



TEC | Tecnológico
de Costa Rica

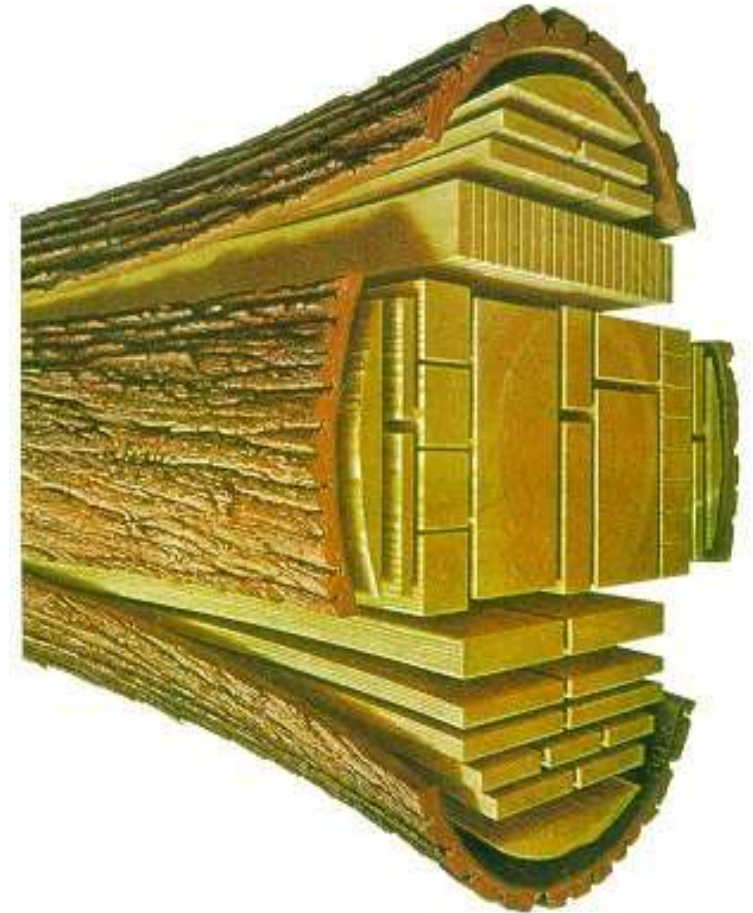
Química, anatomía y daños en la madera cortada

Dr. Alexander Berrocal Jiménez

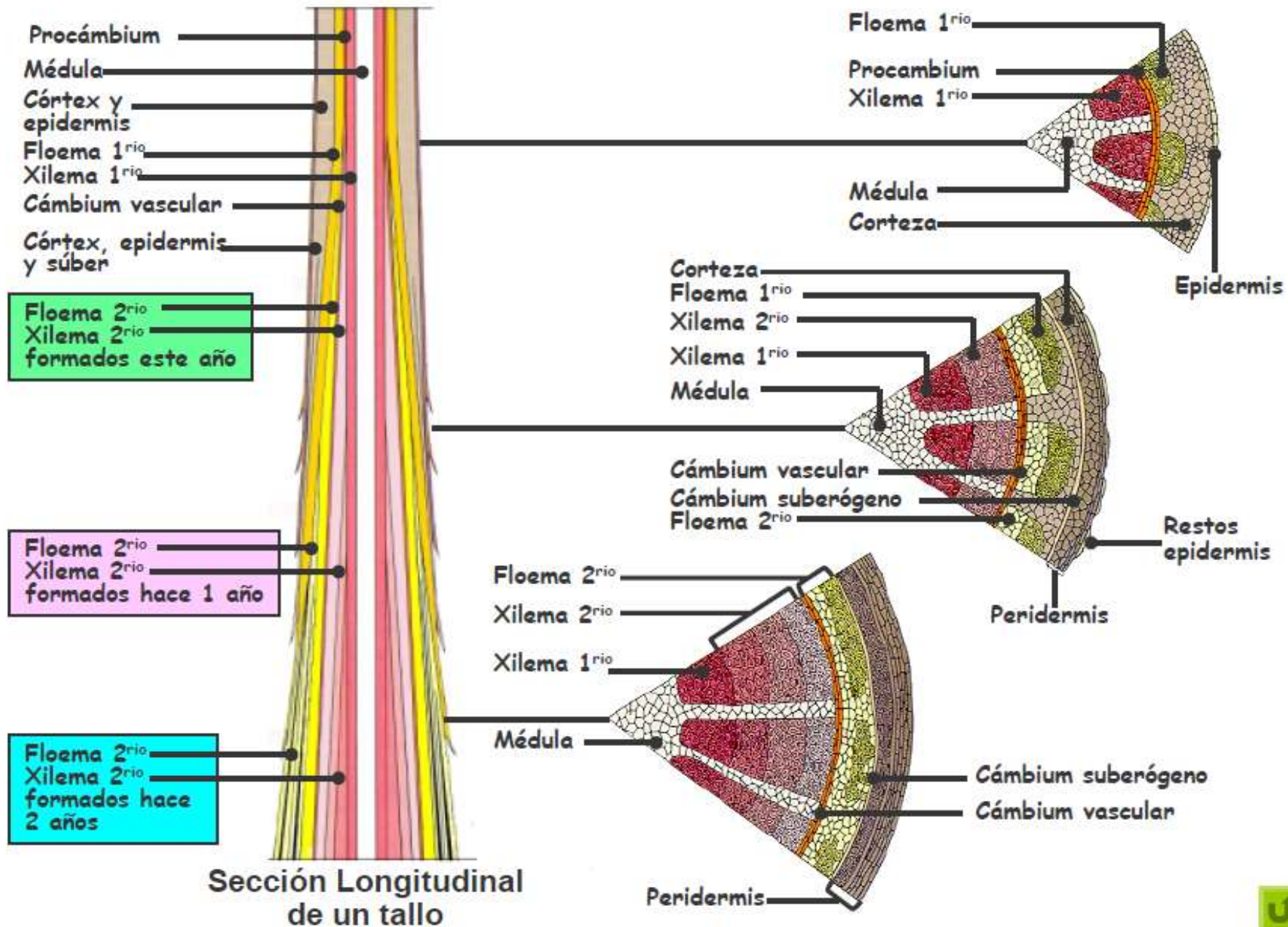
A large, red, curved decorative swoosh is located at the bottom right of the slide.

- **Anatomía de la madera**
- **Química de la madera**
- **Agentes abióticos que causan el deterioro de la madera**
- **Agentes bióticos que causan el deterioro de la madera**

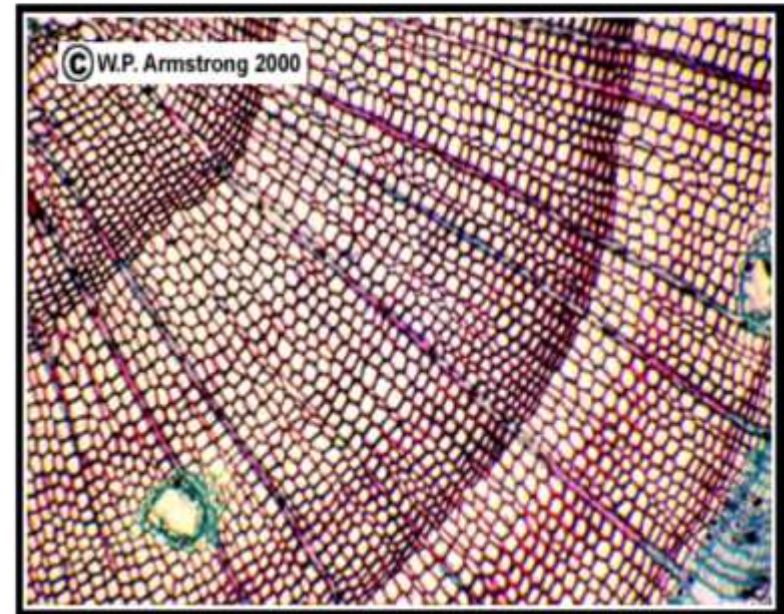
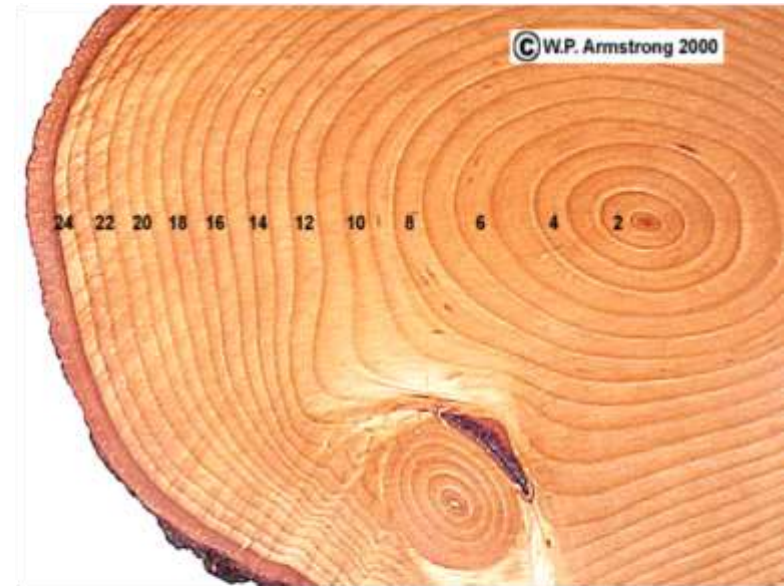
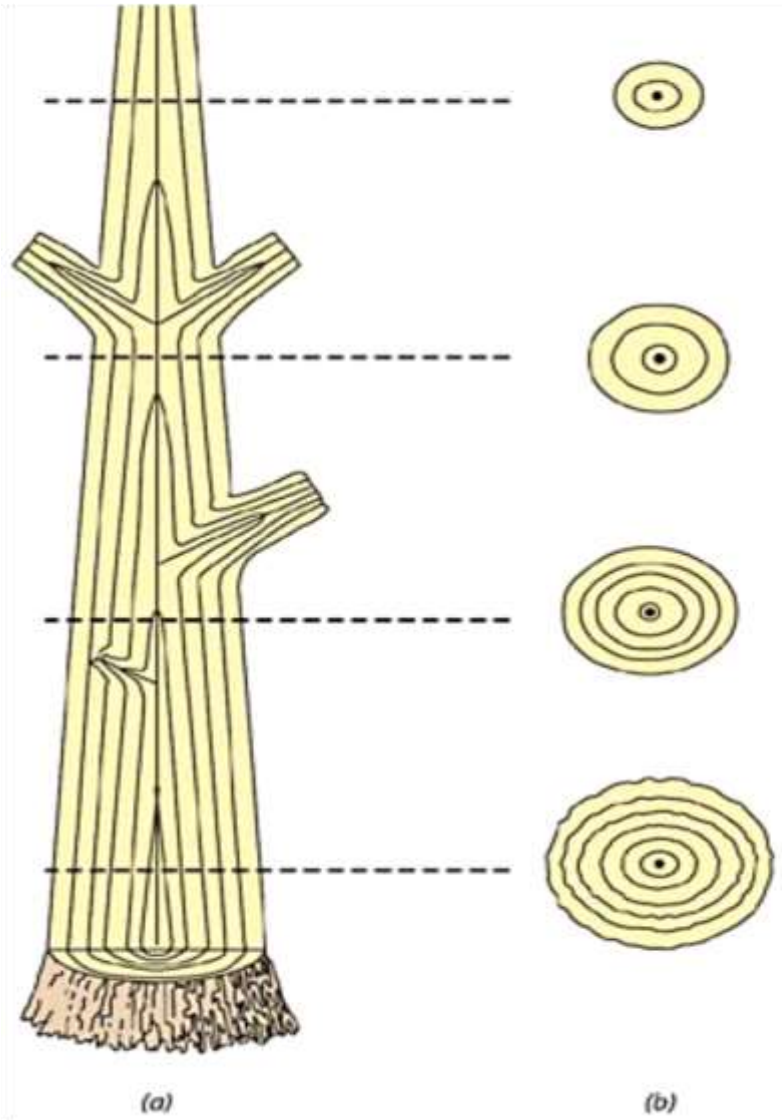
Origen biológico

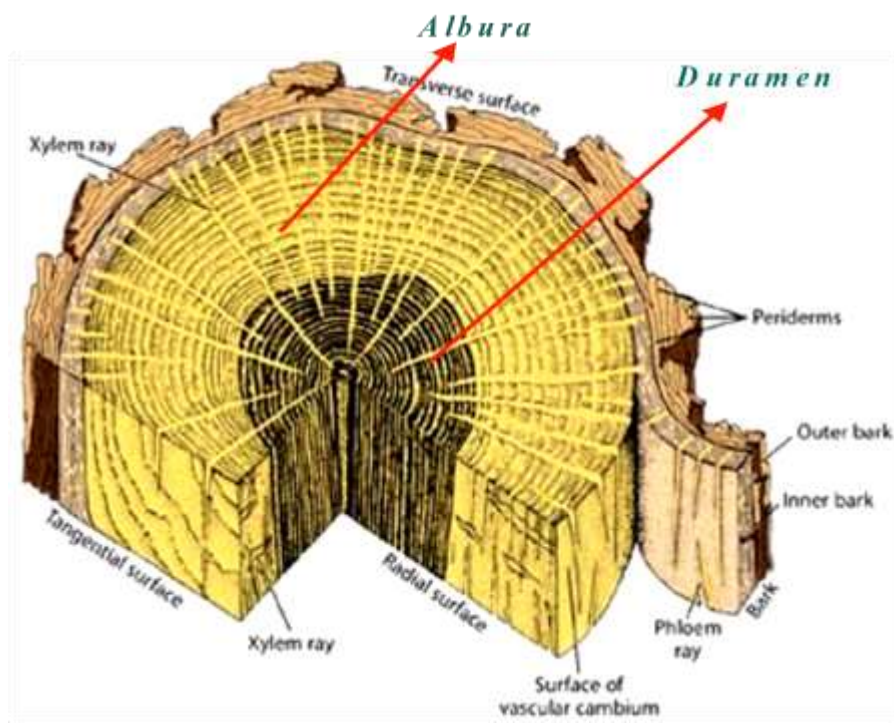


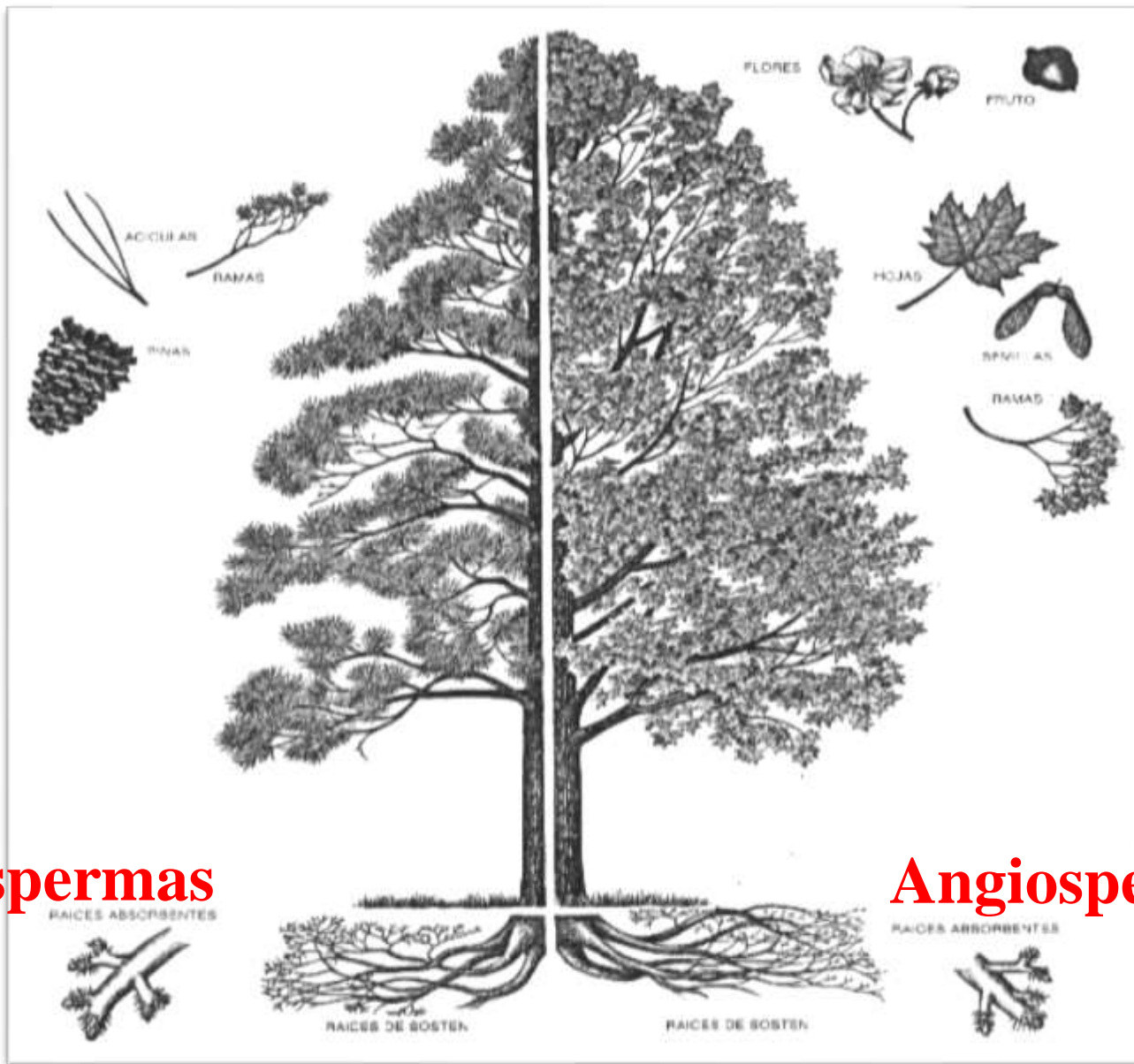
Crecimiento 2^{rio} en el tallo



Anillos de crecimiento

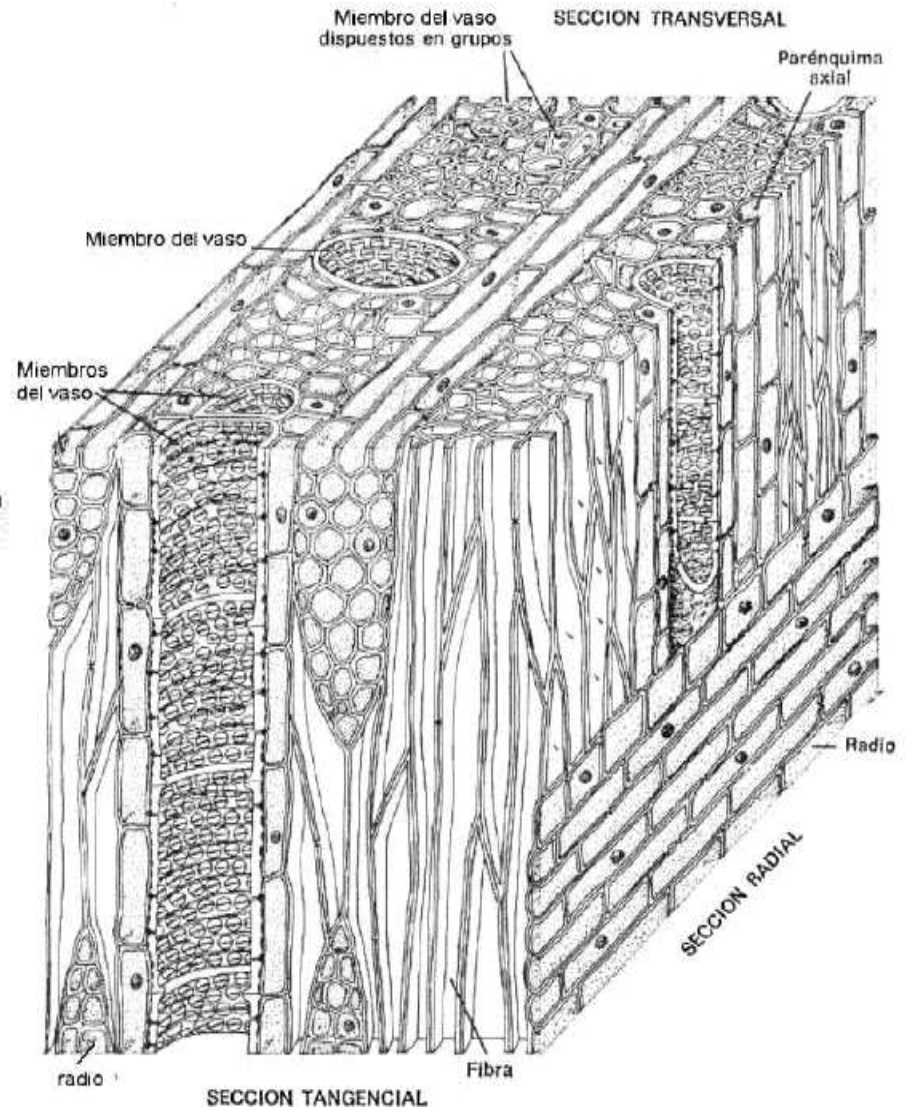
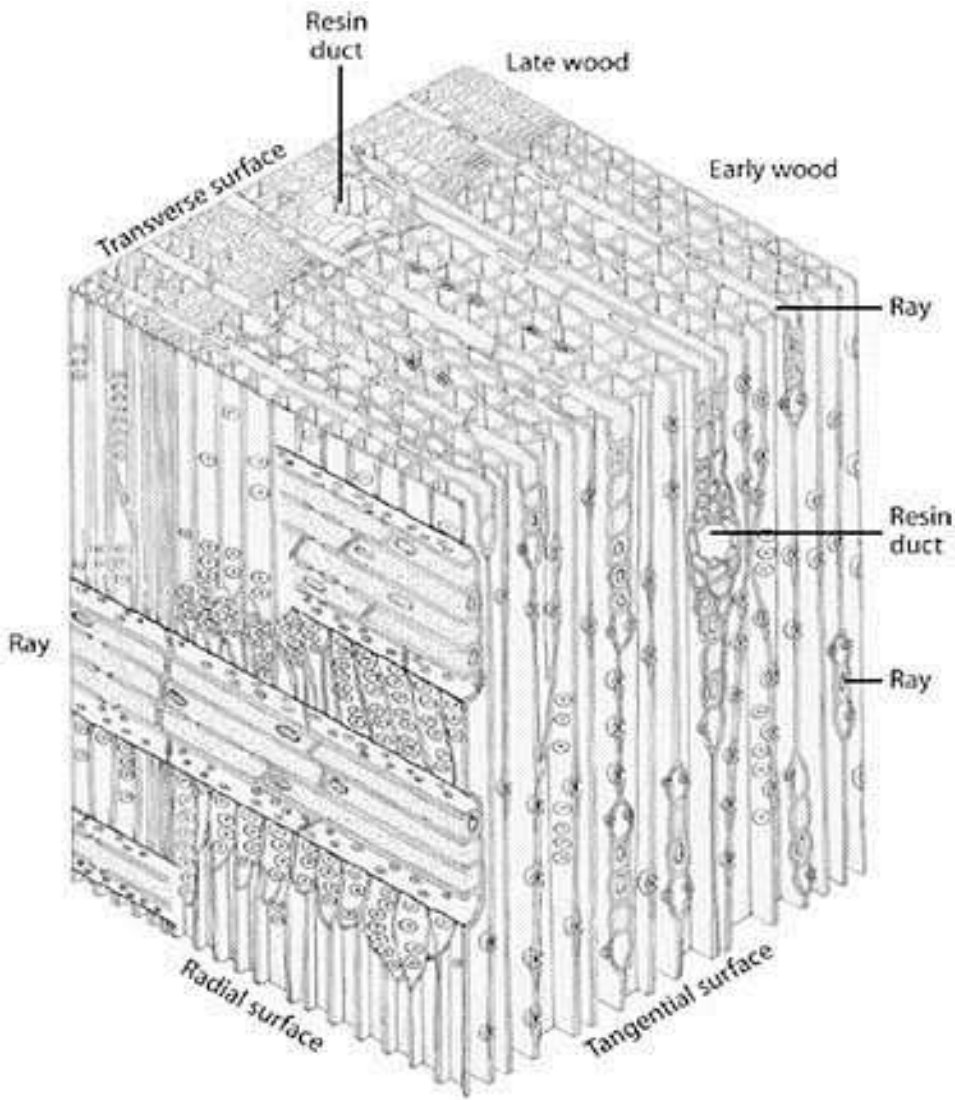






Gimnospermas

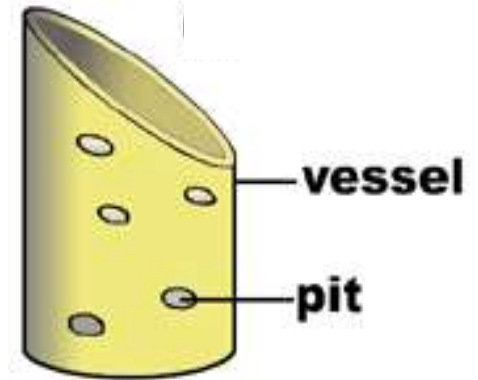
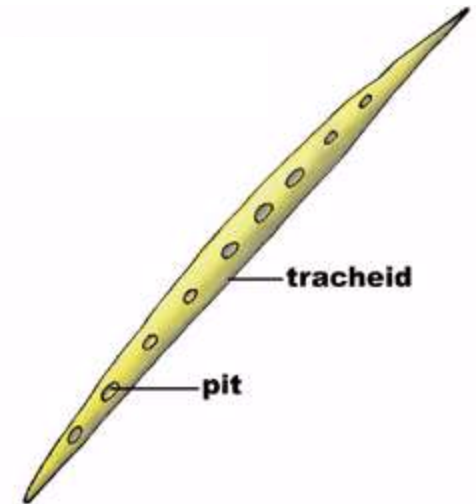
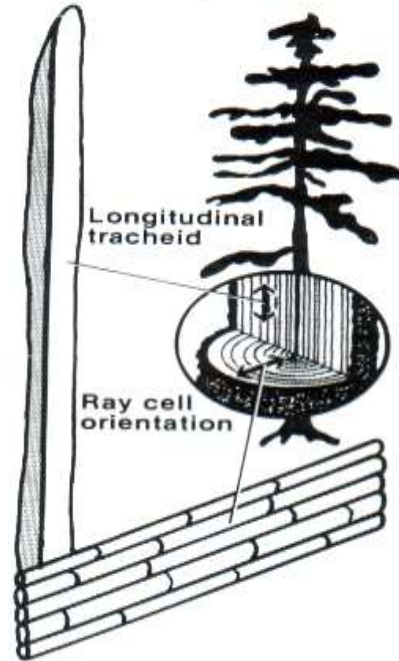
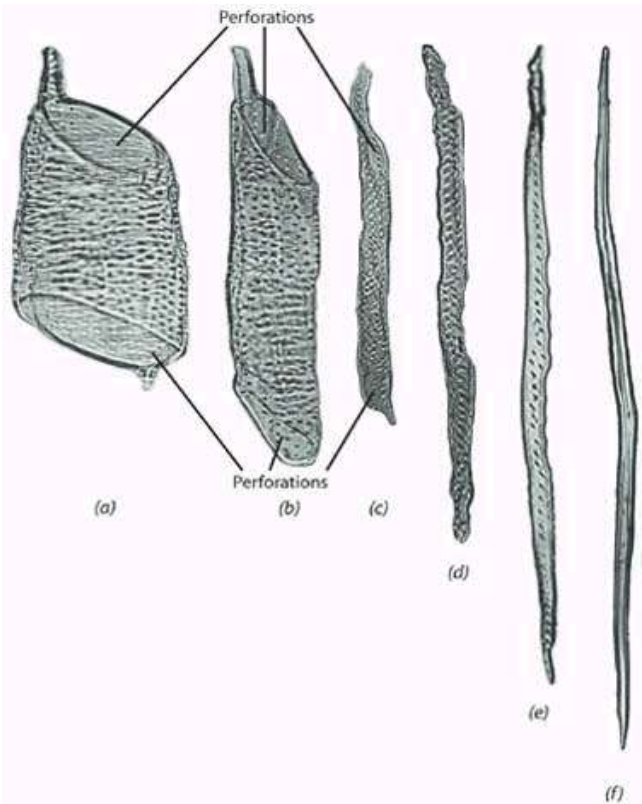
Angiospermas



Madera de coníferas

Madera de latifoliadas

Células del Xilema



↪ (a) y (b) Vasos anchos

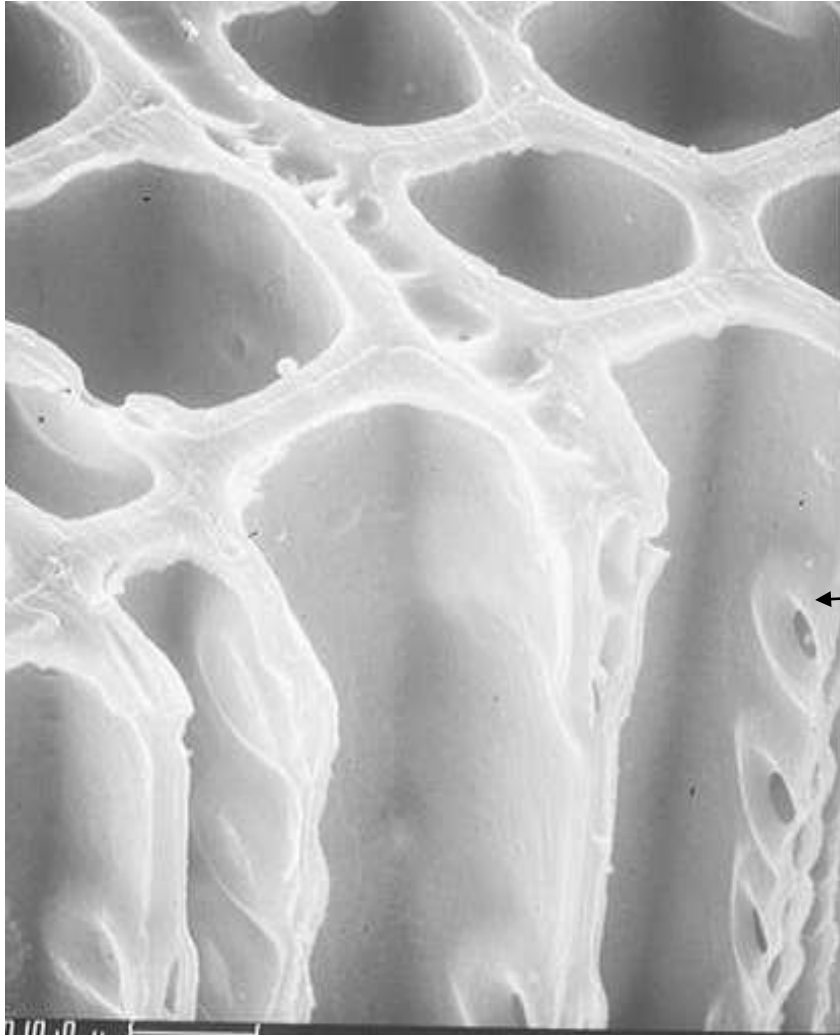
↪ (c) Vaso alargado.

↪ (d) Traqueida

↪ (e) Fibrotraqueida

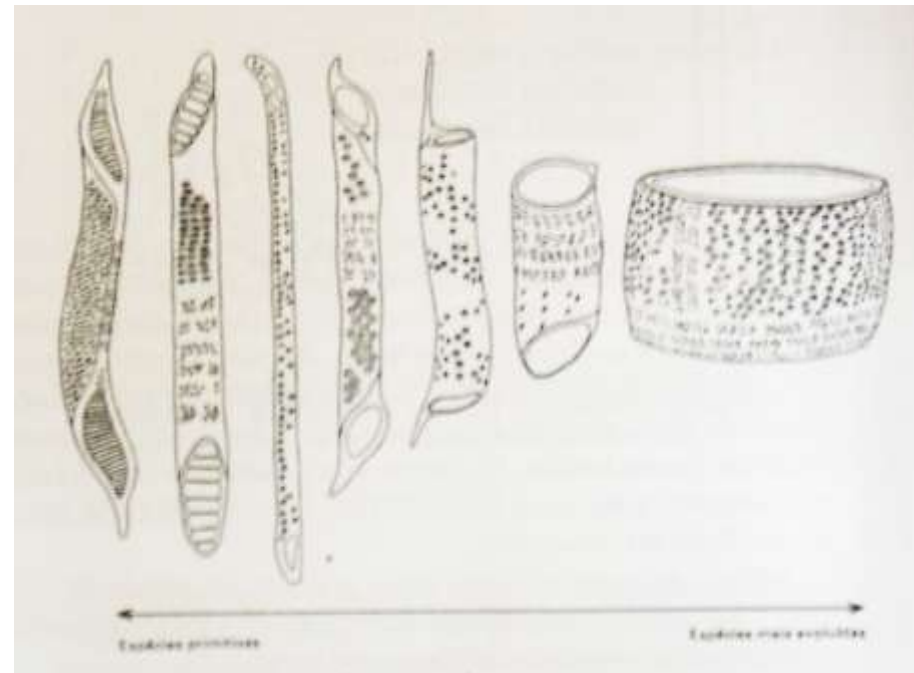
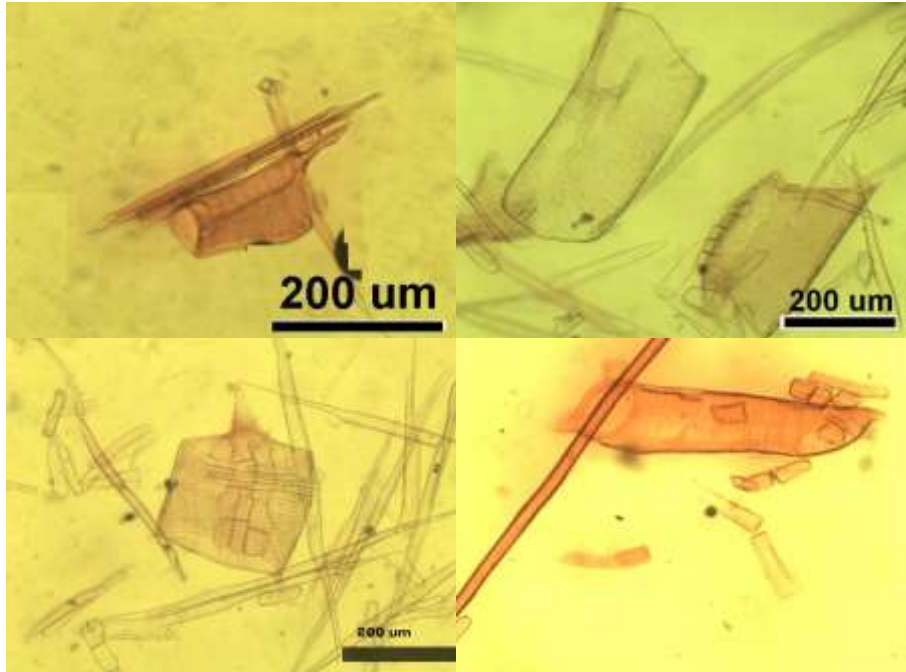
↪ (f) Fibra libriforme

Morfología de las fibras



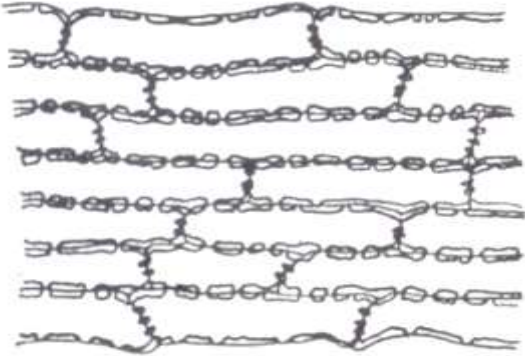
← **Punteadura**

Morfología del vaso

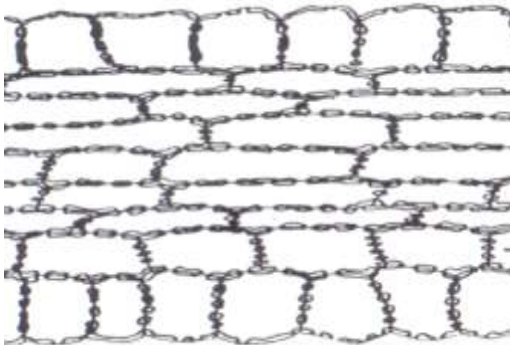


Morfología de los radios

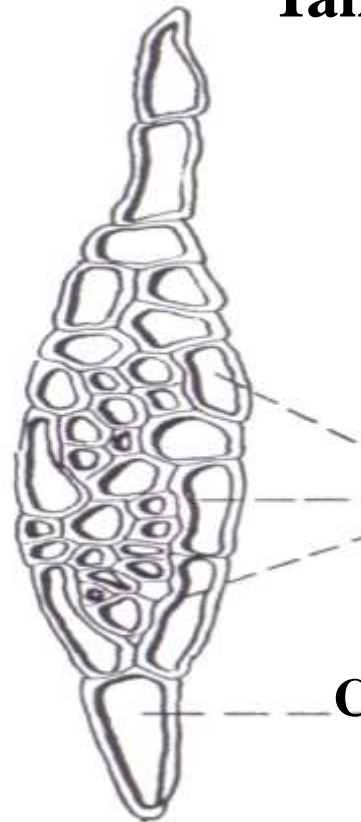
Radio homogéneo (vista radial)



Radio heterogéneo (vista radial)



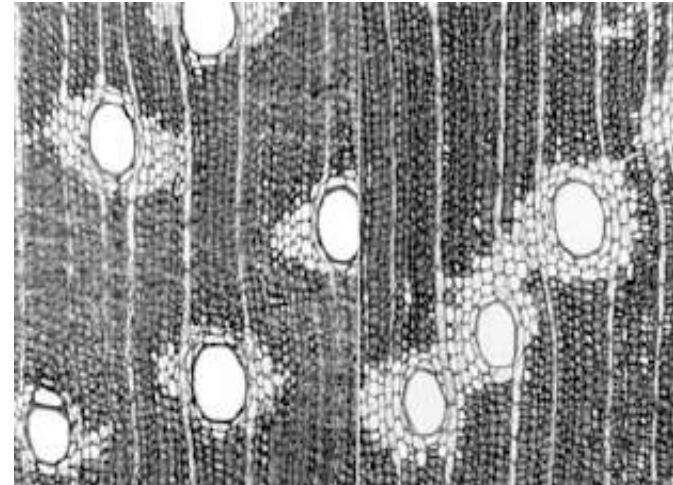
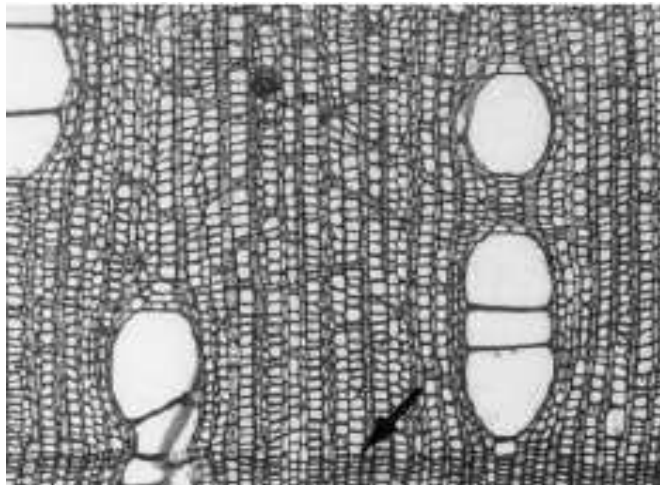
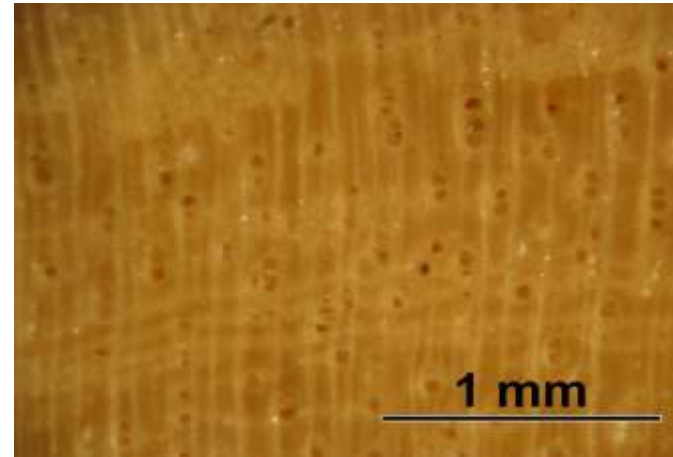
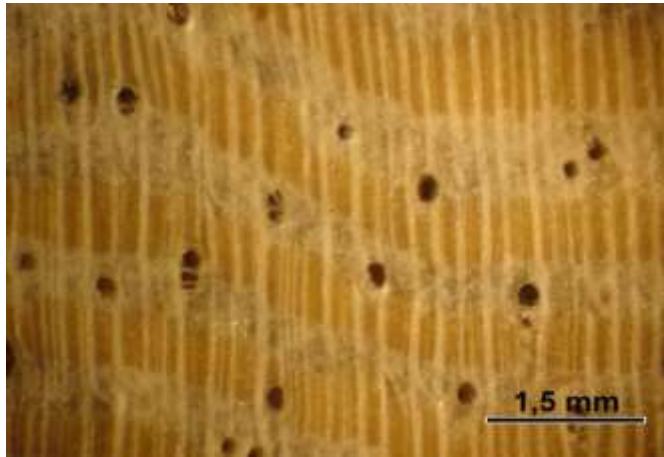
Partes de los radios -Vista Tangencial de un radio



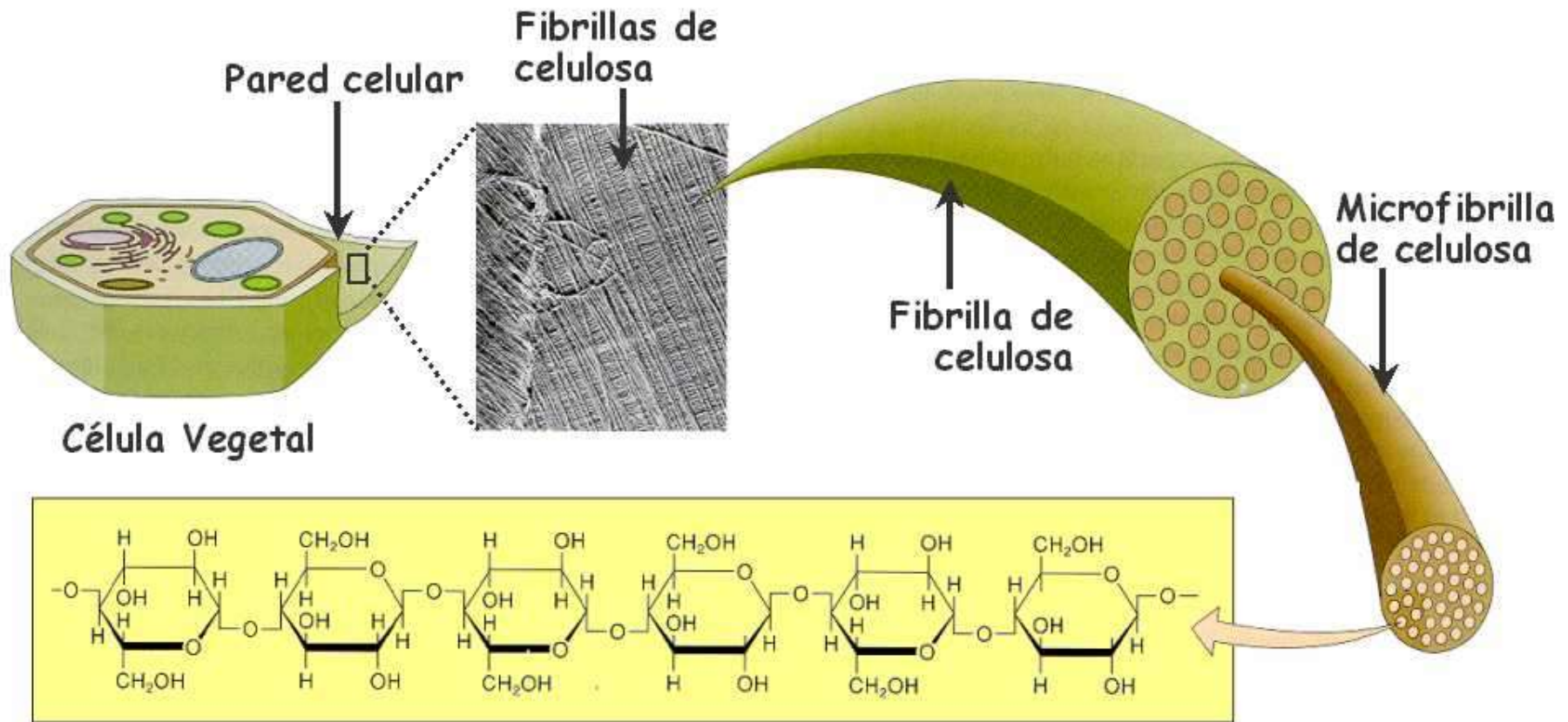
Células que forman
el cuerpo del radio

Células del extremo
o marginales

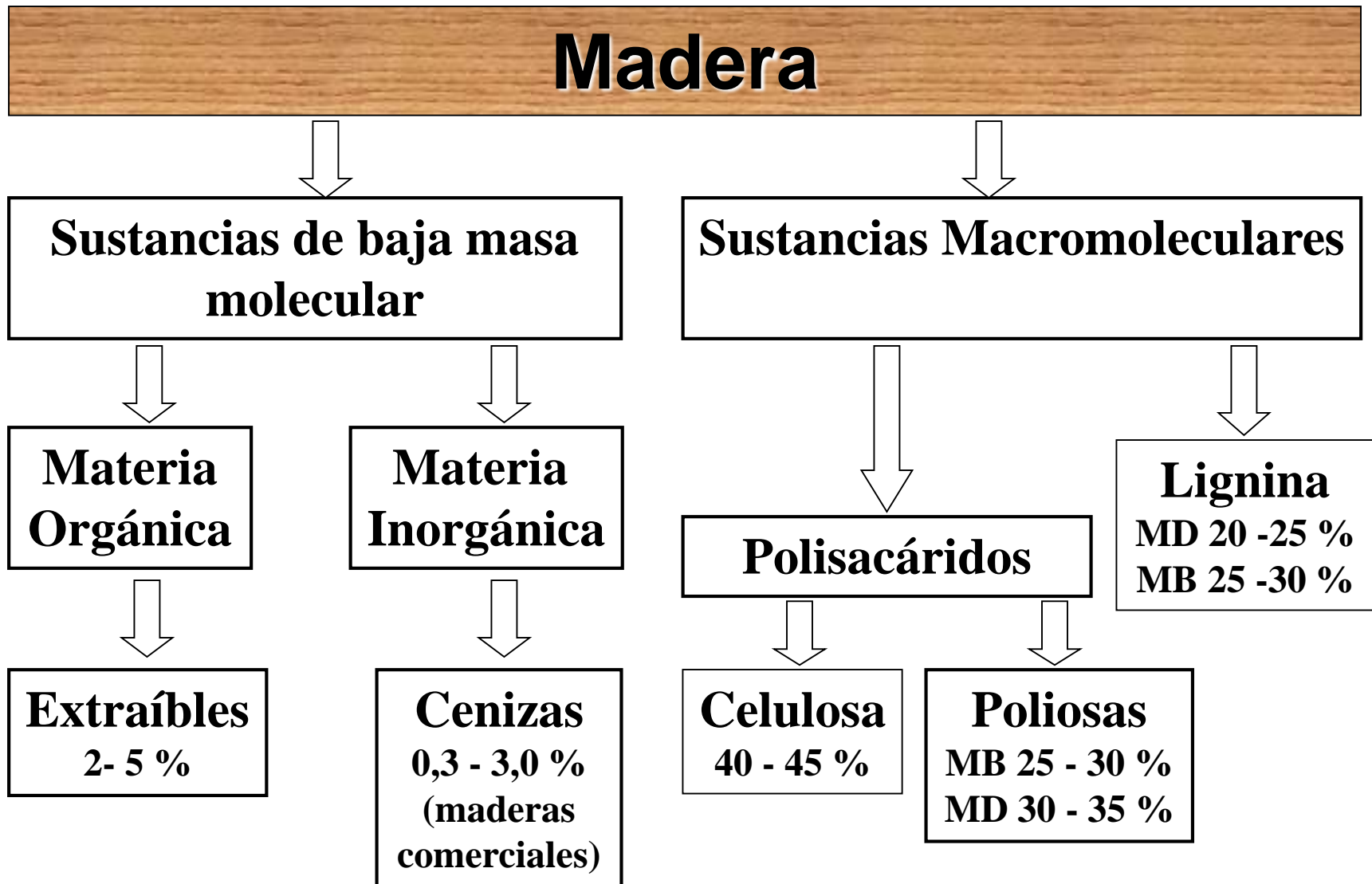
Parénquima



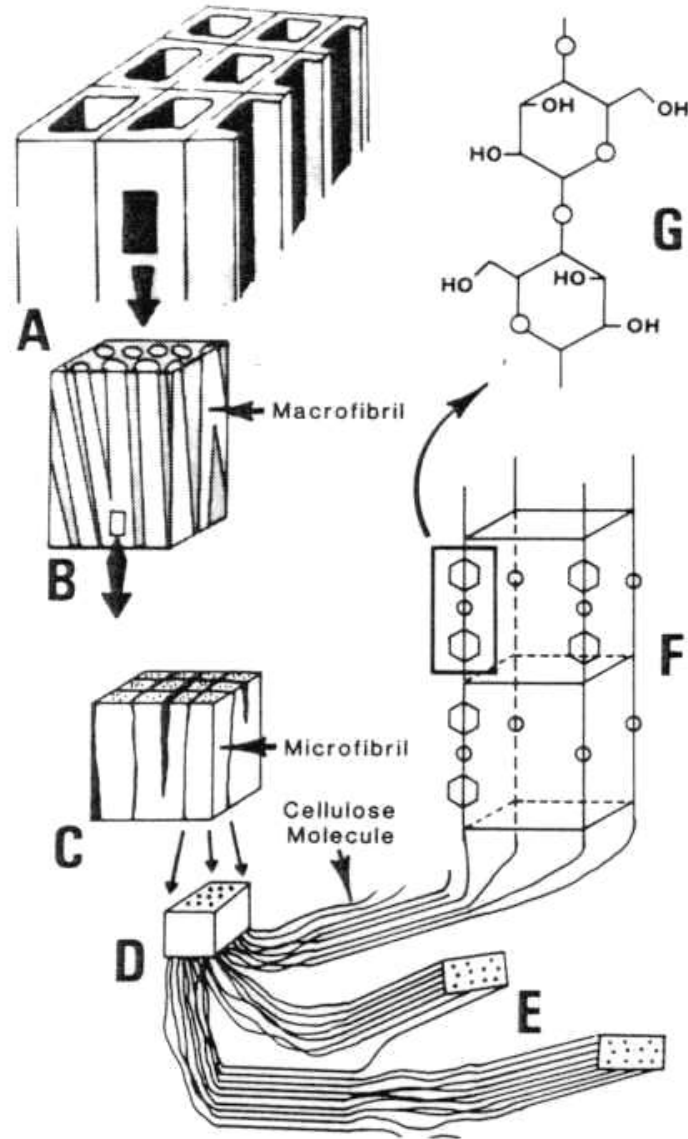
Estructura de la pared celular



Composición Química de la Pared Celular

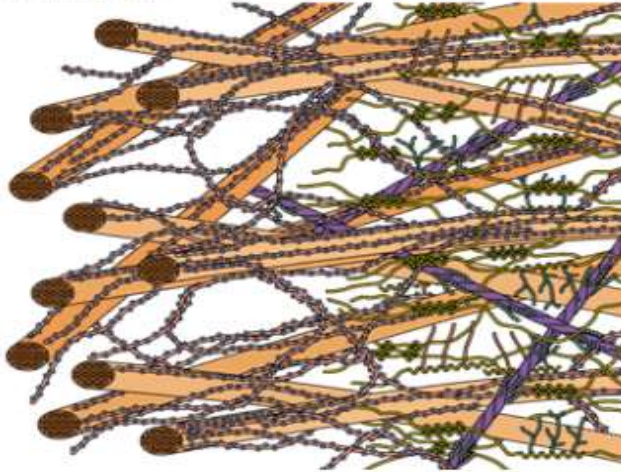


Celulosa

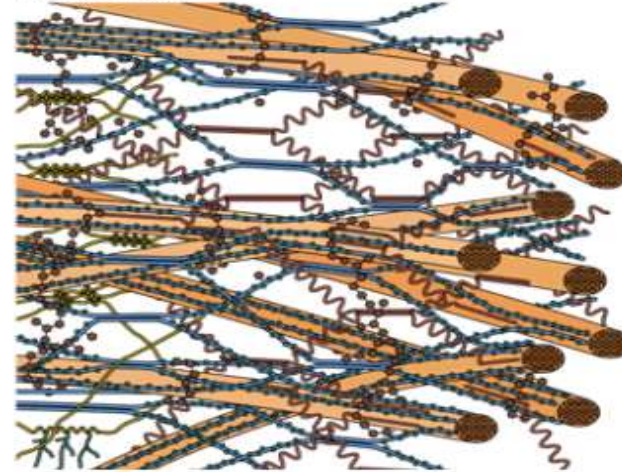


Hemicelulosas

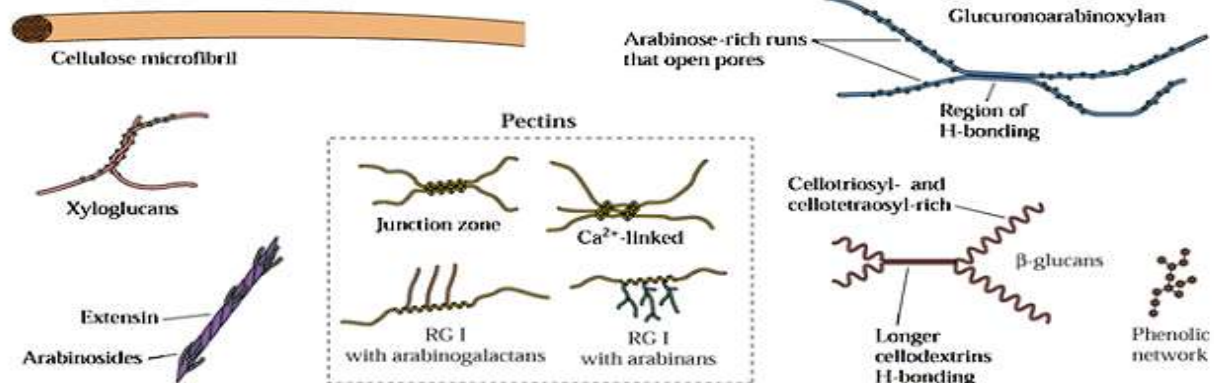
(A) Type I wall



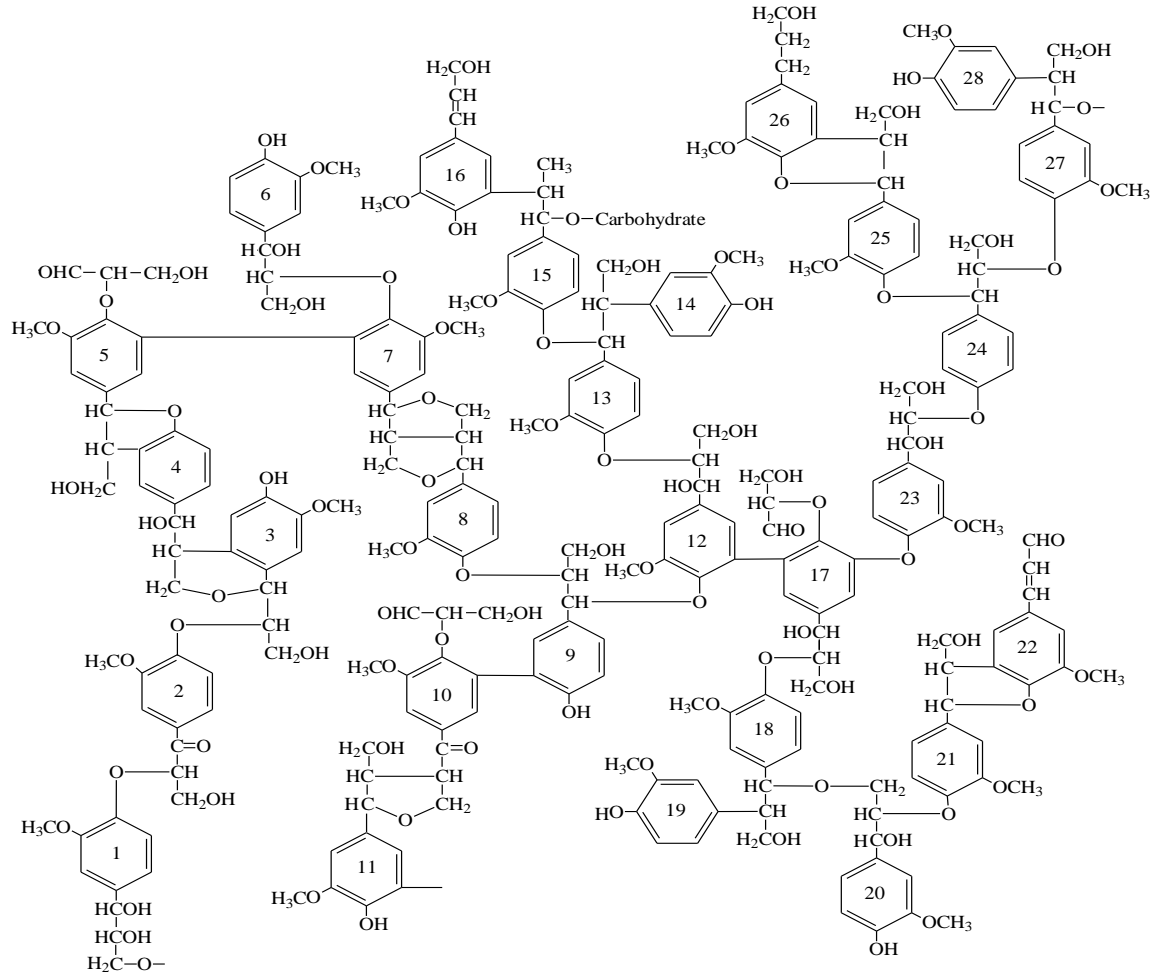
(B) Type II wall



Key:



Lignina



Extraíbles

Destilación con vapor



**Terpenos
Fenoles
Hidrocarburos
Lignanós**

Extracción con éter



**Grasas/Ceras
Acidos Resínicos
Esteroles**

Extracción con alcohol

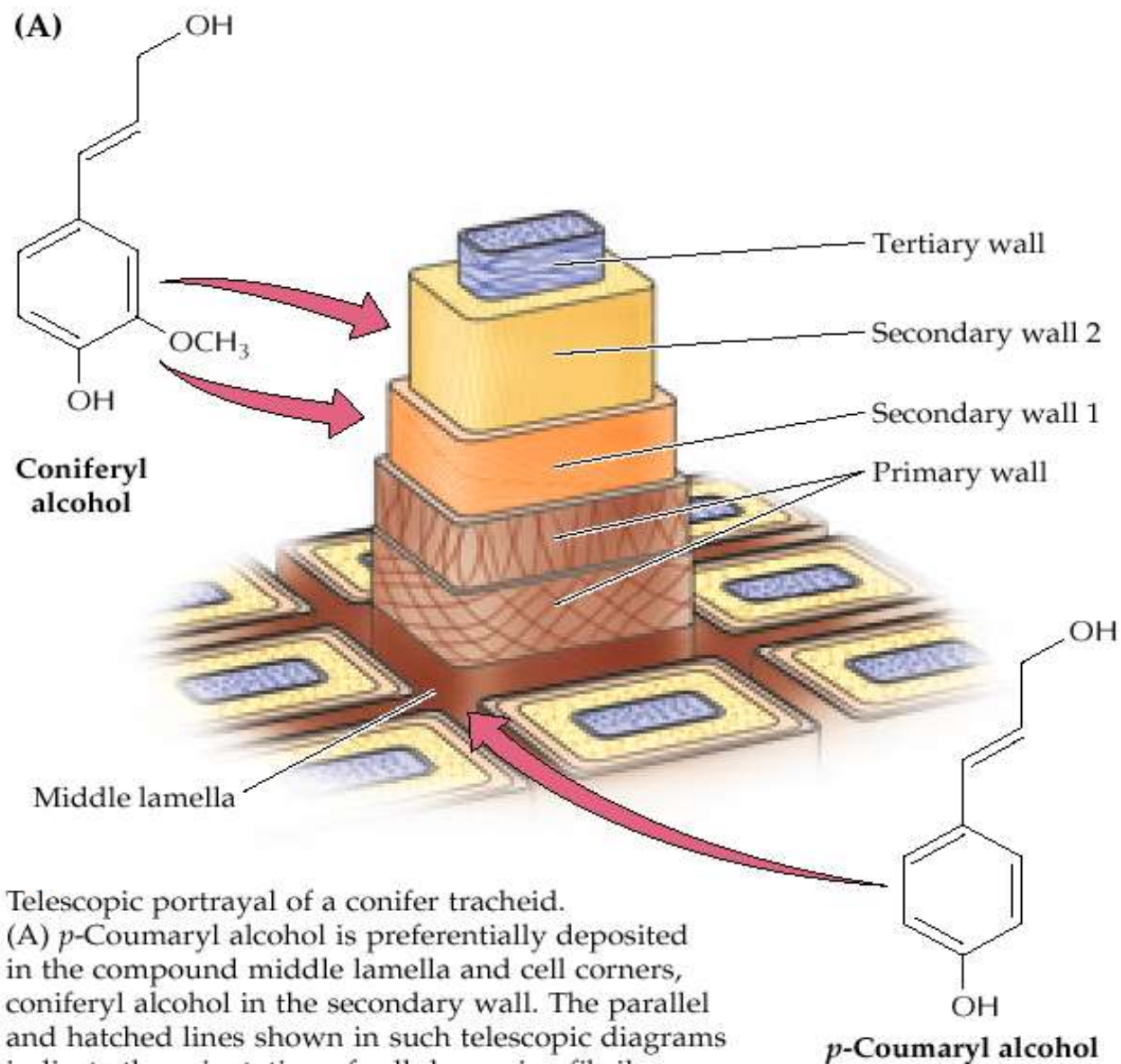


**Flavonoides
Flobafenos
Taninos
Estilbenos**

Extracción con agua

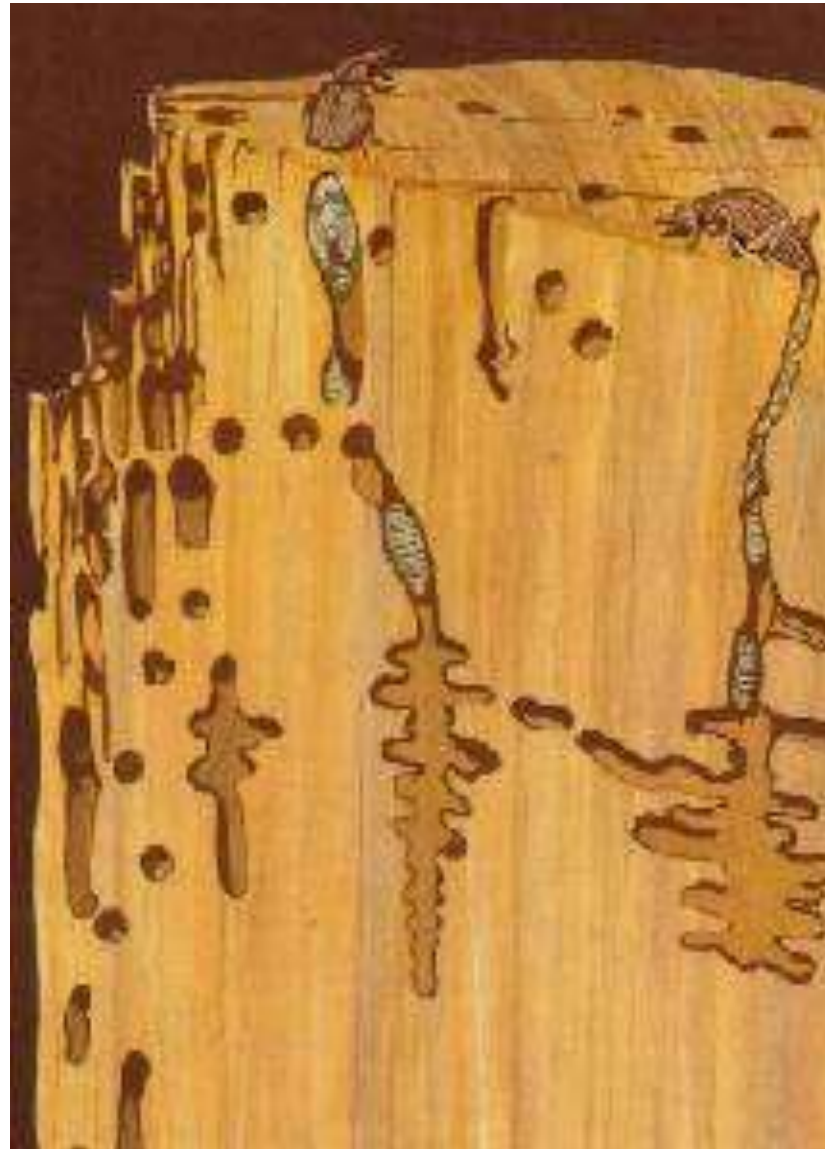


**Carbohidratos
Proteínas/Alcaloides
Inorgánicos**



Telescopic portrayal of a conifer tracheid.
 (A) *p*-Coumaryl alcohol is preferentially deposited in the compound middle lamella and cell corners, coniferyl alcohol in the secondary wall. The parallel and hatched lines shown in such telescopic diagrams indicate the orientation of cellulose microfibrils.

Daños en la madera cortada



ECO FOREST



25 2:59PM

AGENTES CAUSANTES DE DETERIORO DE LA MADERA

AGENTES AMBIENTALES

AVES

CRUSTÁCEOS

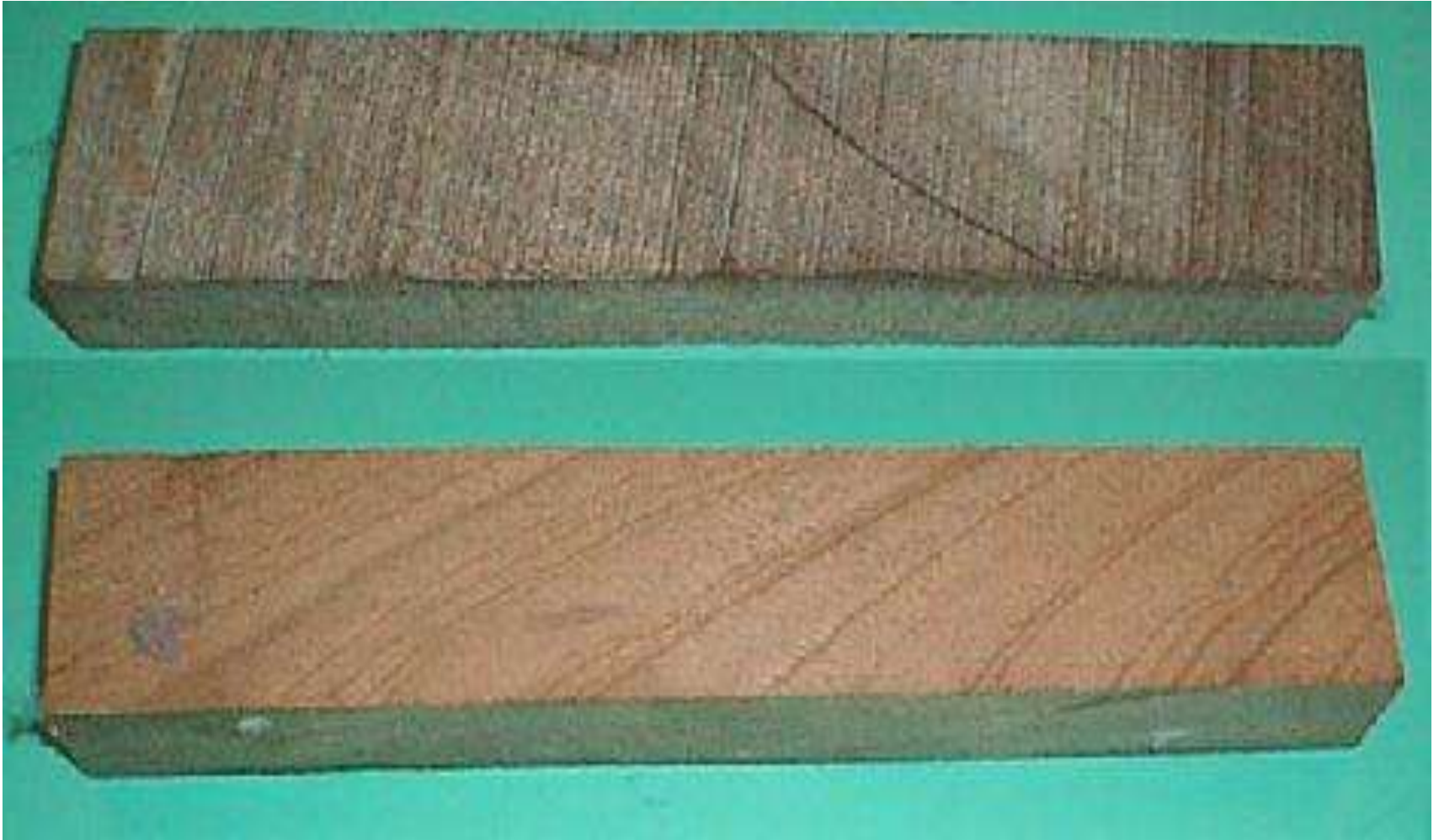
MOLUSCOS Familia Teredinidae
Familia Pholodiadae

INSECTOS Orden Coleoptera Familias Buprestidae y Cerambycidae
Familias Scolytidae y Platipodidae
Familias Bostrychidae y Lyctidae
Familia Anobiidae
Orden Blattodea

HONGOS


- PUDRICIONES: * BLANCA
* PARDA
- MANCHAS
- MOHOS

AGENTES AMBIENTALES



AGENTES AMBIENTALES



 alamy stock photo



shutterstock

AGENTES AMBIENTALES



AGENTES AMBIENTALES



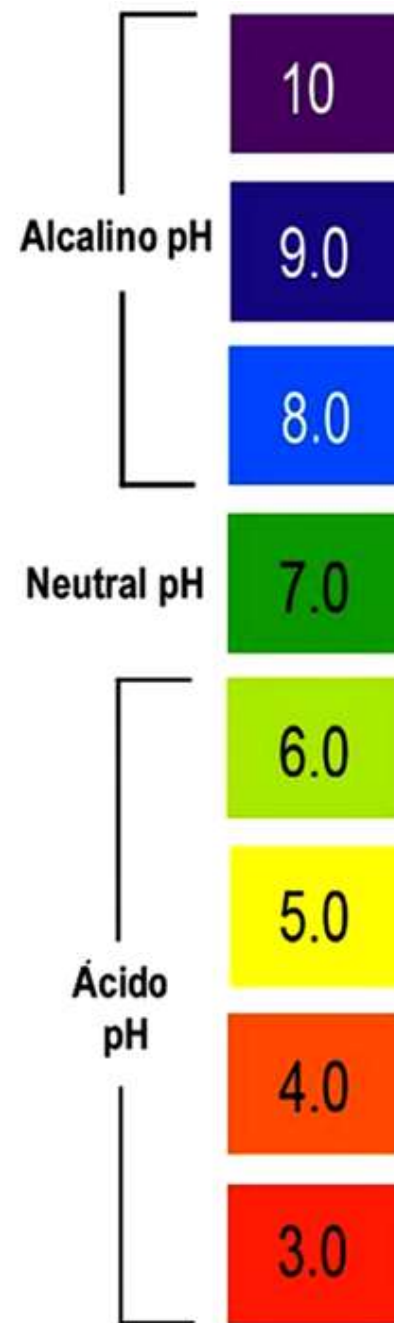
AGENTES AMBIENTALES



AGENTES AMBIENTALES



AGENTES AMBIENTALES



AGENTES AMBIENTALES



AGENTES AMBIENTALES



AGENTES AMBIENTALES



AVES



*Campephilus
principalis*

AVES



AVES



PERFORADORES MARINOS



CRUSTÁCEOS

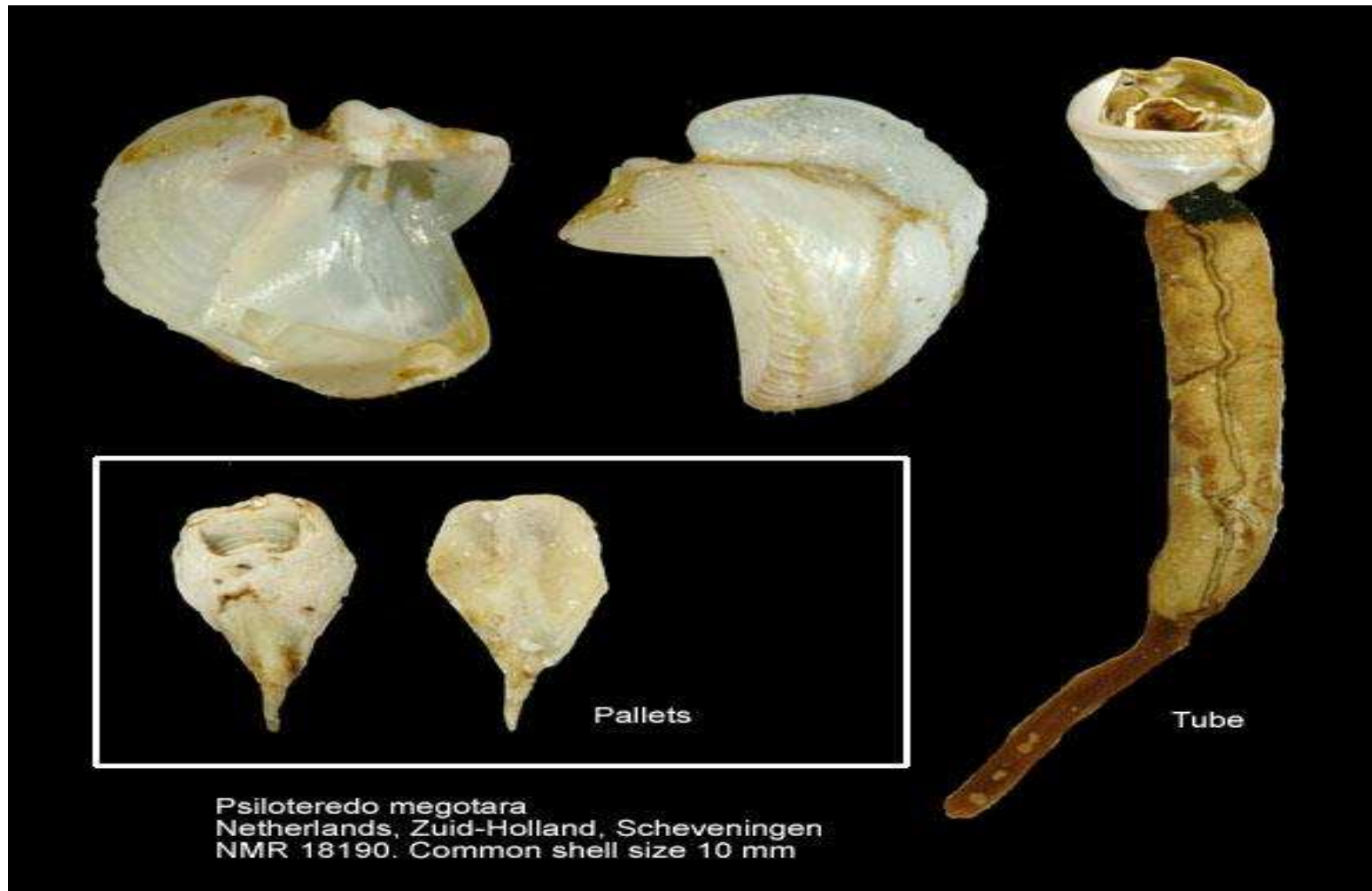


CRUSTÁCEOS



MOLUSCOS

Familia Teredinidae



MOLUSCOS



MOLUSCOS

Familia Pholadiadae



MOLUSCOS



Barnea manilensis inornata
Japan, Mie, Ise-wan, Tokoname
NMR 52135. Common size 55 mm

INSECTOS (Orden Hymenoptera)



Camponotus sp y *Xylocopa* sp

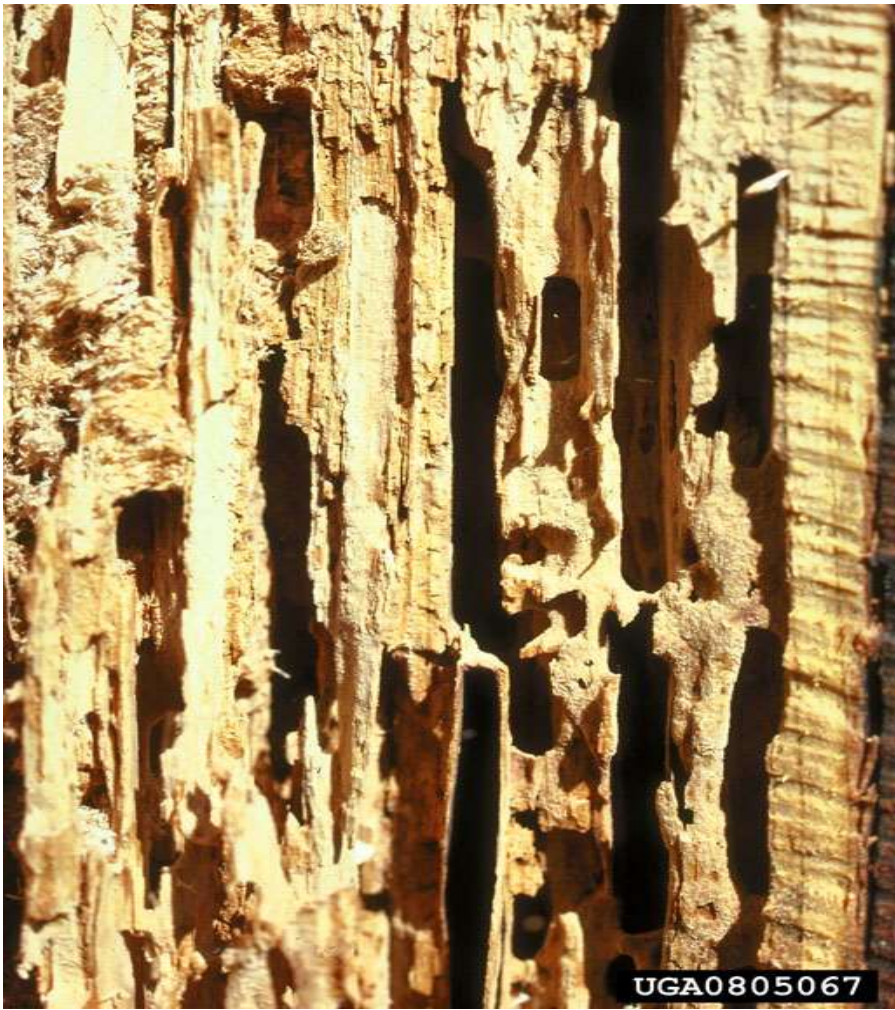
INSECTOS (Orden Hymenoptera)

- Familias Formicidae



INSECTOS (Orden Hymenoptera)

- Familias Formicidae



Camponotus sp

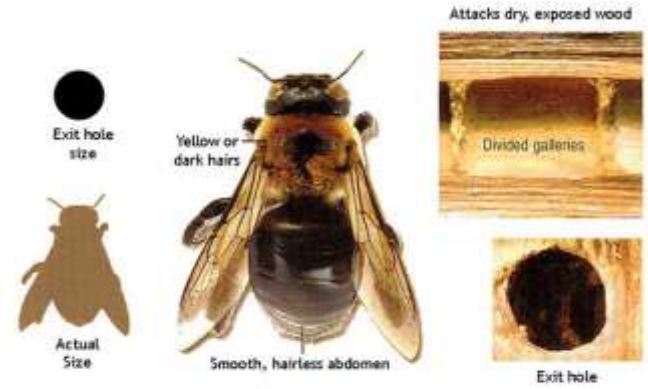
INSECTOS (Orden Hymenoptera)

- Familias Apidae y Siricidae



***Xylocopa* sp y varios géneros de avispas**

INSECTOS (Orden Hymenoptera)



Carpenter Bee
Xylocopa



Xylocopa sp

INSECTOS (Orden Hymenoptera)



Siricidae

INSECTOS (Orden Coleoptera)

- Familias Cerambycidae



Cerambycidae

INSECTOS (Orden Coleoptera)

- Familia Cerambycidae



Cerambycidae

INSECTOS (Orden Coleoptera)

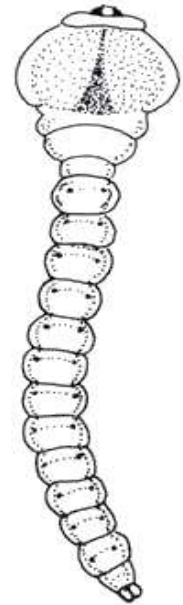
- Familia Cerambycidae



EL BARRENADOR DE LAS TUCAS *Neoclytus cassicus*

INSECTOS (Orden Coleoptera)

- Familias Buprestidae



Buprestidae

INSECTOS (Orden Coleoptera)

- Familias Cerambycidae y Buprestidae



***Chrysobothris* sp.**

INSECTOS (Orden Coleoptera)

- Subfamilia Platypodidae



Male



Female

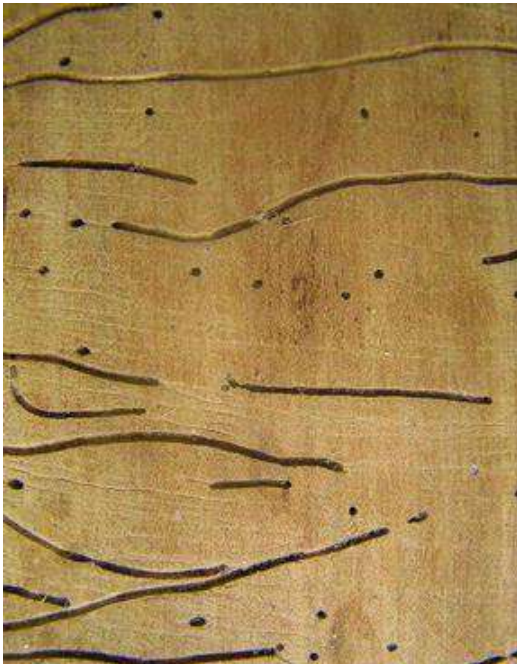
UGA5322048



UGA5322067

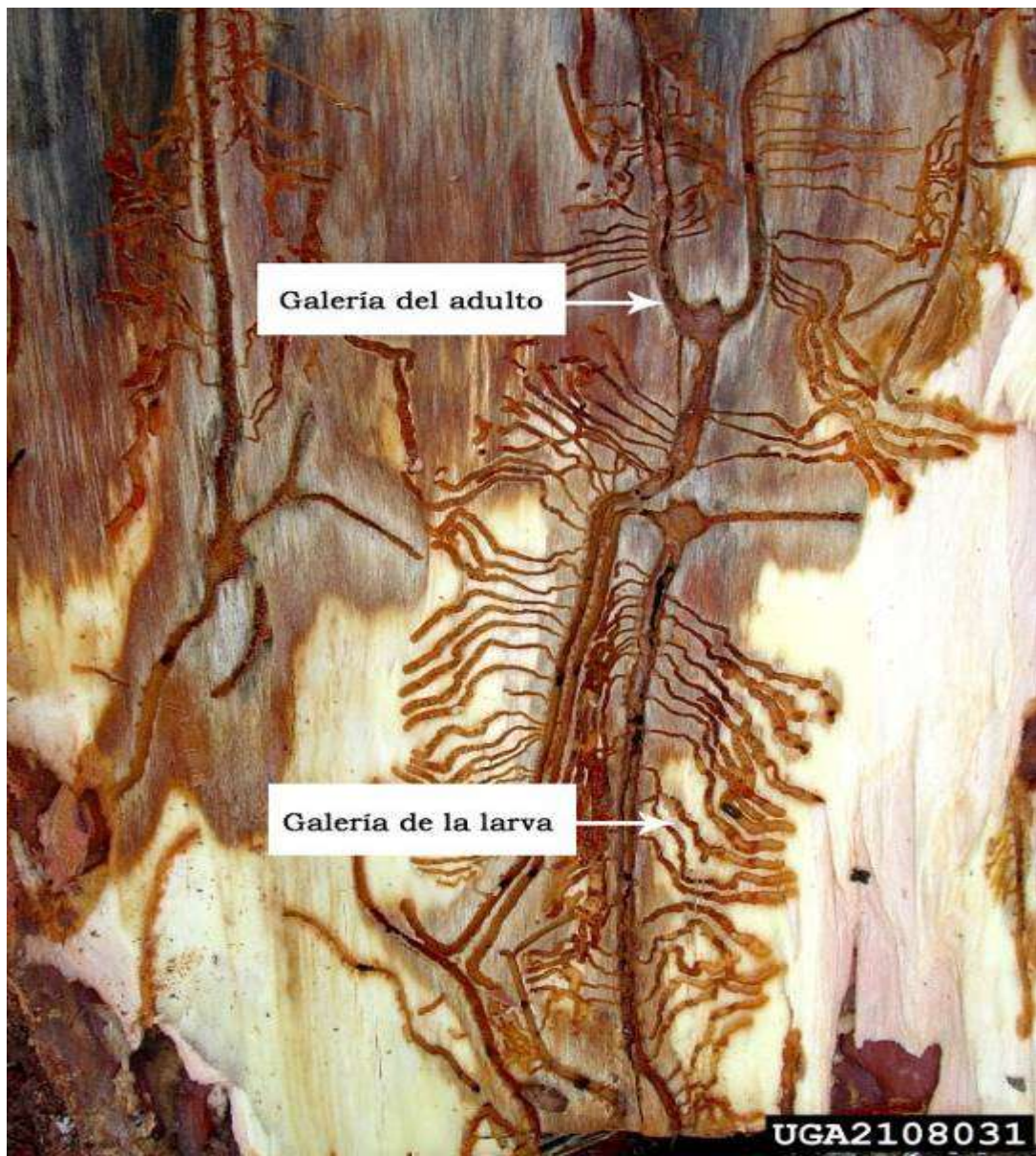
INSECTOS (Orden Coleoptera)

- Sub familia Platypodidae



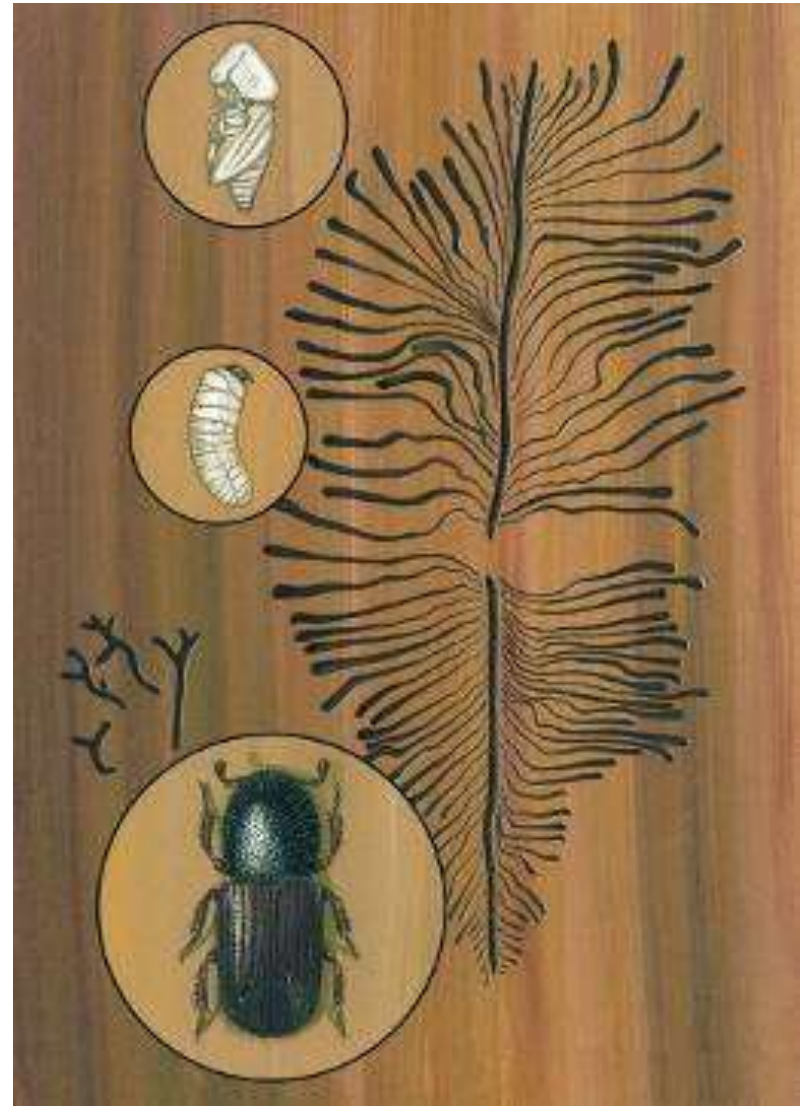
INSECTOS (Orden Coleoptera)

- Subfamilia Scolytinae



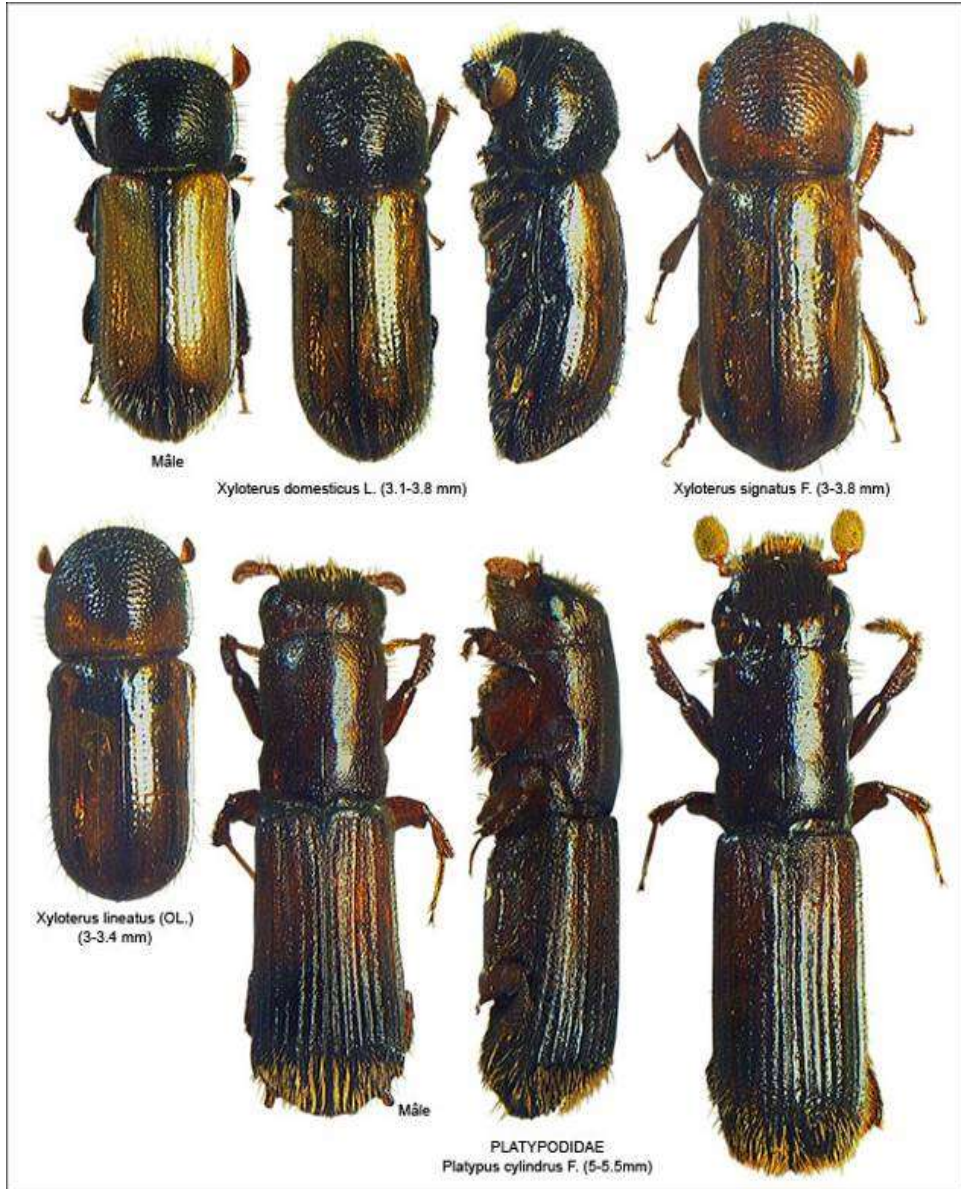
INSECTOS (Orden Coleoptera)

- Subfamilia Scolytinae



INSECTOS (Orden Coleoptera)

- Subfamilia Scolytinae



INSECTOS (Orden Coleoptera)

- Familias Scolytinae



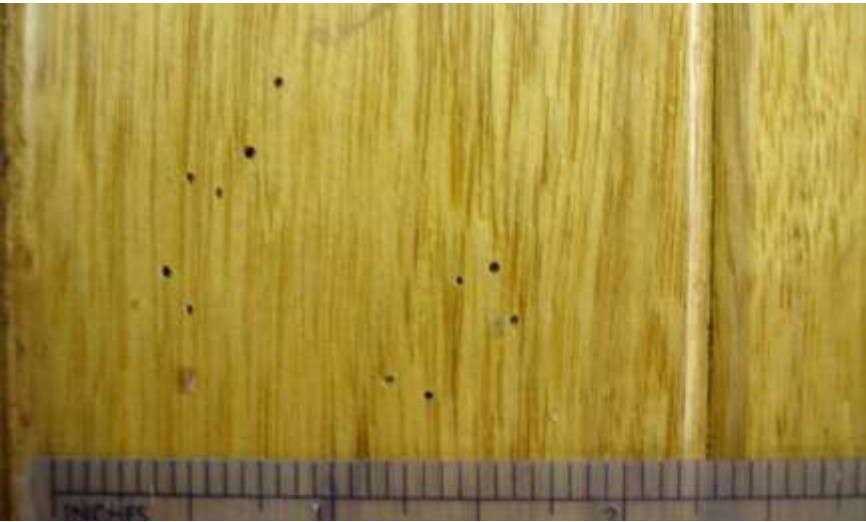
INSECTOS (Orden Coleoptera)

- Familia Bostrychidae (incluida la sub familia Lyctinae)
superfamilia Bostrichoidea



INSECTOS (Orden Coleoptera)

- Familia Bostrychidae (incluida la sub familia Lyctinae)
superfamilia Bostrichoidea



INSECTOS (Orden Coleoptera)

- Familia Bostrychidae (incluida la sub familia Lyctinae)
superfamilia Bostrichoidea



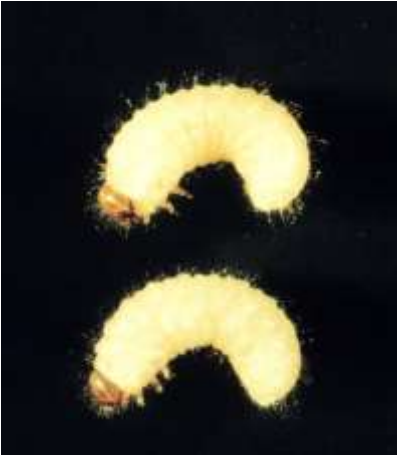
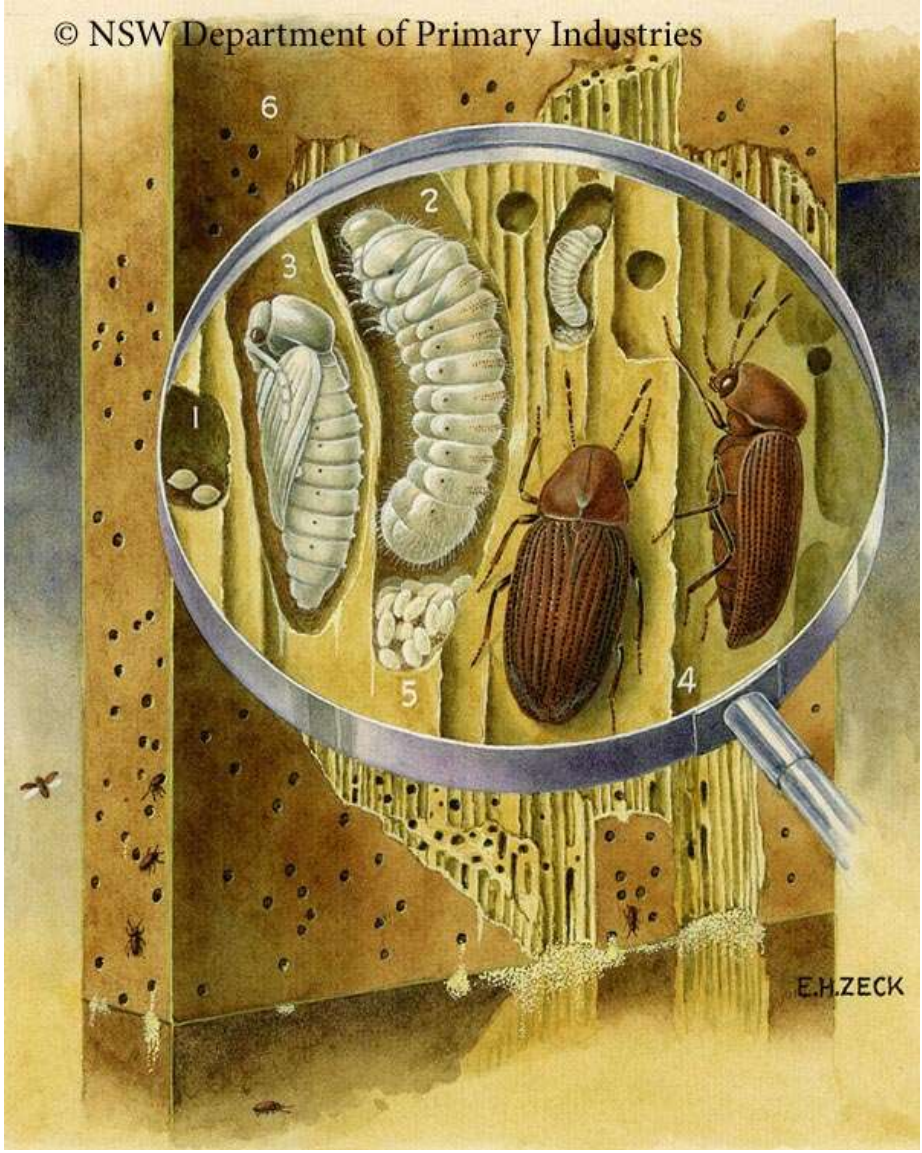
INSECTOS (Orden Coleoptera)

- Familia Bostrychidae (incluida la sub familia Lyctinae)
superfamilia Bostrichoidea



INSECTOS (Orden Coleoptera)

- Familia Anobiidae (superfamilia Bostrichoidea)



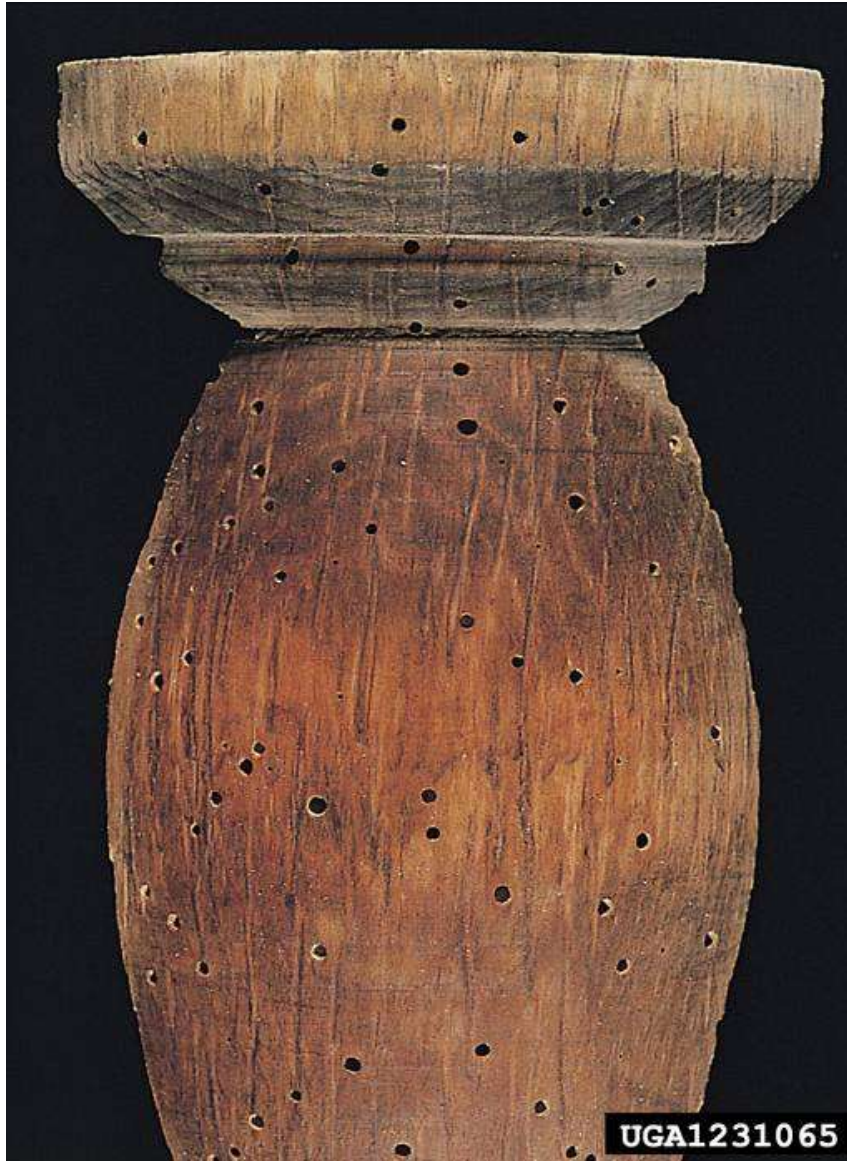
INSECTOS (Orden Coleoptera)

- Familia Anobiidae (superfamilia Bostrichoidea)



INSECTOS (Orden Coleoptera)

- Familia Anobiidae (superfamilia Bostrichoidea)



UGA1231065



INSECTOS (Orden Blattodea)



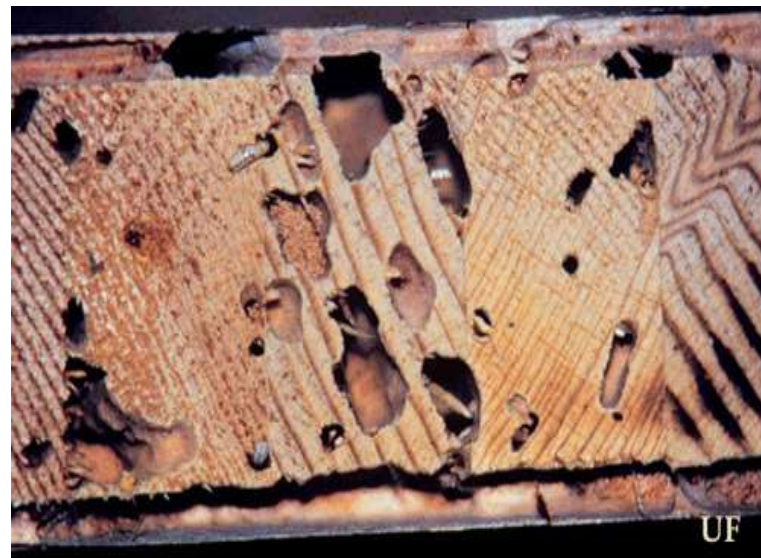
Coptotrmes testaceus



Nasutitermes corniger



Cryptotermes brevis



PUDRICIÓN BLANCA





ECO FOREST

MIRIAM 33

PUDRICIÓN PARDÁ



PUDRICIÓN PARDÁ



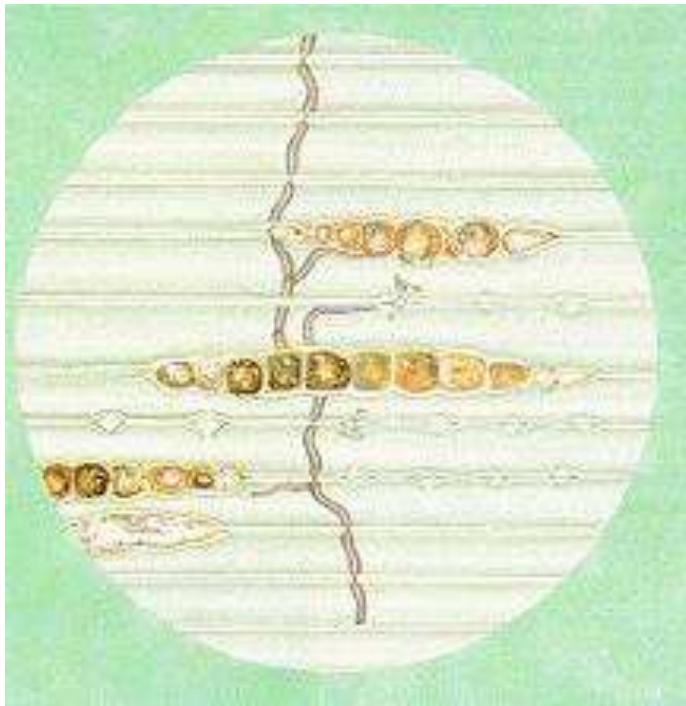
PUDRICIÓN PARDÁ



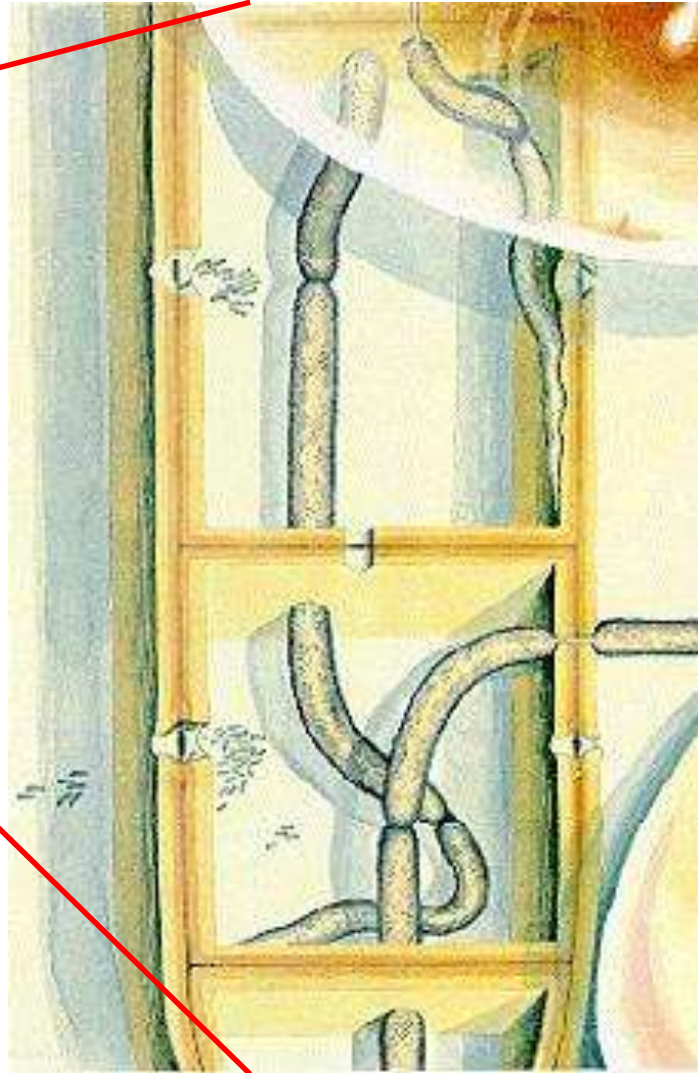
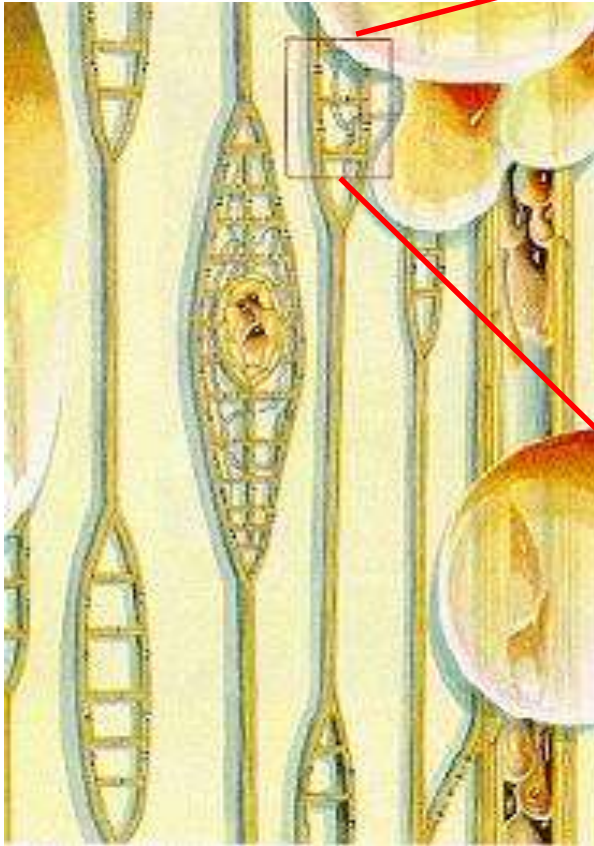
HONGOS MANCHADORES



HONGOS MANCHADORES



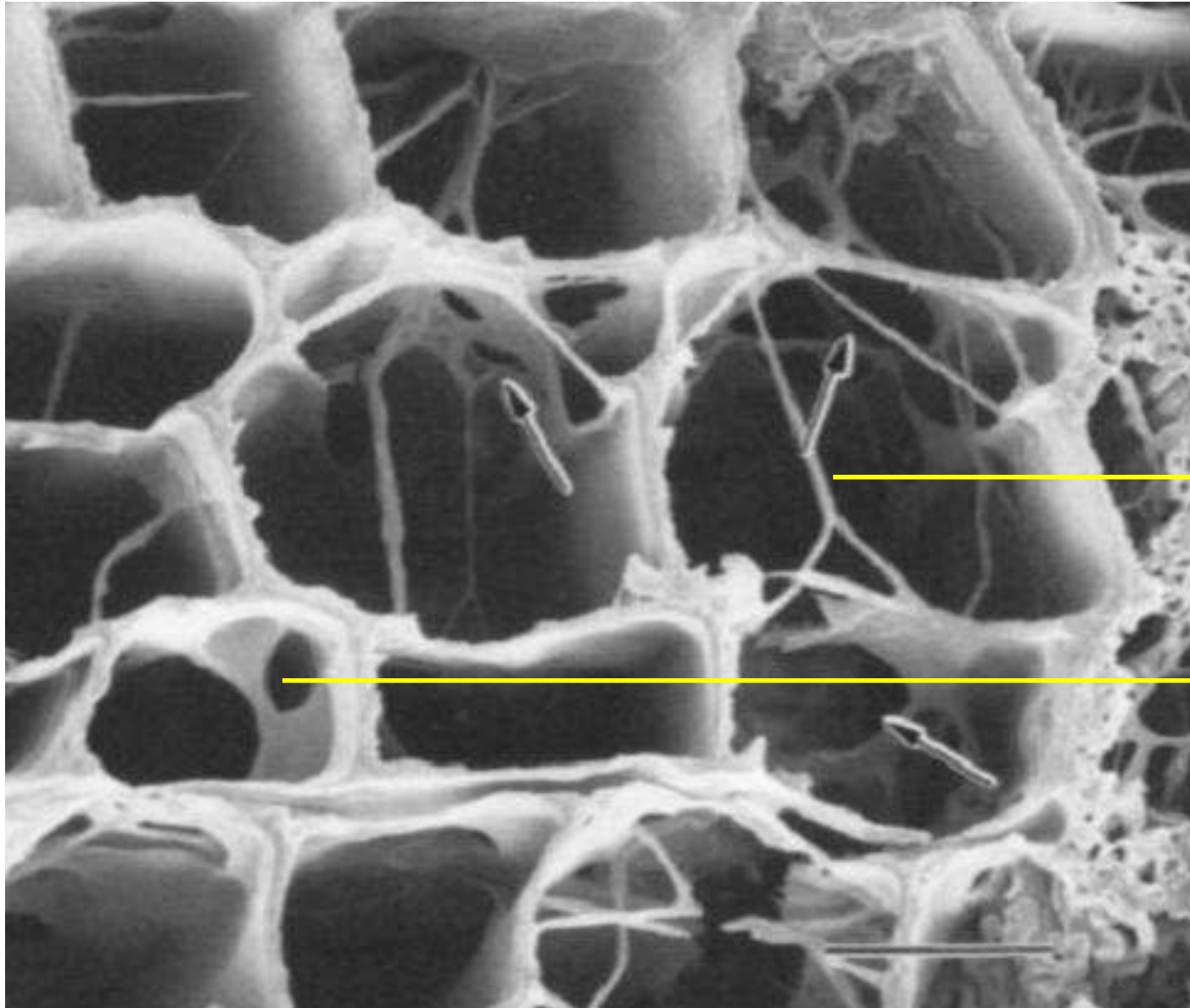
HONGOS MANCHADORES



HONGOS MANCHADORES



HONGOS MANCHADORES



**Penetración
hifas**

**Degradación
Pared celular**

HONGOS MANCHADORES



MOHOS



MOHOS



MOHOS

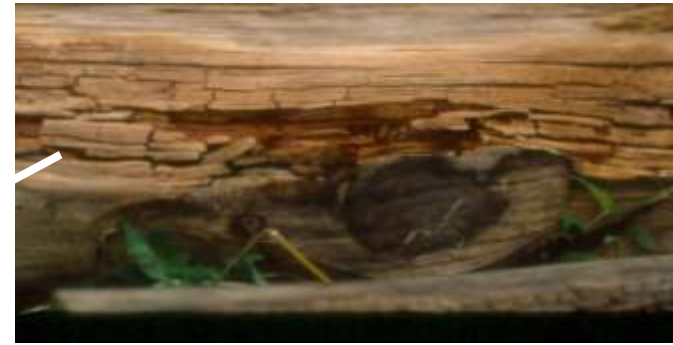


MOHOS



HONGOS

- PUDRIFICIONES: * BLANCA
* PARDA
- MANCHAS
- MOHOS



¡Gracias por su atención!

