

STEM

STEM

**TRACHEOPHYTE
ORGANS
STEM**



ASCENDING PLANT AXIS

**TRACHEOPHYTE
ORGANS
STEM**

**TRACHEOPHYTE
ORGANS
STEM**



ASCENDING PLANT AXIS

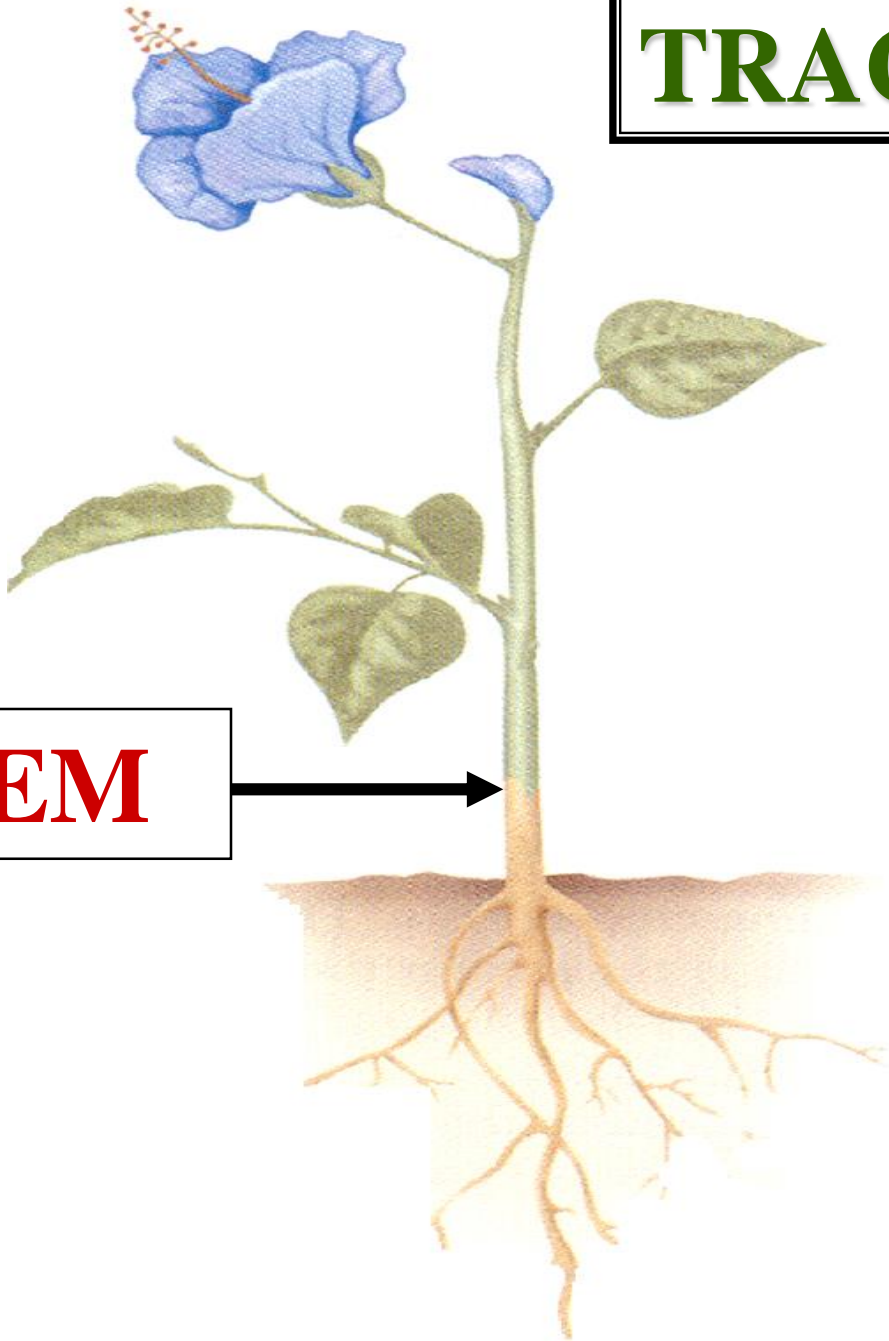
ELEVATES LEAVES TO LIGHT

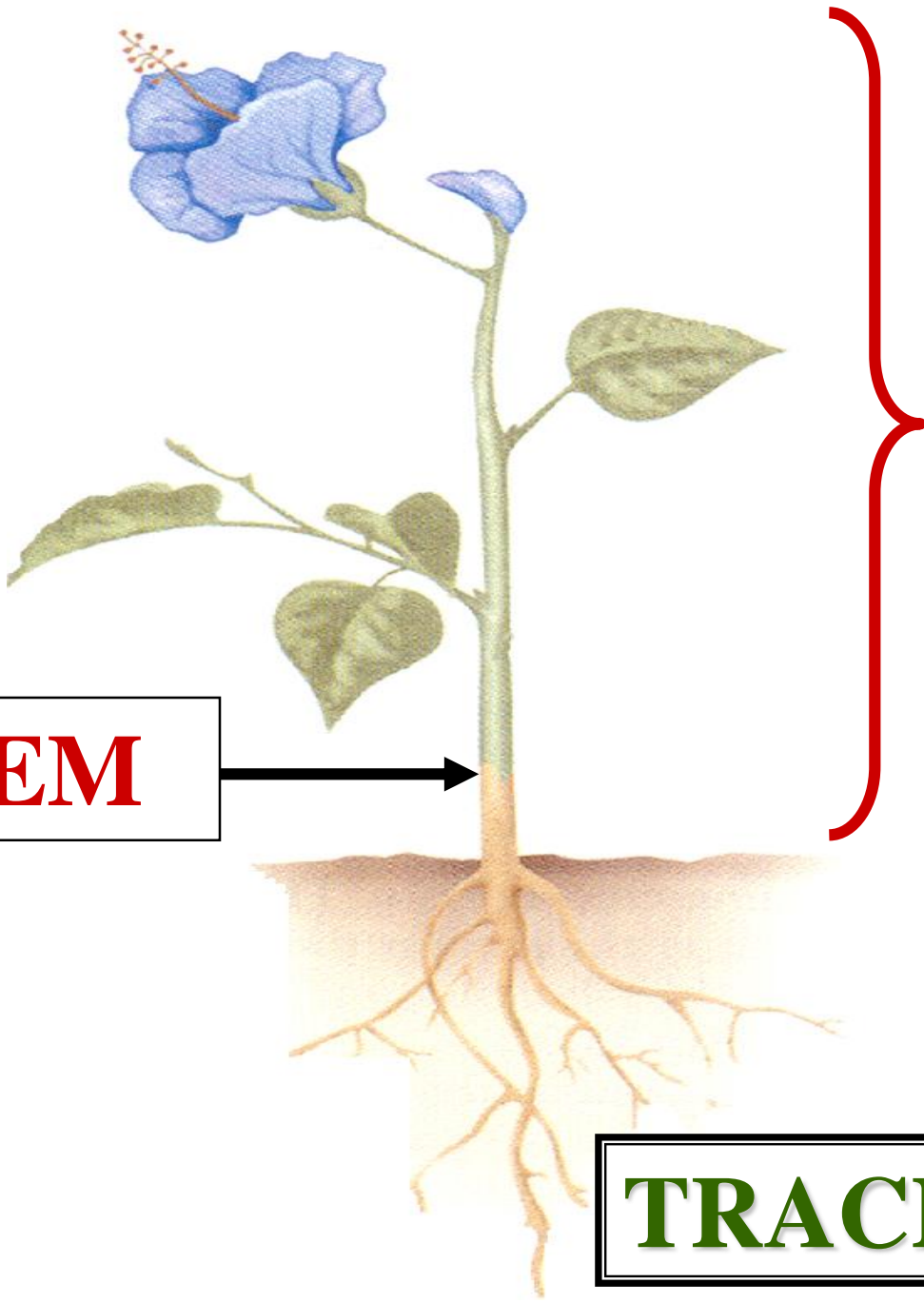
**TRACHEOPHYTE
ORGANS
STEM**

TRACHEOPHYTE

A

STEM





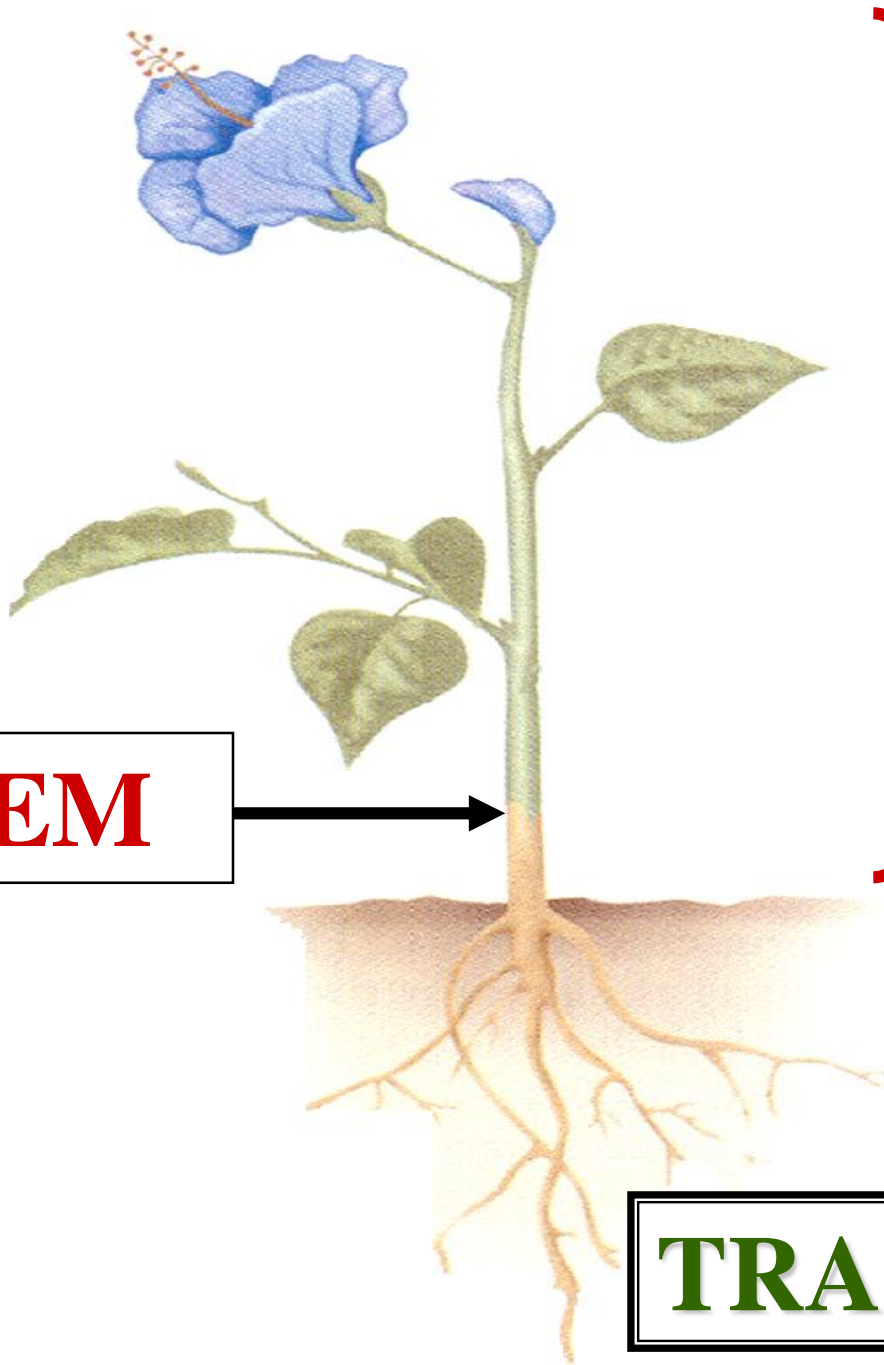
STEM

**ASCENDING
PLANT
AXIS**

TRACHEOPHYTE



P

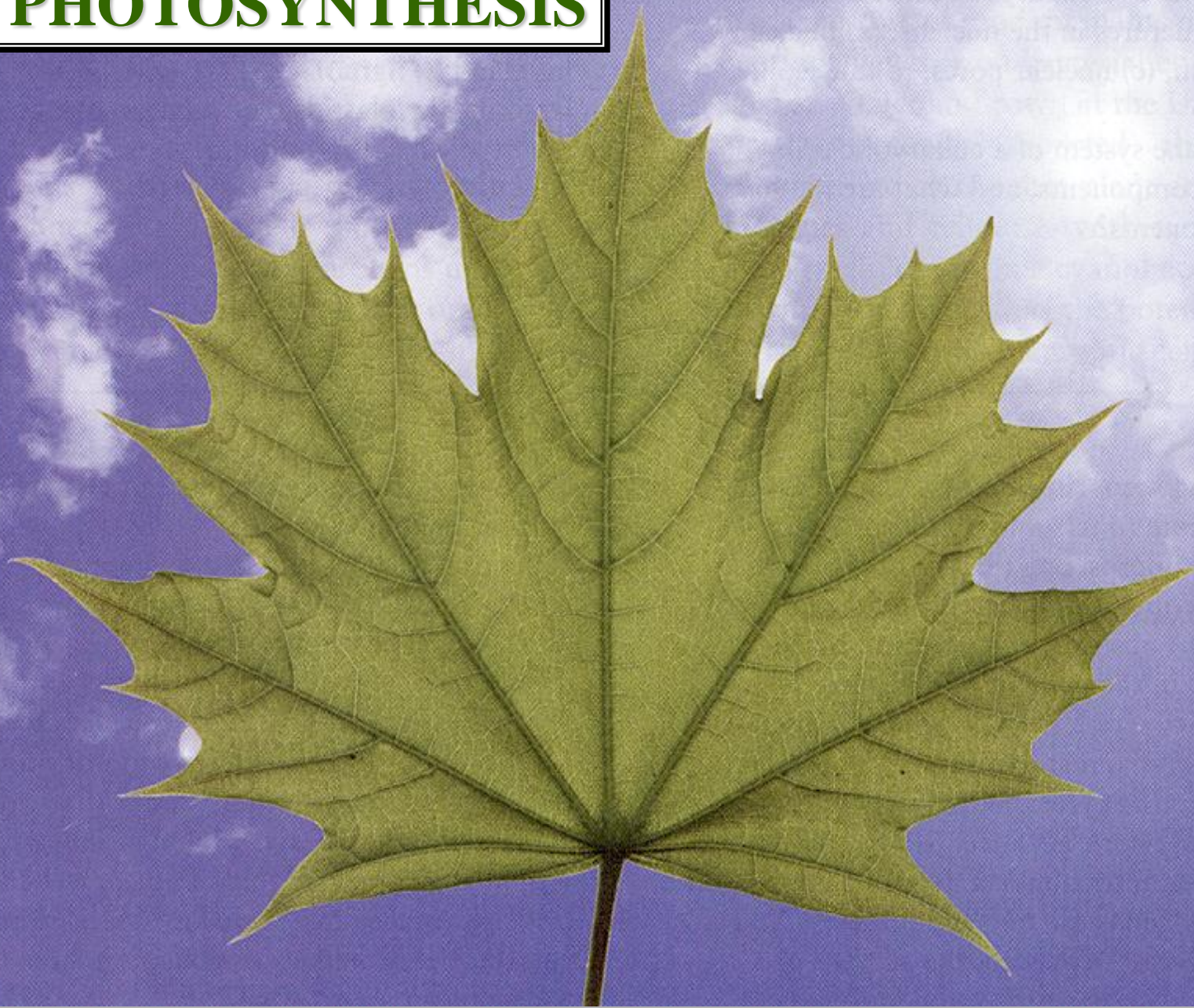


STEM

**ELEVATES LEAVES
TO LIGHT**

TRACHEOPHYTE

PHOTOSYNTHESIS



STEM BRANCHING TYPES

STEM BRANCHING TYPES



DICHOTOMOUS

STEM BRANCHING TYPES

STEM BRANCHING TYPES



**DICHOTOMOUS
MONOPODIAL**

**STEM BRANCHING
TYPES**

STEM BRANCHING TYPES



**DICHOTOMOUS
MONOPODIAL
EXCURRENT**

**STEM BRANCHING
TYPES**

STEM BRANCHING TYPES

**DICHOTOMOUS
MONOPODIAL
EXCURRENT
DELIQUESCENT**

**STEM BRANCHING
TYPES**

DICHOTOMOUS BRANCHING



STEM BRANCHING DICHOTOMOUS

**FORKED BRANCHES
WITH
EQUAL STATURE**

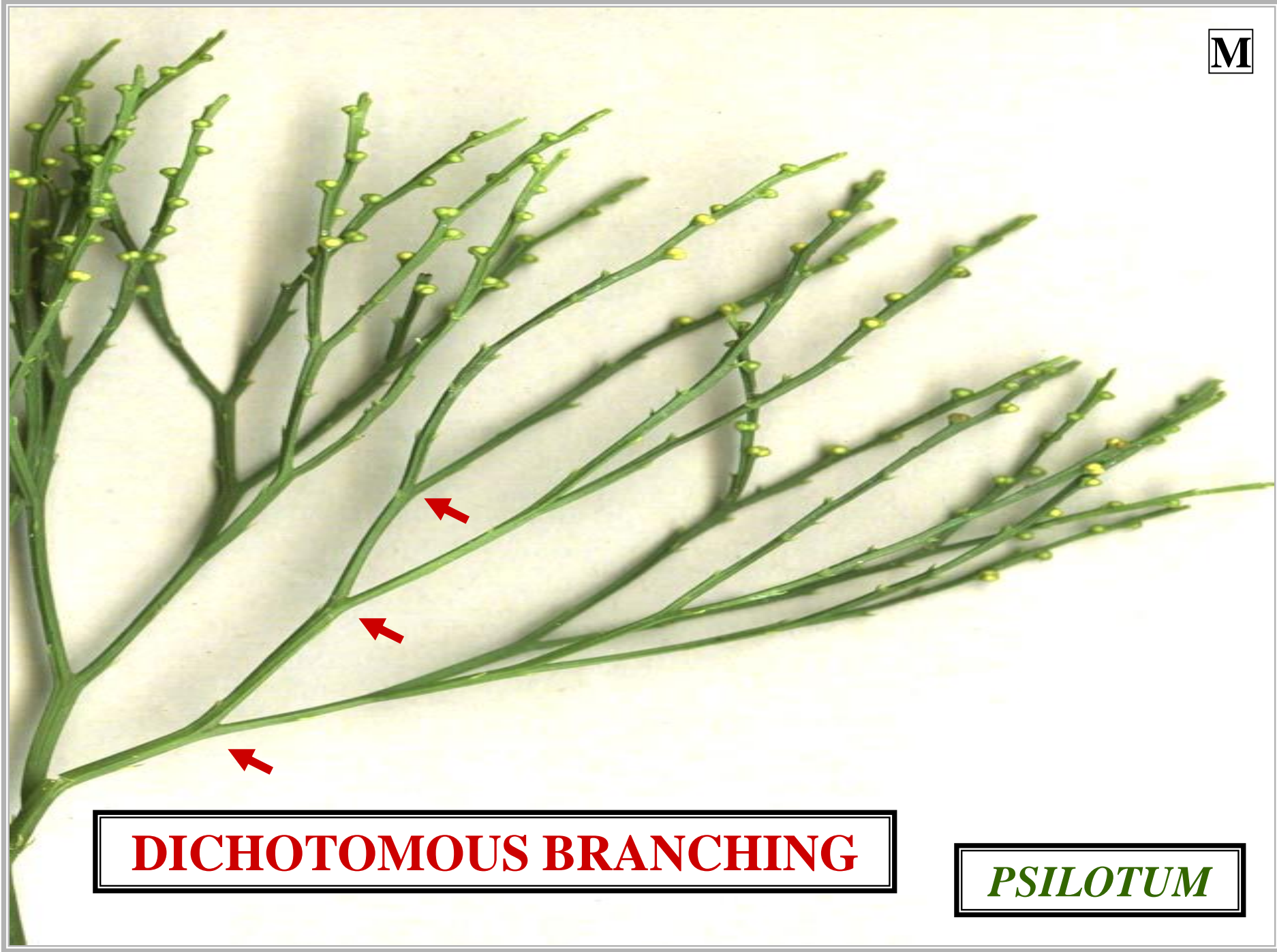
**STEM BRANCHING
DICHOTOMOUS**











DICHOTOMOUS BRANCHING

PSILOTUM

MONOPODIAL BRANCHING

STEM BRANCHING MONOPODIAL



**MAIN AXIS
WITH REDUCED
DICHOTOMOUS
LATERALS**

**STEM BRANCHING
MONOPODIAL**



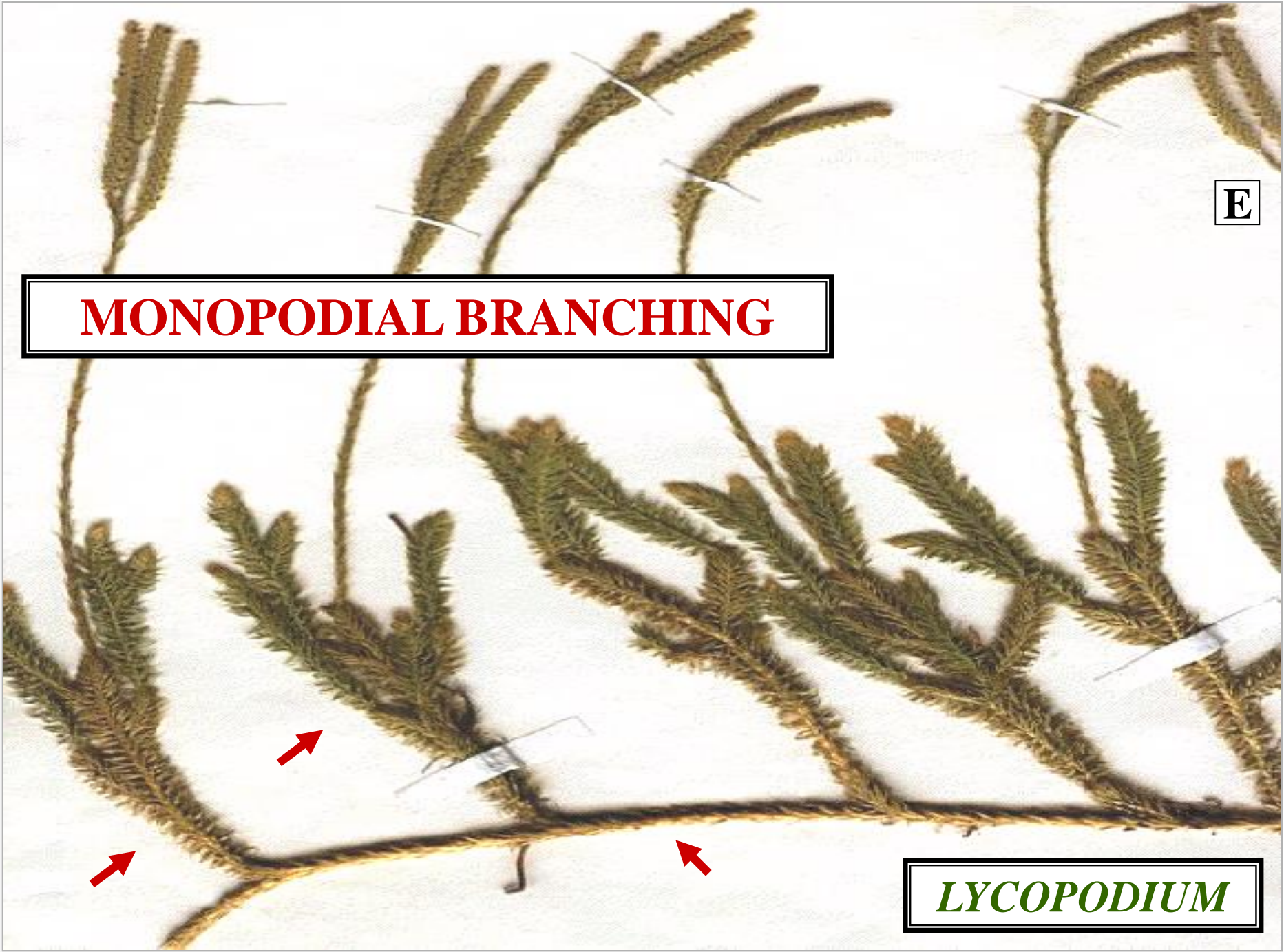




M

E

MONOPODIAL BRANCHING



LYCOPODIUM

EXCURRENT BRANCHING

STEM BRANCHING EXCURRENT



**MAIN AXIS
WITH INHIBITED
LATERALS**

**STEM BRANCHING
EXCURRENT**









AD



**APICAL
DOMINANCE**

E



ABIES

**APICAL
DOMINANCE**

D



EXCURRENT BRANCHING

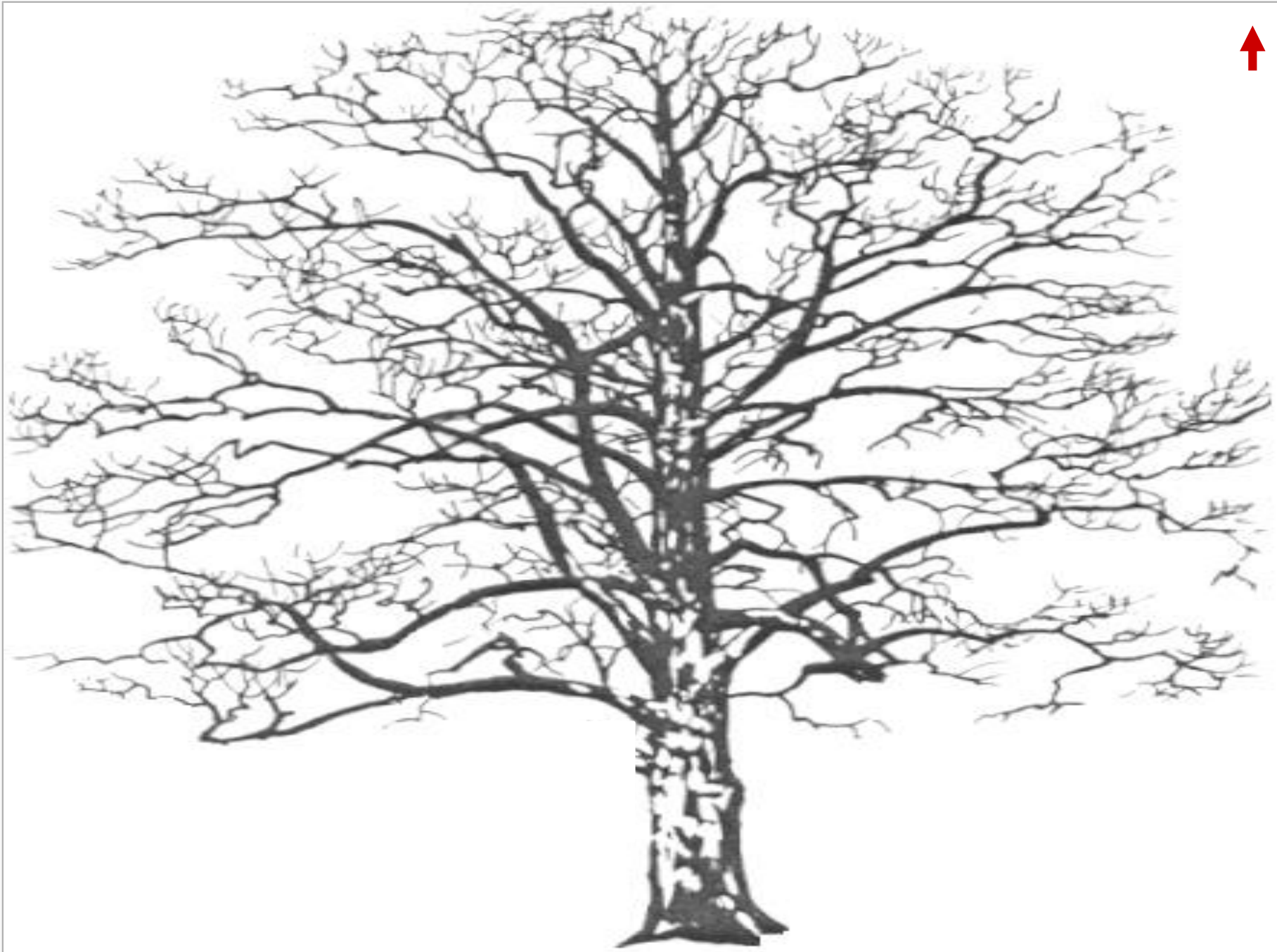
DELIQUESCENT BRANCHING

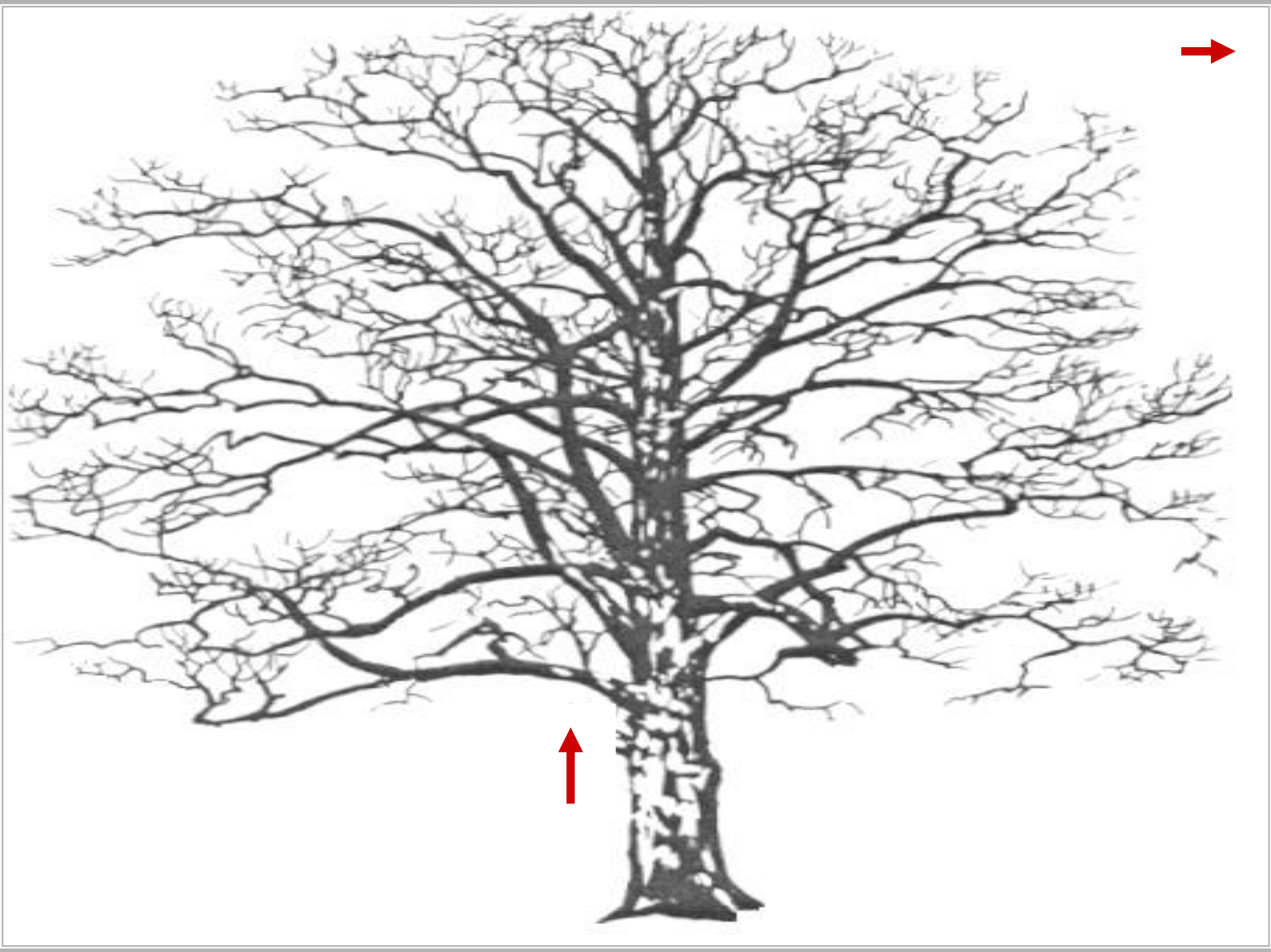


STEM BRANCHING DELIQUESCENT

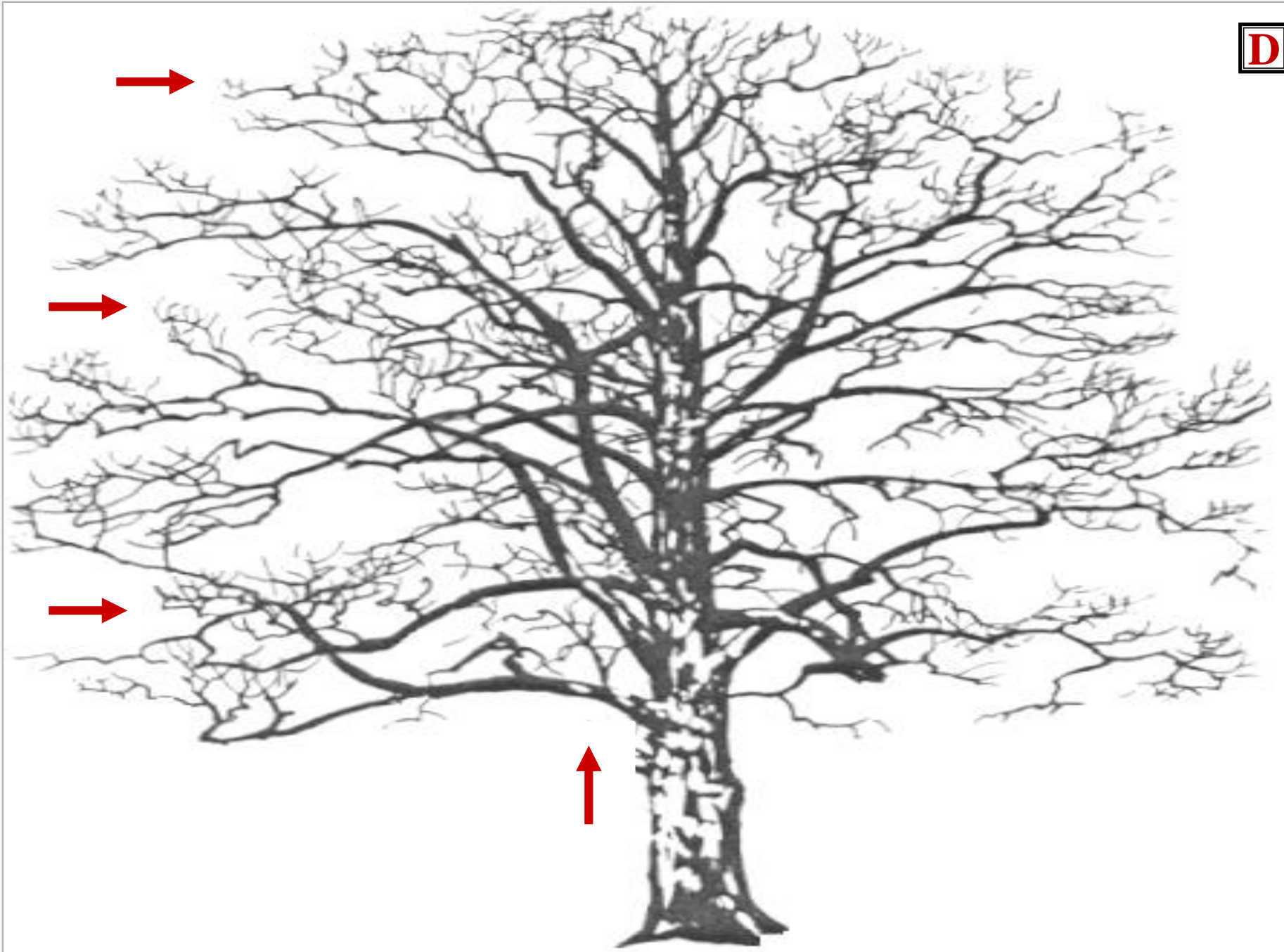
**MAIN AXIS
WITH NON-INHIBITED
LATERALS**

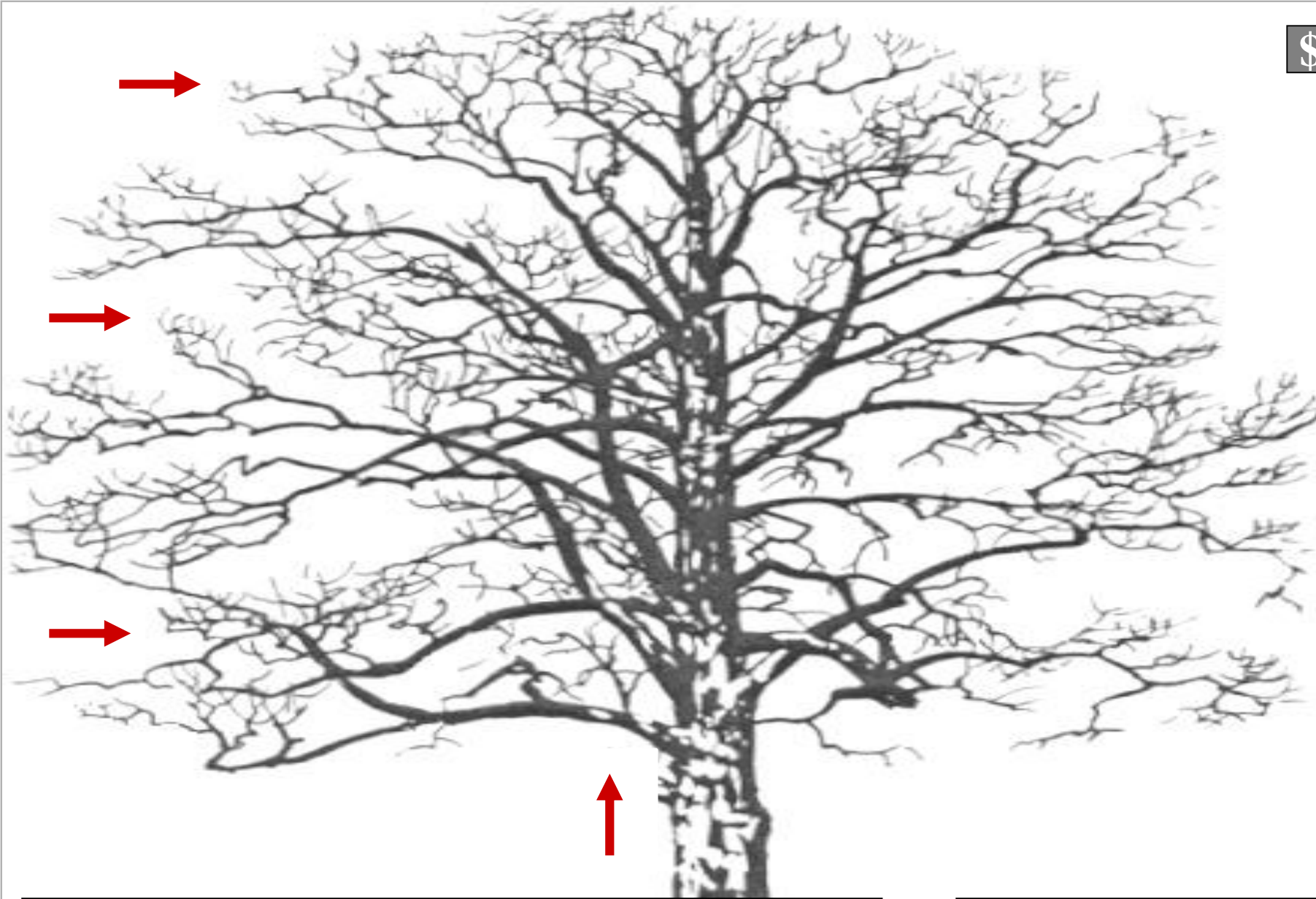
**STEM BRANCHING
DELIQUESCENT**





D





DELIQUESCENT BRANCHING

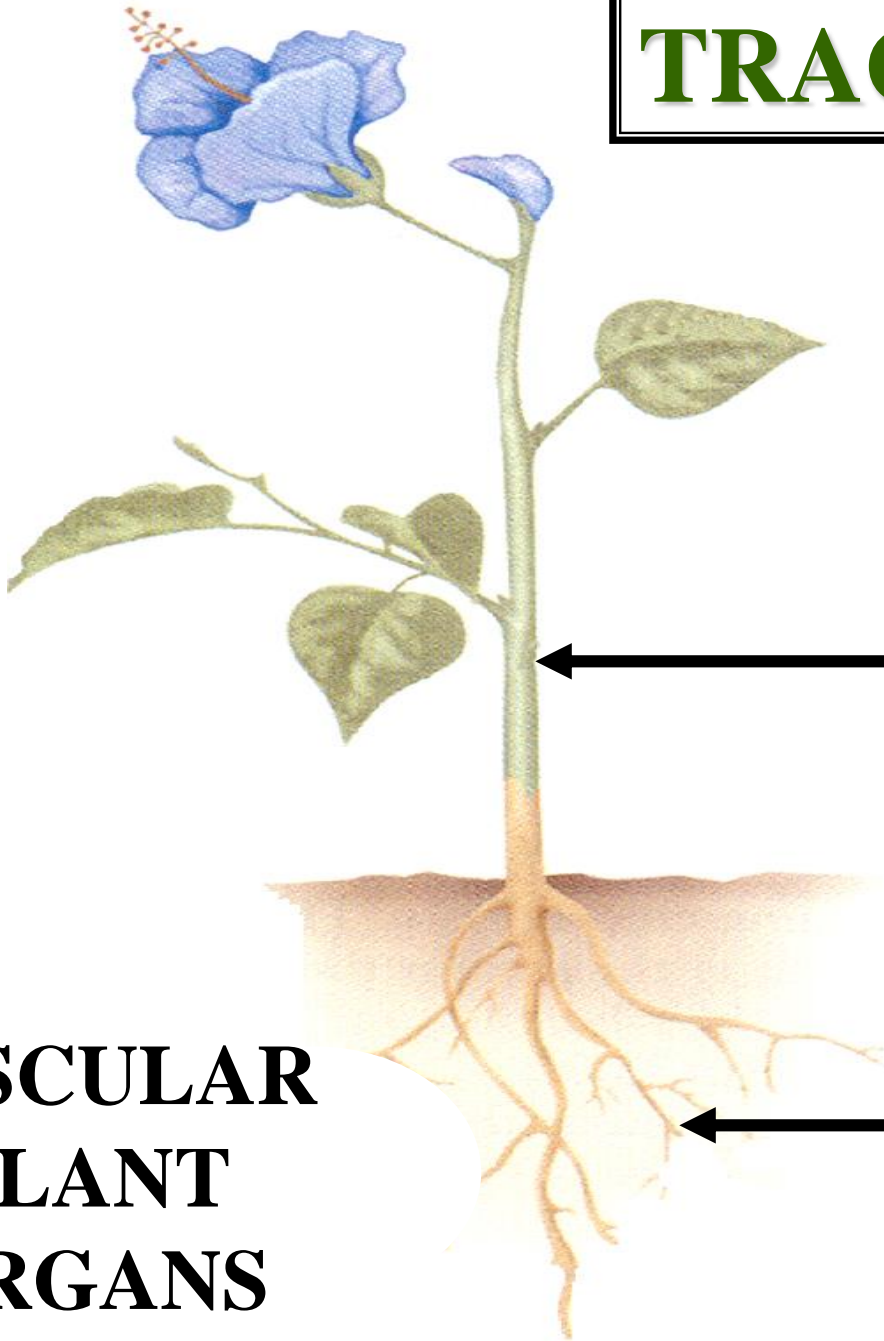
MAGNOLIA



TRACHEOPHYTE ORGANS SUMMARY

TRACHEOPHYTE

LF

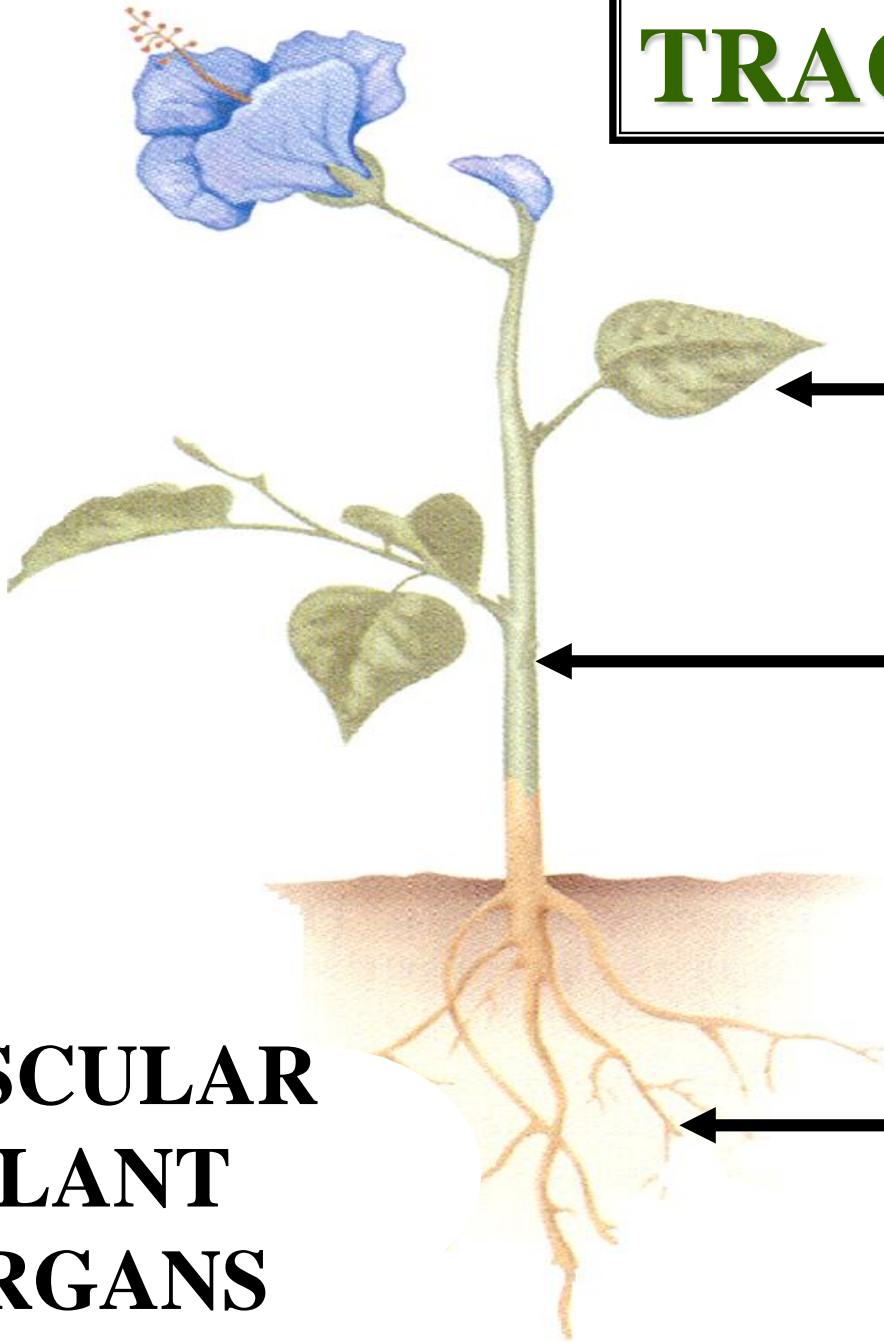


STEM

ROOT

**VASCULAR
PLANT
ORGANS**

TRACHEOPHYTE



LEAF

STEM

ROOT

**VASCULAR
PLANT
ORGANS**

LEAF

LEAF

**TRACHEOPHYTE
ORGANS
LEAF**



MODIFIED STEM OUTGROWTH

**TRACHEOPHYTE
ORGANS
LEAF**



**TRACHEOPHYTE
ORGANS
LEAF**

MODIFIED STEM OUTGROWTH

**CONDUCTS
PHOTOSYNTHESIS**

**TRACHEOPHYTE
ORGANS
LEAF**

**TRACHEOPHYTE
ORGANS
LEAF**

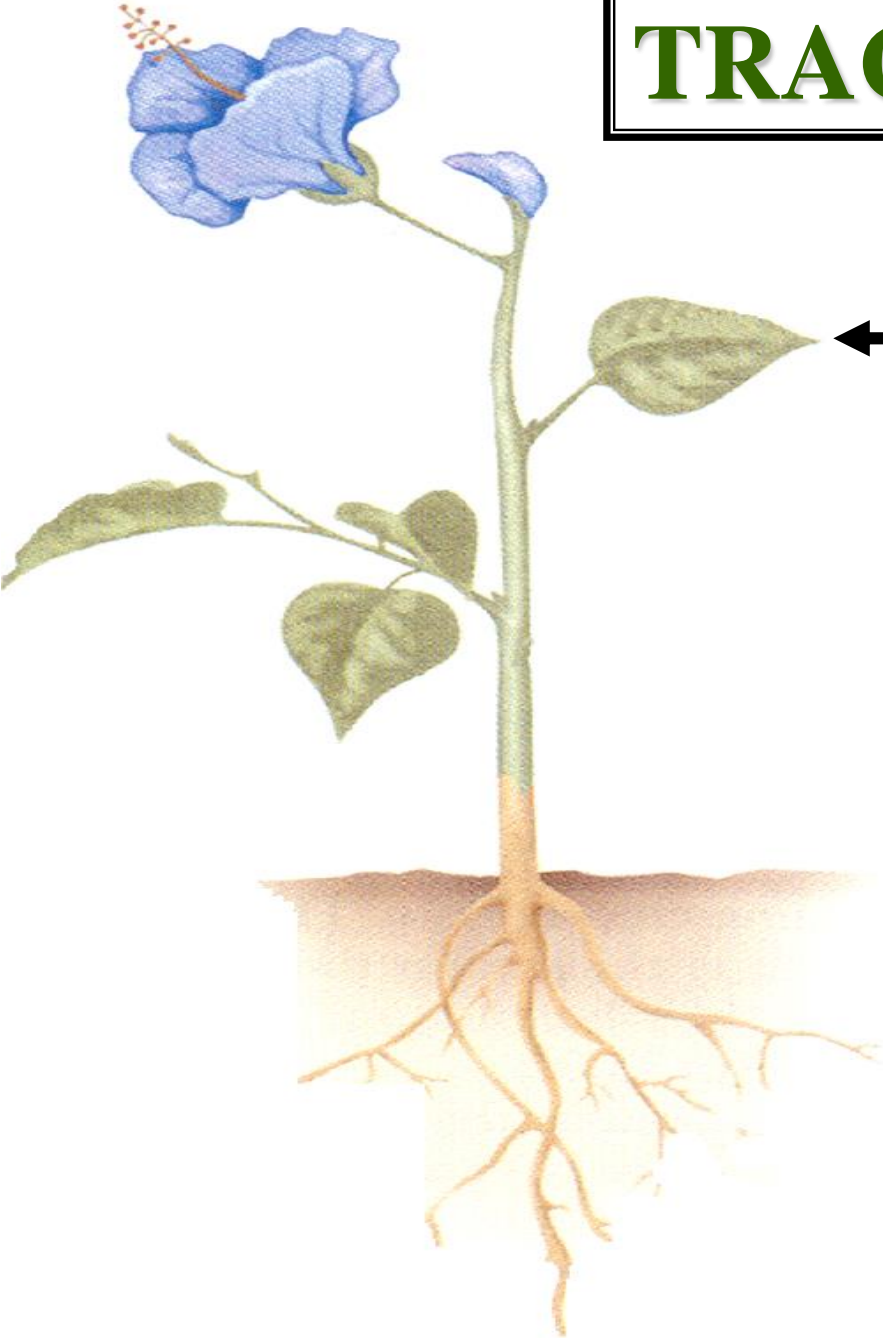


MODIFIED STEM OUTGROWTH

**CONDUCTS
REPRODUCTION**

**TRACHEOPHYTE
ORGANS
LEAF**

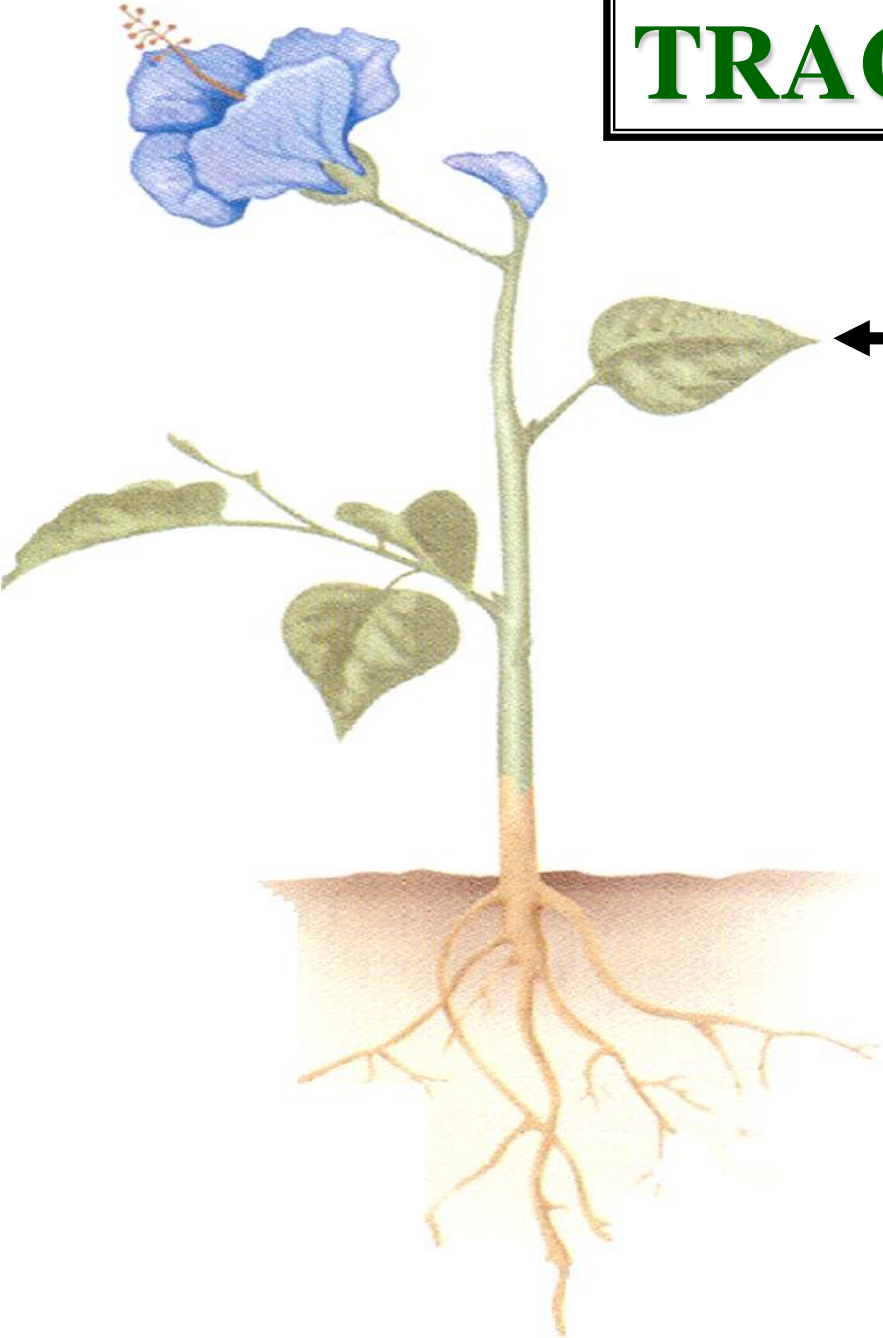
TRACHEOPHYTE



LEAF

MD

TRACHEOPHYTE



LEAF

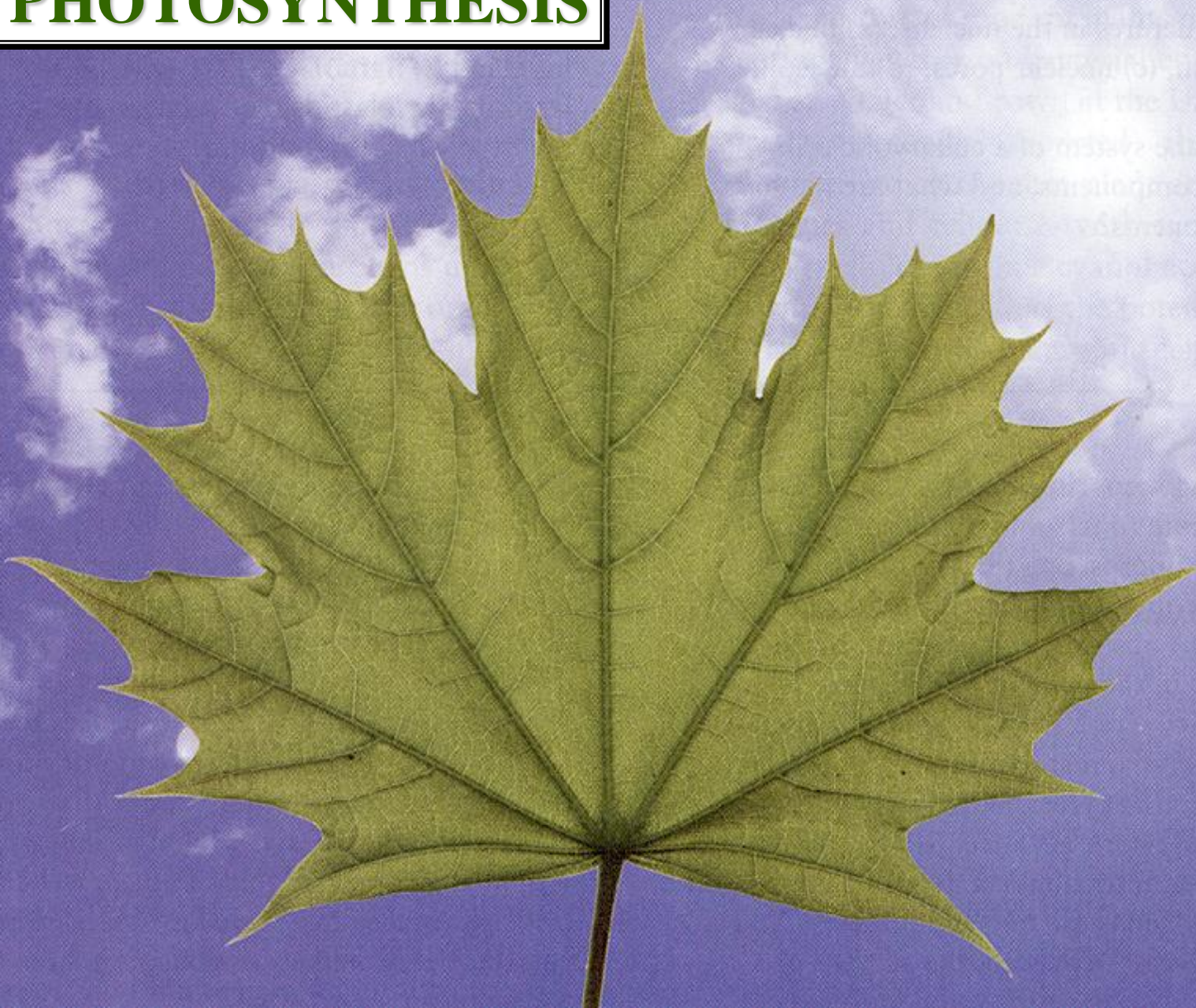
**MODIFIED STEM
OUTGROWTH**

P



PHOTOSYNTHESIS

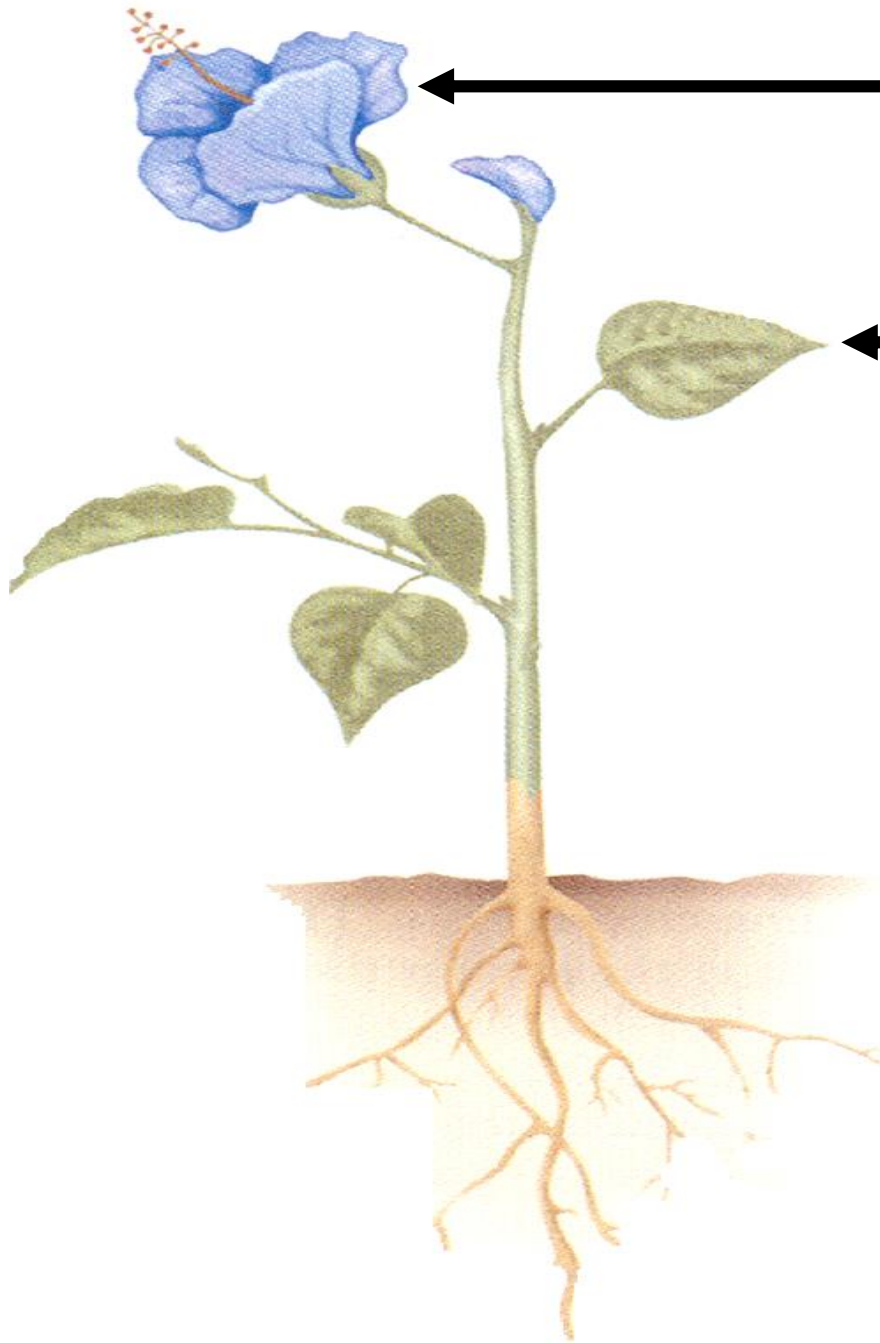
R



REPRODUCTION

P





FLOWER



LEAF



PHOTOSYNTHESIS

GENERAL LEAF TYPES



GENERAL LEAF TYPES

MICROPHYLLS

GENERAL LEAF TYPES



GENERAL LEAF TYPES

MICROPHYLLS

MEGAPHYLLS

GENERAL LEAF TYPES



MICROPHYLLS

VS

MEGAPHYLLS



MICROPHYLL



**MICROPHYLLS
KNOWN ONLY TO
LYCOPHYTES**



MICROPHYLLS

LYCOPHYTES



MICROPHYLLS

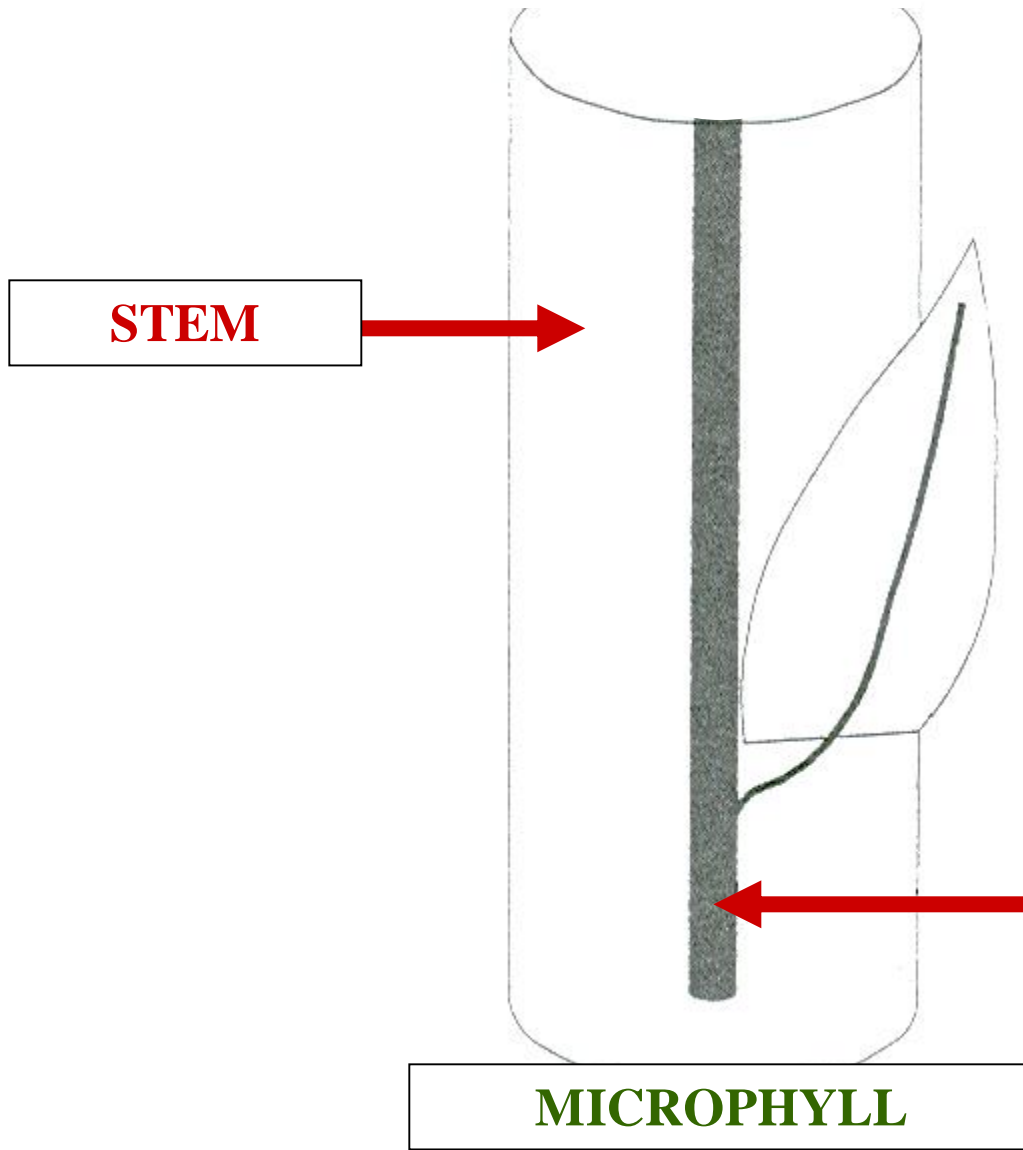
LYCOPHYTES

LYCOPODIOPHYTA



MICROPHYLL CHARACTERS

MICROPHYLL CHARACTERS

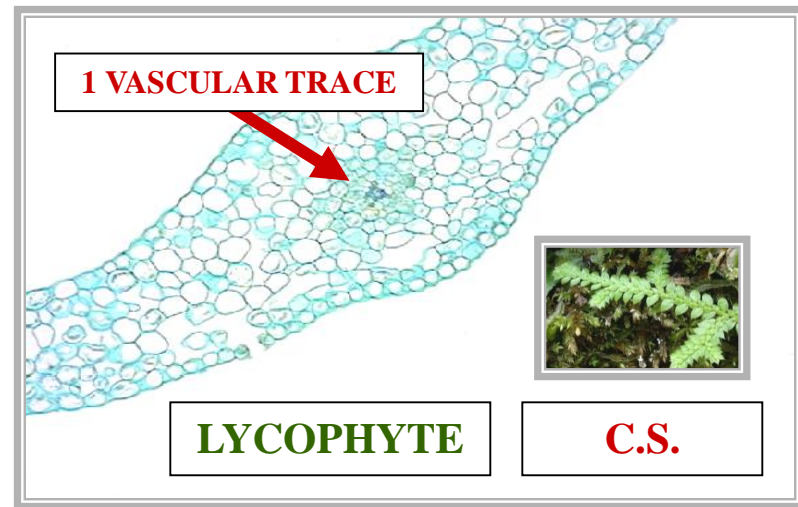
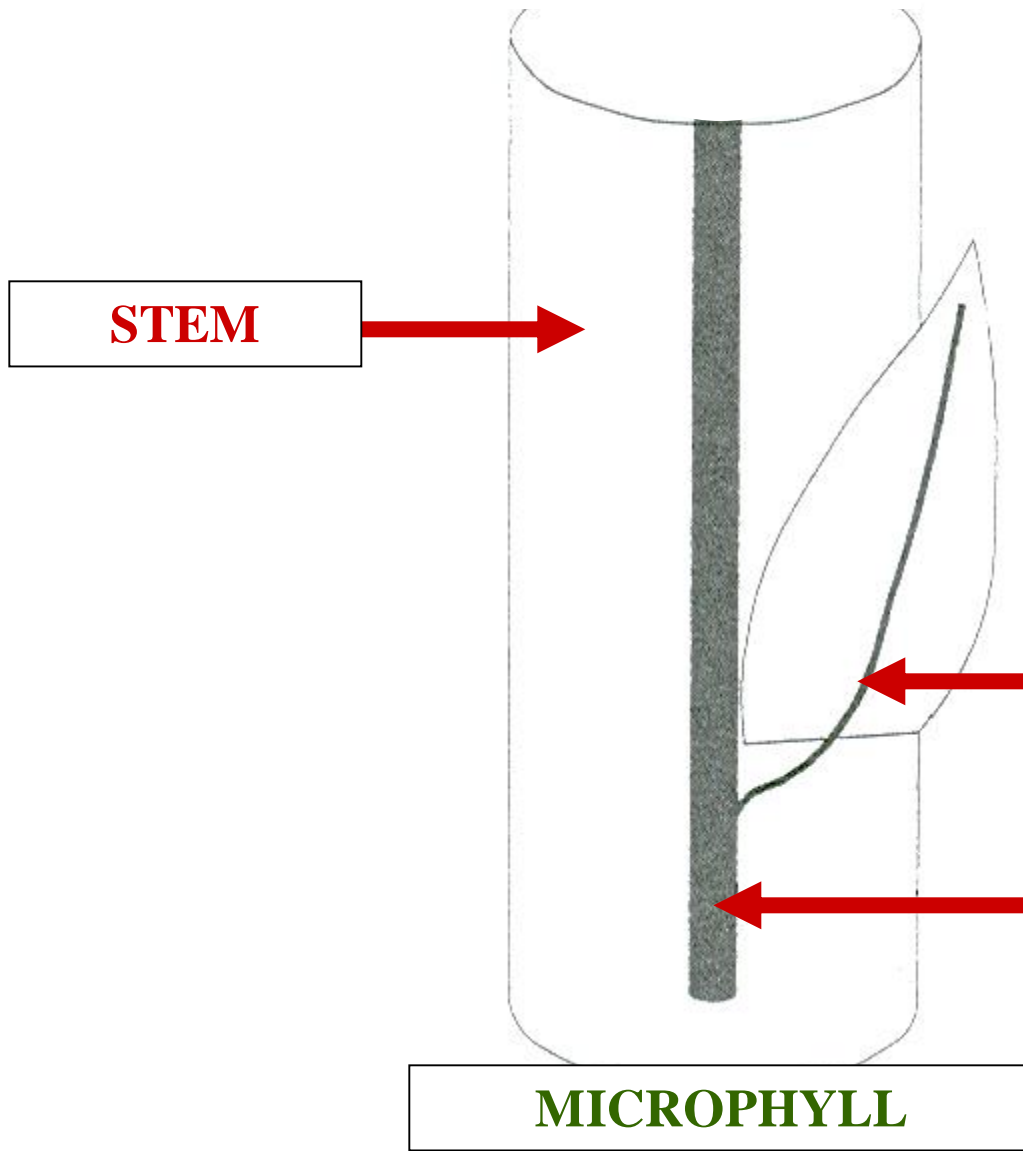


VT

VASCULAR TISSUE

MICROPHYLL

MICROPHYLL CHARACTERS

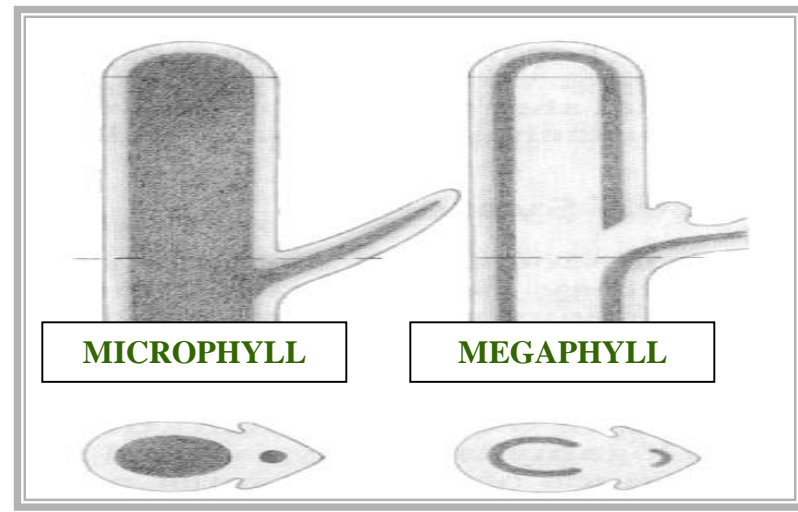
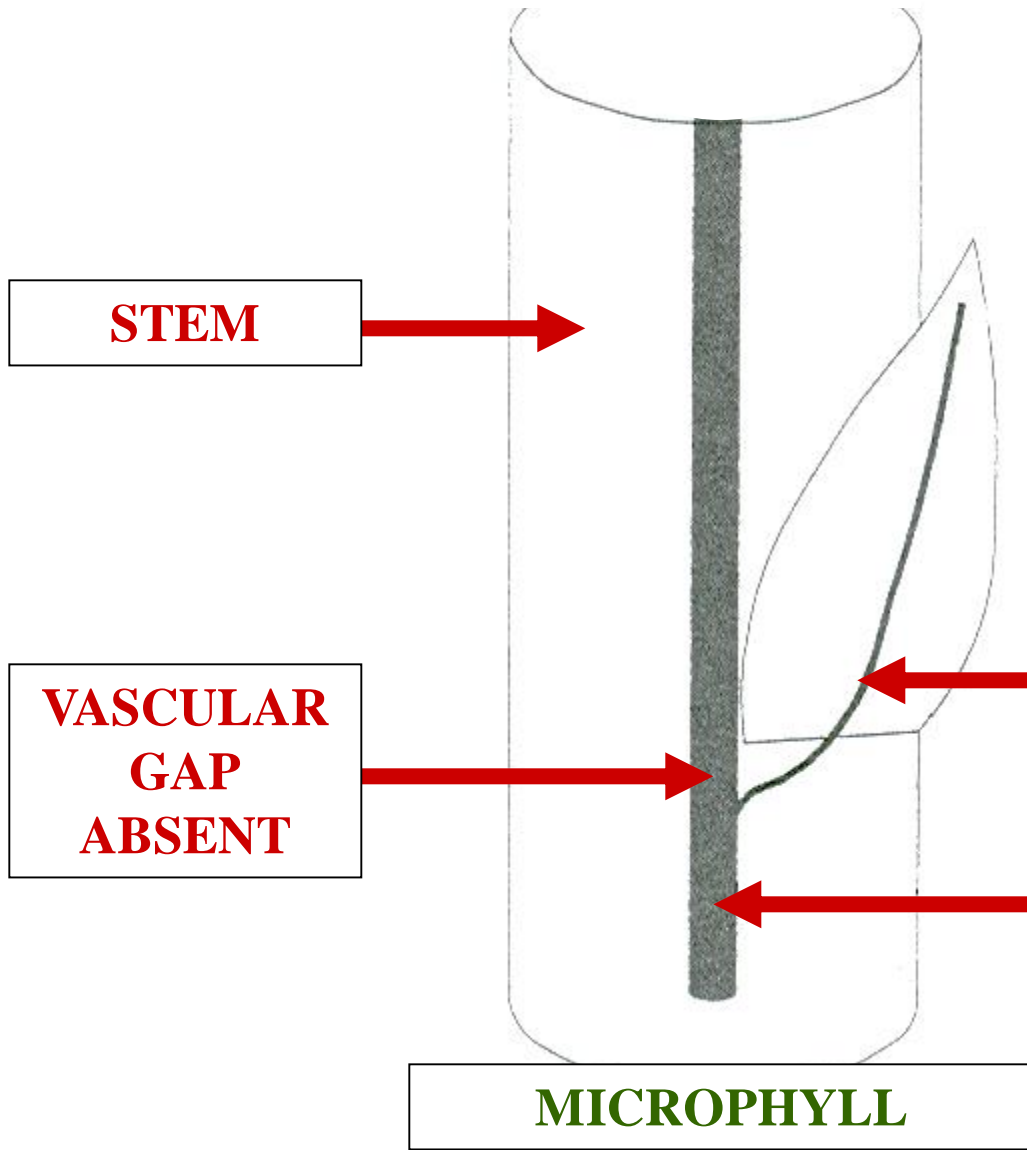


VG

1 VASCULAR TRACE

VASCULAR TISSUE

MICROPHYLL CHARACTERS



MICROPHYLL

MEGAPHYLL

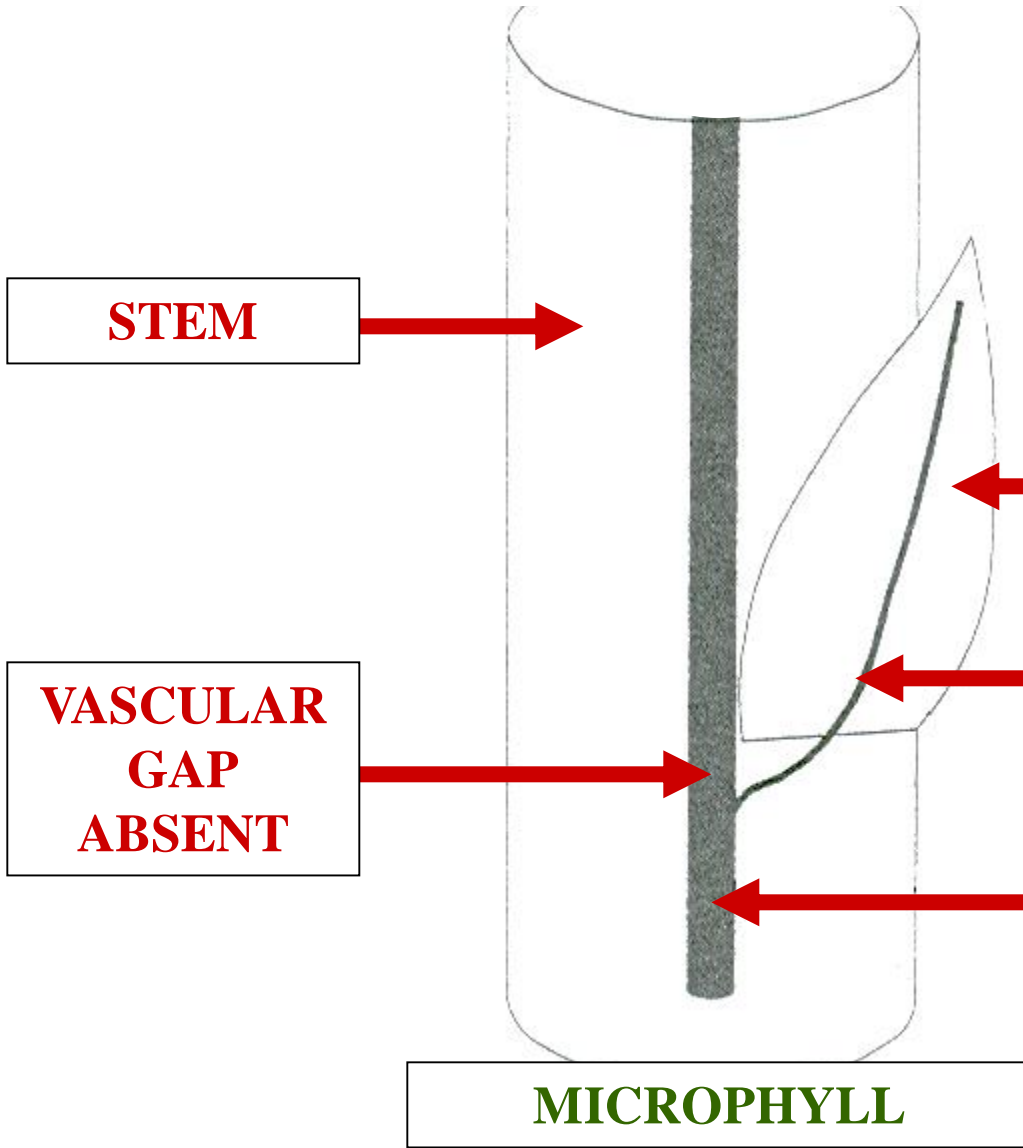
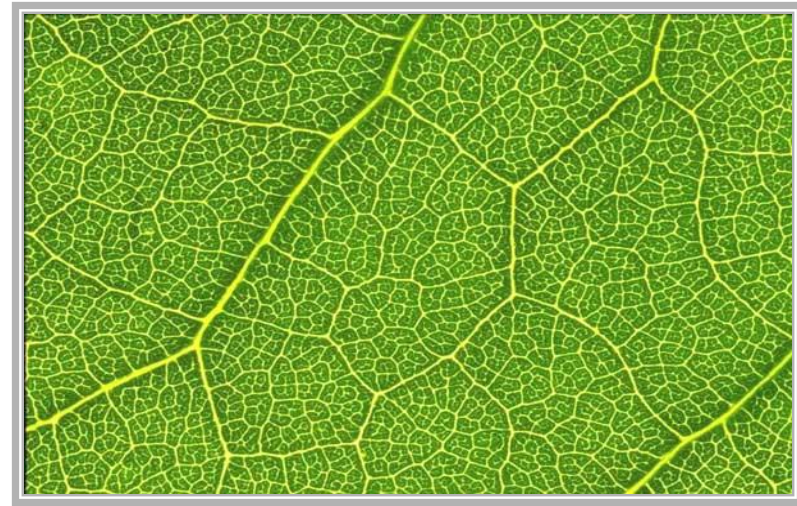
VA

1 VASCULAR TRACE

VASCULAR TISSUE

MICROPHYLL

MICROPHYLL CHARACTERS



STEM

**VASCULAR
GAP
ABSENT**

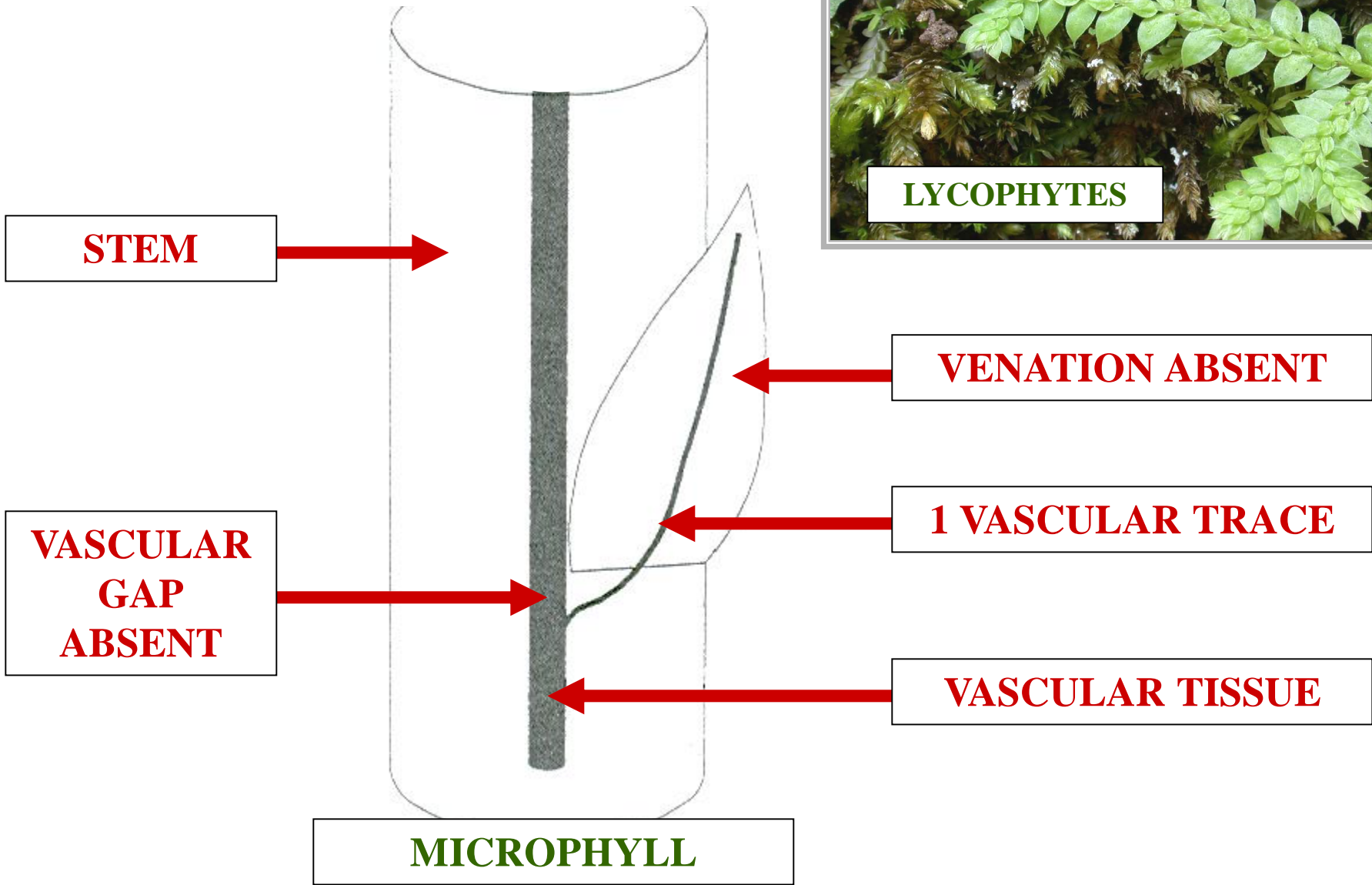
MICROPHYLL

VENATION ABSENT

1 VASCULAR TRACE

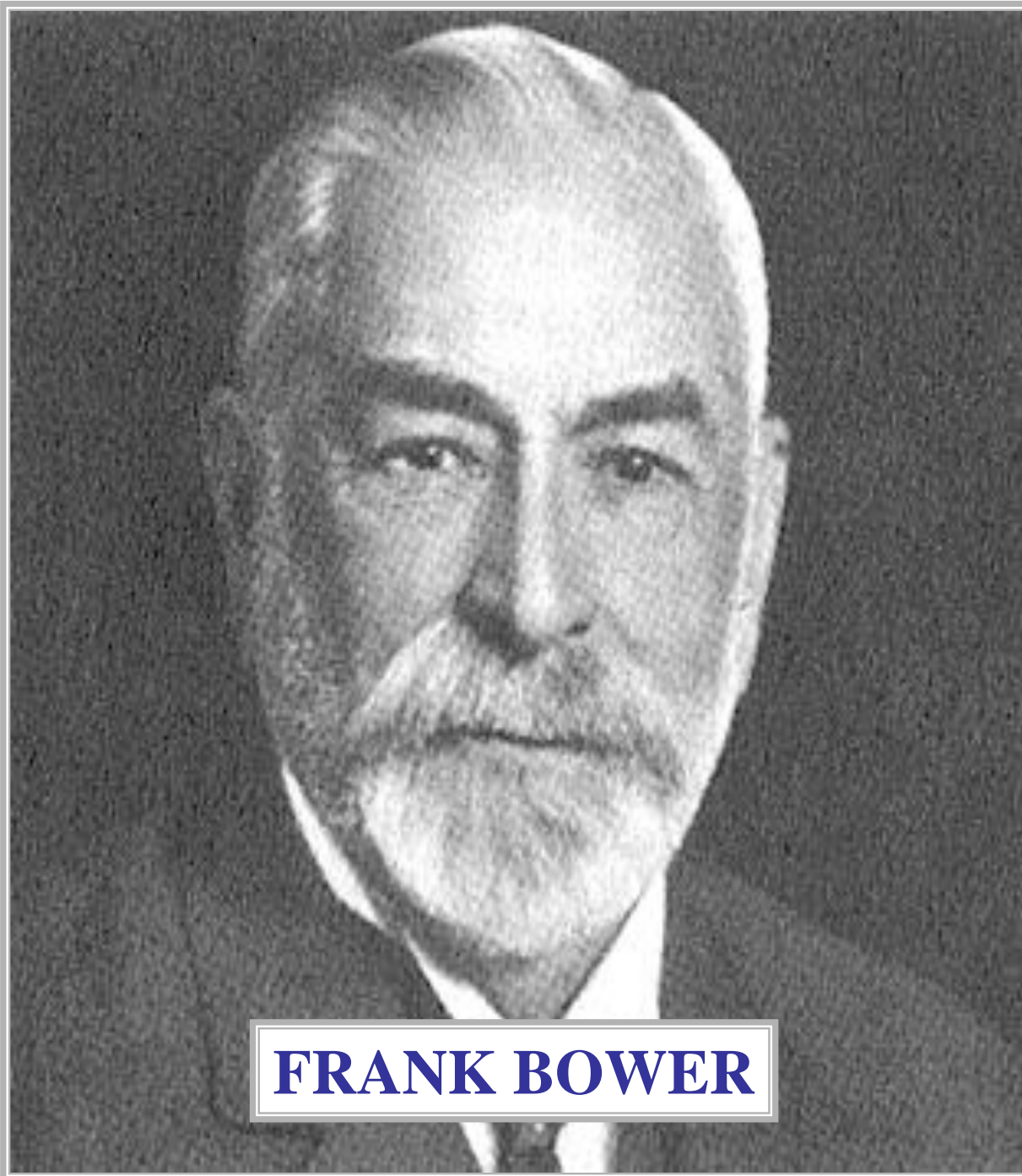
VASCULAR TISSUE

MICROPHYLL CHARACTERS





MICROPHYLL
EVOLUTION
ENATION THEORY



FRANK BOWER

ENATION

MICROPHYLL ENATION



**NON-VASCULAR
PHOTOSYNTHETIC
STEM OUTGROWTH**

MICROPHYLL ENATION



NON-VASCULAR PHOTOSYNTHETIC STEM OUTGROWTH

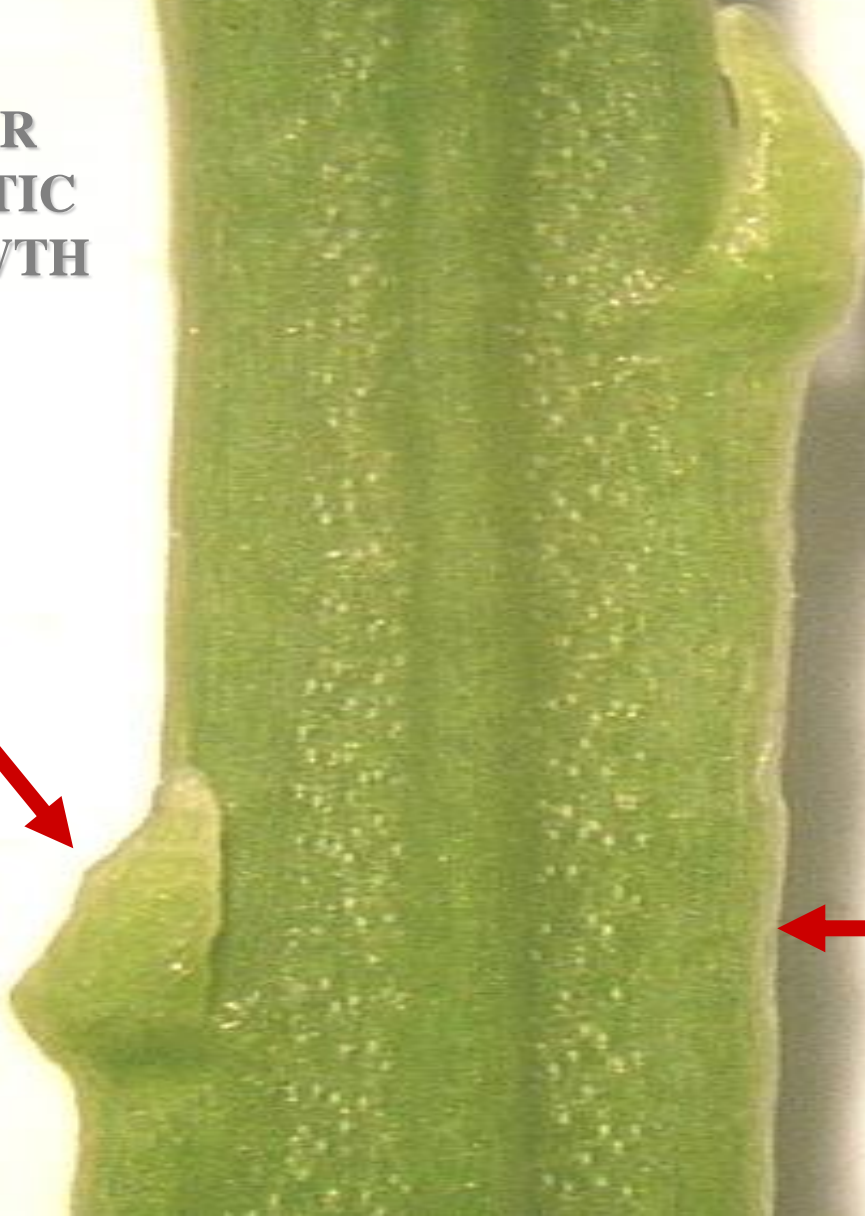
ENATION

NON-VASCULAR

NON-VASCULAR

ENATION

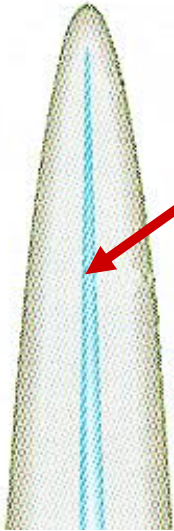
STEM





ENATION THEORY COMPONENTS

ENATION THEORY COMPONENTS

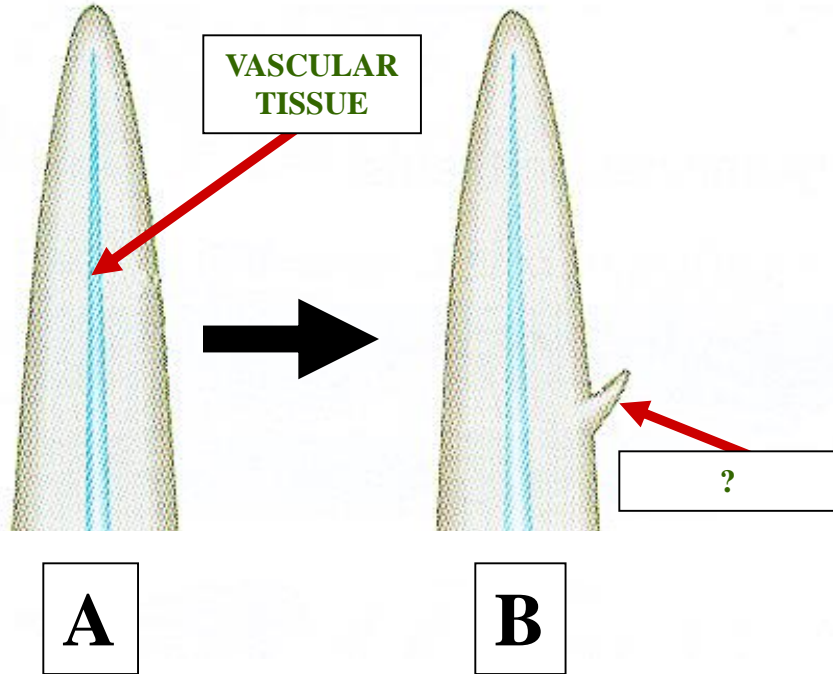


VASCULAR
TISSUE

A

ENATION ABSENT

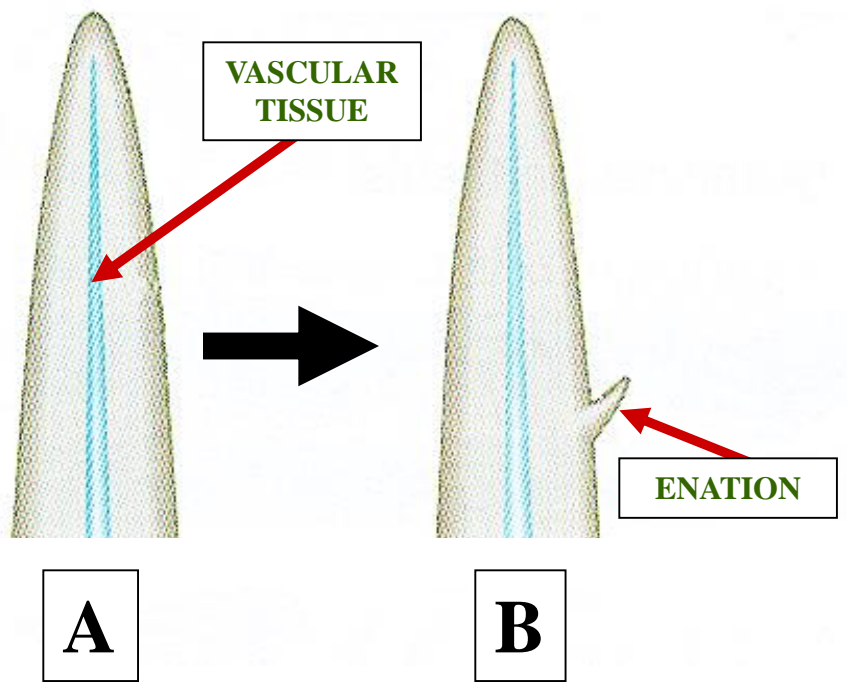
ENATION THEORY COMPONENTS



ENATION ABSENT

➔ = TIME

ENATION THEORY COMPONENTS



VASCULAR
TISSUE

ENATION

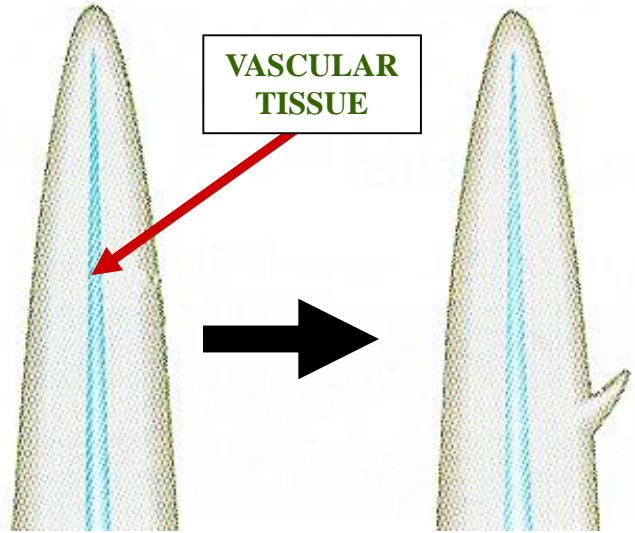
A

B

ENATION ABSENT

➡ = TIME

ENATION THEORY COMPONENTS



VASCULAR
TISSUE

A

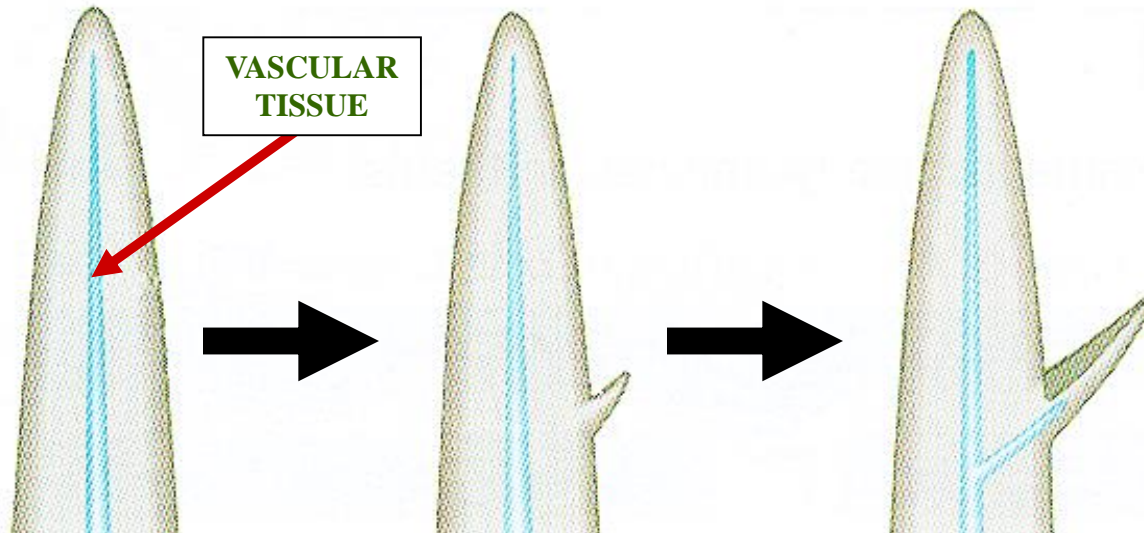
B

ENATION ABSENT

ENATION PRESENT
INCREASES PSYN
SURFACE AREA

→ = TIME

ENATION THEORY COMPONENTS



VASCULAR
TISSUE

A

B

C

ENATION ABSENT

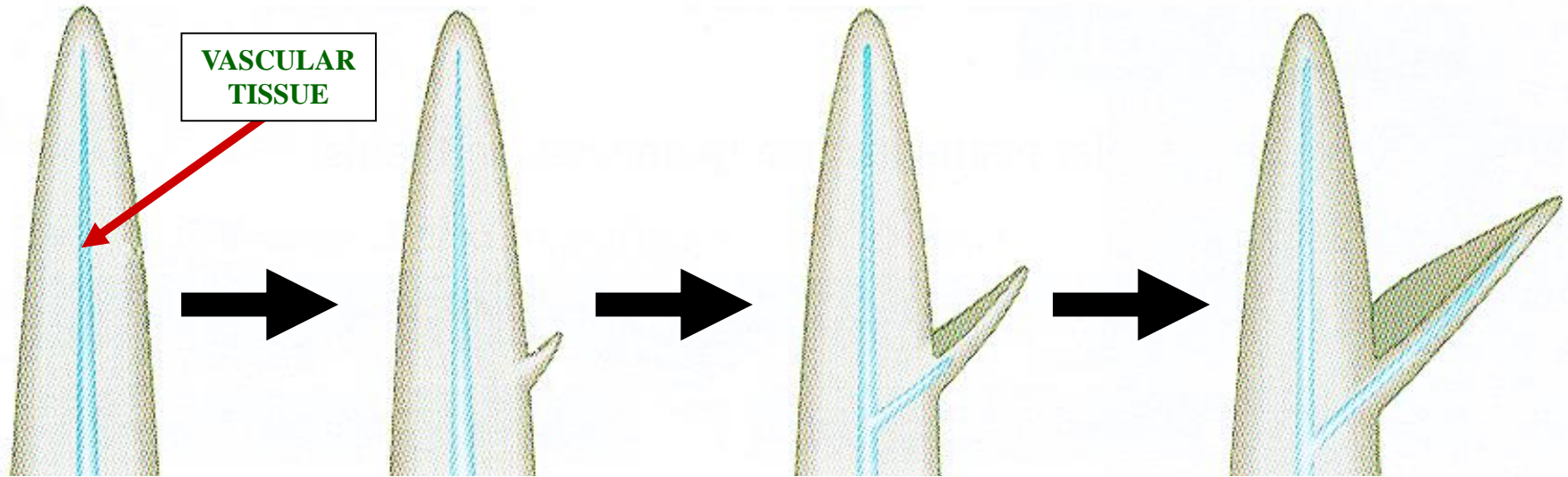
ENATION PRESENT
INCREASES PSYN
SURFACE AREA

PARTLY
VASCULARIZED
ENATION

➔ = TIME

ENATION THEORY

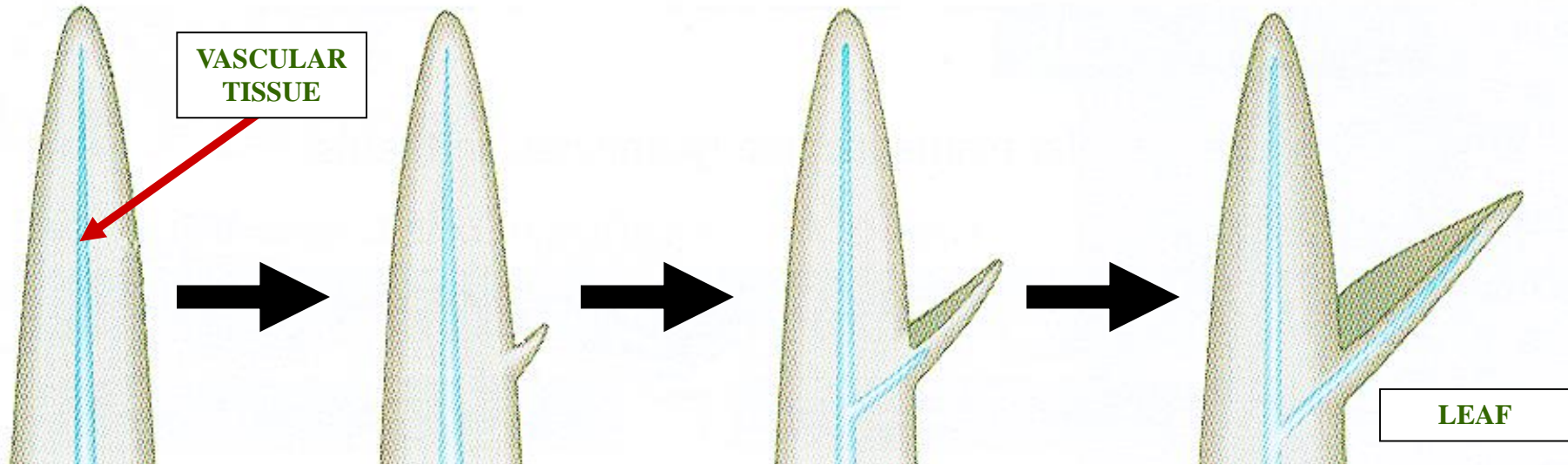
COMPONENTS

**A****B****C****D**

ENATION ABSENT

ENATION PRESENT
INCREASES PSYN
SURFACE AREAPARTLY
VASCULARIZED
ENATIONFULLY
VASCULARIZED
ENATION**→ = TIME**

ENATION THEORY COMPONENTS



A

B

C

D

ENATION ABSENT

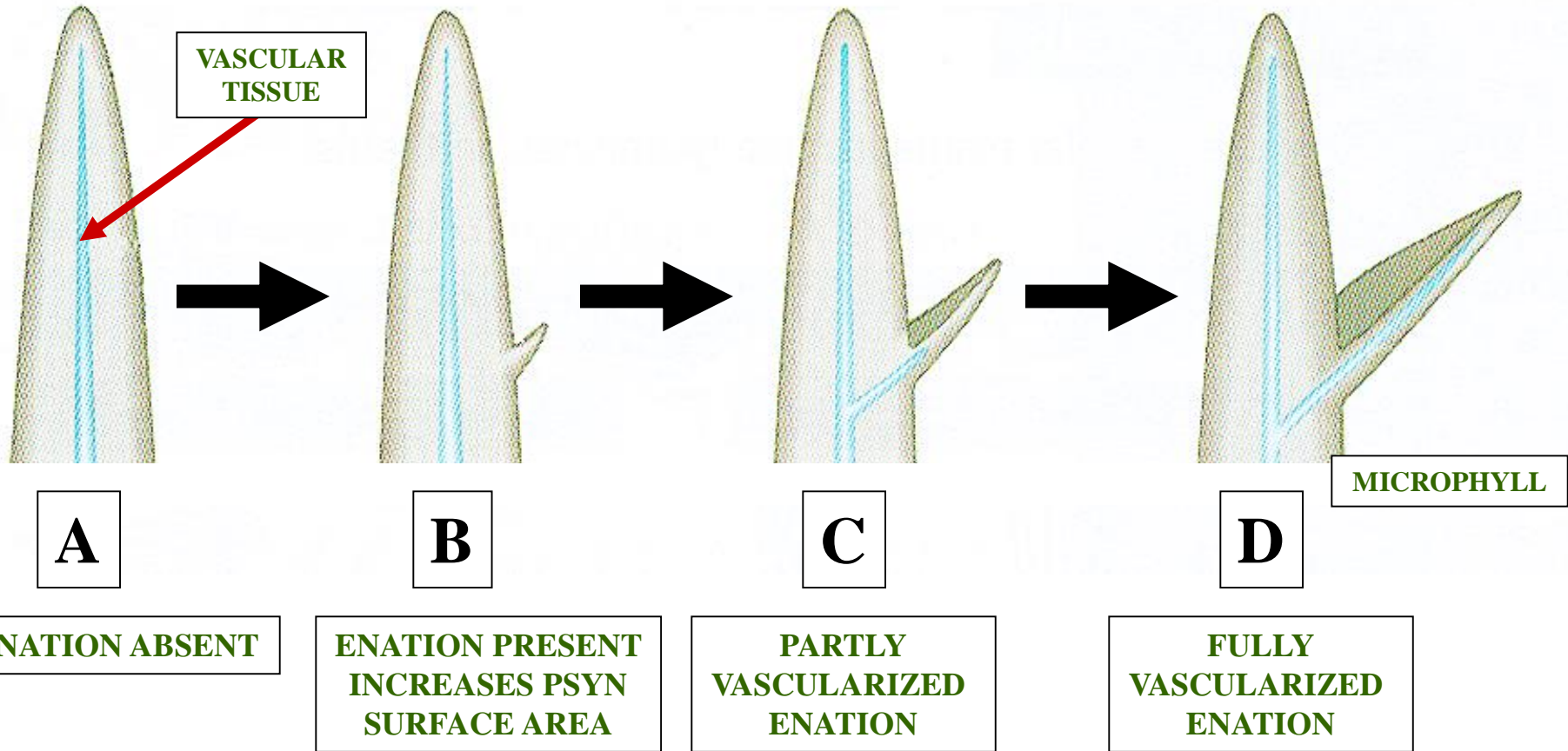
ENATION PRESENT
INCREASES PSYN
SURFACE AREA

PARTLY
VASCULARIZED
ENATION

FULLY
VASCULARIZED
ENATION

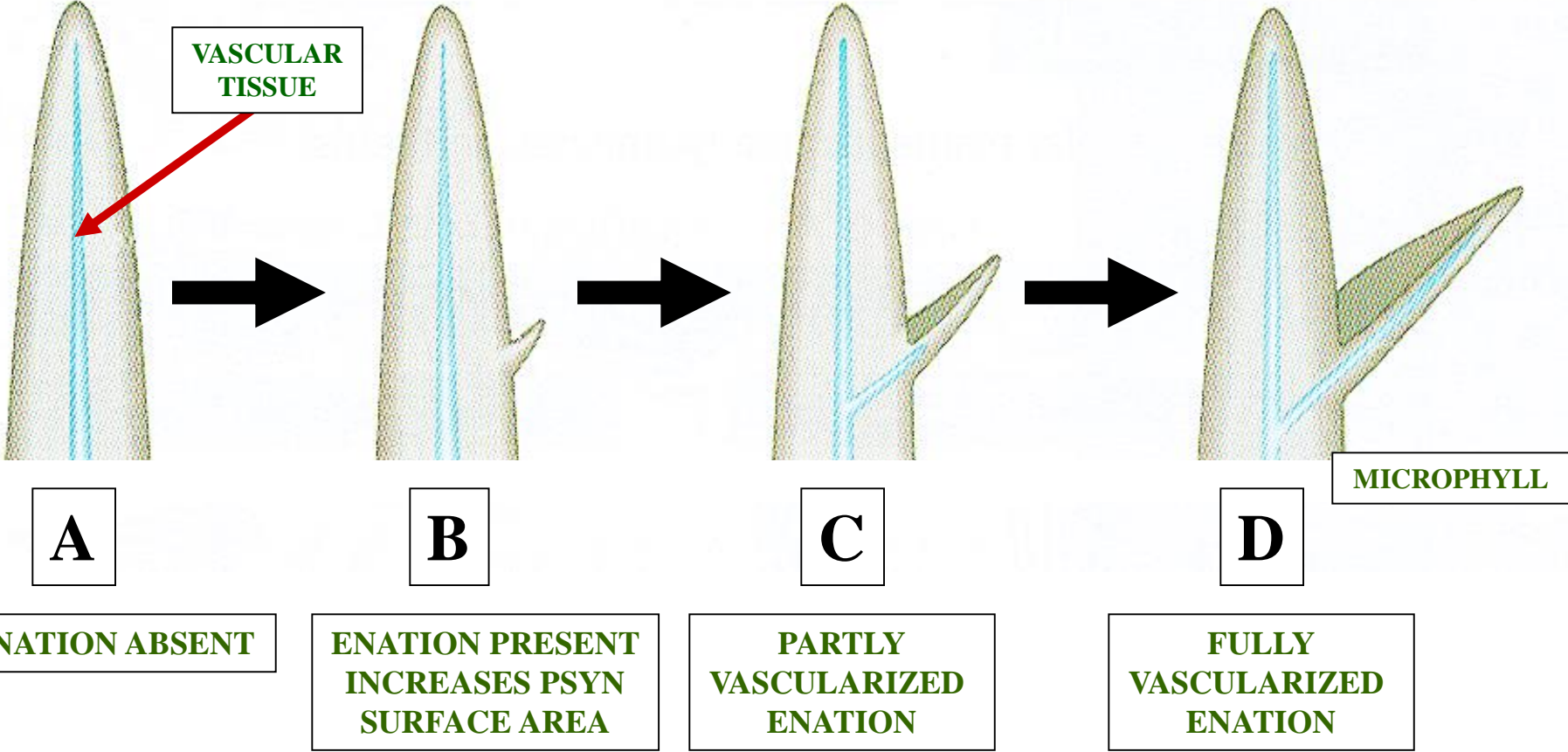
➔ = TIME

ENATION THEORY COMPONENTS



MICROPHYLL

ENATION THEORY COMPONENTS



ENATION THEORY




MICROPHYLLS

LYCOPHYTES

LYCOPODIOPHYTA



MEGAPHYLL



**MEGAPHYLLS
KNOWN TO MOST
VASCULAR PLANTS**



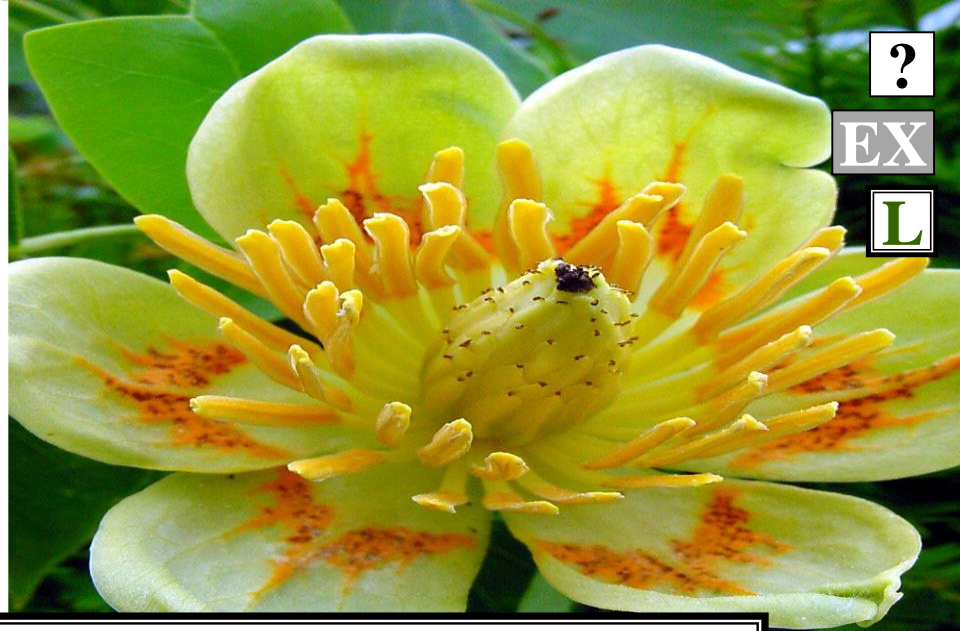
FERNS





GYMNOSPERMS





?

EX

L

ANGIOSPERMS





EXCEPTION

EXCEPTION

EXCEPTION

LYCOPHYTES

EXCEPTION



EXCEPTION

MICROPHYLLS

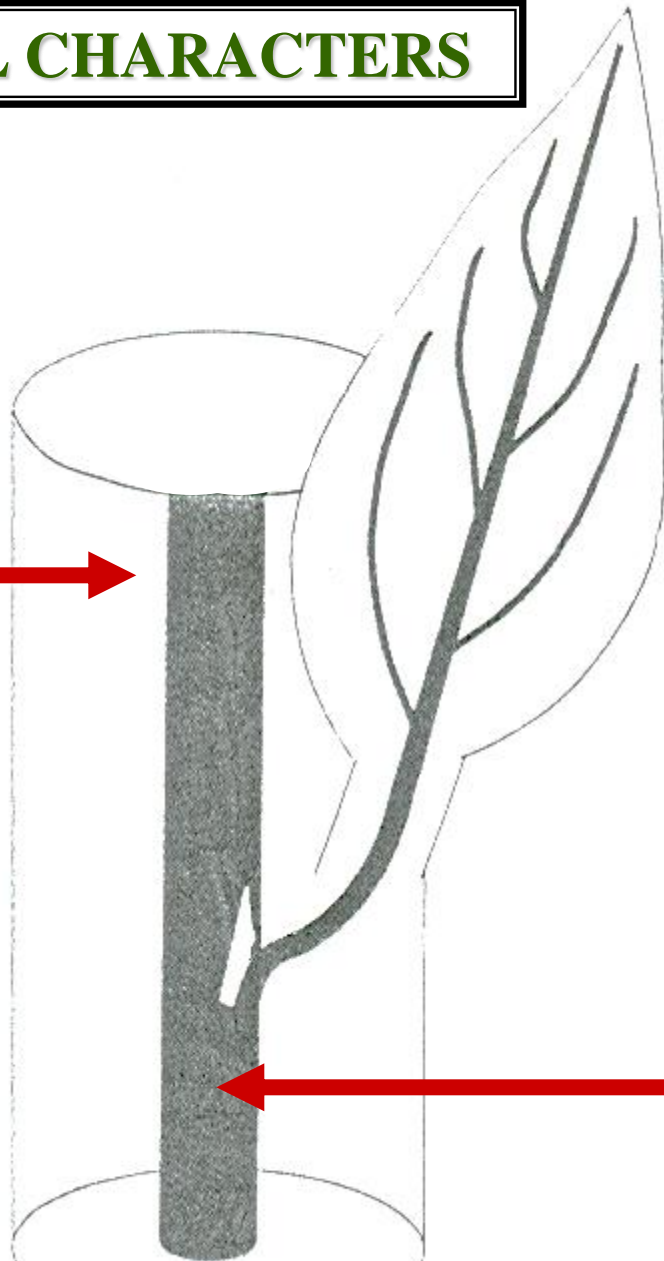
EXCEPTION



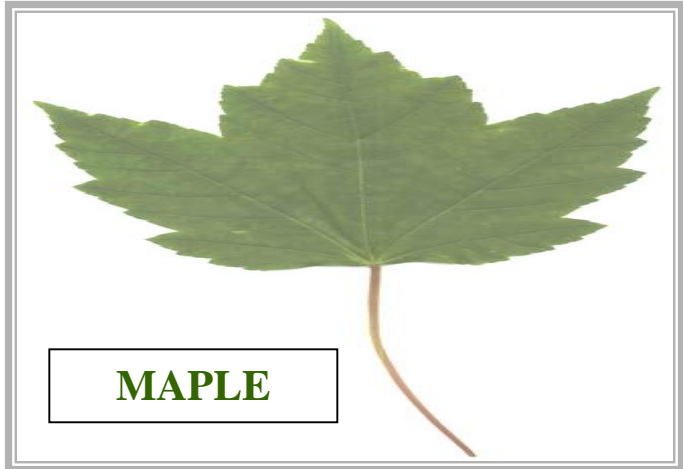
MEGAPHYLL CHARACTERS

MEGAPHYLL CHARACTERS

STEM



MEGAPHYLL



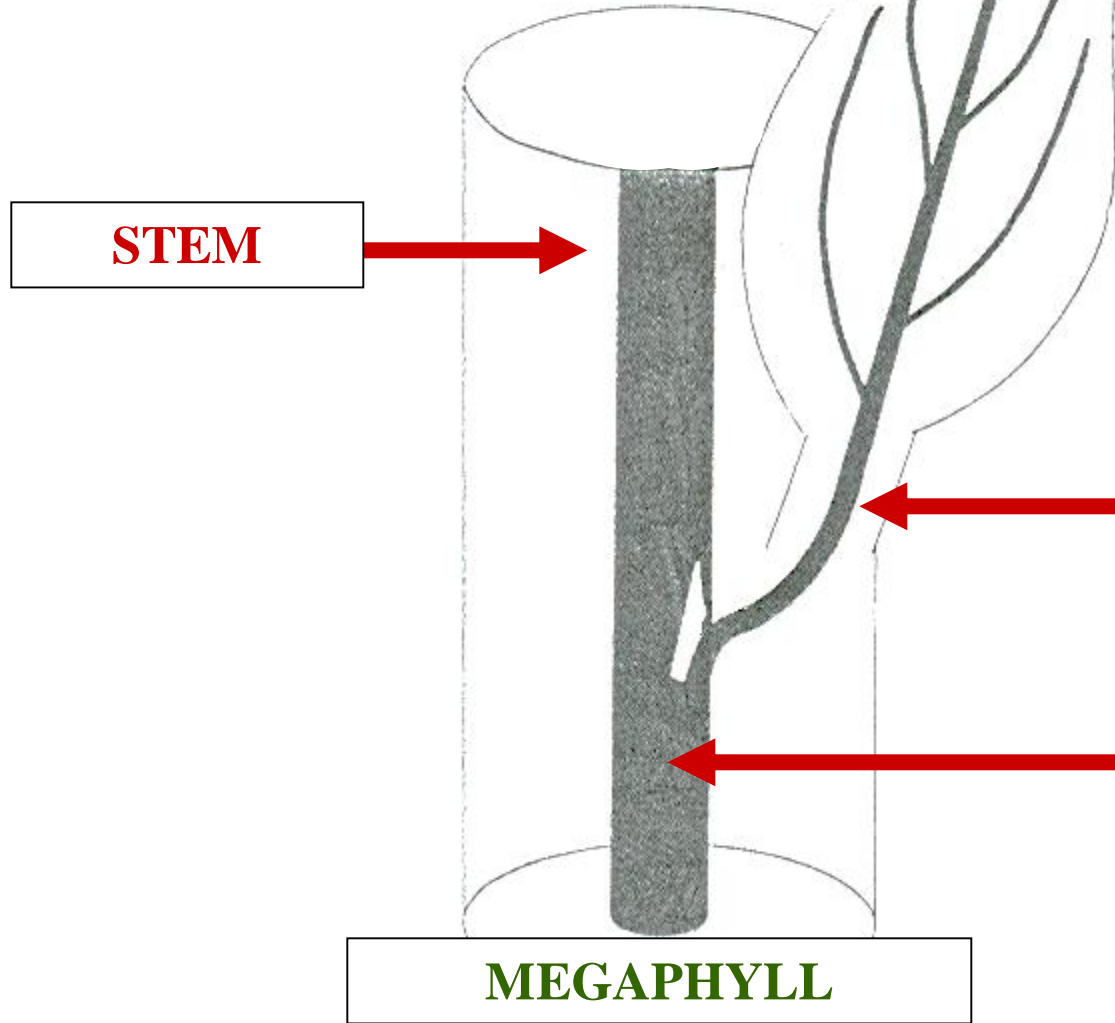
MAPLE

VT

VASCULAR TISSUE



MEGAPHYLL CHARACTERS



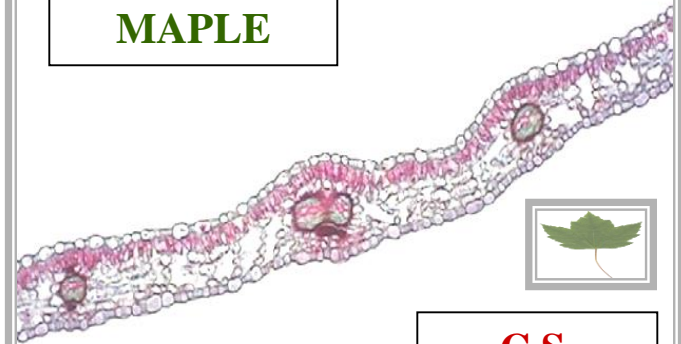
STEM

MEGAPHYLL

**SEVERAL
VASCULAR TRACES**

VASCULAR TISSUE

MAPLE



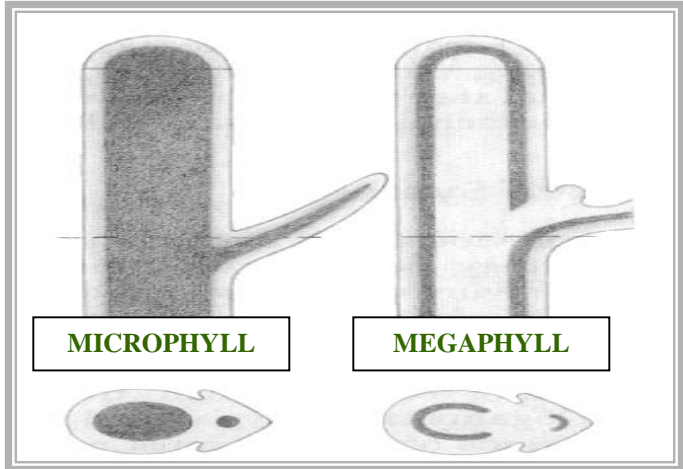
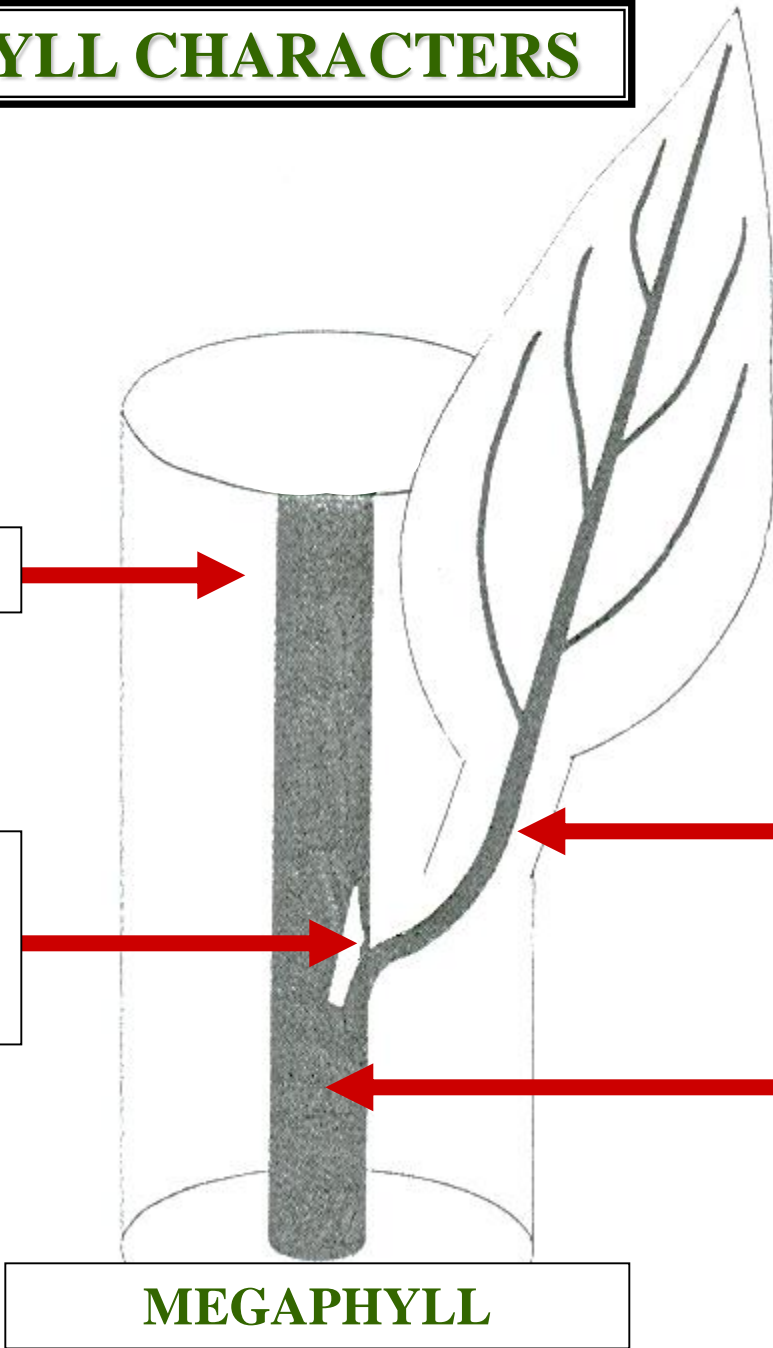
C.S.

VG

MEGAPHYLL CHARACTERS

STEM

VASCULAR GAP PRESENT



MICROPHYLL

MEGAPHYLL

VP

SEVERAL VASCULAR TRACES

VASCULAR TISSUE

MEGAPHYLL

MEGAPHYLL CHARACTERS

STEM



VASCULAR GAP PRESENT



VENATION PRESENT



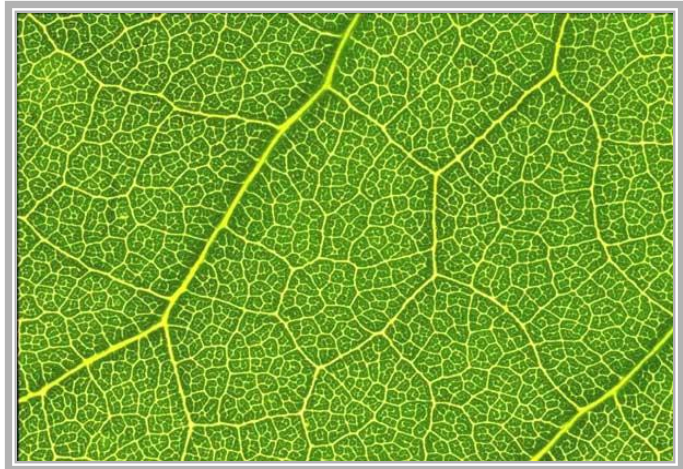
SEVERAL VASCULAR TRACES



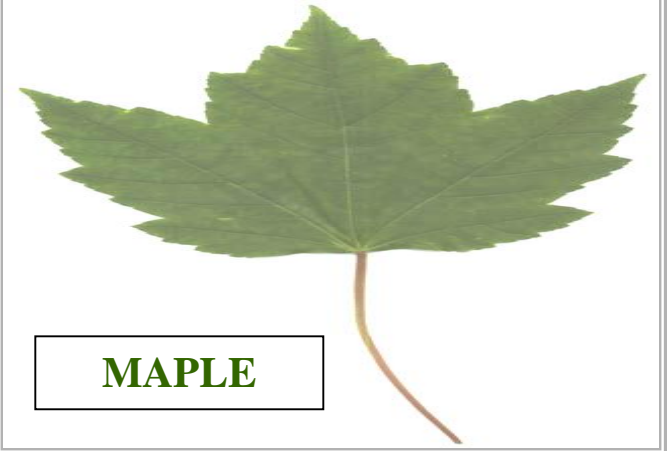
VASCULAR TISSUE



MEGAPHYLL



MEGAPHYLL CHARACTERS



MAPLE

STEM



VENATION PRESENT



VASCULAR GAP PRESENT



SEVERAL VASCULAR TRACES



VASCULAR TISSUE

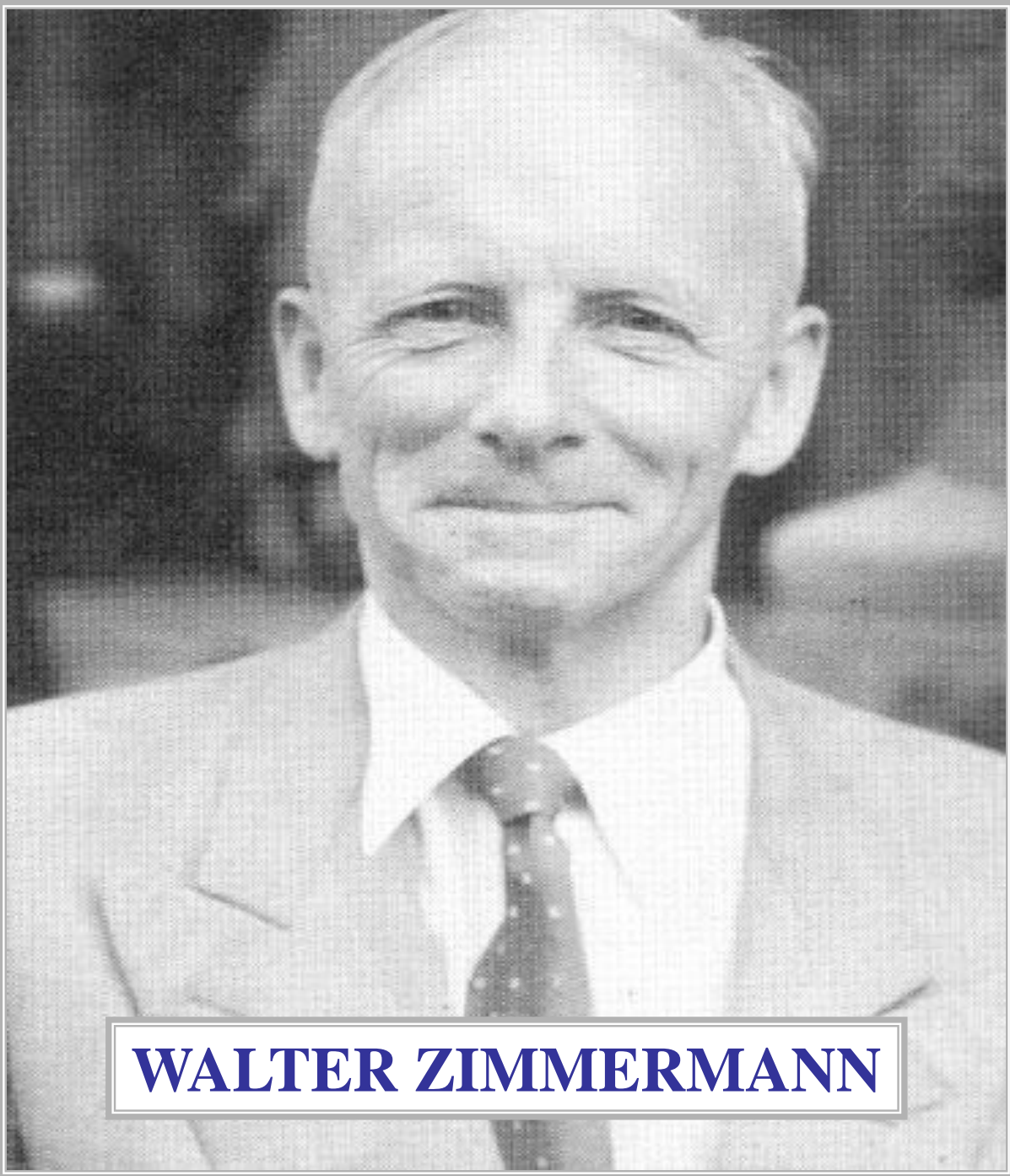


MEGAPHYLL





MEGAPHYLL
EVOLUTION
TELOME THEORY



WALTER ZIMMERMANN