

A photograph of a dried Lycopodium plant specimen, showing its characteristic monopodial branching. The main stem is at the bottom, with several upright stems branching off from it. The stems are covered in small, scale-like leaves. The specimen is pinned to a white background with several white pins. A red box with the text 'MONOPODIAL BRANCHING' is overlaid on the image. Three red arrows point to the nodes where the upright stems branch off from the main stem. In the top right corner, there is a small box containing the letters '^' and 'E' stacked vertically. In the bottom right corner, there is a box containing the word 'LYCOPODIUM' in green, italicized font.

MONOPODIAL BRANCHING

^
E

LYCOPODIUM

EXCURRENT BRANCHING

STEM BRANCHING EXCURRENT



**MAIN AXIS
WITH INHIBITED
LATERALS**

**STEM BRANCHING
EXCURRENT**

ABIES



ABIES



ABIES



ABIES



ABIES

AD



ABIES

**APICAL
DOMINANCE**

E

+



ABIES

**APICAL
DOMINANCE**

^

D



EXCURRENT BRANCHING

DELIQUESCENT BRANCHING

STEM BRANCHING DELIQUESCENT

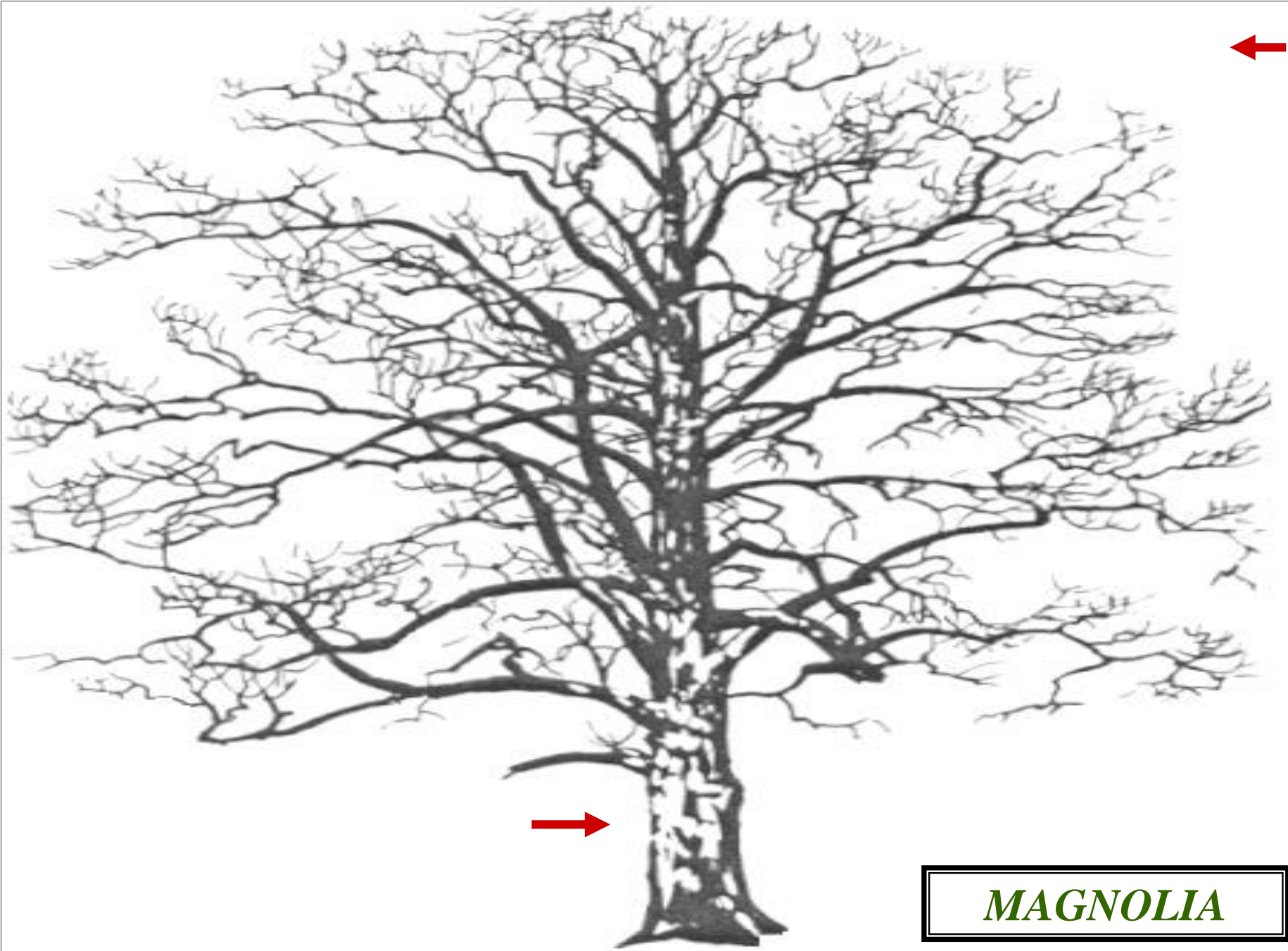


**MAIN AXIS
WITH NON-INHIBITED
LATERALS**

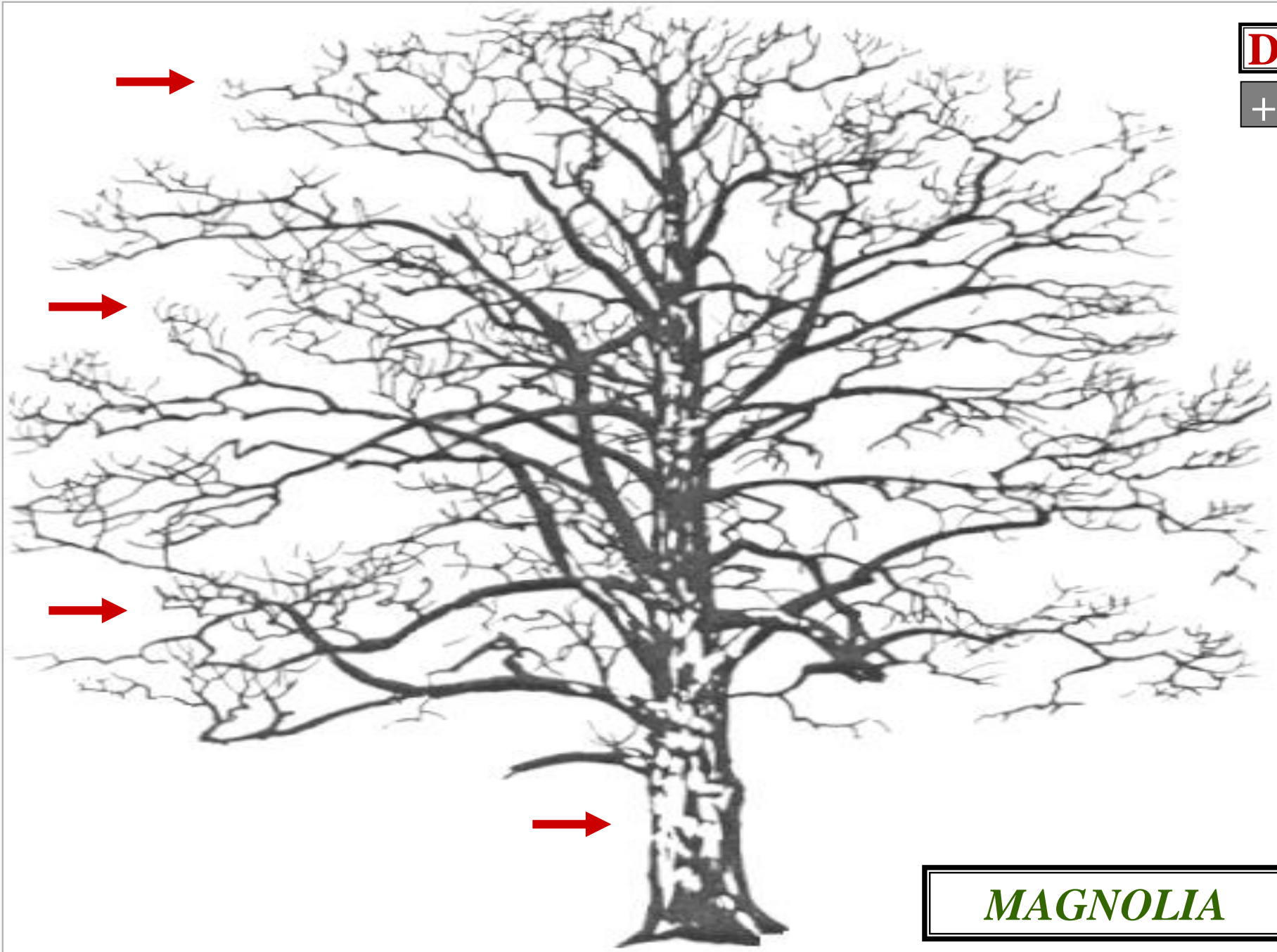
**STEM BRANCHING
DELIQUESCENT**



MAGNOLIA



MAGNOLIA



D

+

MAGNOLIA

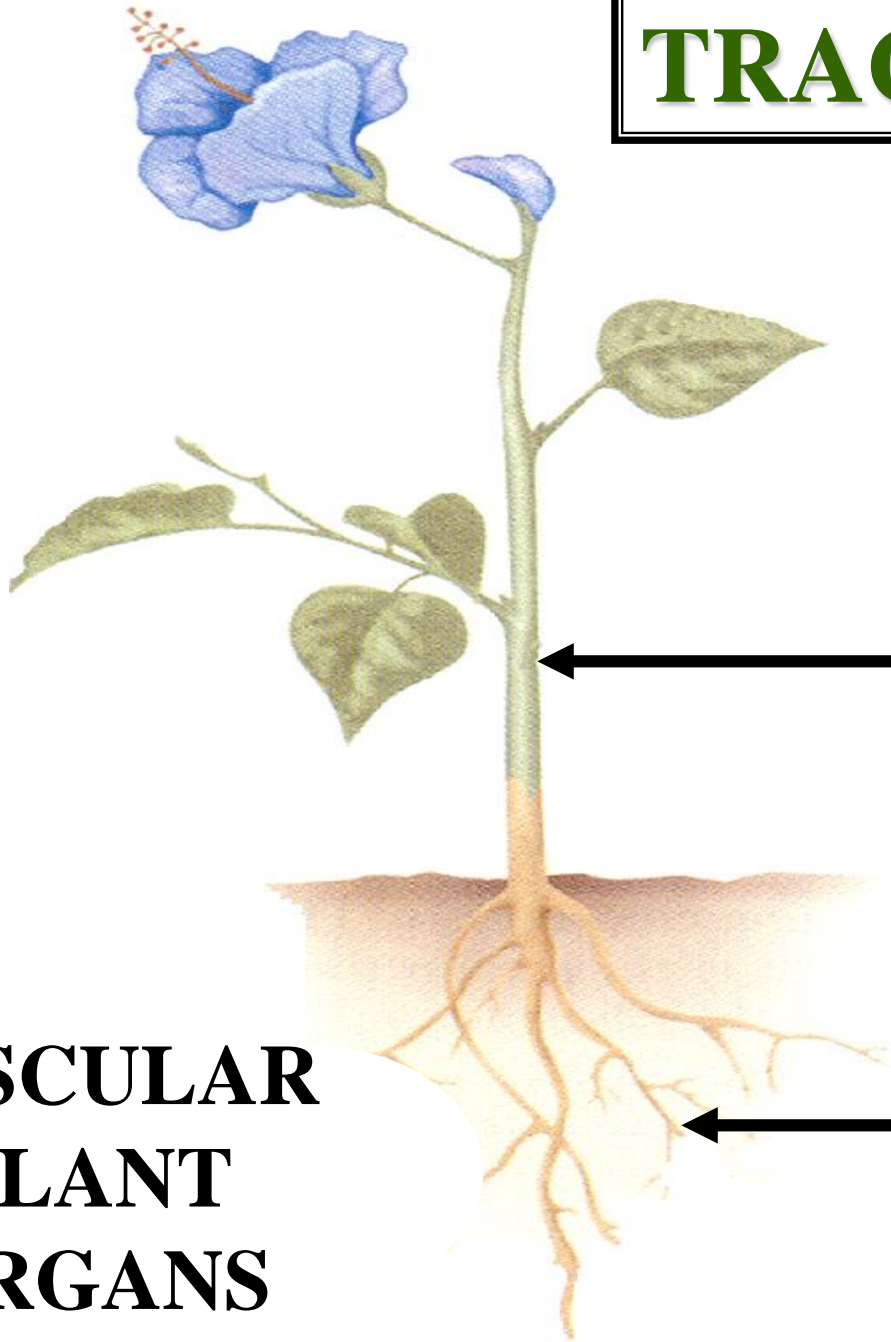


DELIQUESCENT BRANCHING

MAGNOLIA

TRACHEOPHYTE

L

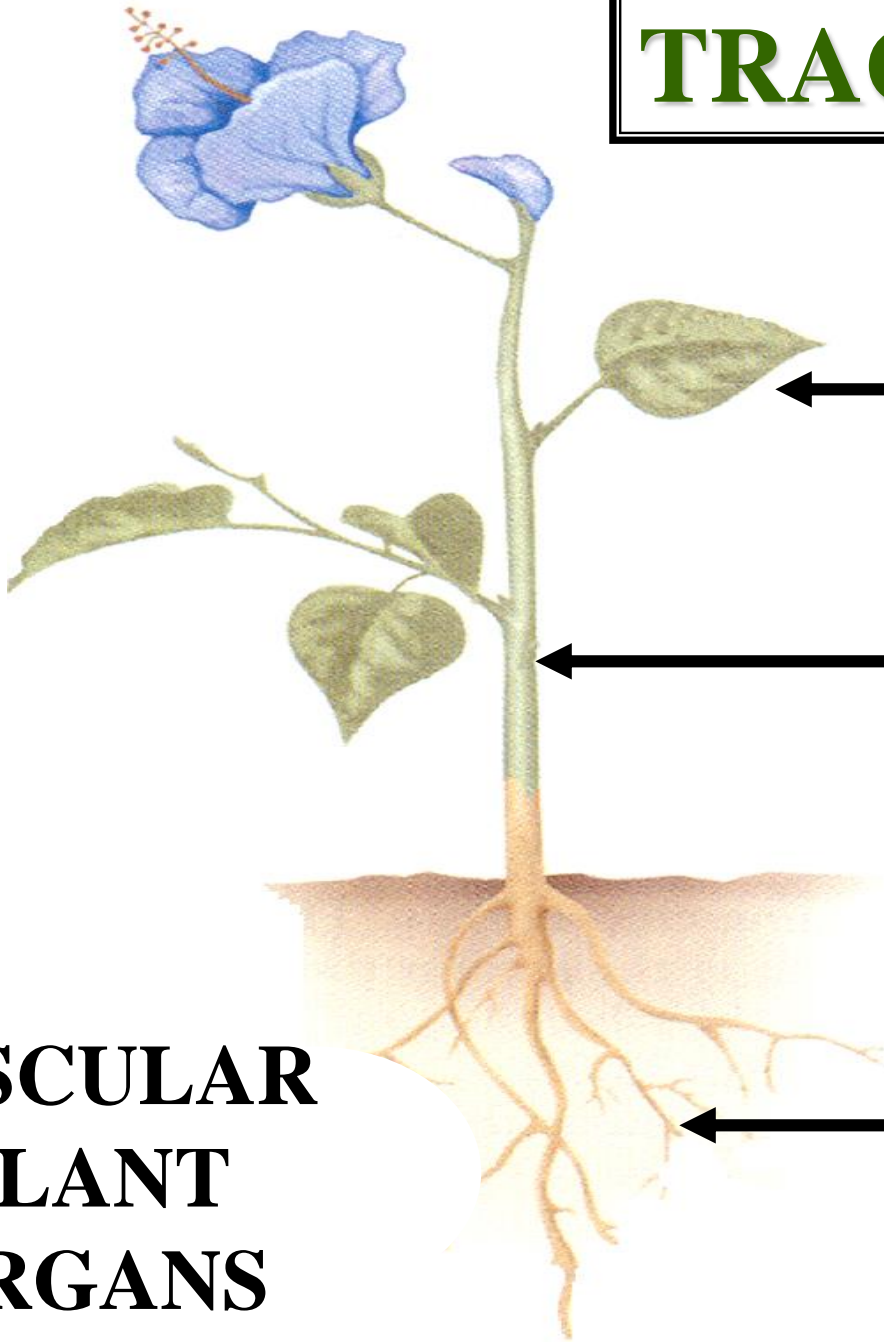


STEM

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**



R

MODIFIED STEM OUTGROWTH

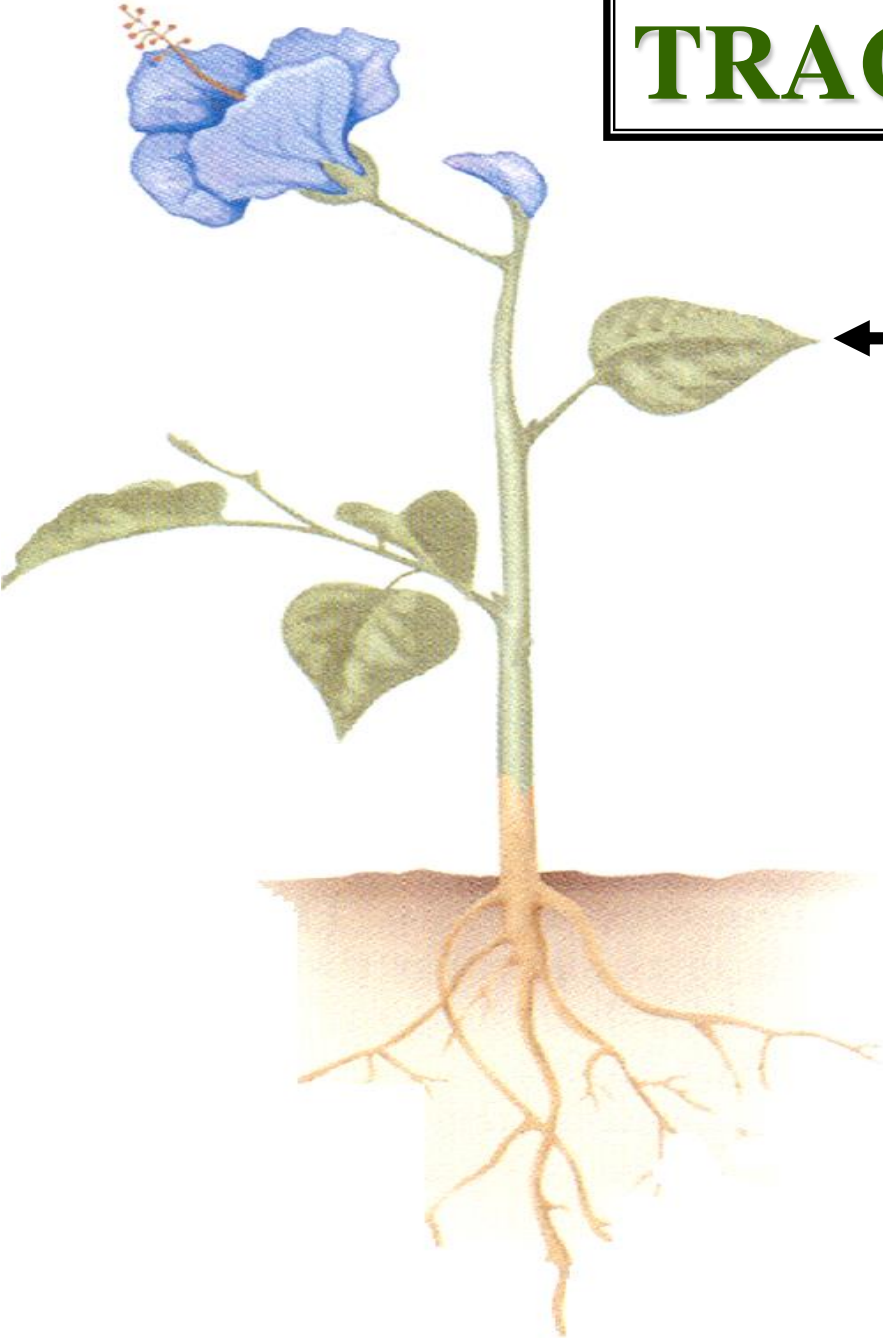
**CONDUCTS
REPRODUCTION**

**TRACHEOPHYTE
ORGANS
LEAF**

TRACHEOPHYTE

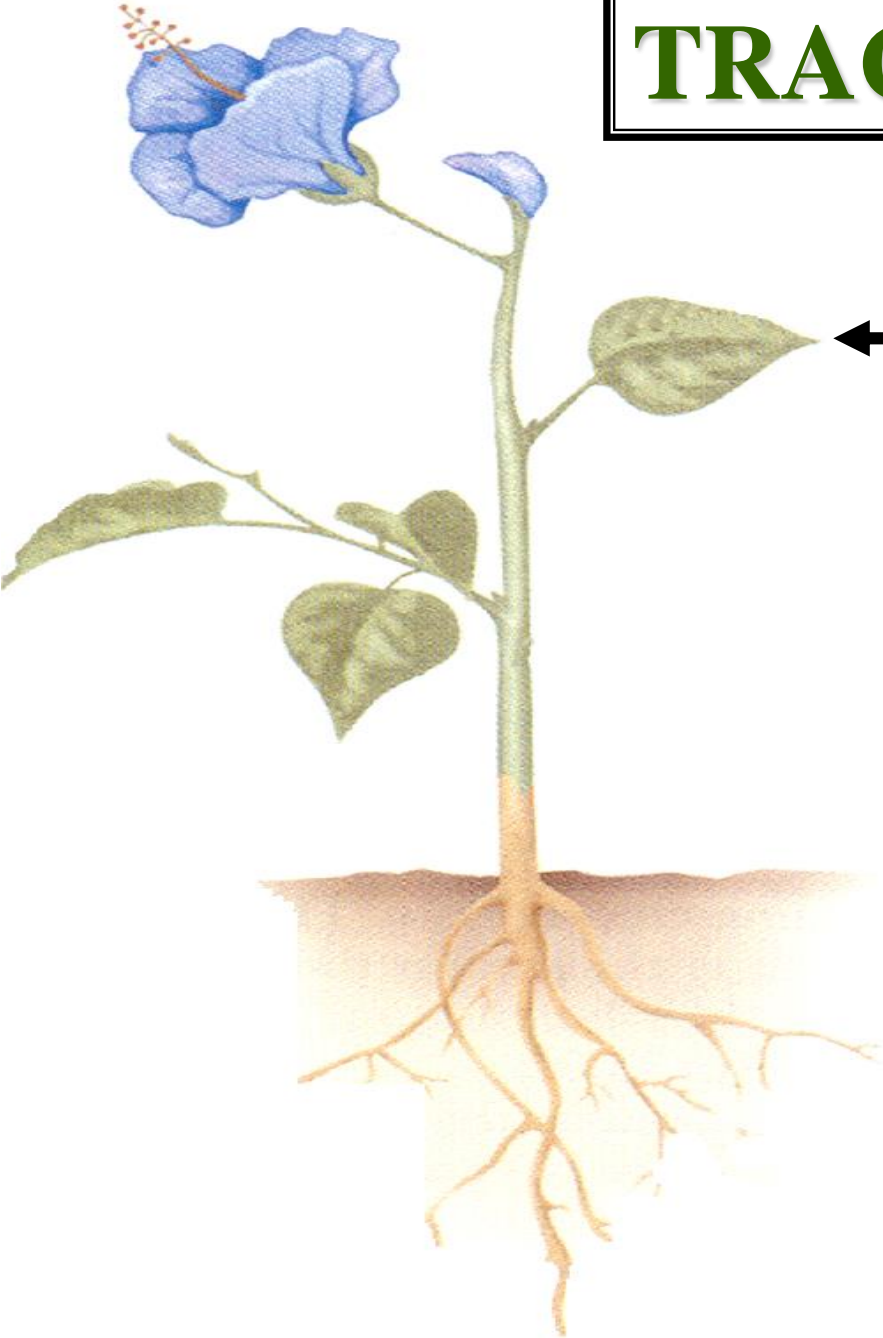
M

LEAF



TRACHEOPHYTE

P

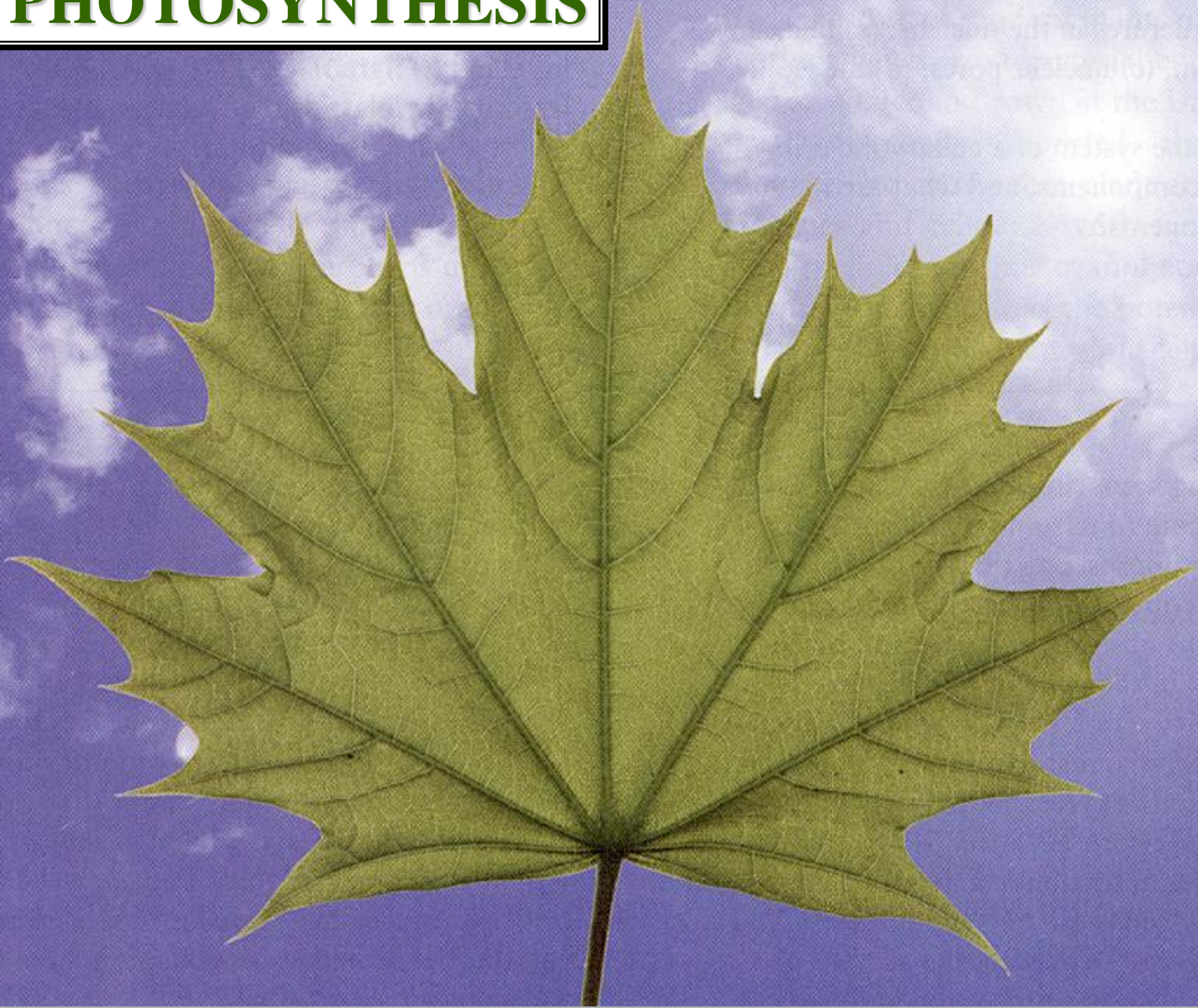


LEAF

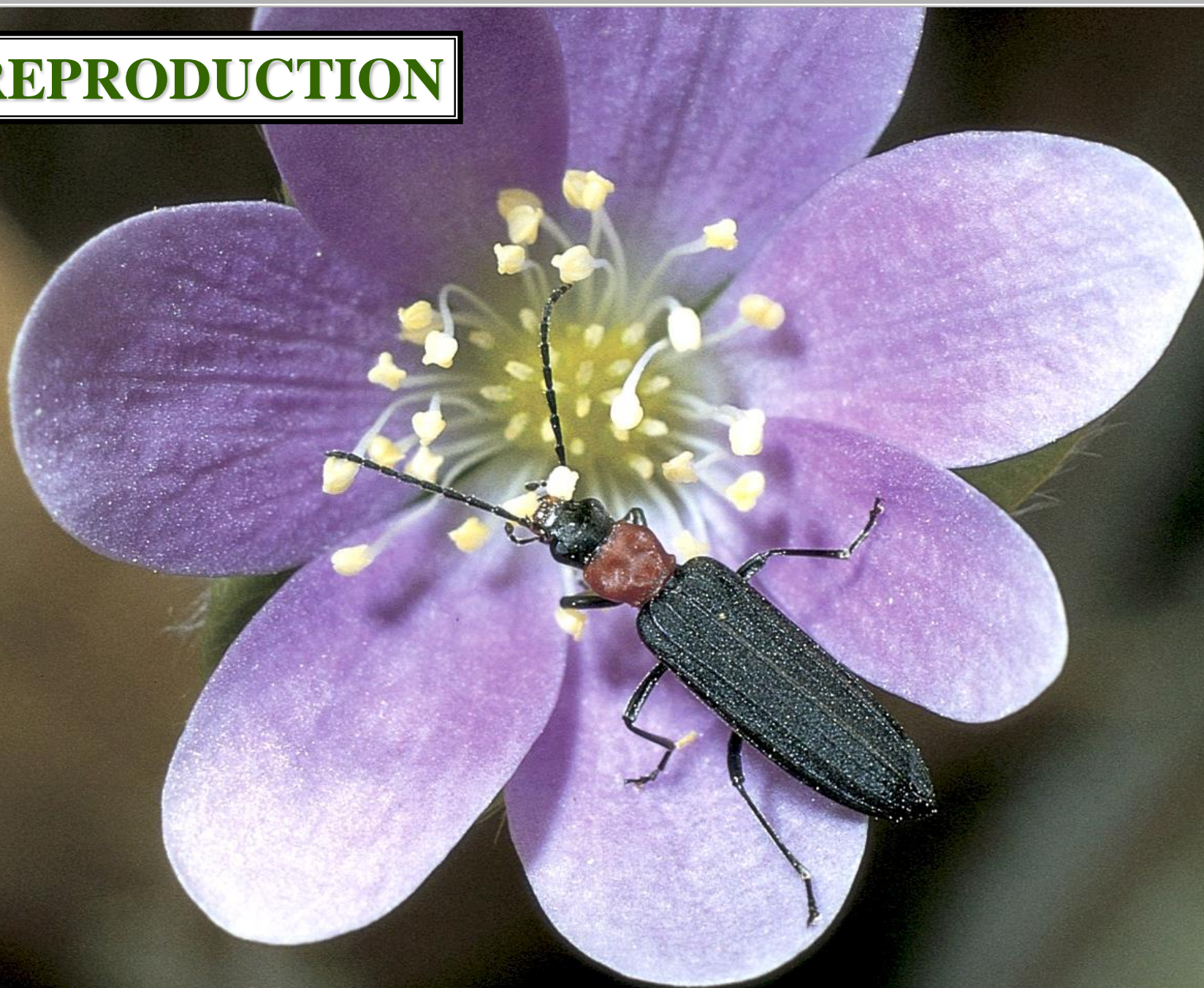
**MODIFIED STEM
OUTGROWTH**

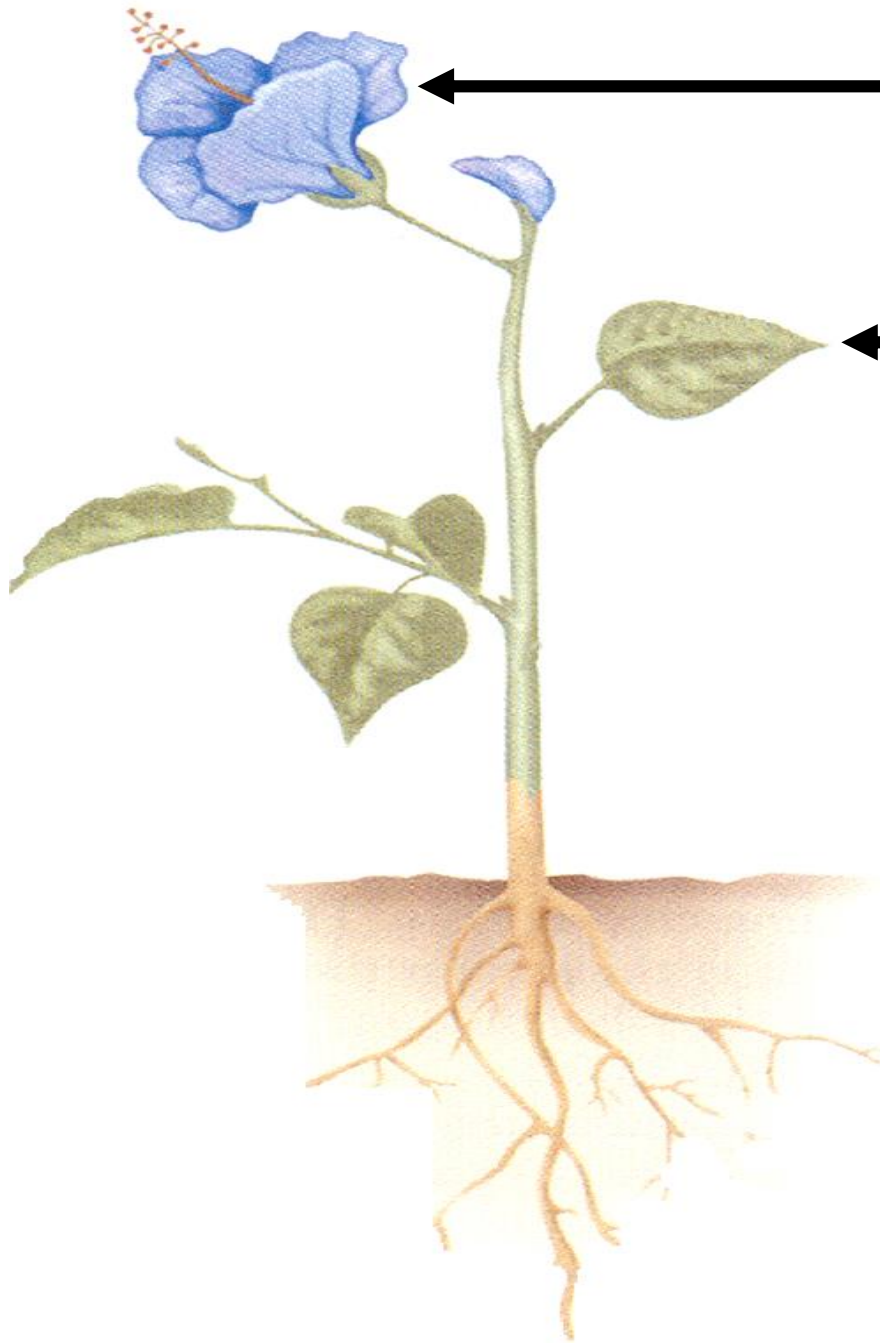
PHOTOSYNTHESIS

R



REPRODUCTION





FLOWER



LEAF



PHOTOSYNTHESIS

GENERAL PHOTOSYNTHESIS 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**

A small black and white icon of an information symbol (i) inside a square box.A small black and white icon of the letter 'L' inside a square box.A photograph of a moss plant with several upright stems. Each stem is densely covered with small, bright green, ovate leaves. The background is a dark, textured mass of other mosses and organic matter.A photograph of a moss plant with several upright stems. Each stem is densely covered with small, bright green, ovate leaves. The background is a dark, textured mass of other mosses and organic matter.



MICROPHYLLS

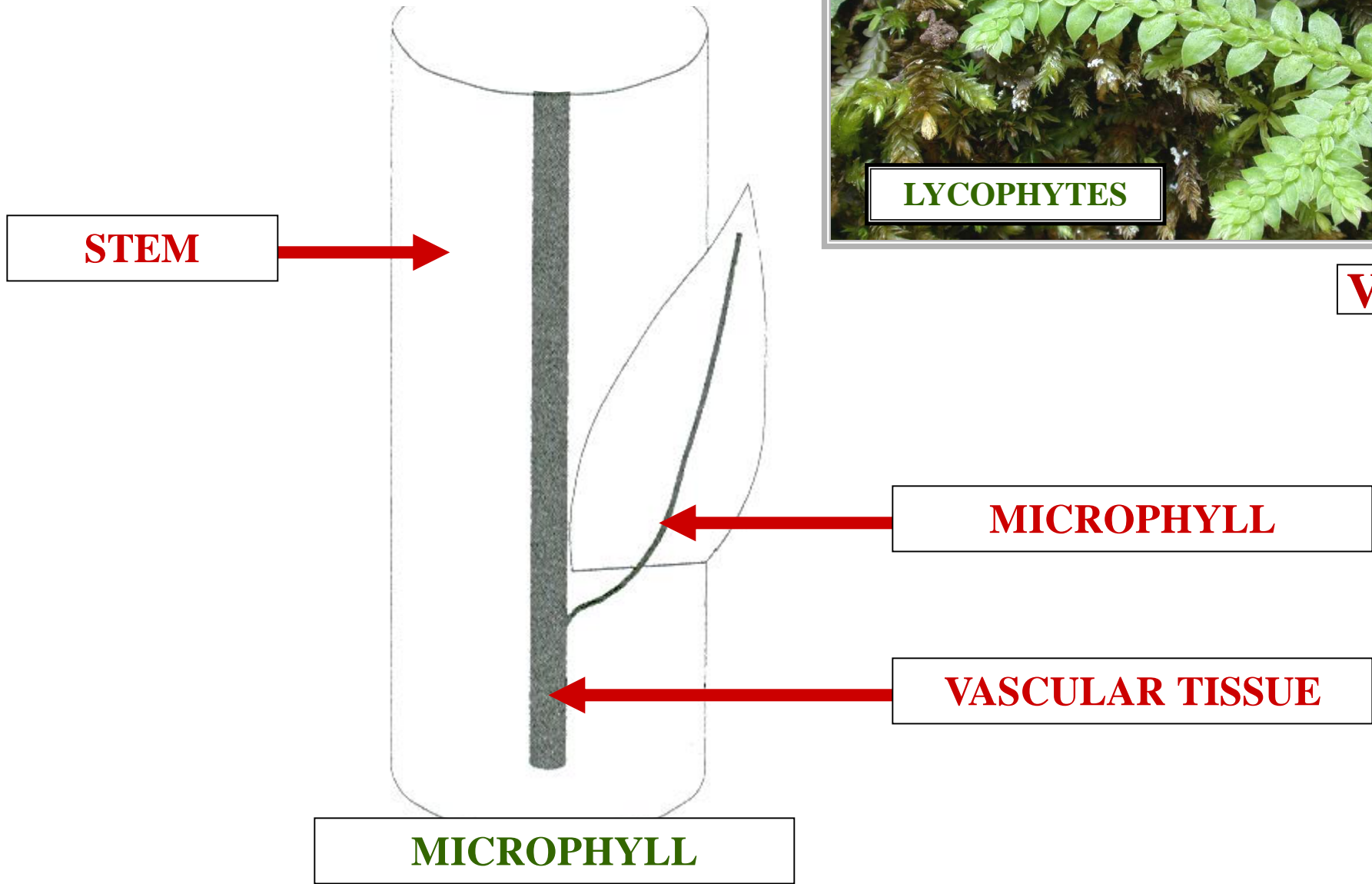
LYCOPHYTES

LYCOPODIOPHYTA



MICROPHYLL CHARACTERS

MICROPHYLL CHARACTERS



LYCOPHYTES

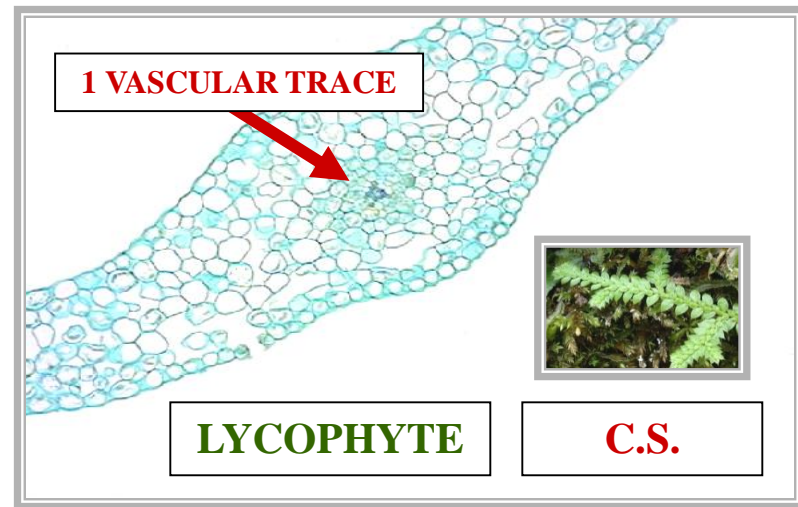
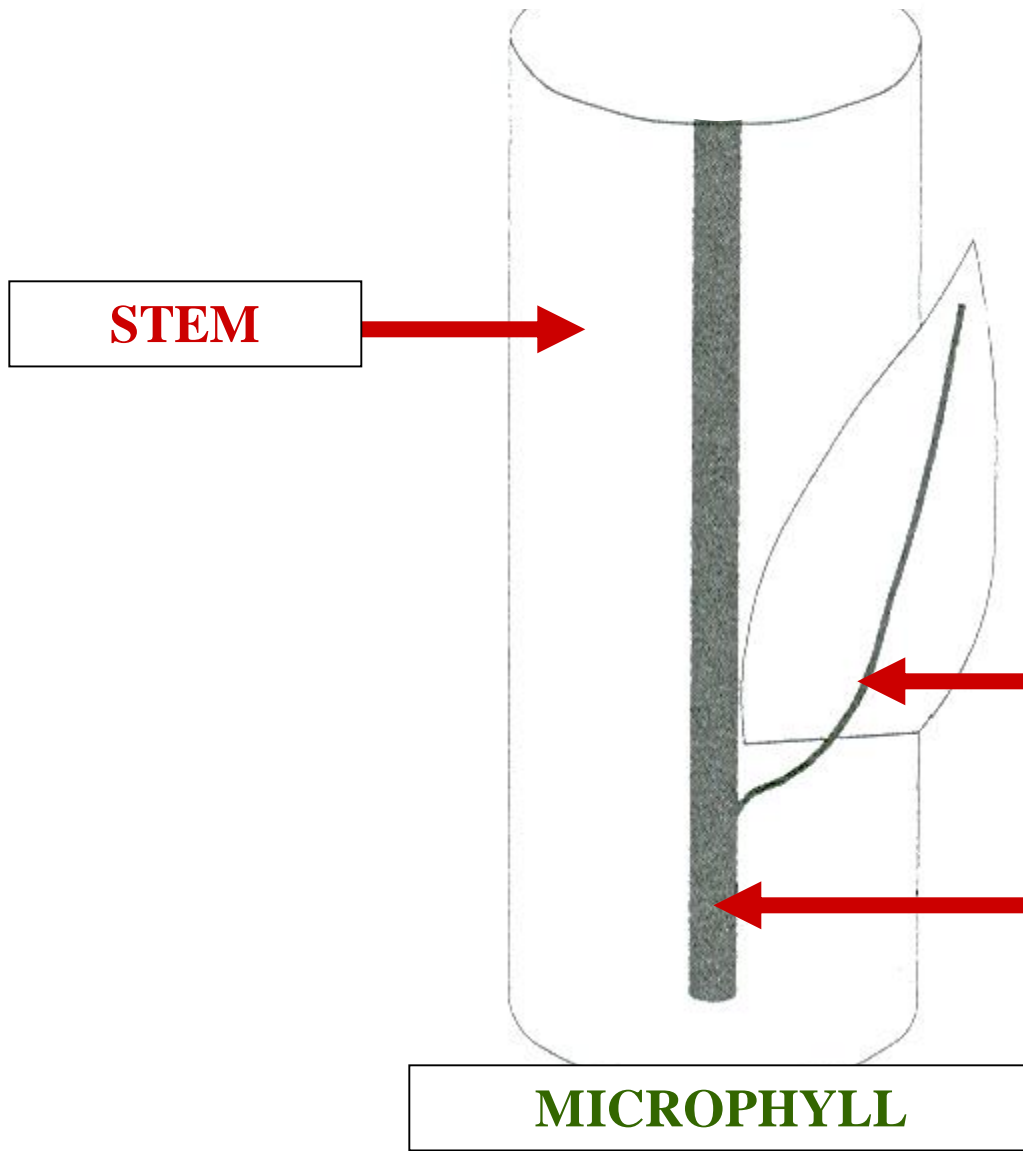
VT

MICROPHYLL

VASCULAR TISSUE

MICROPHYLL

MICROPHYLL CHARACTERS

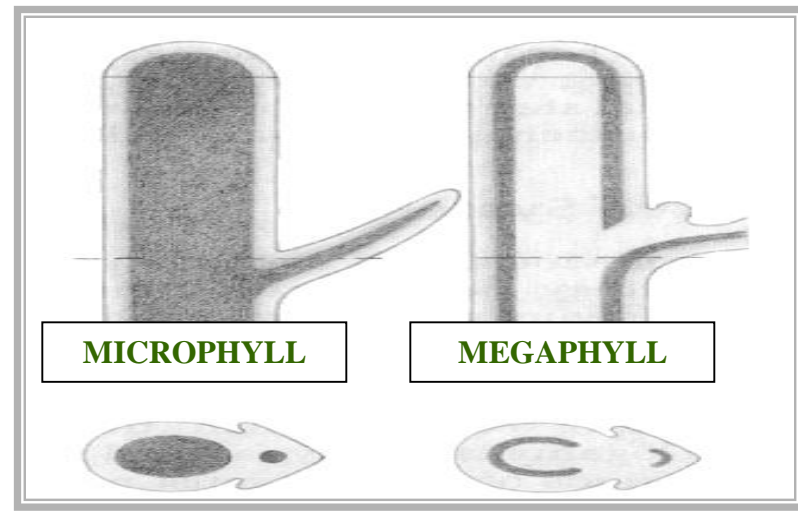
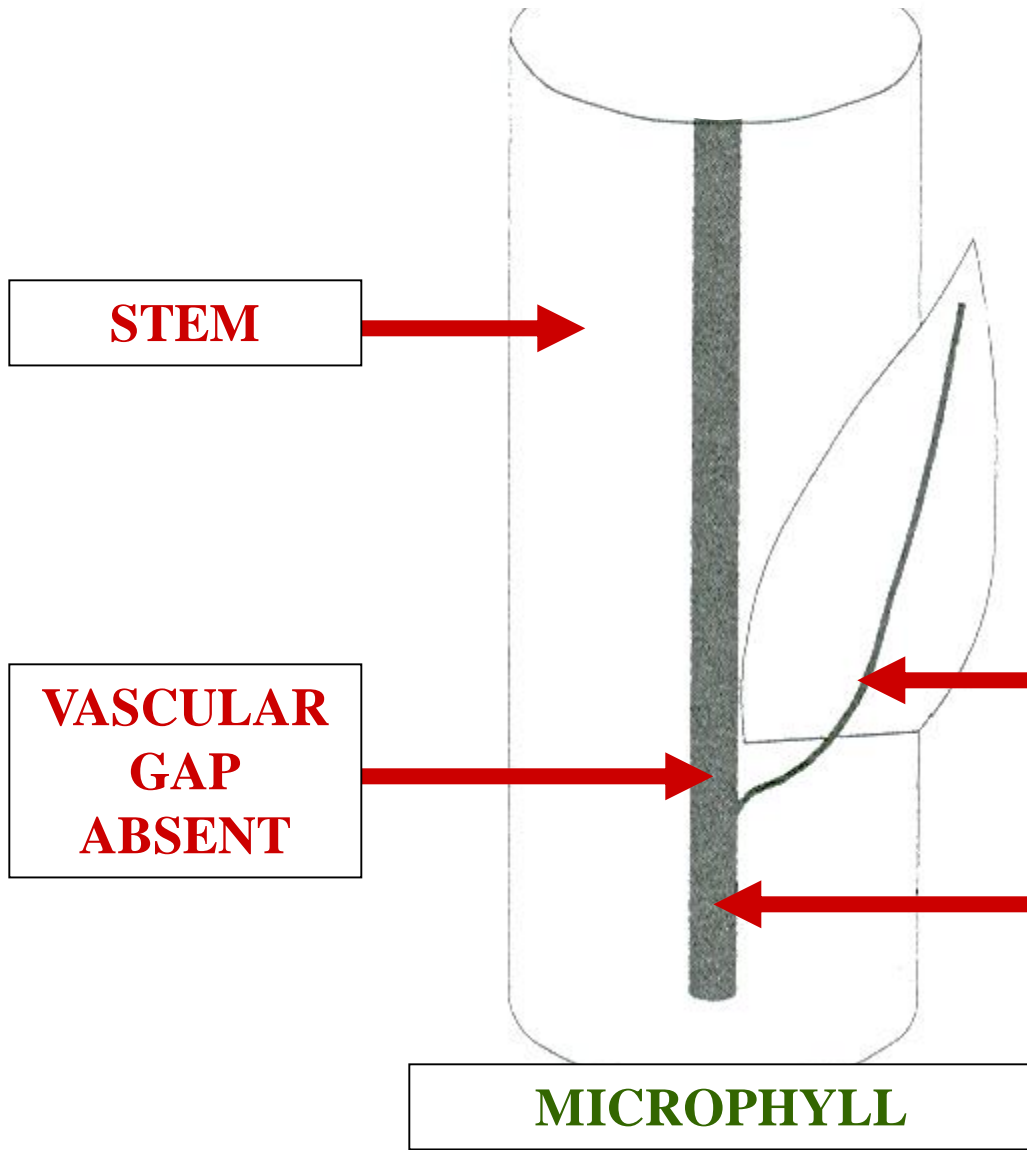


VG

1 VASCULAR TRACE

VASCULAR TISSUE

MICROPHYLL CHARACTERS

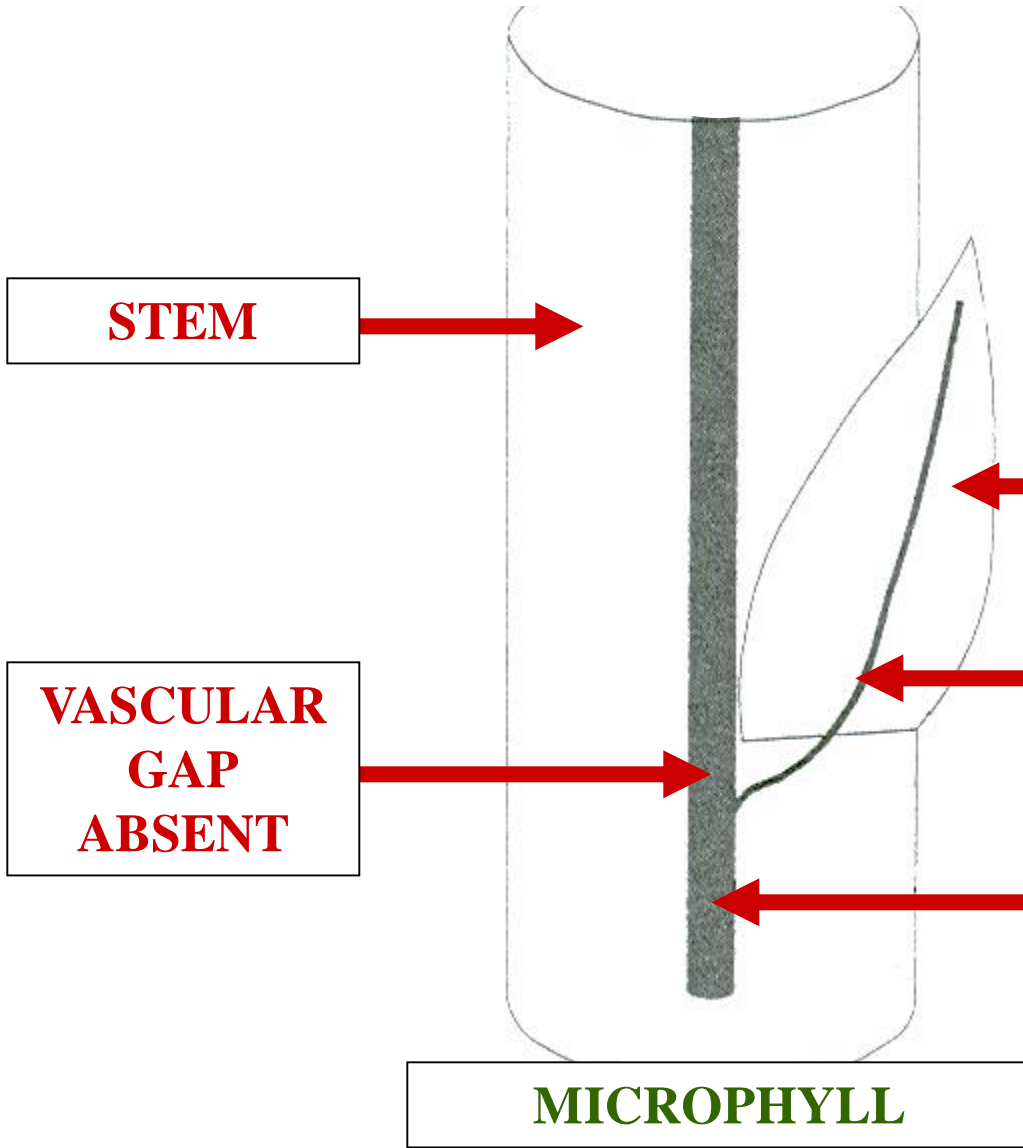
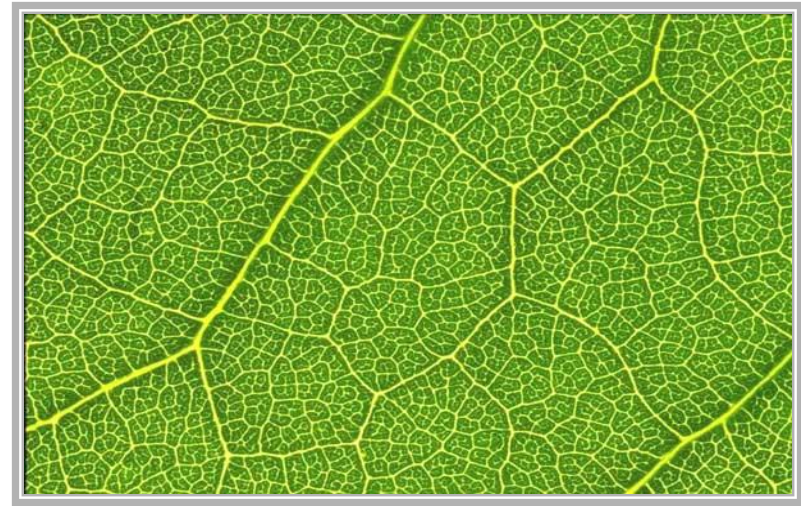


VA

1 VASCULAR TRACE

VASCULAR TISSUE

MICROPHYLL CHARACTERS



STEM

**VASCULAR
GAP
ABSENT**

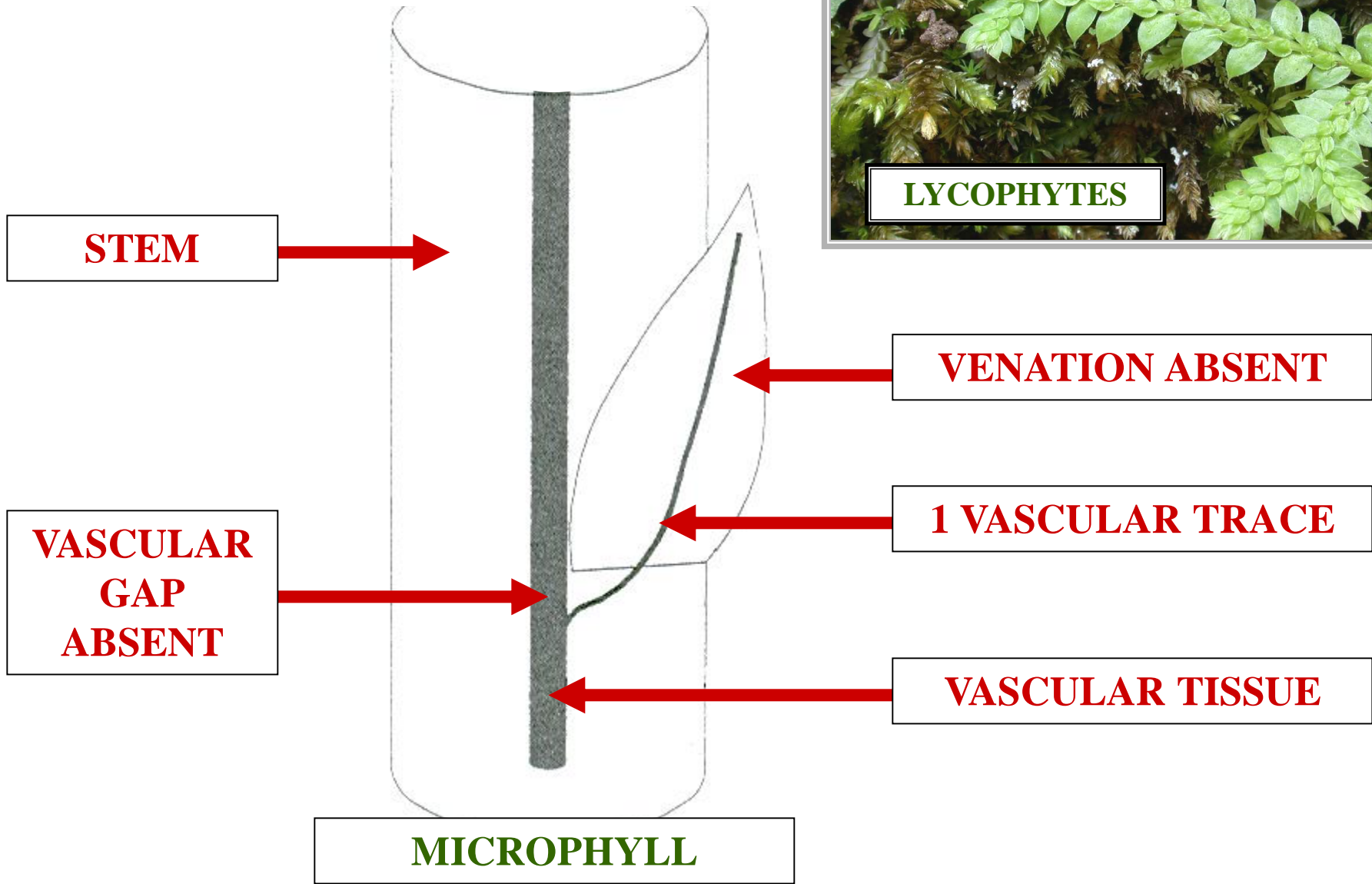
MICROPHYLL

VENATION ABSENT

1 VASCULAR TRACE

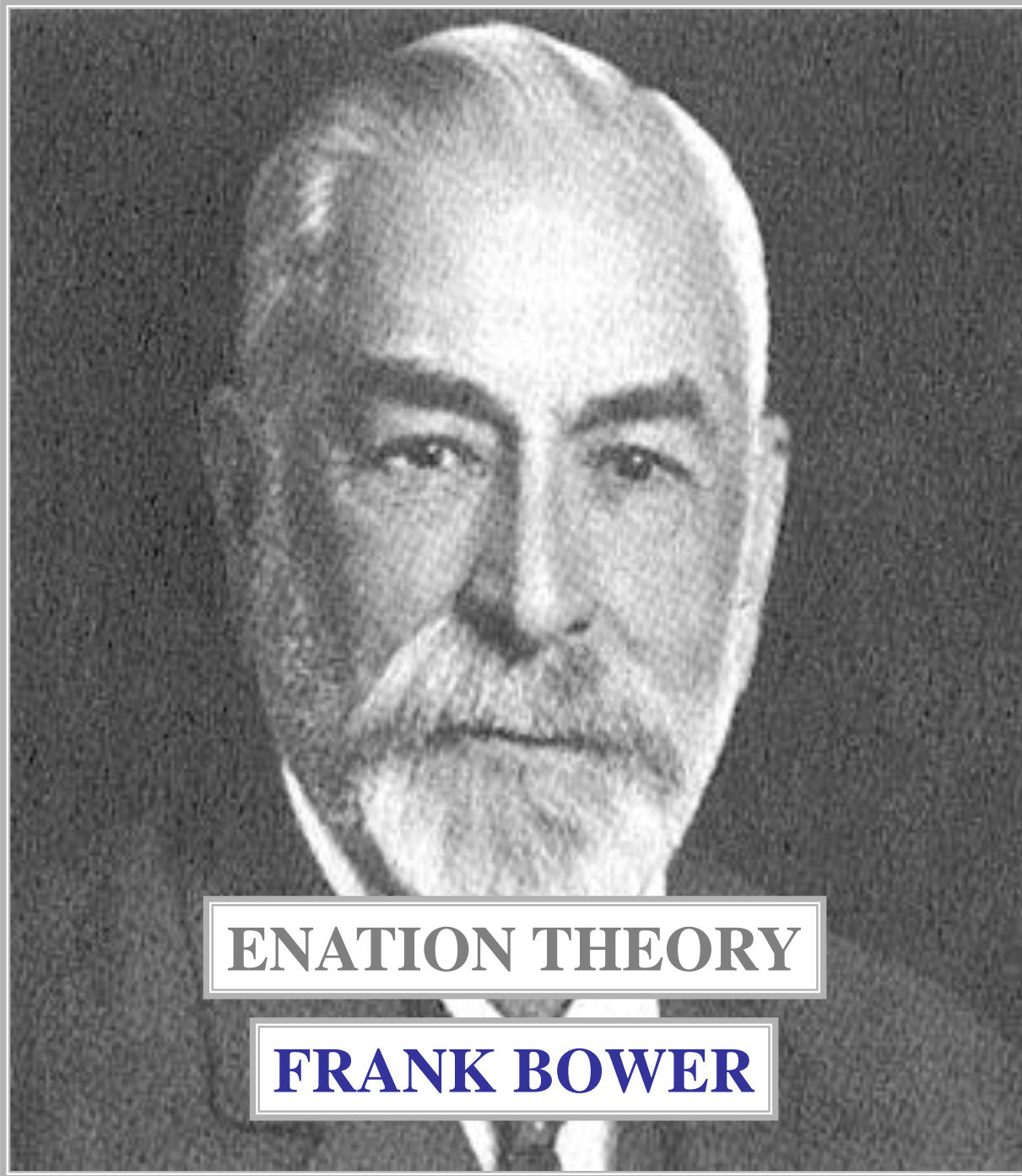
VASCULAR TISSUE

MICROPHYLL CHARACTERS





MICROPHYLL
EVOLUTION
ENATION THEORY



ENATION THEORY

FRANK BOWER

ENATION

MICROPHYLL ENATION



**NON-VASCULAR
PHOTOSYNTHETIC
STEM OUTGROWTH**

MICROPHYLL ENATION



**NON-VASCULAR
PHOTOSYNTHETIC
STEM OUTGROWTH**

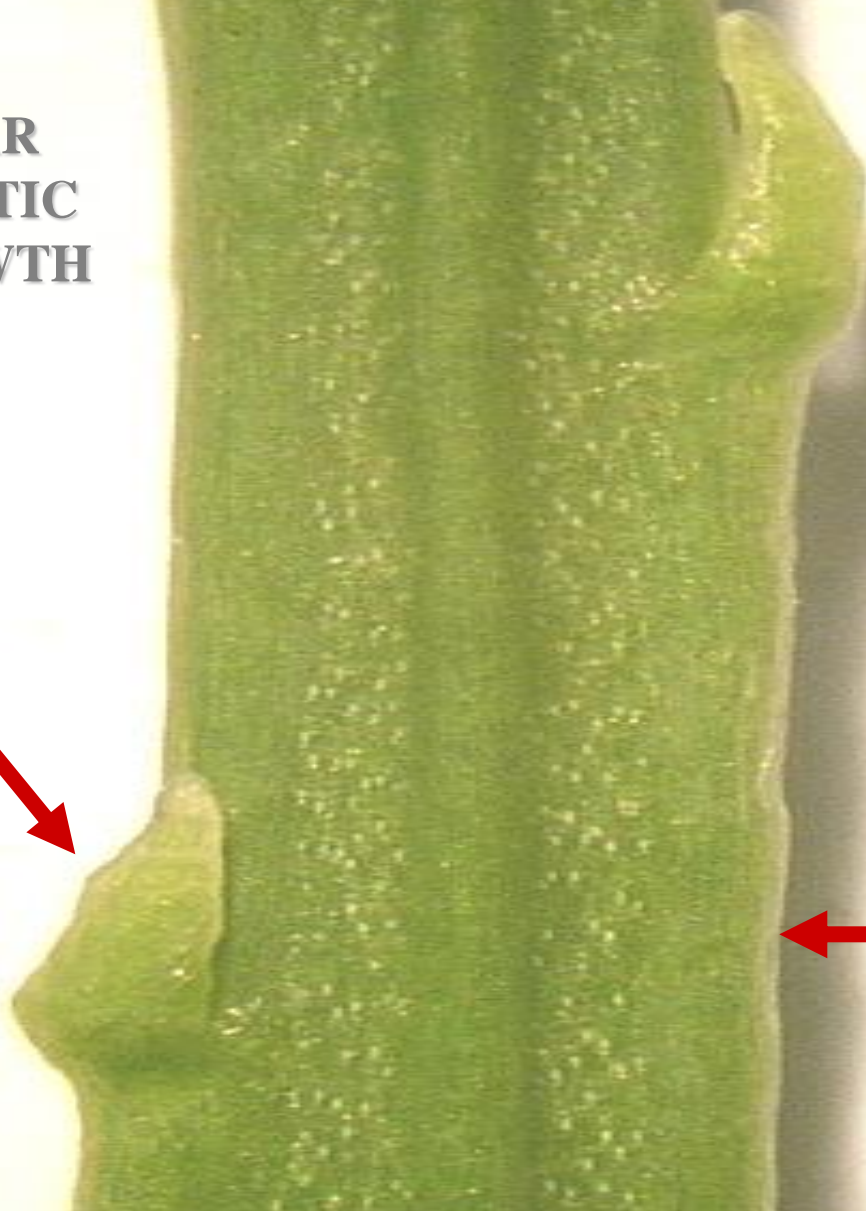
ENATION

NON-VASCULAR

NON-VASCULAR

ENATION

STEM

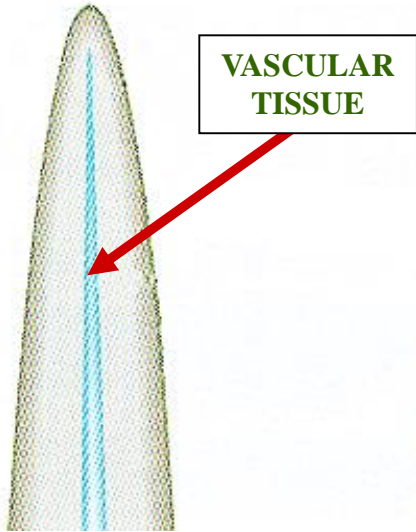




ENATION THEORY COMPONENTS



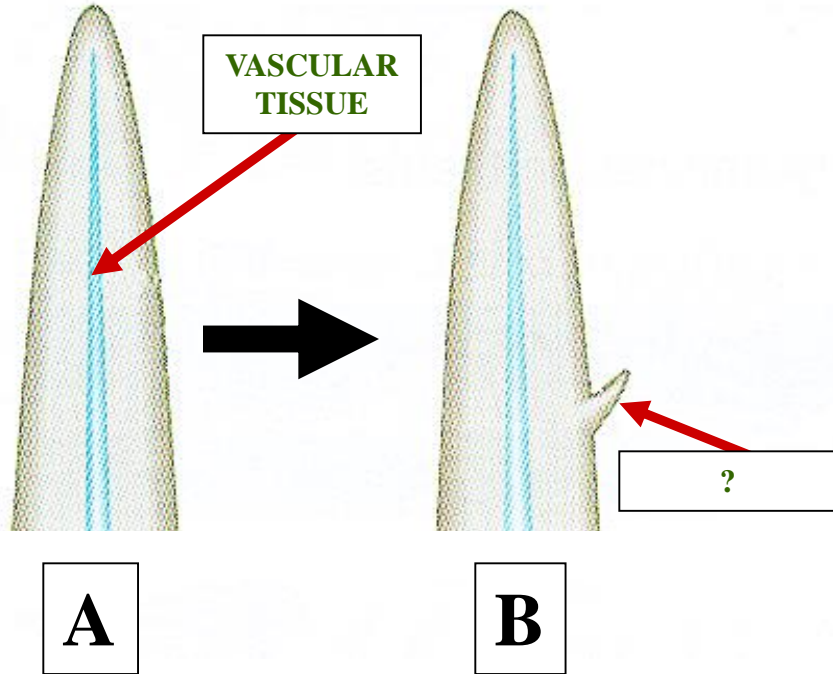
ENATION THEORY COMPONENTS



A

ENATION ABSENT

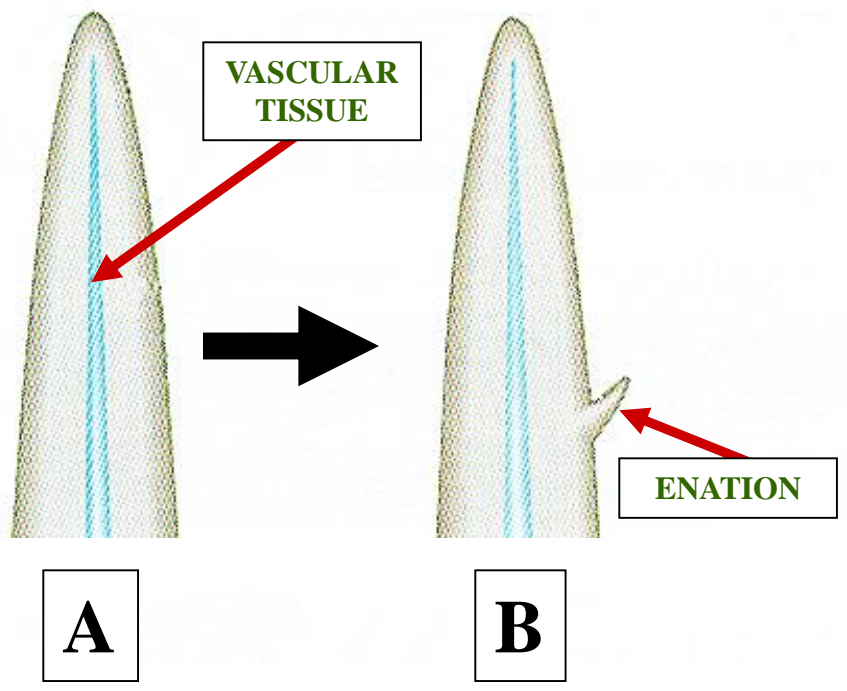
ENATION THEORY COMPONENTS



ENATION ABSENT

➔ = TIME

ENATION THEORY COMPONENTS



VASCULAR
TISSUE

ENATION

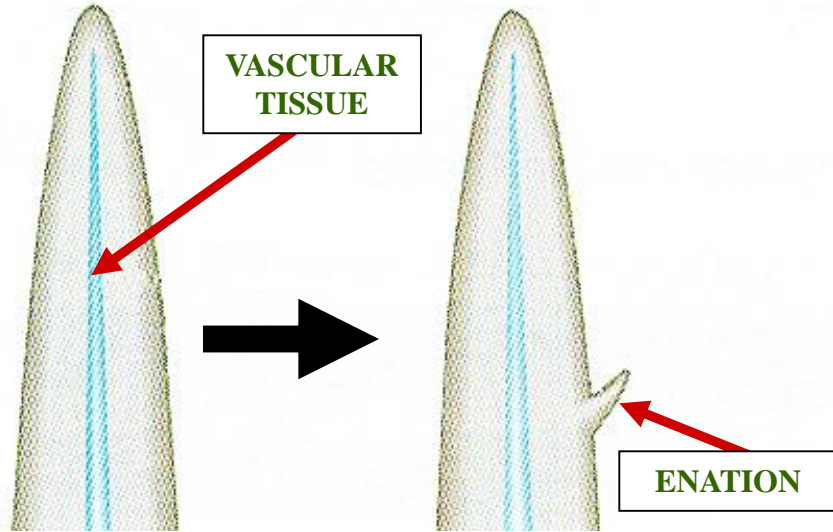
A

B

ENATION ABSENT

➔ = TIME

ENATION THEORY COMPONENTS



A

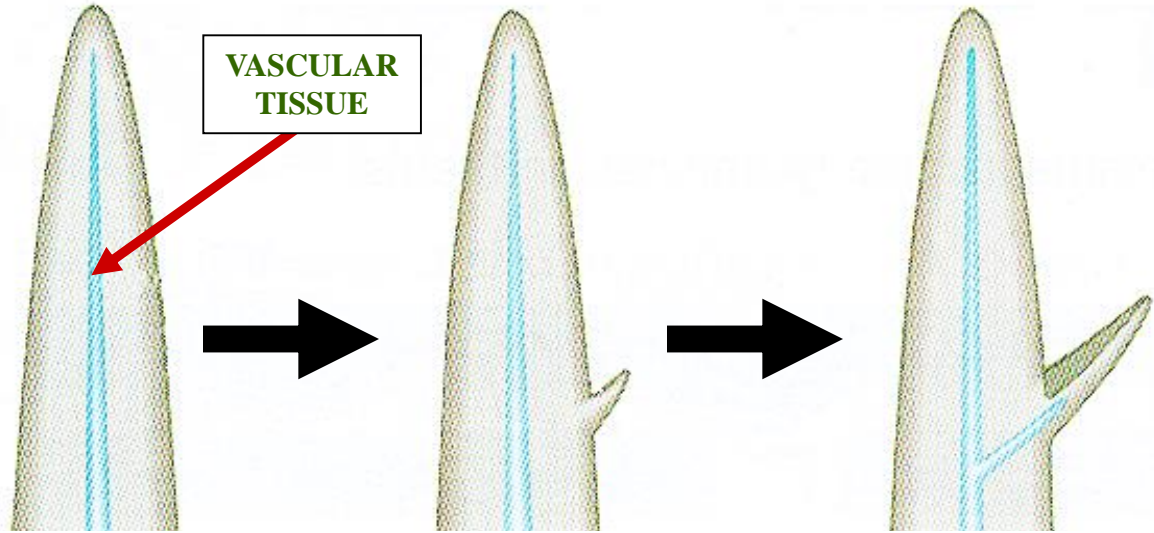
B

ENATION ABSENT

ENATION PRESENT
INCREASES PSYN
SURFACE AREA

➔ = TIME

ENATION THEORY COMPONENTS



A

B

C

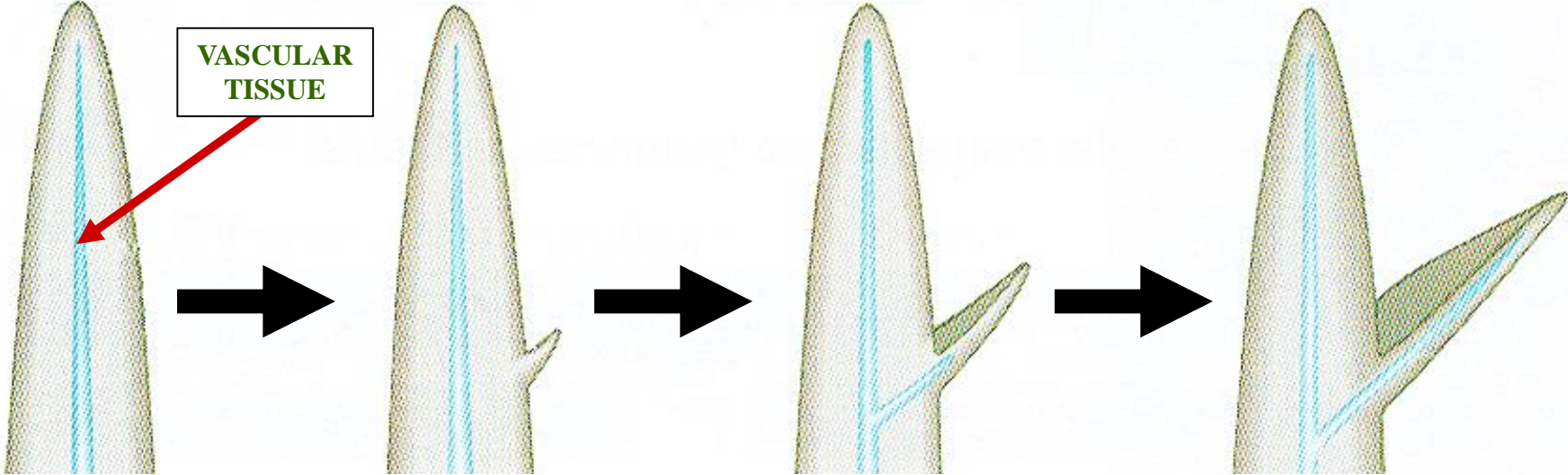
ENATION ABSENT

ENATION PRESENT
INCREASES PSYN
SURFACE AREA

PARTLY
VASCULARIZED
ENATION

→ = TIME

ENATION THEORY COMPONENTS



A

B

C

D

ENATION ABSENT

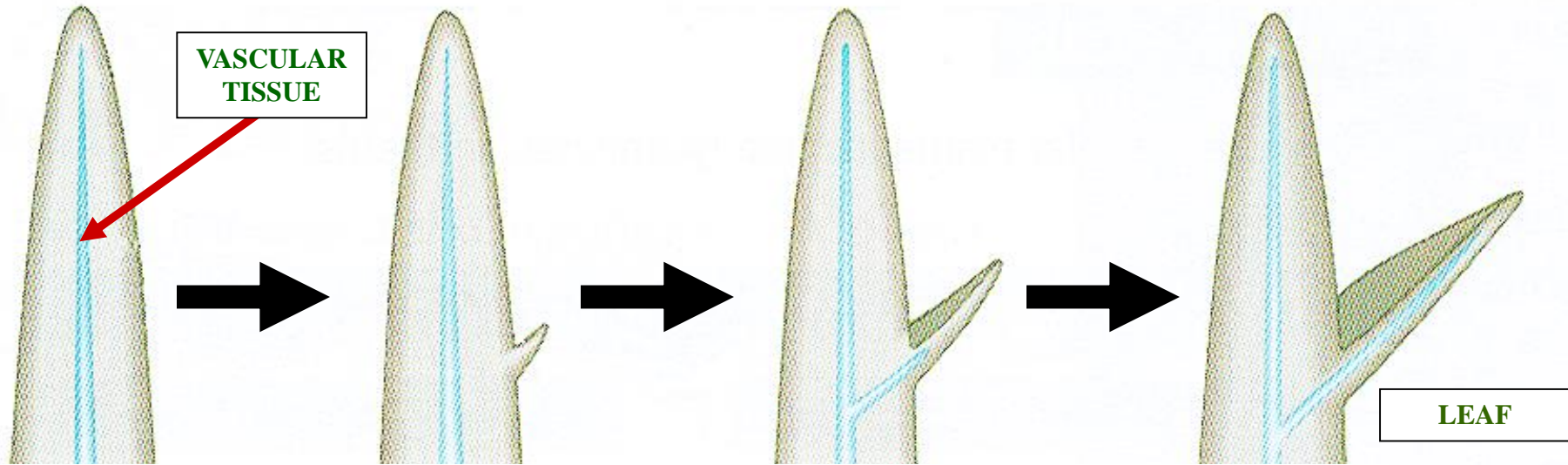
ENATION PRESENT
INCREASES PSYN
SURFACE AREA

PARTLY
VASCULARIZED
ENATION

FULLY
VASCULARIZED
ENATION

→ = TIME

ENATION THEORY COMPONENTS



A

B

C

D

ENATION ABSENT

ENATION PRESENT
INCREASES PSYN
SURFACE AREA

PARTLY
VASCULARIZED
ENATION

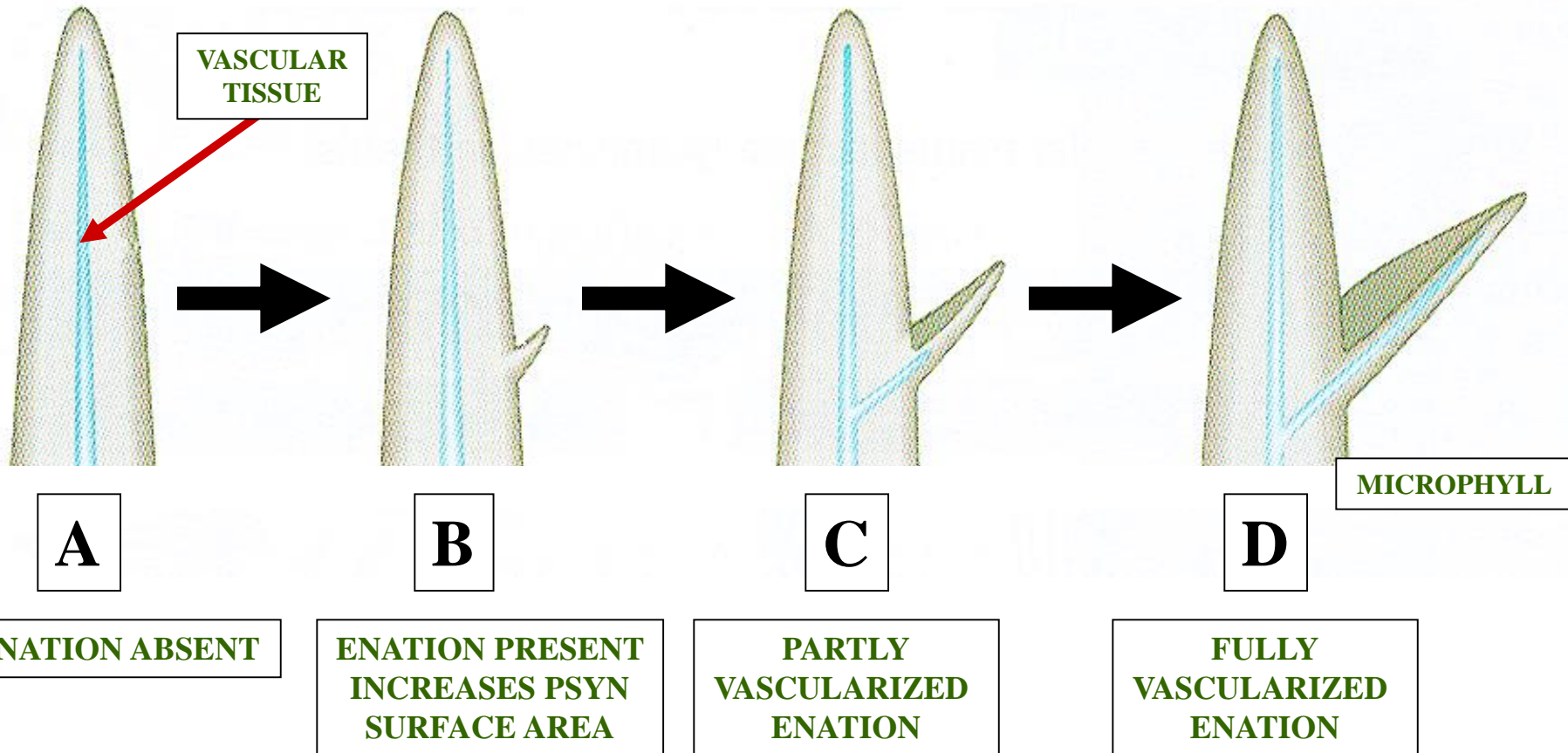
FULLY
VASCULARIZED
ENATION

→ = TIME

ENATION THEORY COMPONENTS

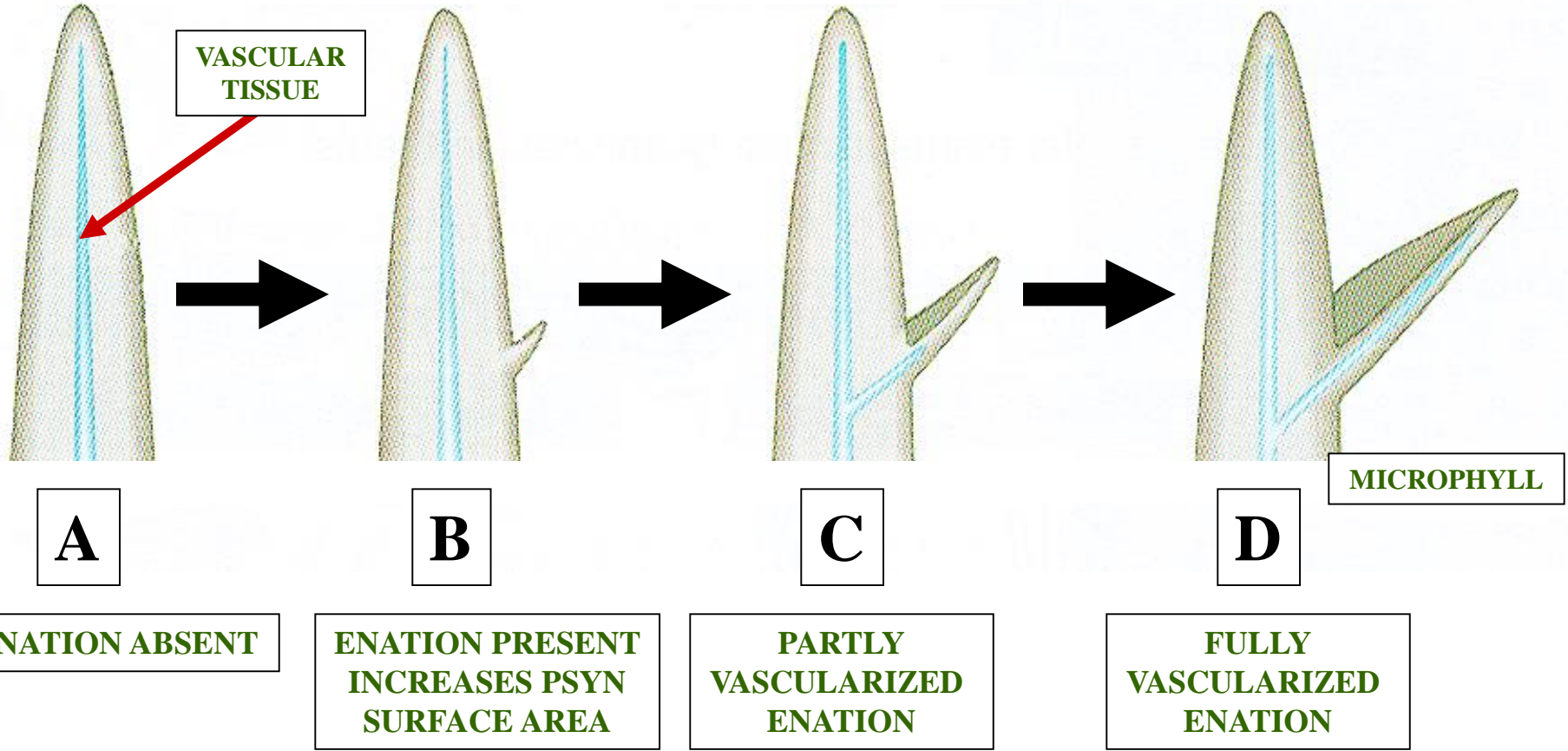
ET

+



MICROPHYLL

ENATION THEORY COMPONENTS



ENATION THEORY




MICROPHYLLS

LYCOPHYTES

LYCOPODIOPHYTA



MEGAPHYLL

A lush tropical forest scene with various green plants and a small orange flower. The text is overlaid in the center.

**MEGAPHYLLS
KNOWN TO MOST
VASCULAR PLANTS**



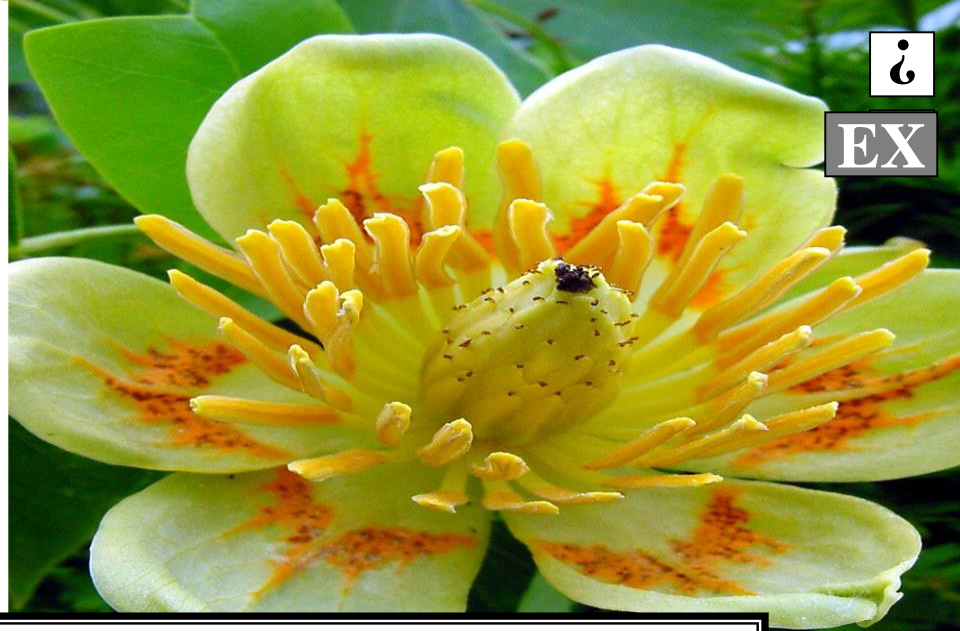
FERNS





GYMNOSPERMS





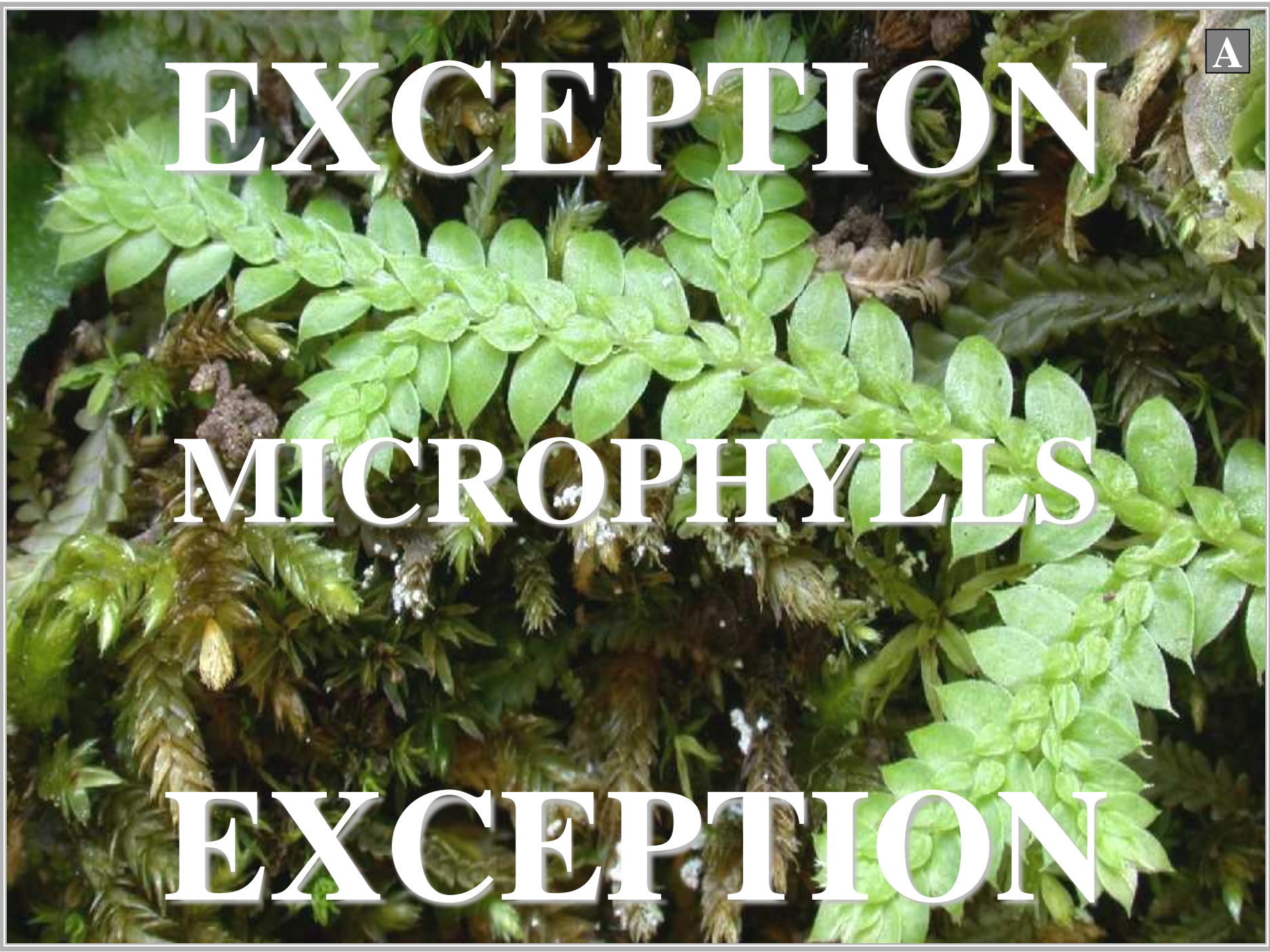
ANGIOSPERMS



EXCEPTION

MICROPHYLLS

EXCEPTION





EXCEPTION

LYCOPHYTES

LYCOPODIOPHYTA

MICROPHYLLS

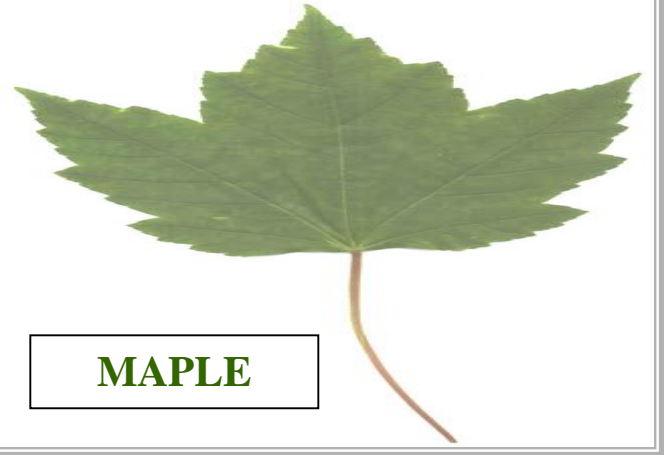
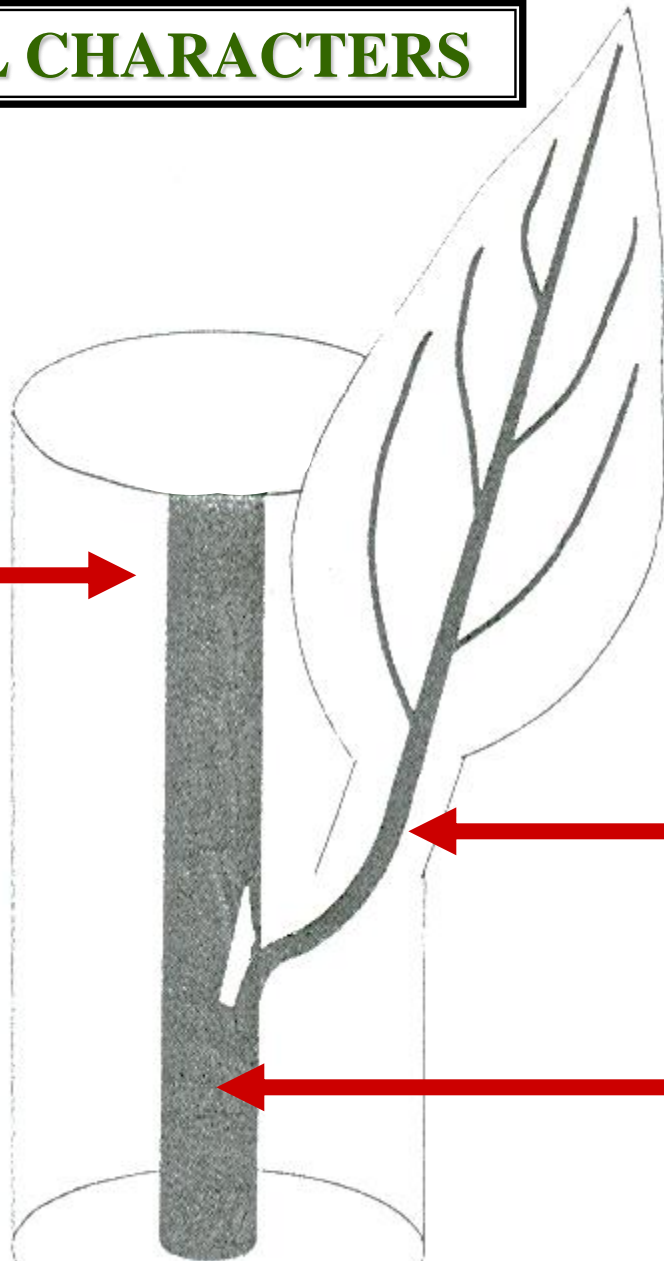
EXCEPTION



MEGAPHYLL CHARACTERS

MEGAPHYLL CHARACTERS

STEM



MAPLE

VT

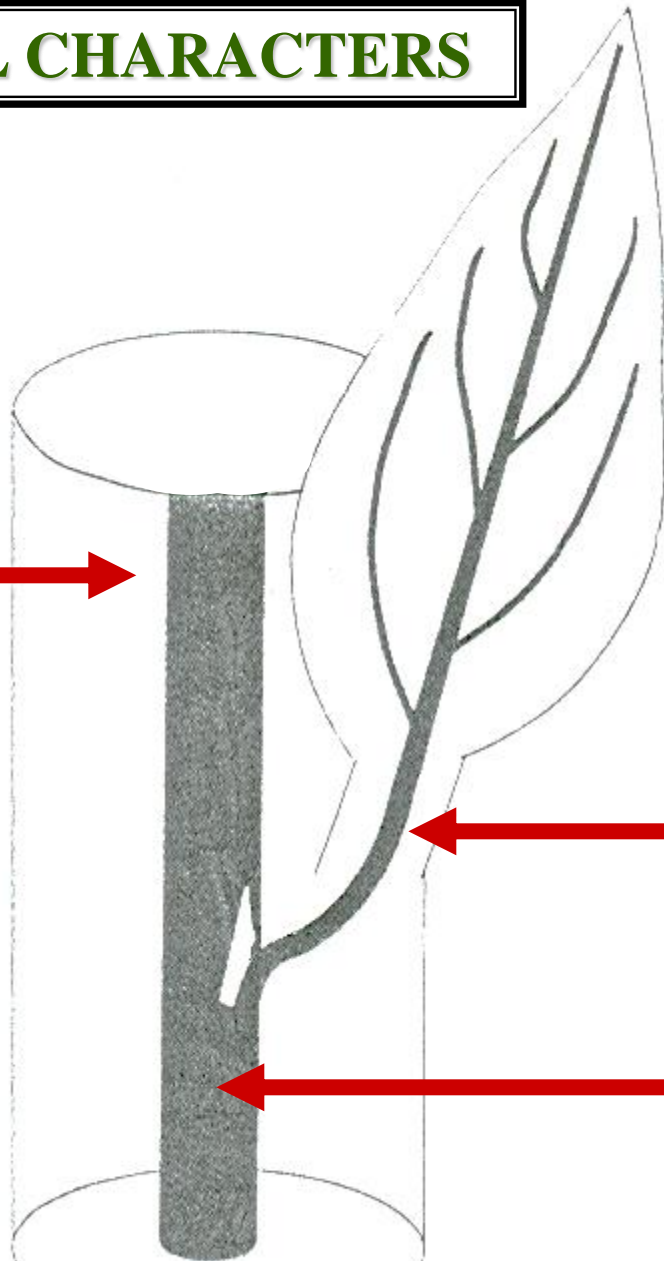
MEGAPHYLL

VASCULAR TISSUE

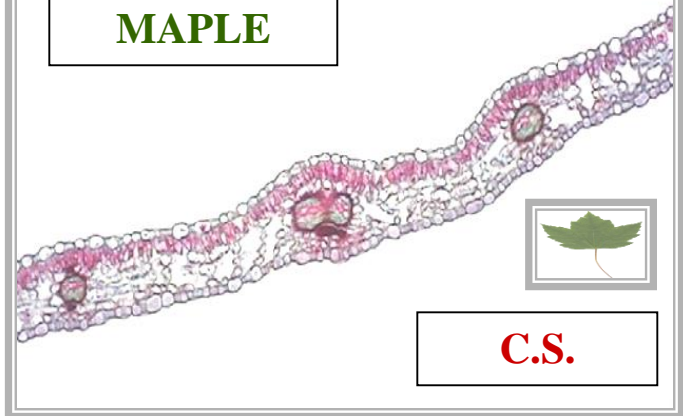
MEGAPHYLL

MEGAPHYLL CHARACTERS

STEM



MAPLE



C.S.

VG

**SEVERAL
VASCULAR TRACES**

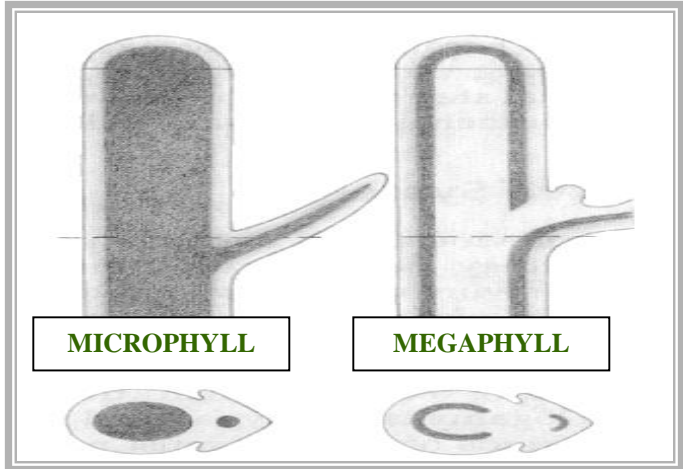
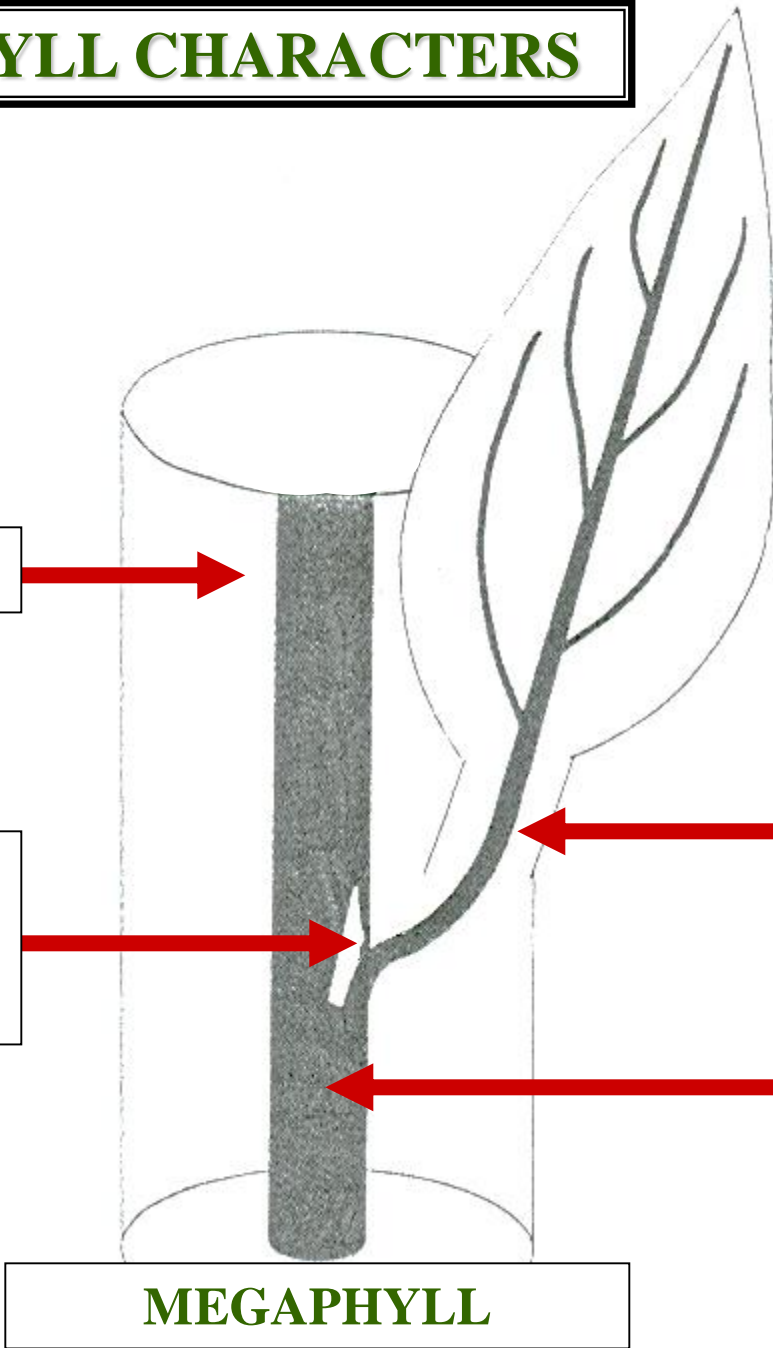
VASCULAR TISSUE

MEGAPHYLL

MEGAPHYLL CHARACTERS

STEM

VASCULAR GAP PRESENT



MICROPHYLL

MEGAPHYLL

VP

SEVERAL VASCULAR TRACES

VASCULAR TISSUE

MEGAPHYLL

MEGAPHYLL CHARACTERS

STEM



VASCULAR GAP PRESENT



VENATION PRESENT



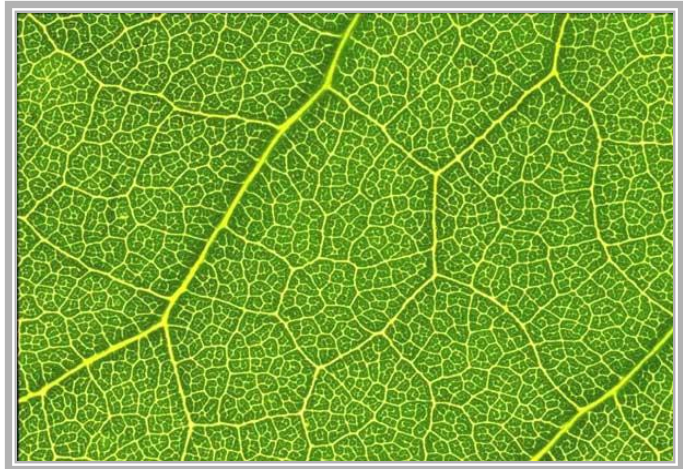
SEVERAL VASCULAR TRACES



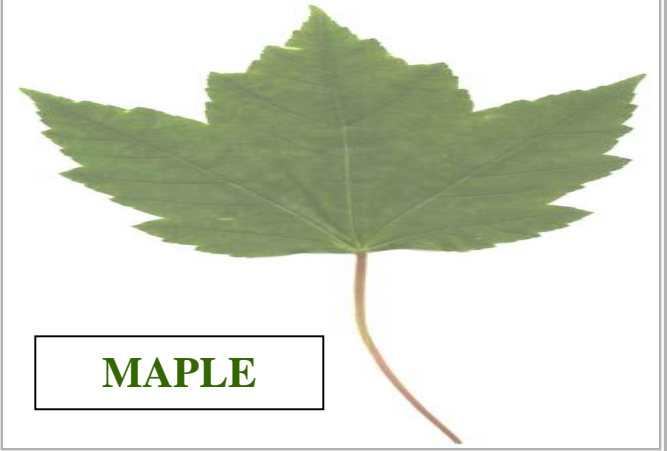
VASCULAR TISSUE



MEGAPHYLL



MEGAPHYLL CHARACTERS



MAPLE

STEM



VENATION PRESENT



VASCULAR GAP PRESENT



SEVERAL VASCULAR TRACES



VASCULAR TISSUE

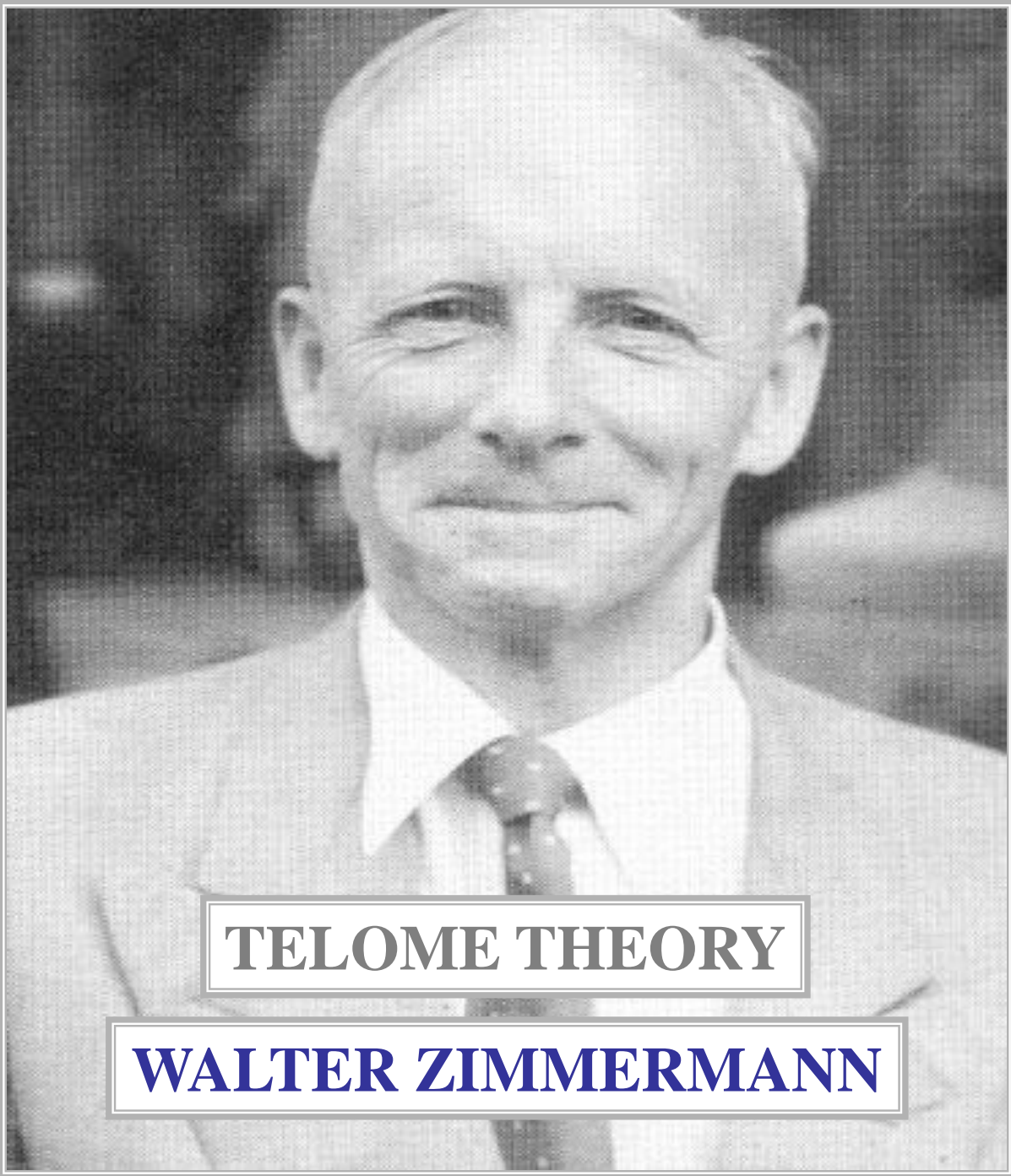


MEGAPHYLL





MEGAPHYLL
EVOLUTION
TELOME THEORY



TELOME THEORY

WALTER ZIMMERMANN

TELOMIE

**MEGAPHYLL
TELOME**



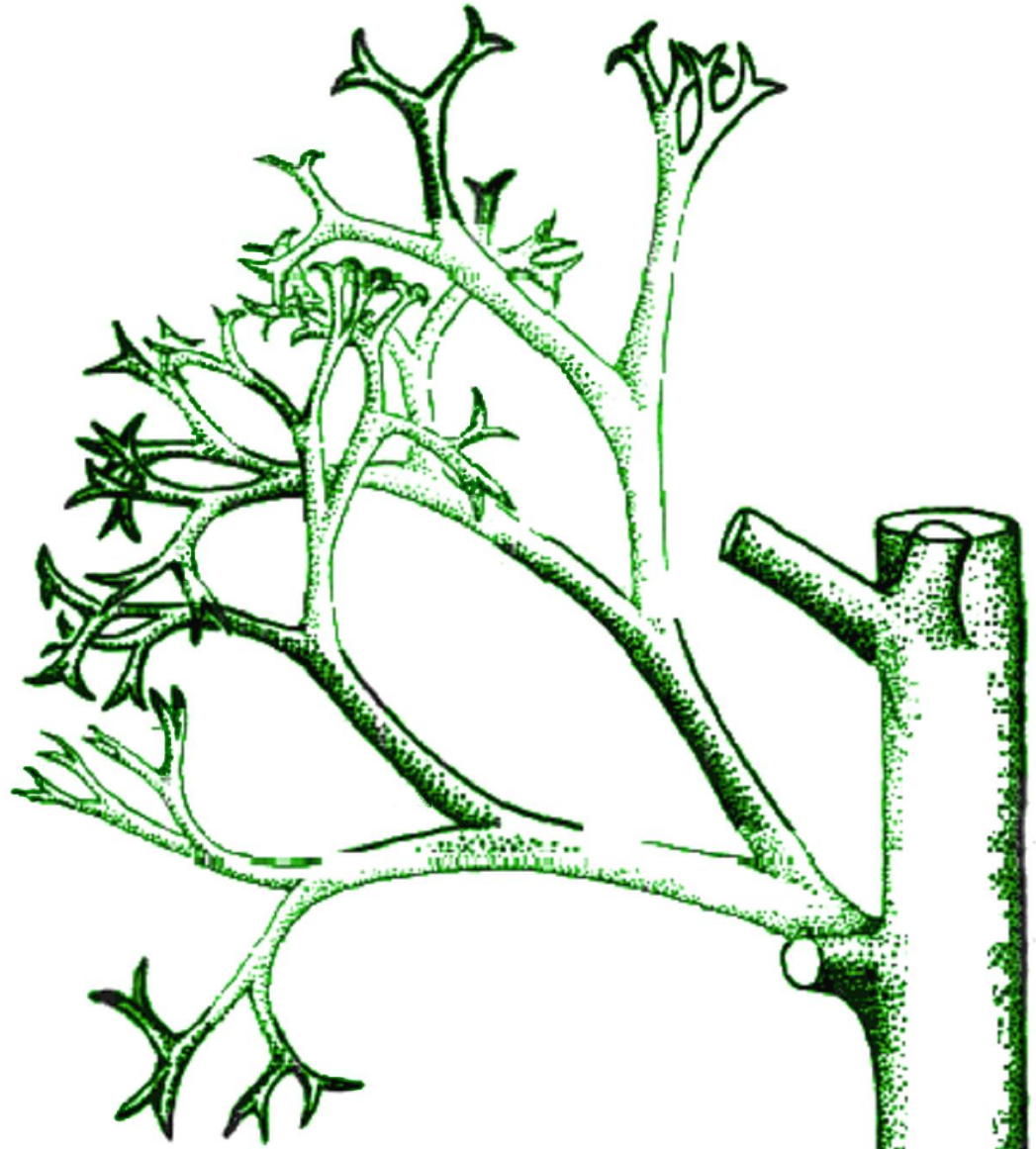
**DICHOTOMOUSLY
BRANCHED
STEM**

**MEGAPHYLL
TELOME**

DICHOTOMOUSLY
BRANCHED
STEM

TELOME

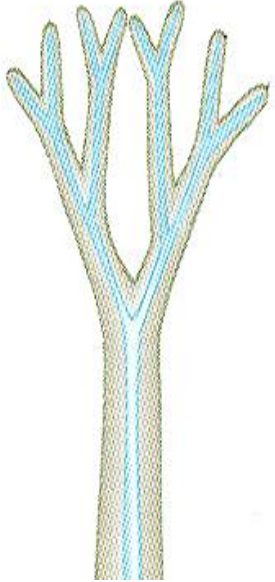
DICHOTOMOUSLY
BRANCHED
STEM





TELOMERE THEORY COMPONENTS

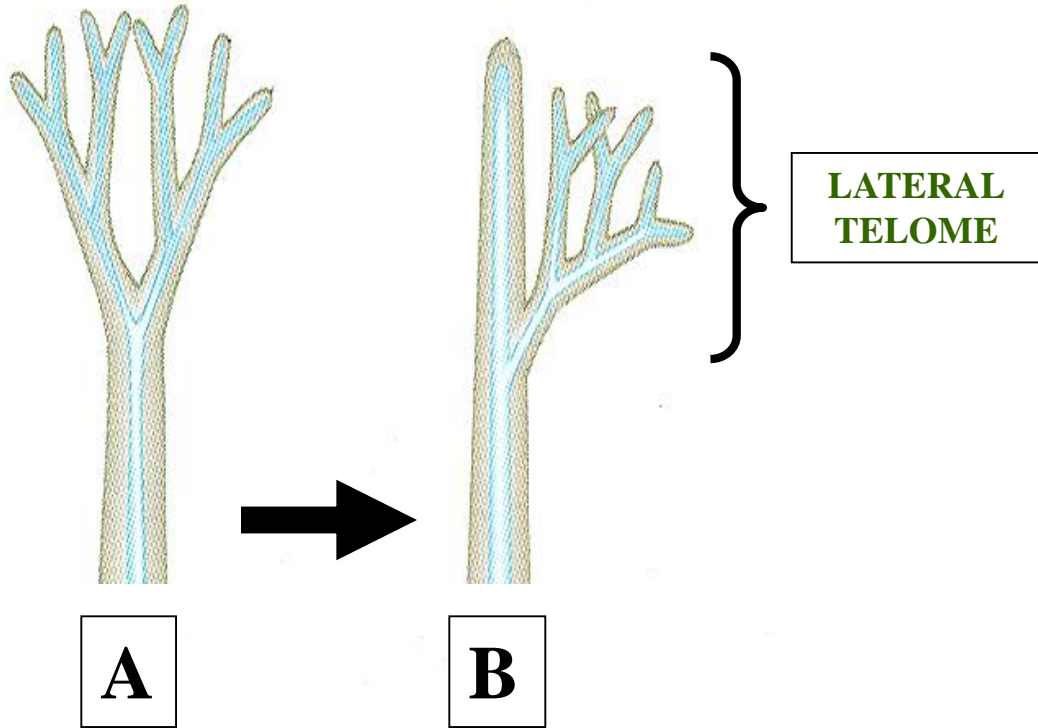
TELOME THEORY COMPONENTS



A

**LATERAL TELOME
ABSENT**

TELOME THEORY COMPONENTS



A

B

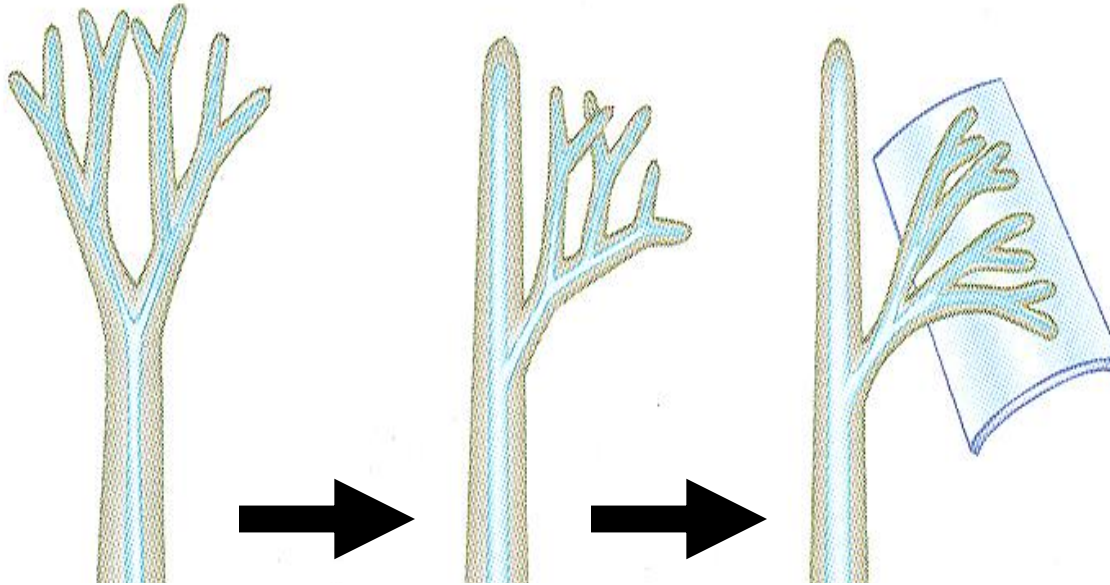
LATERAL TELOME
ABSENT

OVERTOPPING
TELOME

→ = TIME

TELOME THEORY

COMPONENTS

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

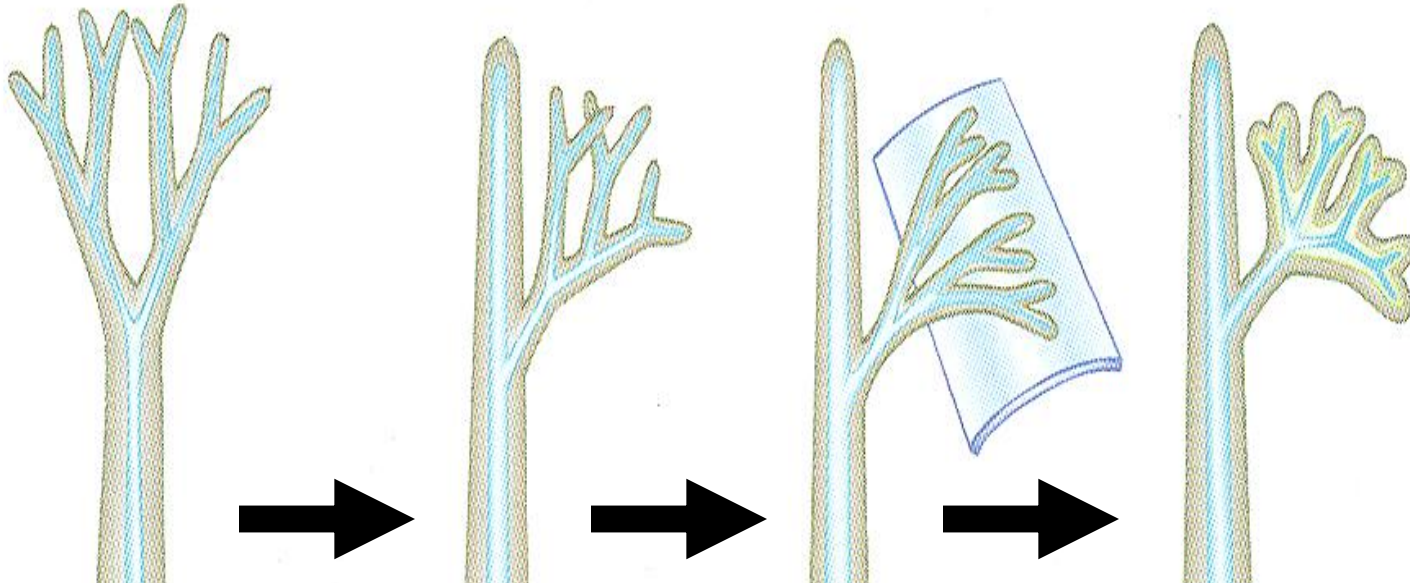
**LATERAL TELOME
ABSENT**

**OVERTOPPING
TELOME**

**PLANATION
TELOME**

→ = TIME

TELOME THEORY COMPONENTS



A

B

C

D

**LATERAL TELOME
ABSENT**

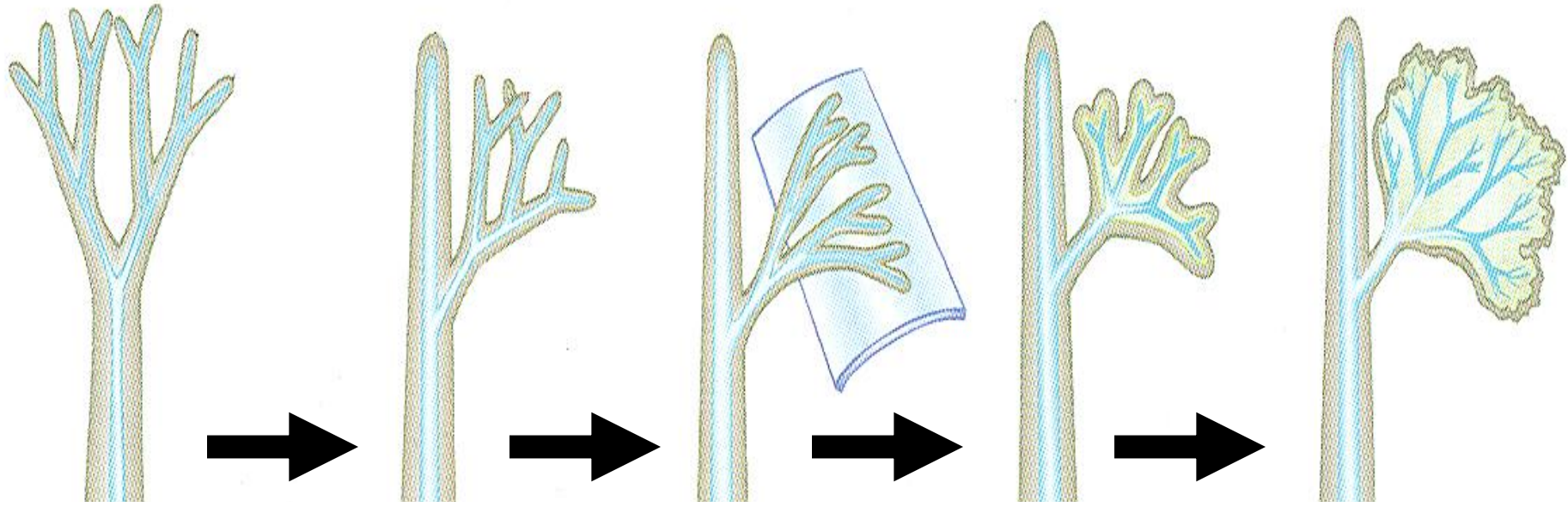
**OVERTOPPING
TELOME**

**PLANATION
TELOME**

**WEBBING
TELOME**

→ = TIME

TELOME THEORY COMPONENTS



A

B

C

D

E

**LATERAL
TELOME
ABSENT**

**OVERTOPPING
TELOME**

**PLANATION
TELOME**

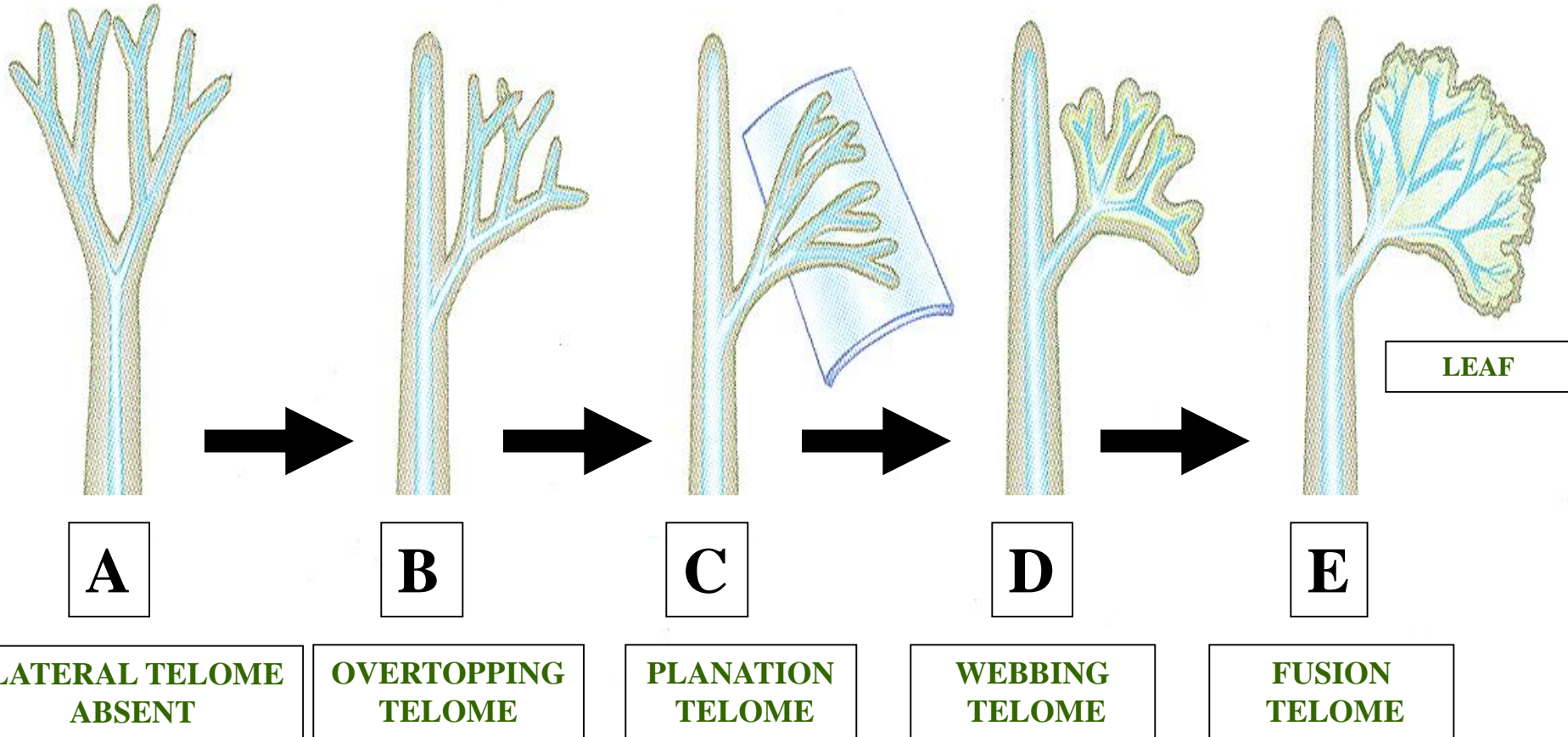
**WEBBING
TELOME**

**FUSION
TELOME**

→ = TIME

TELOME THEORY

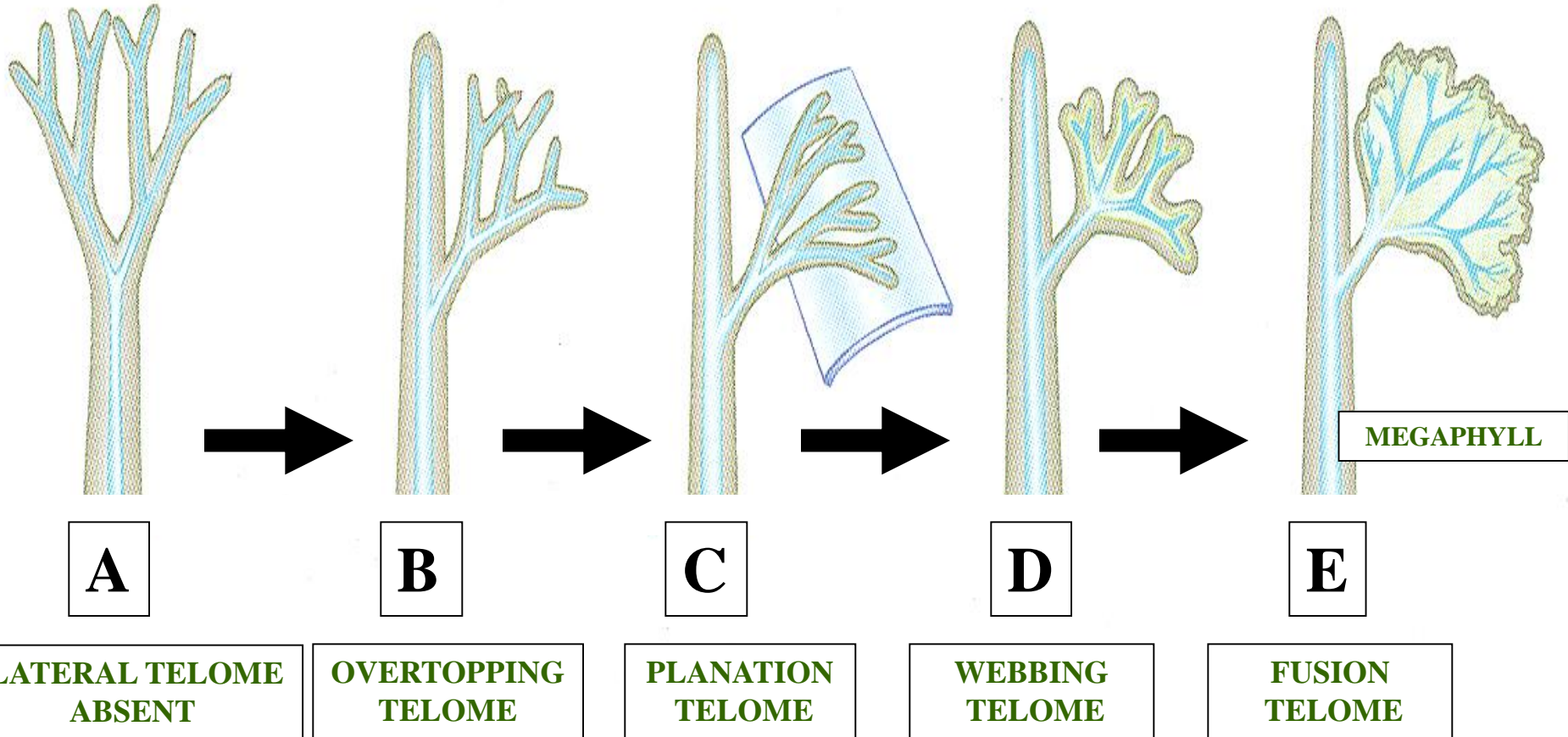
COMPONENTS



➔ = TIME

TELOME THEORY COMPONENTS

TT
+



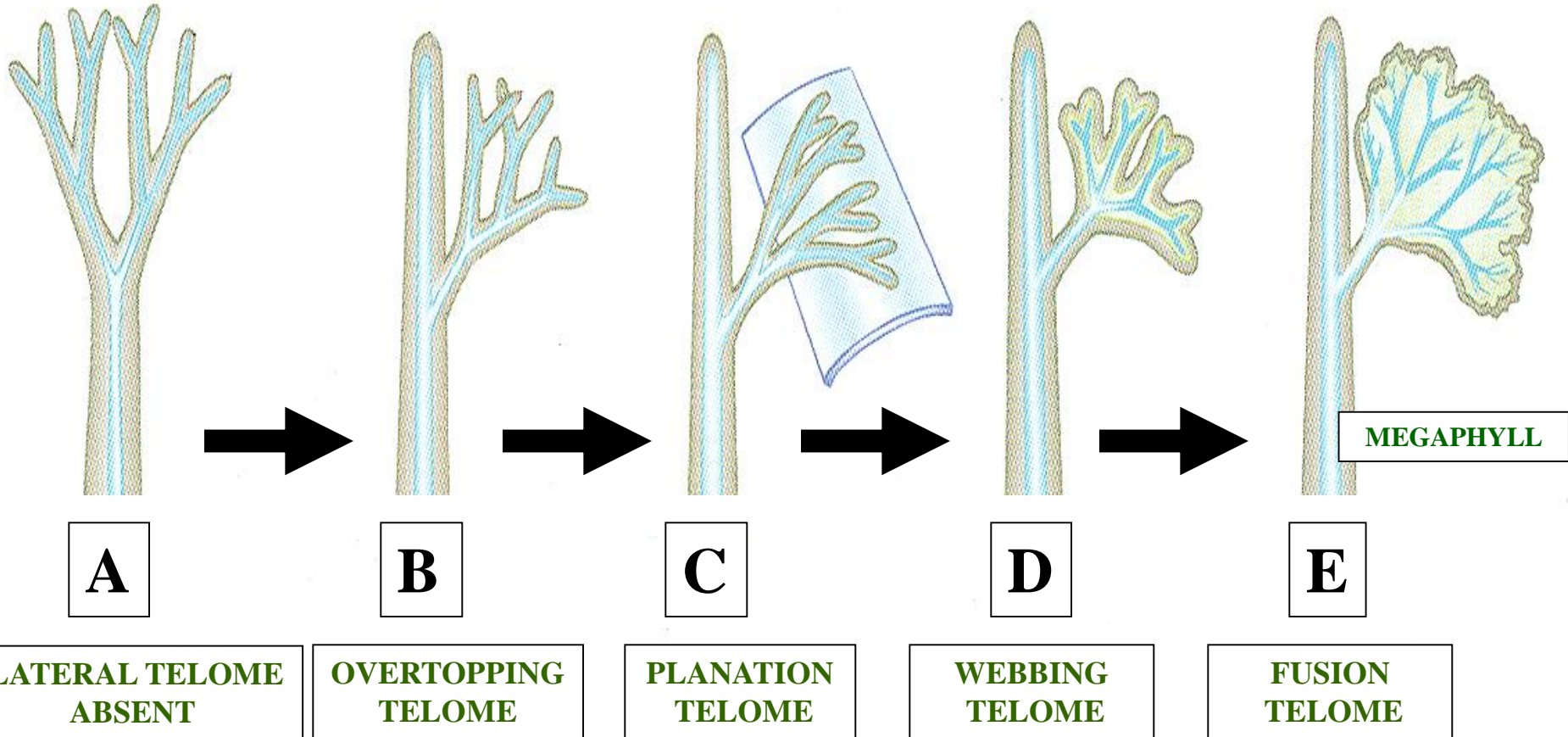
MEGAPHYLL

TELOME THEORY COMPONENTS

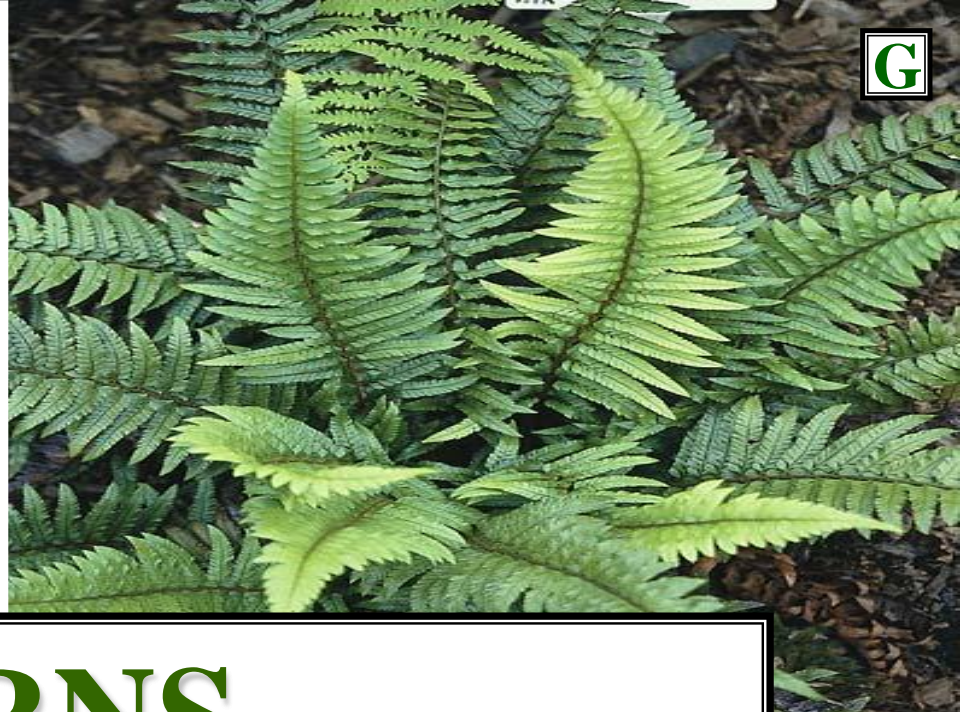
S



F



TELOME THEORY



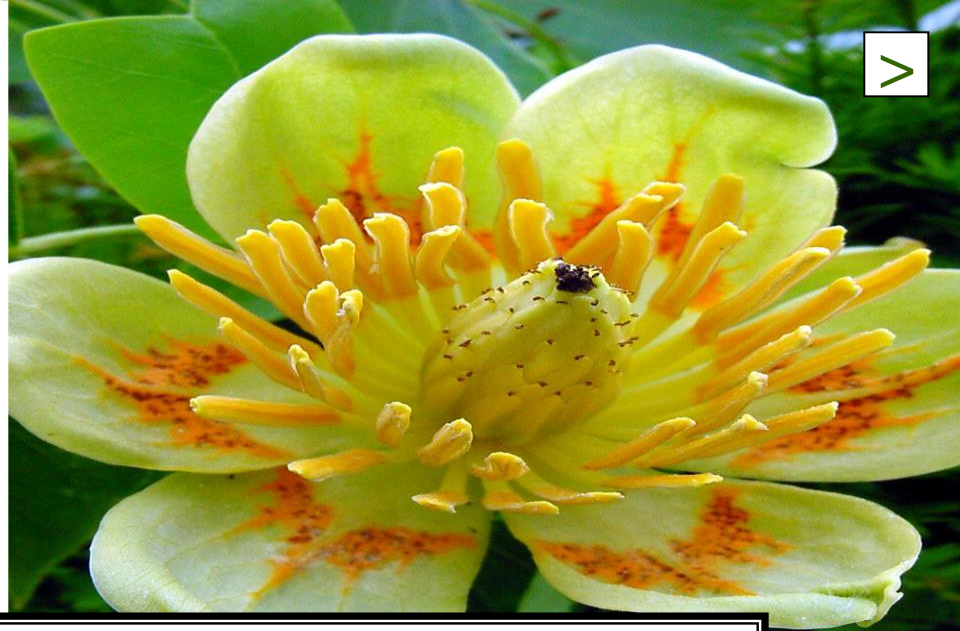
FERNS





GYMNOSPERMS





ANGIOSPERMS





MICROPHYLL

&

MEGAPHYLL

MISNOMERS

SIZE NOT DIAGNOSTIC



MICROPHYLL

&

MEGAPHYLL

DIAGNOSTIC

ANATOMICALLY

LEAF PHYLLOTAXY

PHYLLLOTAXY

PHYLLOTAXY

LEAF ARRANGEMENT UPON STEM

PHYLLOTAXY

NODE

PHYLLOTAXY



NODE

LEAF

ORIGIN POINT

UPON STEM

PHYLLOTAXY

NODE

N

[]



[]

STEM

LEAF

[]



[]

[]



A

[Blank box]



NODE

STEM

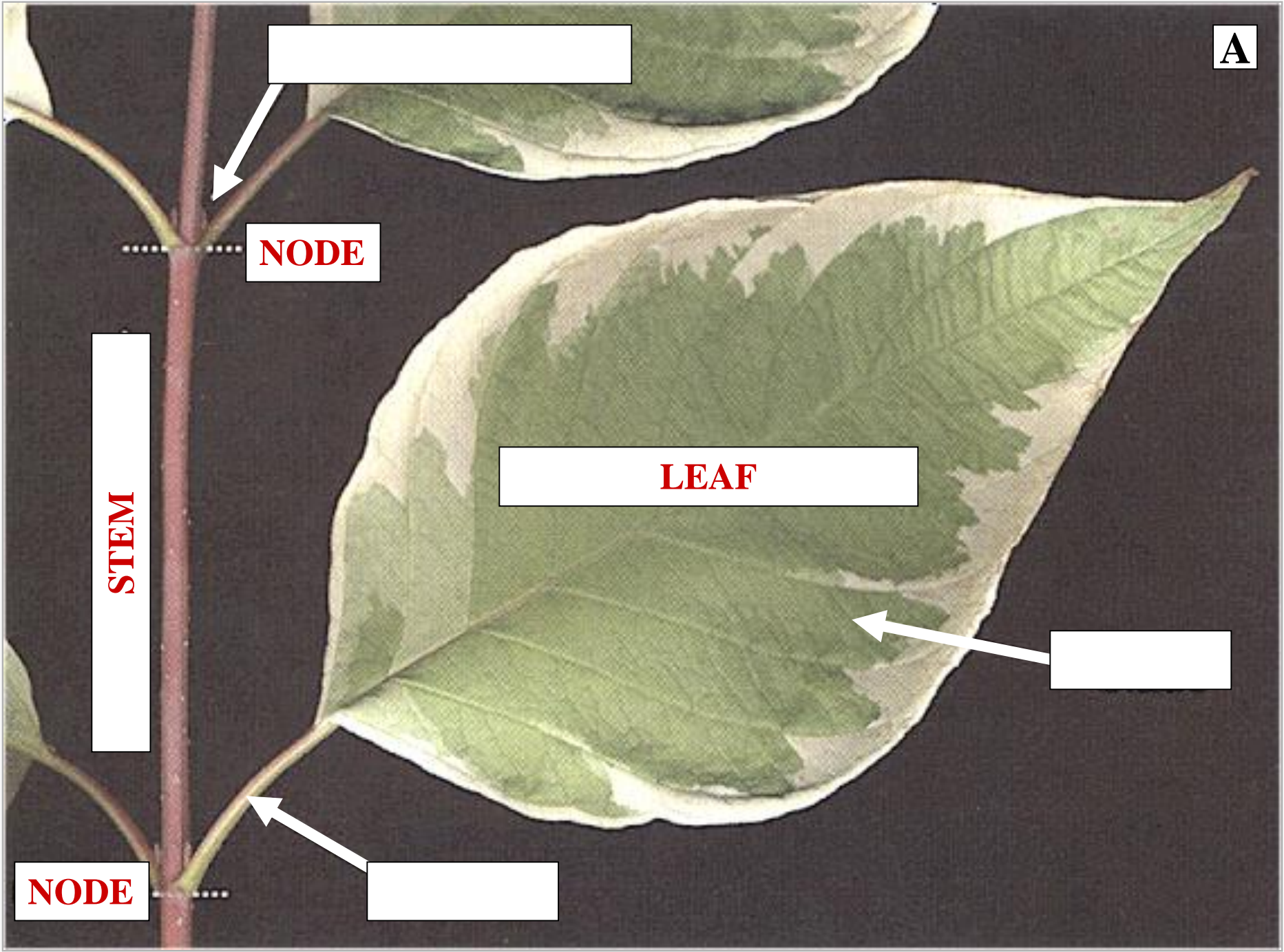
LEAF

[Blank box]



NODE

[Blank box]



AXILLARY BUD



PHYLLOTAXY
AXILLARY BUD

DESIGNATES
STEM NODE
LOCATION

PHYLLOTAXY
AXILLARY BUD

A

[Blank box]



NODE

STEM

LEAF

[Blank box]



NODE

[Blank box]

