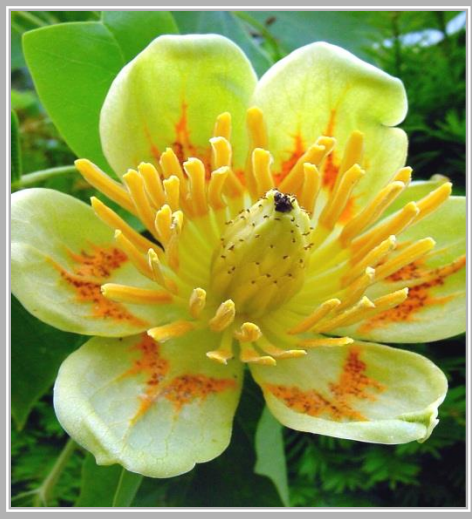
NODE



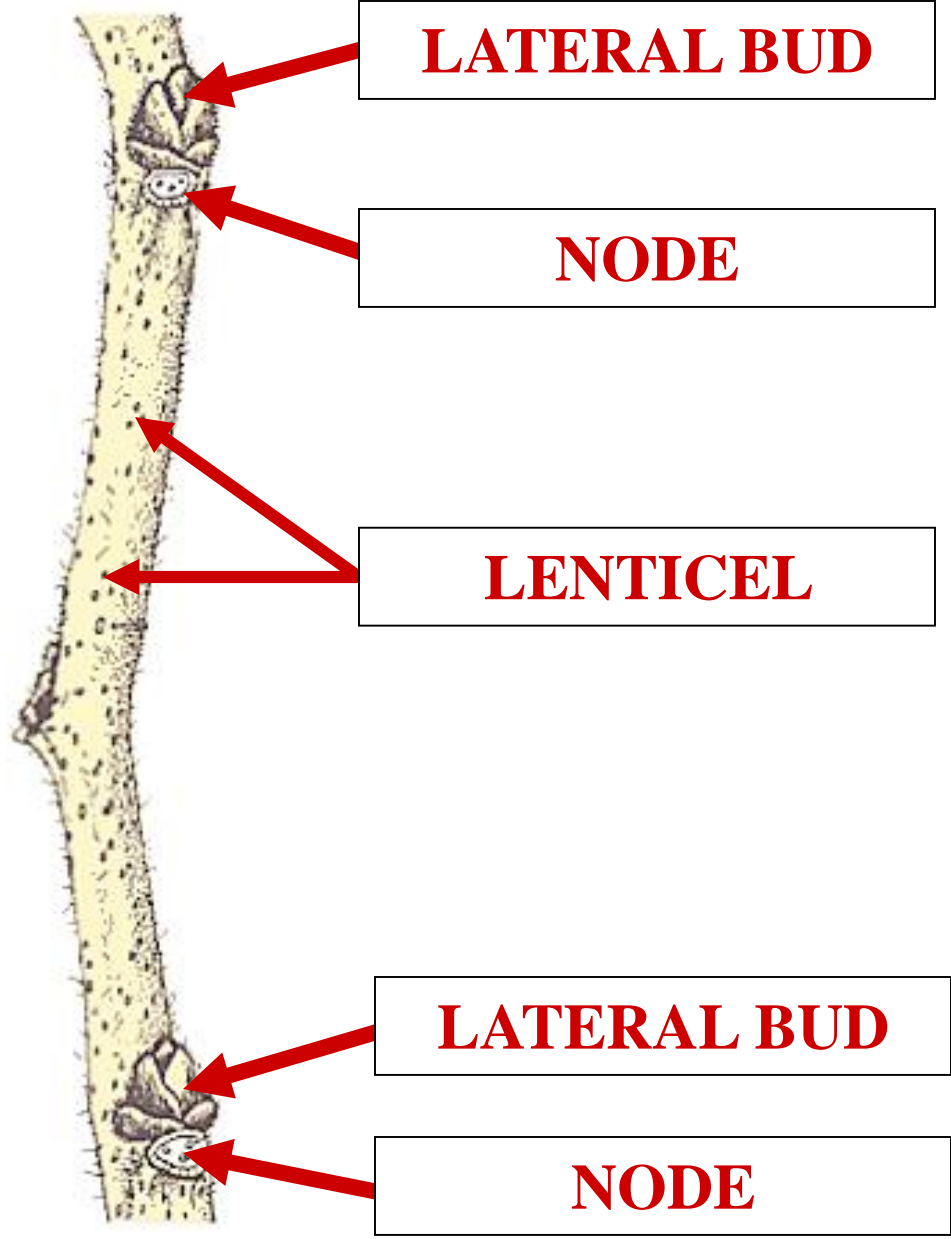
LEAF ORIGIN

DICOT STEM MORPHOLOGY

NODE



DICOT STEM MORPHOLOGY



INTERNODE

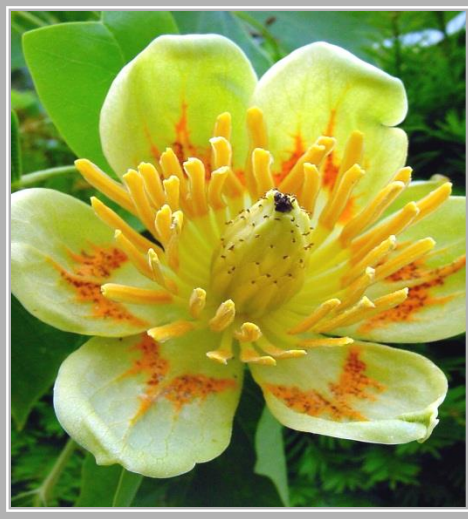
DICOT STEM MORPHOLOGY

INTERNODE

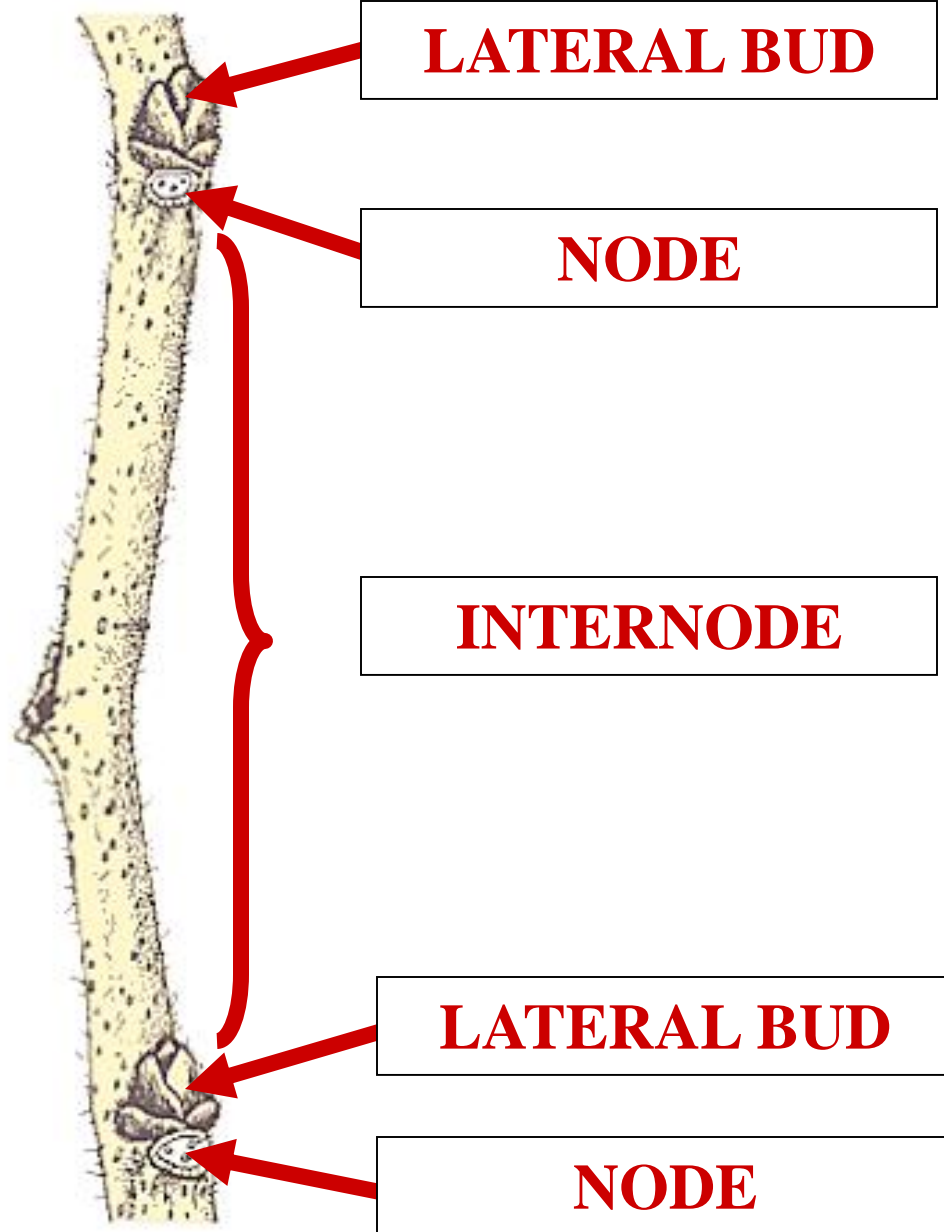


STEM AREA BETWEEN
ADJACENT NODES

DICOT STEM MORPHOLOGY
INTERNODE



DICOT STEM MORPHOLOGY



LEAF SCAR

DICOT STEM MORPHOLOGY

LEAF SCAR



LS

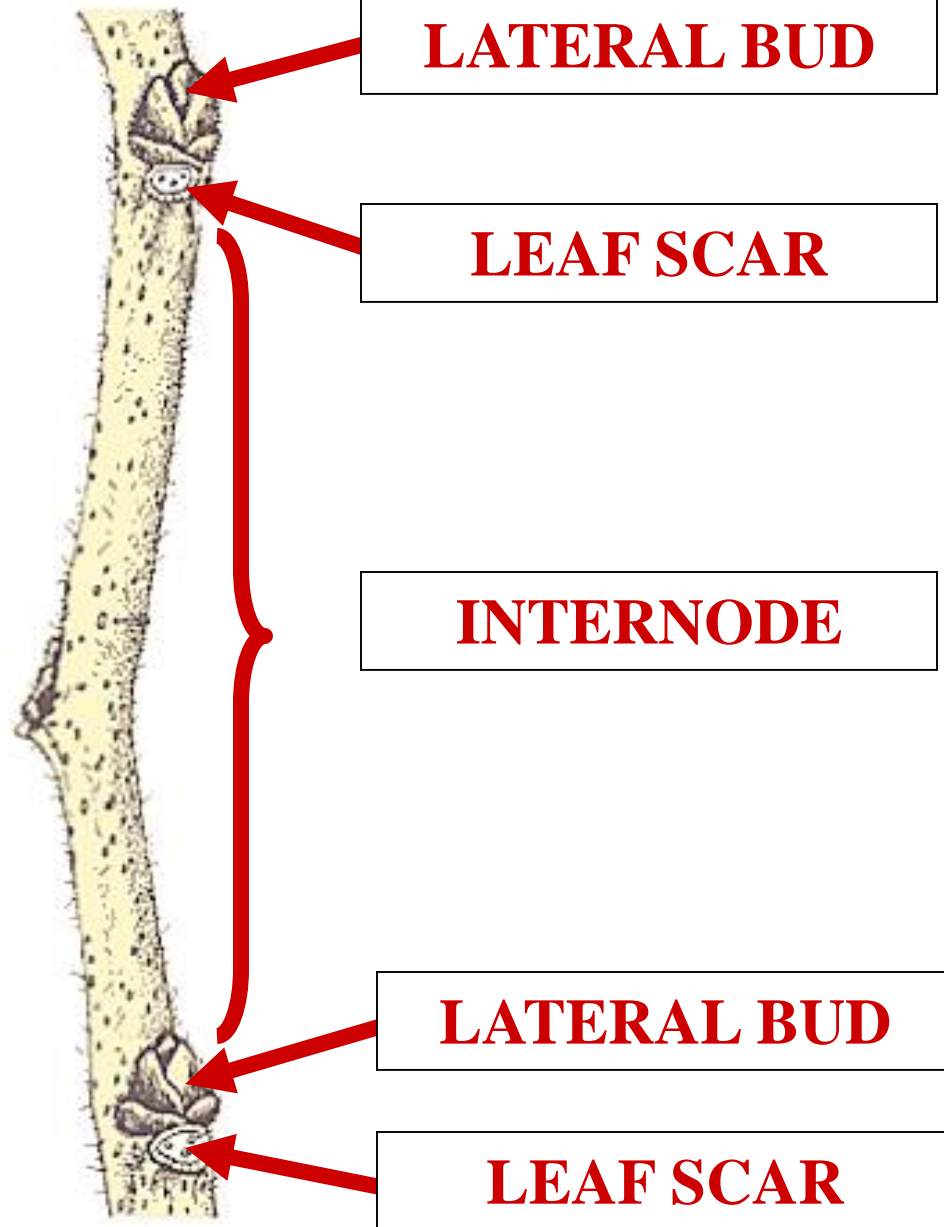
ATTACHMENT POINT
BETWEEN
STEM AND LEAF

DICOT STEM MORPHOLOGY

LEAF SCAR



DICOT STEM MORPHOLOGY

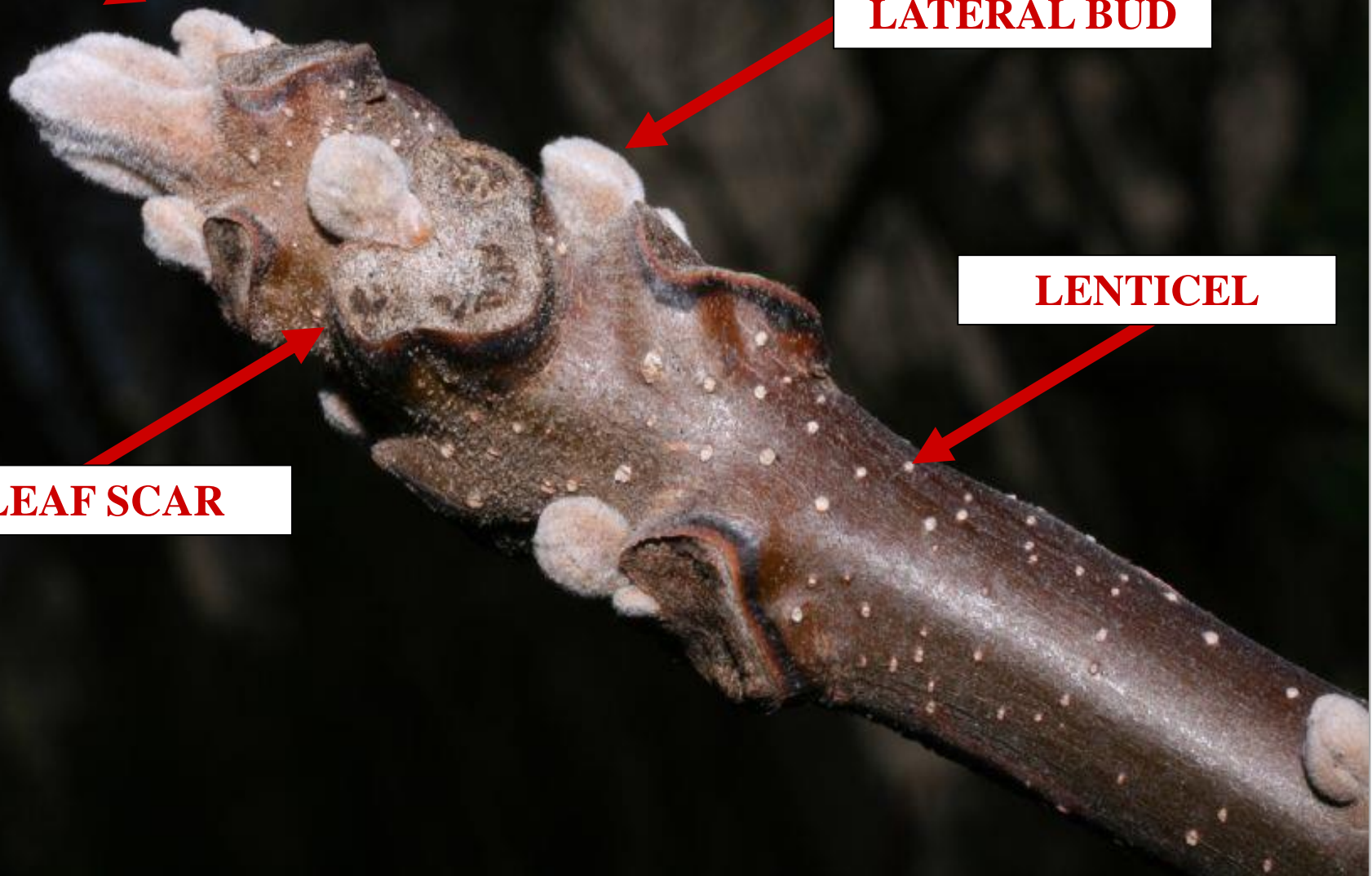


TERMINAL BUD

LATERAL BUD

LENTICEL

LEAF SCAR



VASCULAR BUNDLE SCAR

DICOT STEM MORPHOLOGY

VASCULAR BUNDLE SCAR



BS

ATTACHMENT POINT
VASCULAR TISSUE
BETWEEN
STEM AND LEAF

DICOT STEM MORPHOLOGY

VASCULAR BUNDLE SCAR

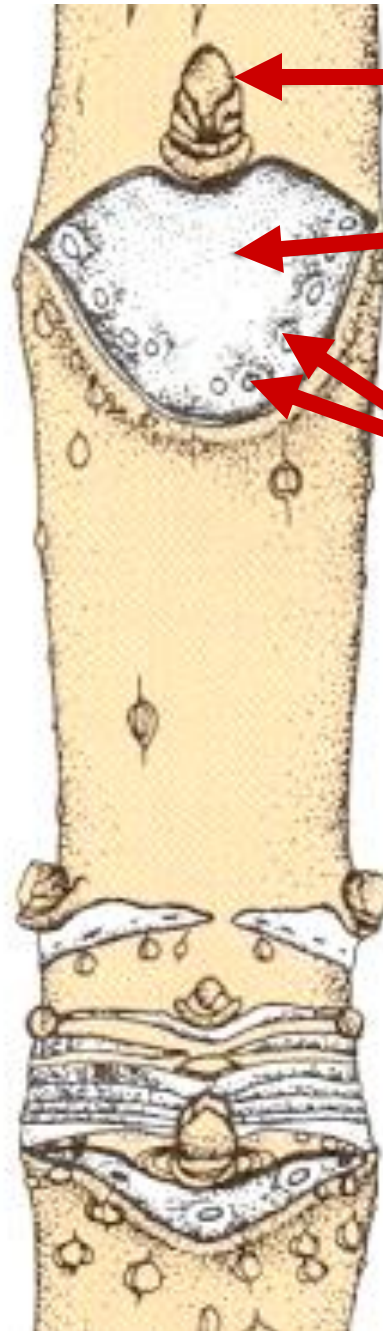


NODE

LATERAL BUD

LEAF SCAR

**VASCULAR
BUNDLE SCARS**



DICOT STEM MORPHOLOGY

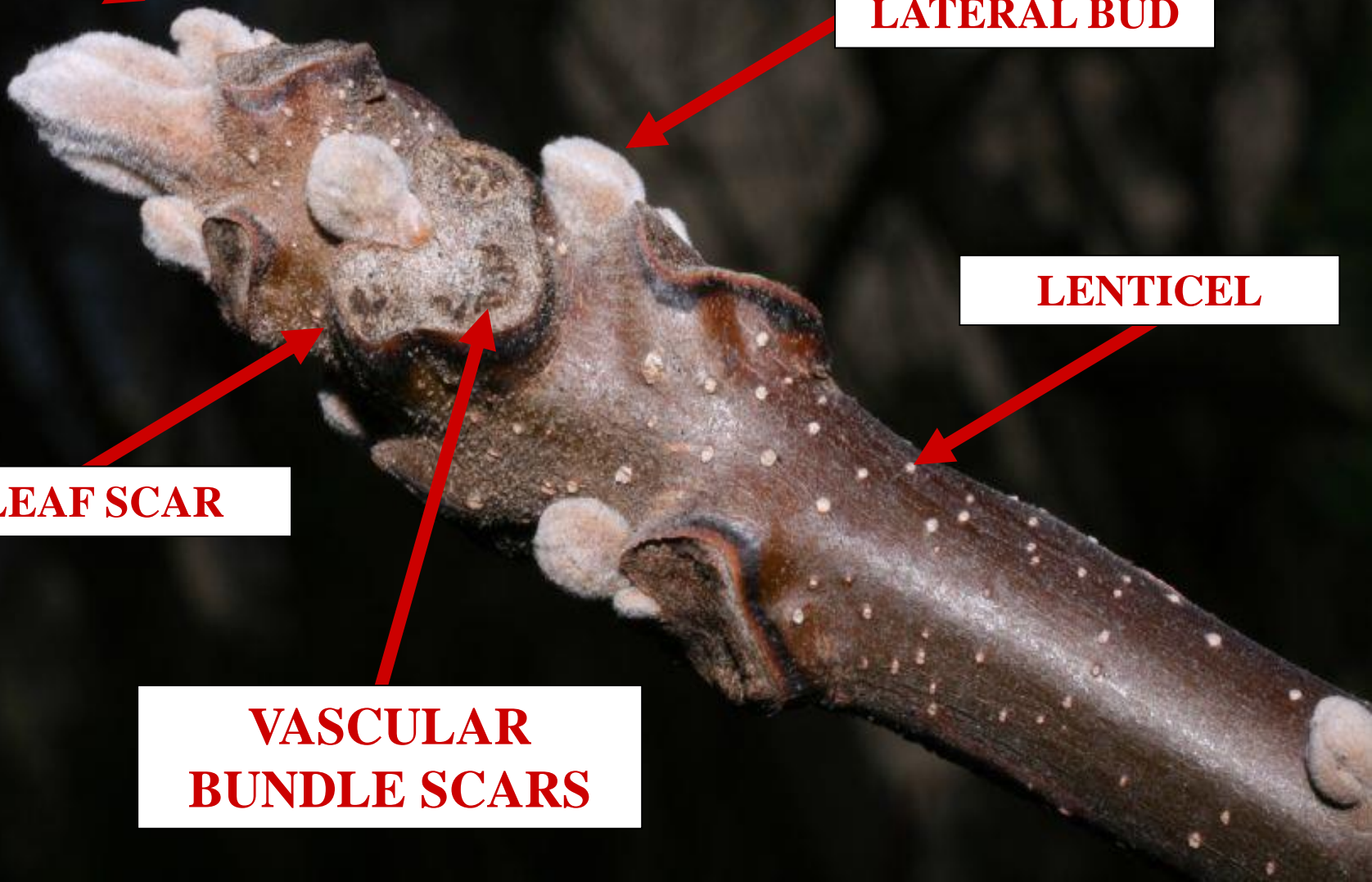
TERMINAL BUD

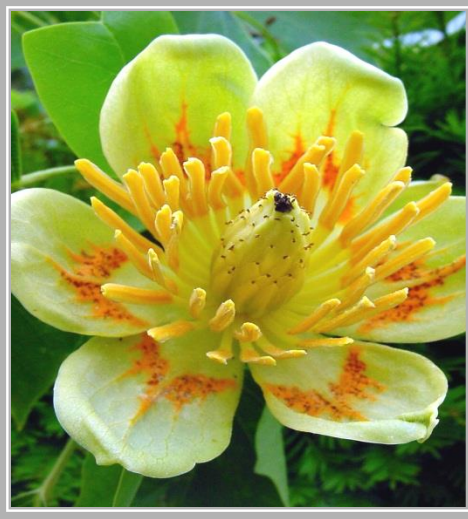
LATERAL BUD

LENTICEL

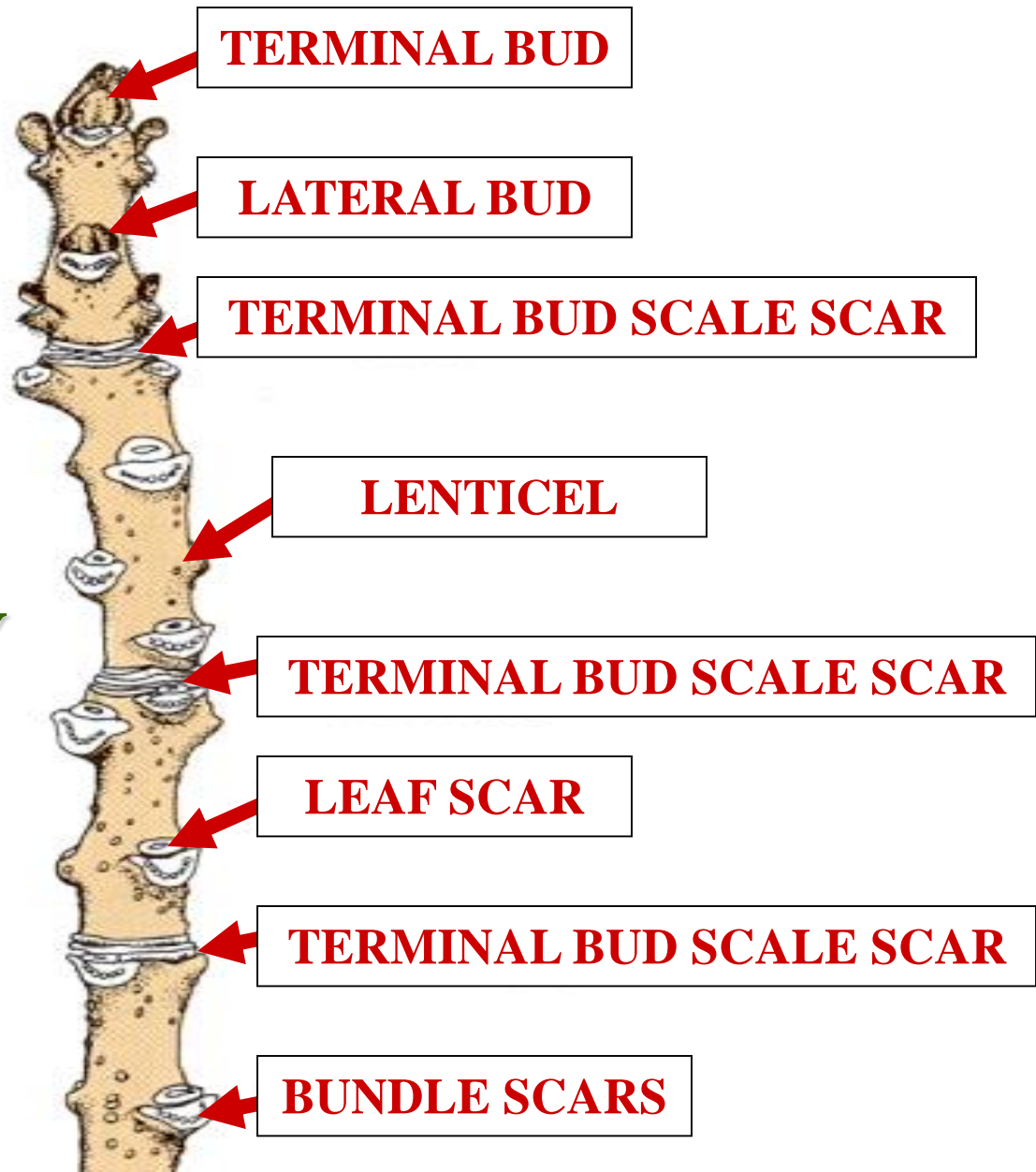
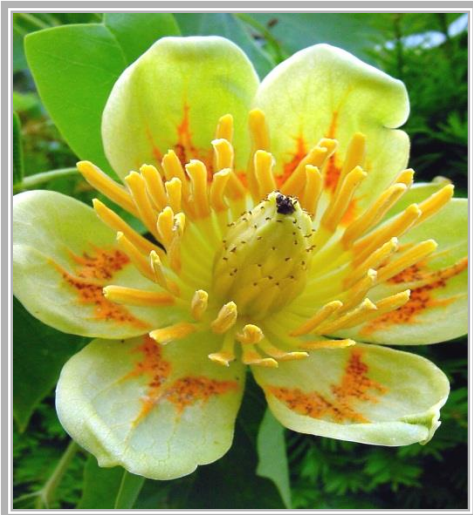
LEAF SCAR

**VASCULAR
BUNDLE SCARS**





DICOT STEM MORPHOLOGY





TRACHEOPHYTE STEM BRANCHING

TRACHEOPHYTE STEM BRANCHING TYPES

**TRACHEOPHYTE
STEM BRANCHING
TYPES**

DICHOTOMOUS BRANCHING

**TRACHEOPHYTE
STEM BRANCHING
TYPES**

**TRACHEOPHYTE
STEM BRANCHING
TYPES**

**DICHOTOMOUS BRANCHING
MONOPODIAL BRANCHING**

**TRACHEOPHYTE
STEM BRANCHING
TYPES**

**TRACHEOPHYTE
STEM BRANCHING
TYPES**

**DICHOTOMOUS BRANCHING
MONOPODIAL BRANCHING
EXCURRENT BRANCHING**

**TRACHEOPHYTE
STEM BRANCHING
TYPES**

TRACHEOPHYTE STEM BRANCHING TYPES

DICHOTOMOUS BRANCHING
MONOPODIAL BRANCHING
EXCURRENT BRANCHING
DELIQUESCENT BRANCHING

TRACHEOPHYTE STEM BRANCHING TYPES

DICHOTOMOUS BRANCHING



**TRACHEOPHYTE
STEM BRANCHING
DICHOTOMOUS**

**FORKED BRANCHES
WITH EQUAL STATURE**

**TRACHEOPHYTE
STEM BRANCHING
DICHOTOMOUS**



PSILOTUM



PSILOTUM



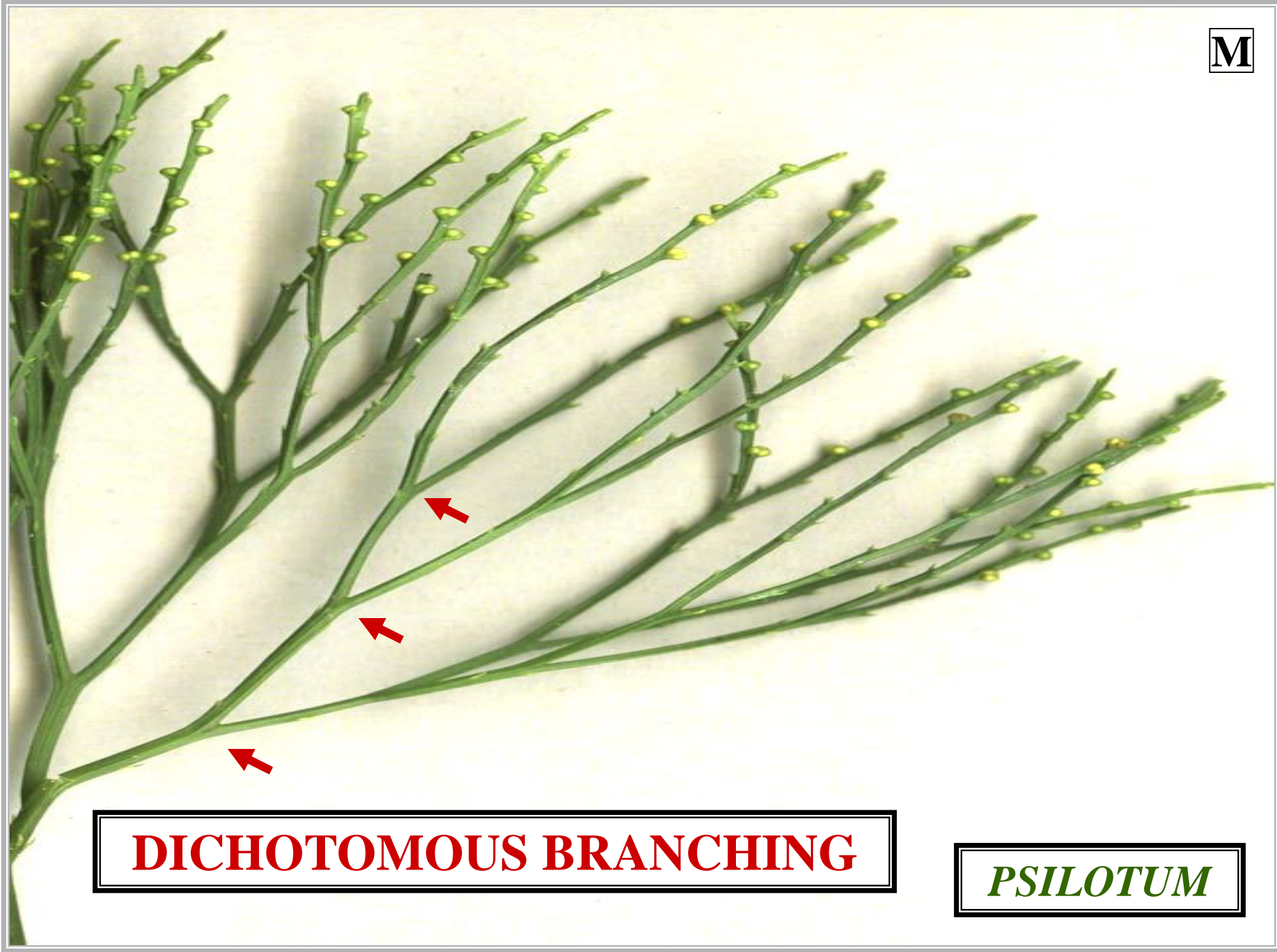
PSILOTUM

S

D



PSILOTUM



DICHOTOMOUS BRANCHING

PSILOTUM

MONOPODIAL BRANCHING



**TRACHEOPHYTE
STEM BRANCHING
MONOPODIAL**

**MAIN AXIS WITH
REDUCED**

DICHOTOMOUS LATERALS

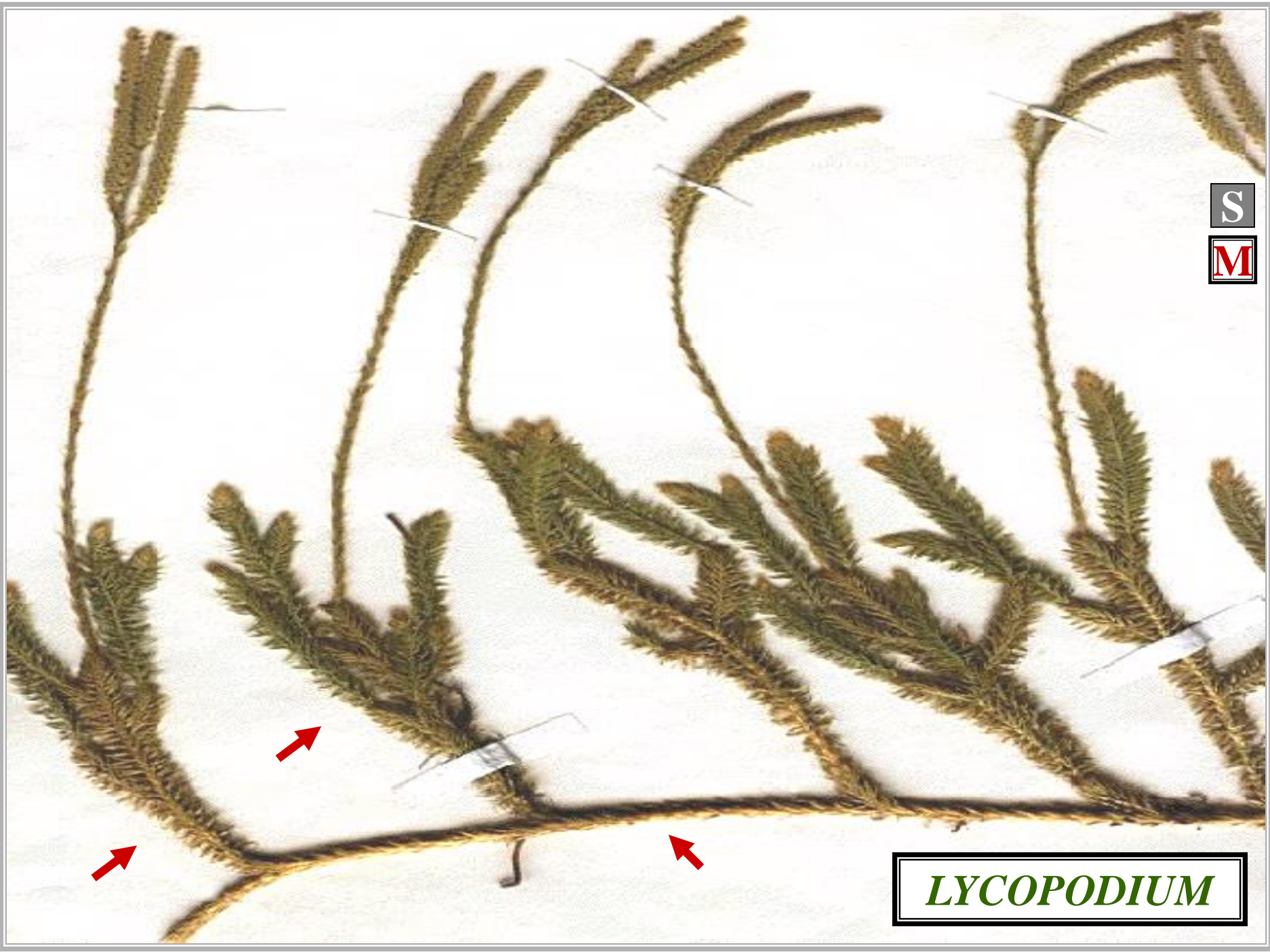
**TRACHEOPHYTE
STEM BRANCHING
MONOPODIAL**



LYCOPODIUM



LYCOPODIUM



S

M

LYCOPODIUM