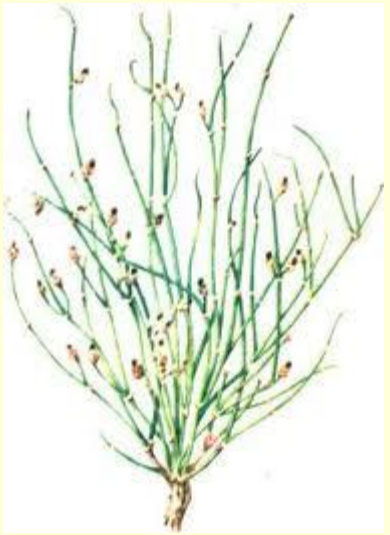
Lesson 4.
Division of Gymnosperm .

The Division of Gymnosperms (Pinophyta or Gymnospermae)

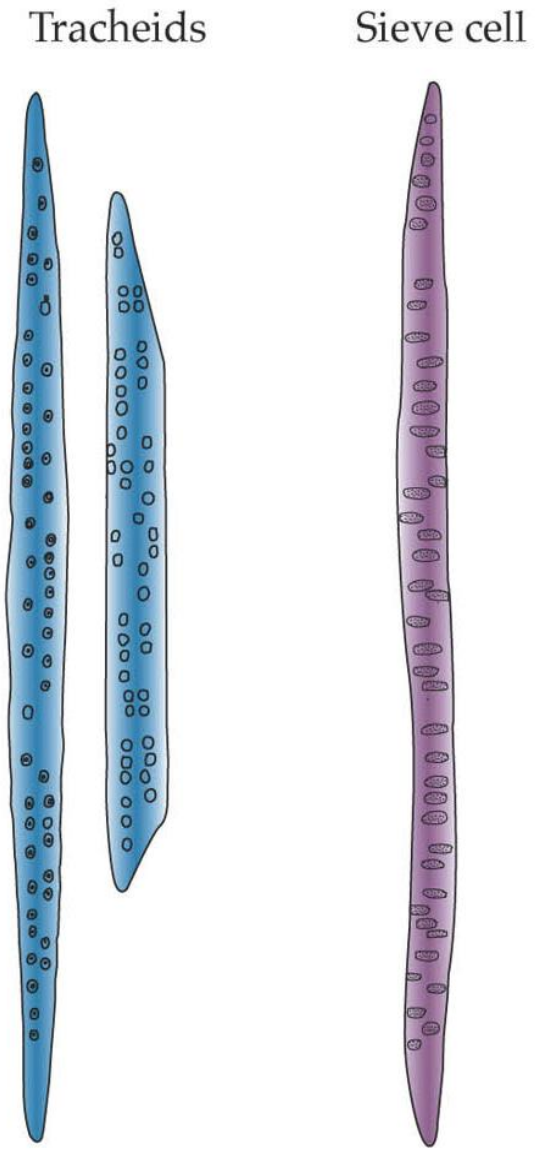


The name of the division suggests a general peculiarity in the structure of Gymnosperms: ovules and seeds are located openly on the surface of sporophylls or similar structures (i.e. "naked").

Most Gymnosperms have micro- and megasporophylls aggregated into strobils, which are collections of sporophylls on the axis isolated from the vegetative part of the shoot.

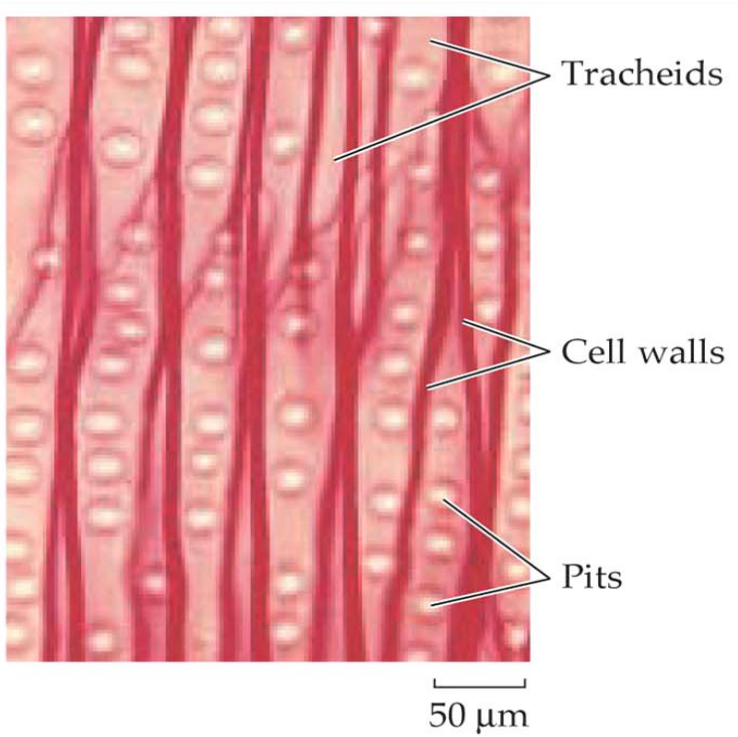
Strobils with megasporophylls are called megastrobils. Those with microsporophylls are called microstrobils. In other words, a strobilus is a spore-bearing shoot - a stem with spore-bearing leaves (sporophylls).

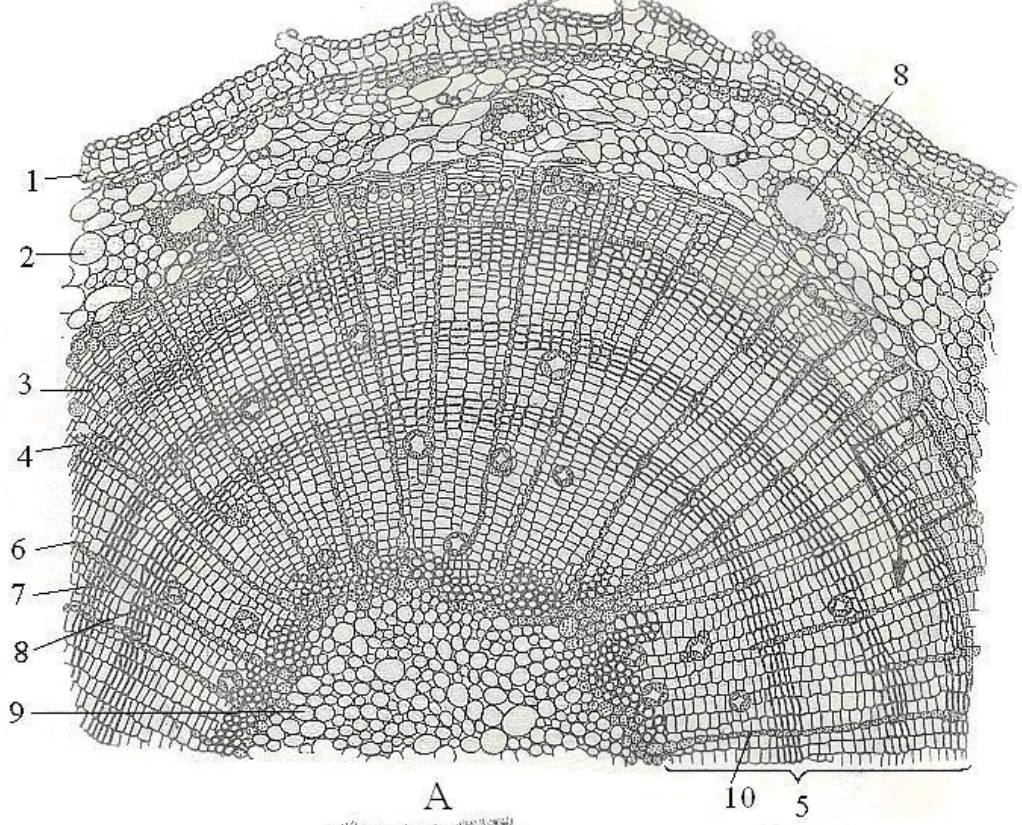
The structure of mega- and microstrobils is different and depends on the systematic belonging of the plant.

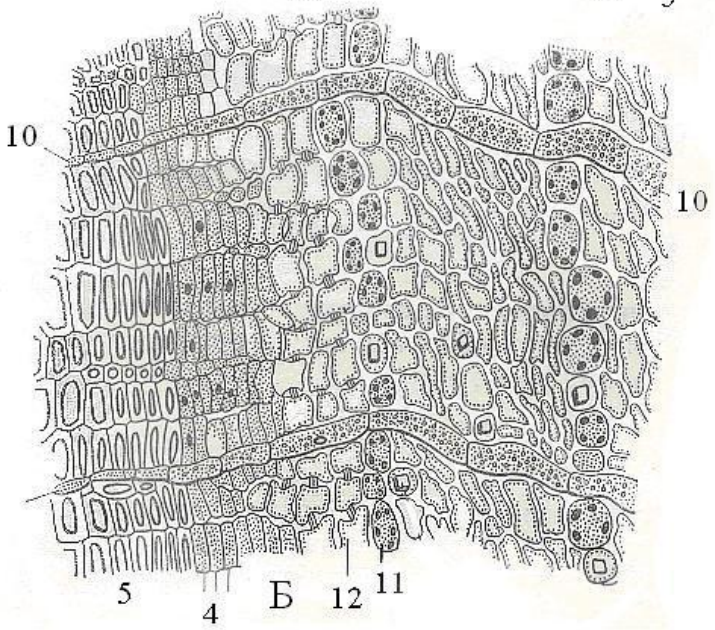


LIFE: THE SCIENCE OF BIOLOGY, Seventh Edition, Figure 35.10 Ev

- The anatomical structure of gymnosperms is characterized by secondary growth in thickness due to cambium activity. The primary cortex consists of a homogeneous parenchyma. Mechanical tissues are absent. The phloem consists of sieve cells (without companion cells), the xylem only of tracheids. Resin passages are often (but far from always) present in the bark and wood.



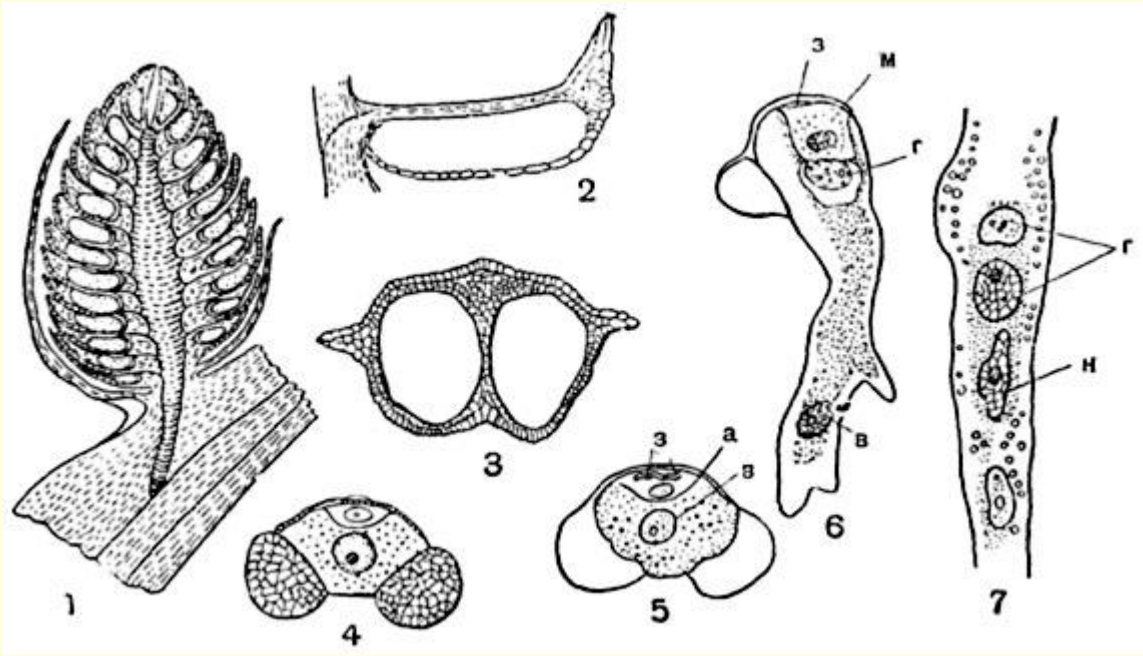




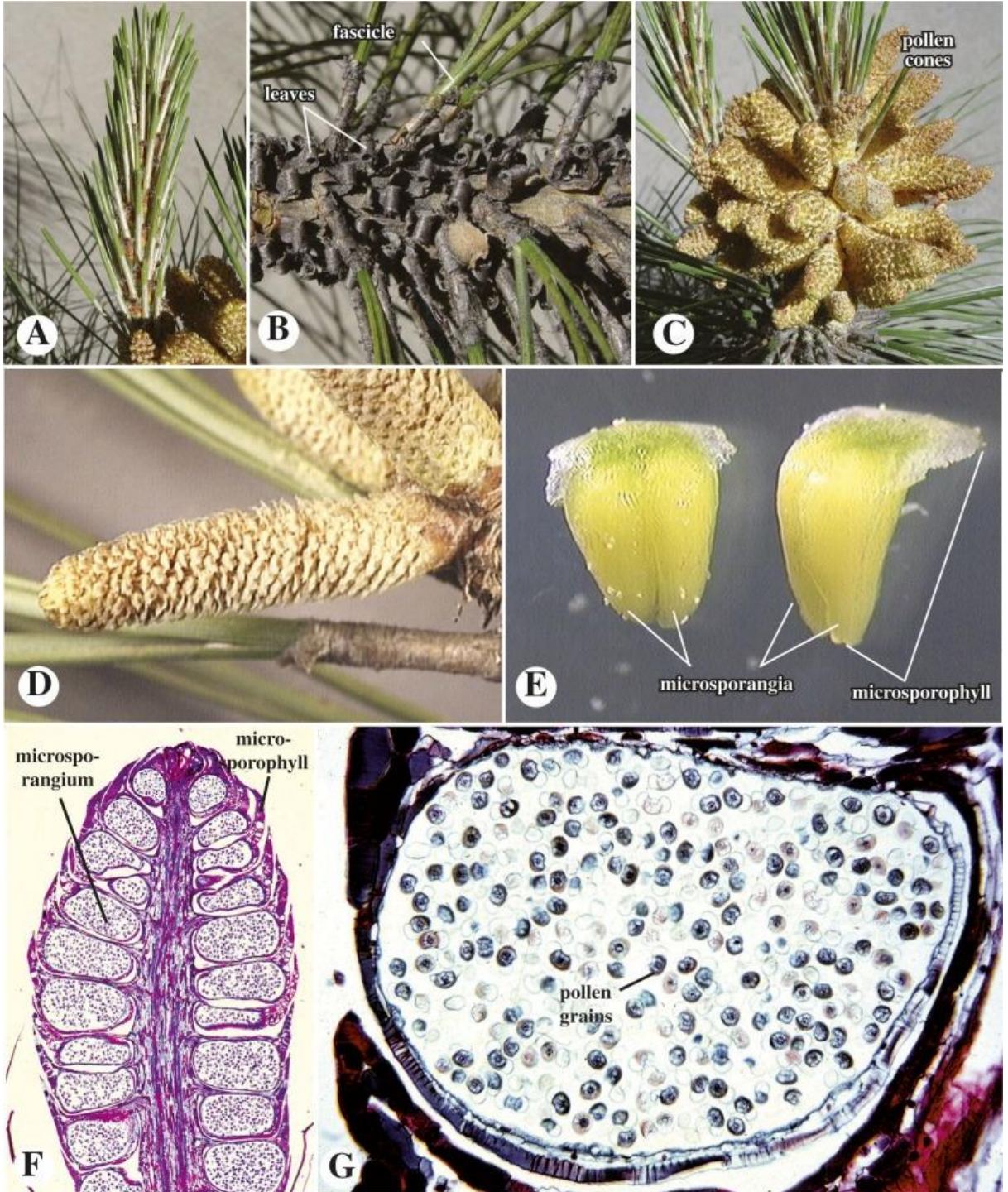
Pine (Pinus sylvestris) stem in cross section: A - part of the cross section; B - phloem and cambium, with adjacent xylem tracheids. 1 - periderm, 2 - primary cortex parenchyma, 3 - phloem, 4 - cambium, 5 - xylem, 6 - spring tracheids, 7 - autumn tracheids, 8 - resin passage, 9 - pith, 10 - pith ray, 11 - bast parenchyma, 12 - sieve tube.

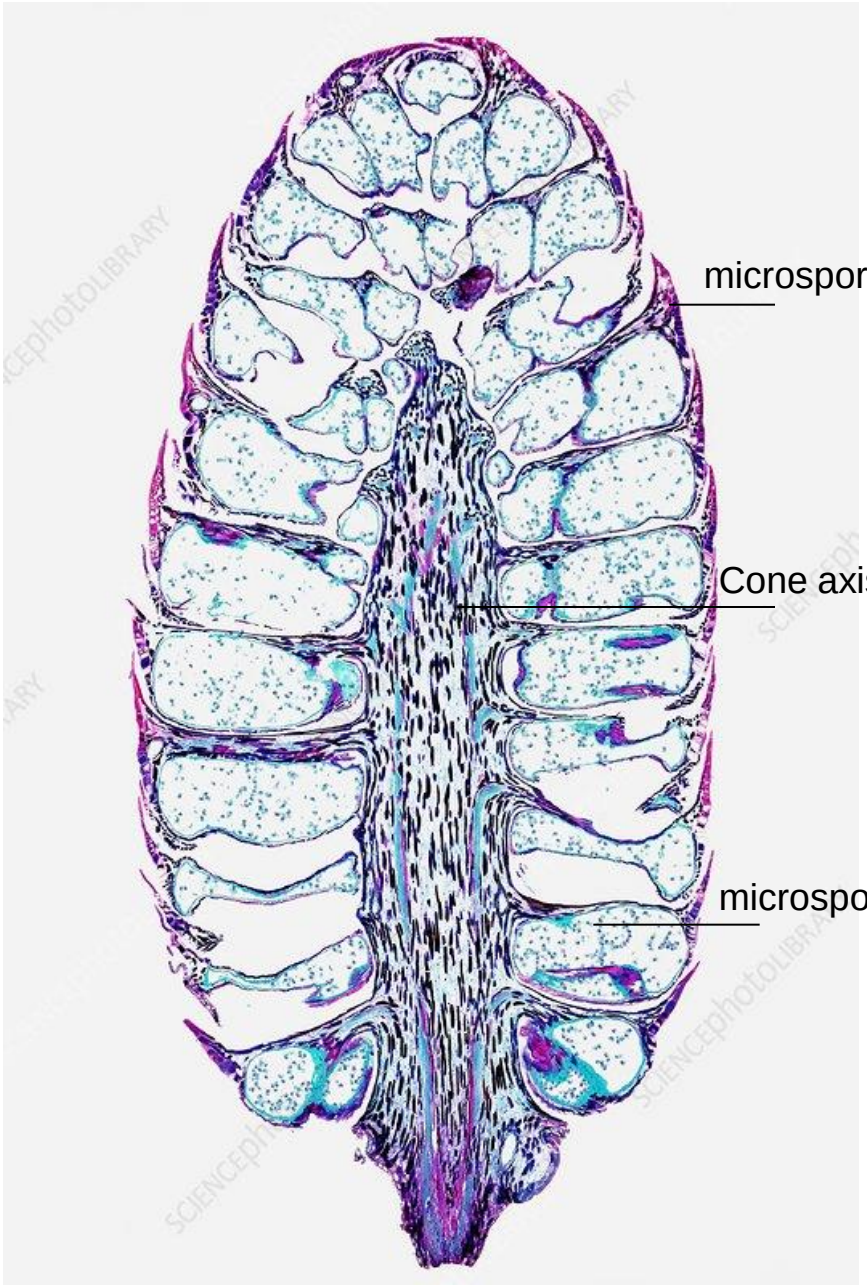
Task 1. The structure of the male cone of the Scots pine

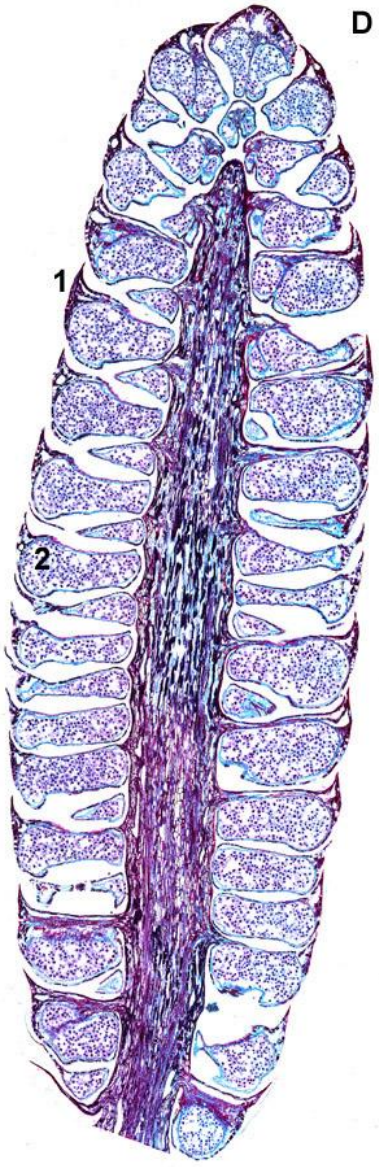
Pinus sylvestris

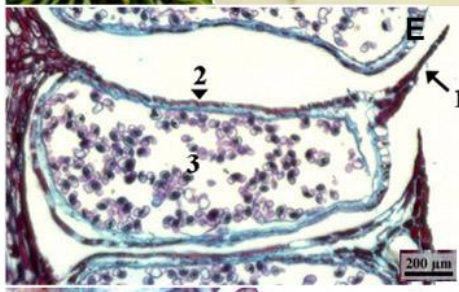


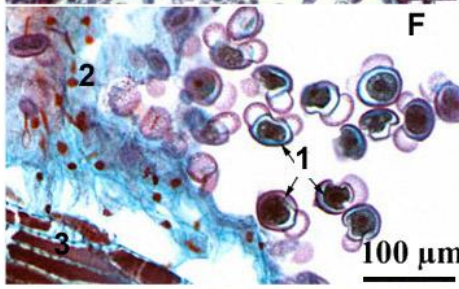
*1 - longitudinal section of male cone; 2 and 3 - longitudinal (2) and transverse (3) sections of microsporophyll (contents of microsporangia not shown); 4 - antheridium; 5 and 6 - sprouting of antheridium; 7 - end of pollen tube (in spruce): **з** - rests of bud; а - antheridial cell; **в** - vegetative nucleus of pollen tube; **н** - antheridial pedicle cell (in Fig. 7 - its nucleus); **г** - generative cell (sperm cells in Fig. 7).*

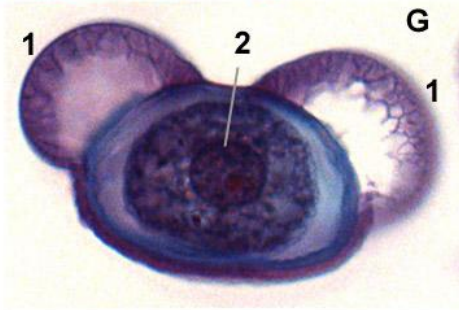

A
fascicle
leaves
B
pollen cones
C
D
microsporangia
microsporophyll
E
microspo-rangium
micro-sporophyll
F
pollen grains
G

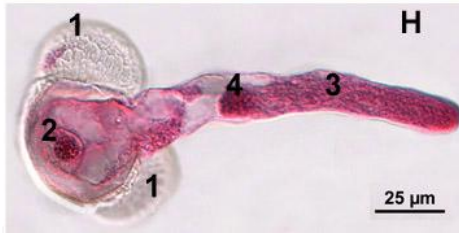








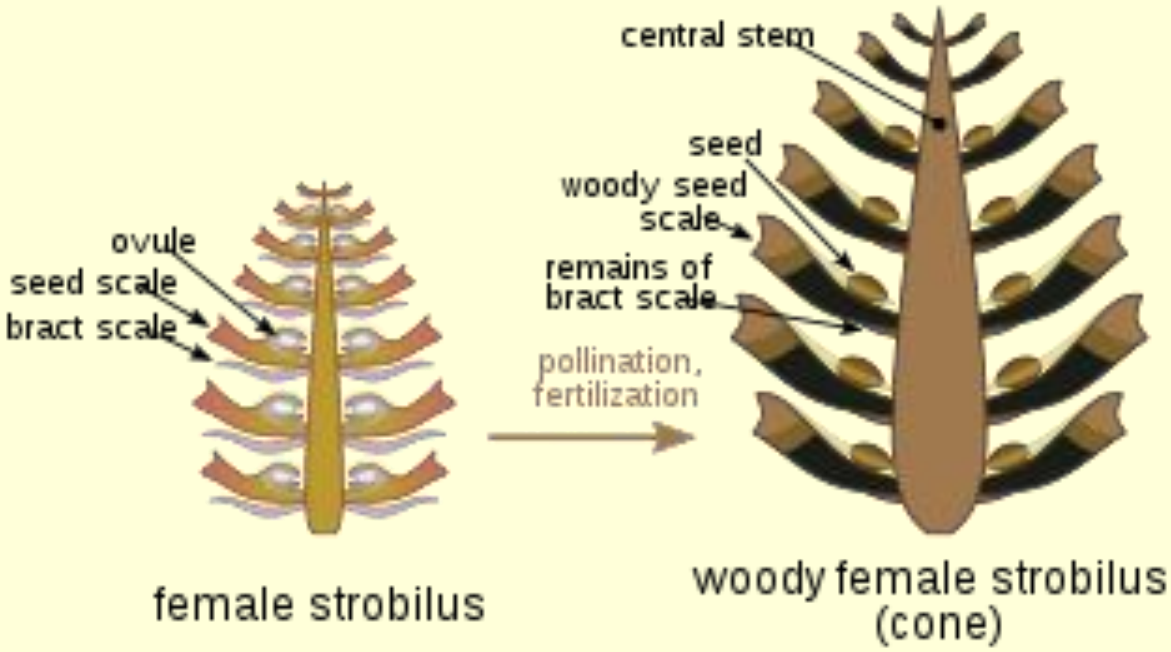


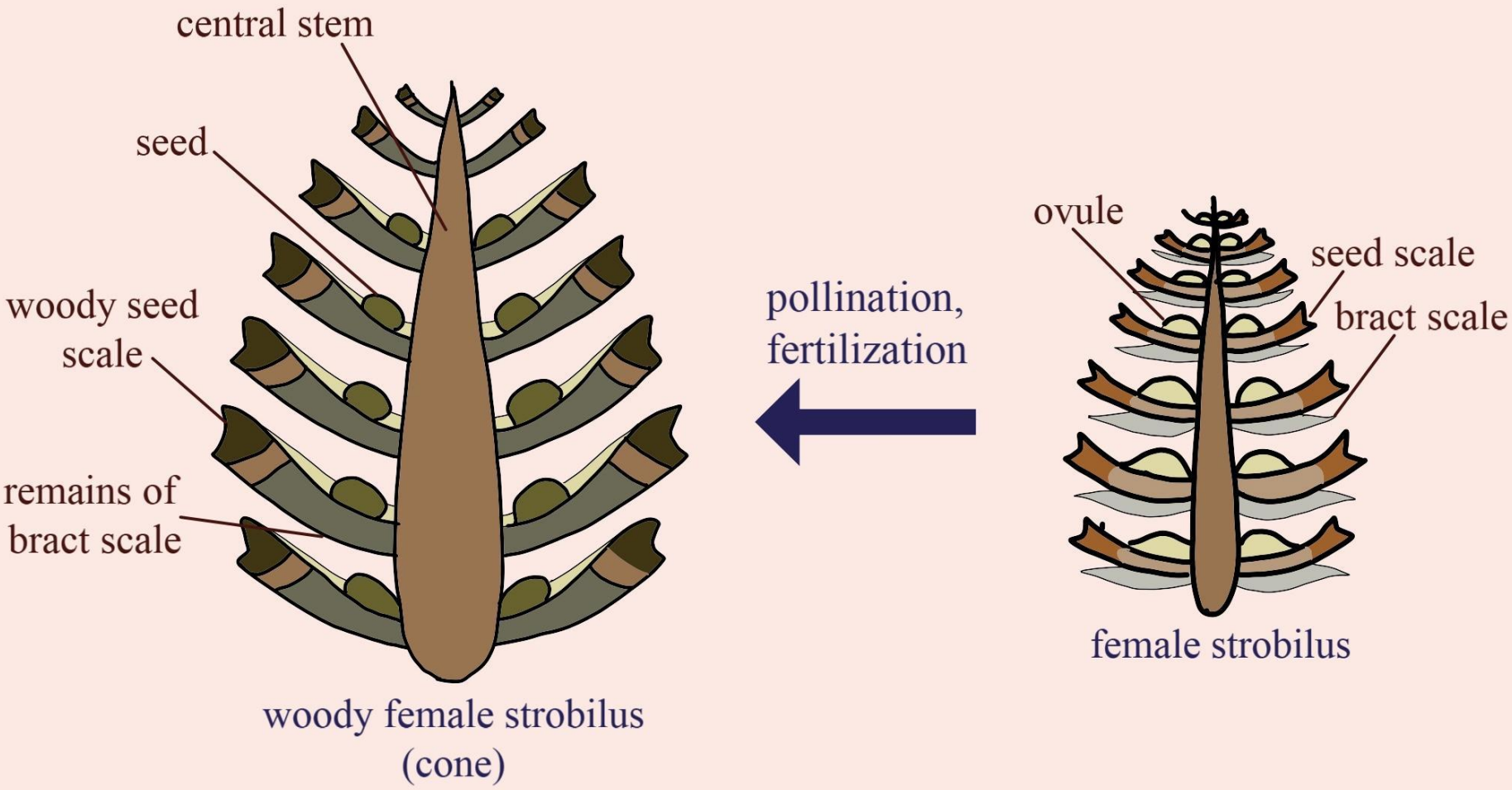


Microstrobils (pollen cone) of pine through microscope

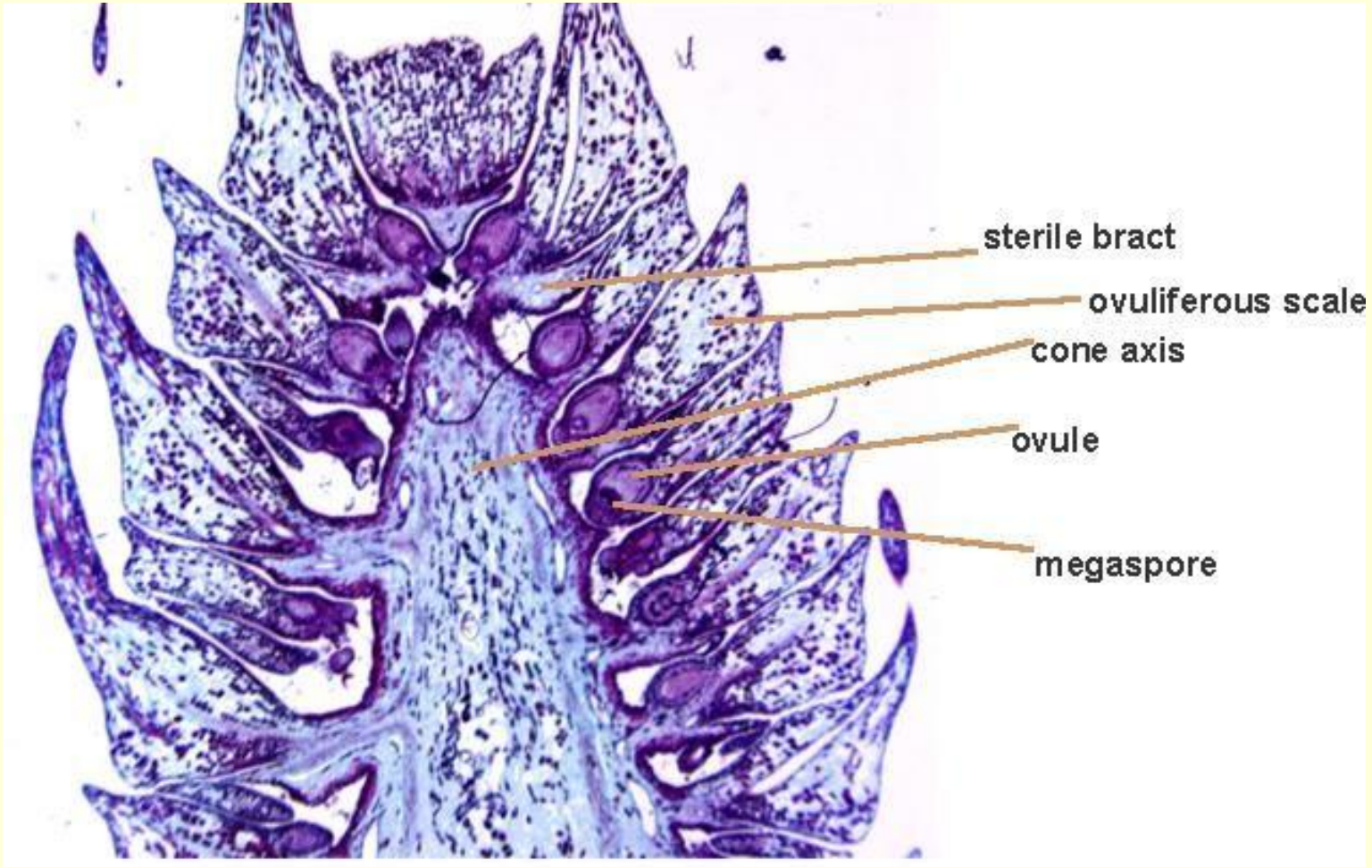
Task 2. The structure of the female cone of the Scots pine

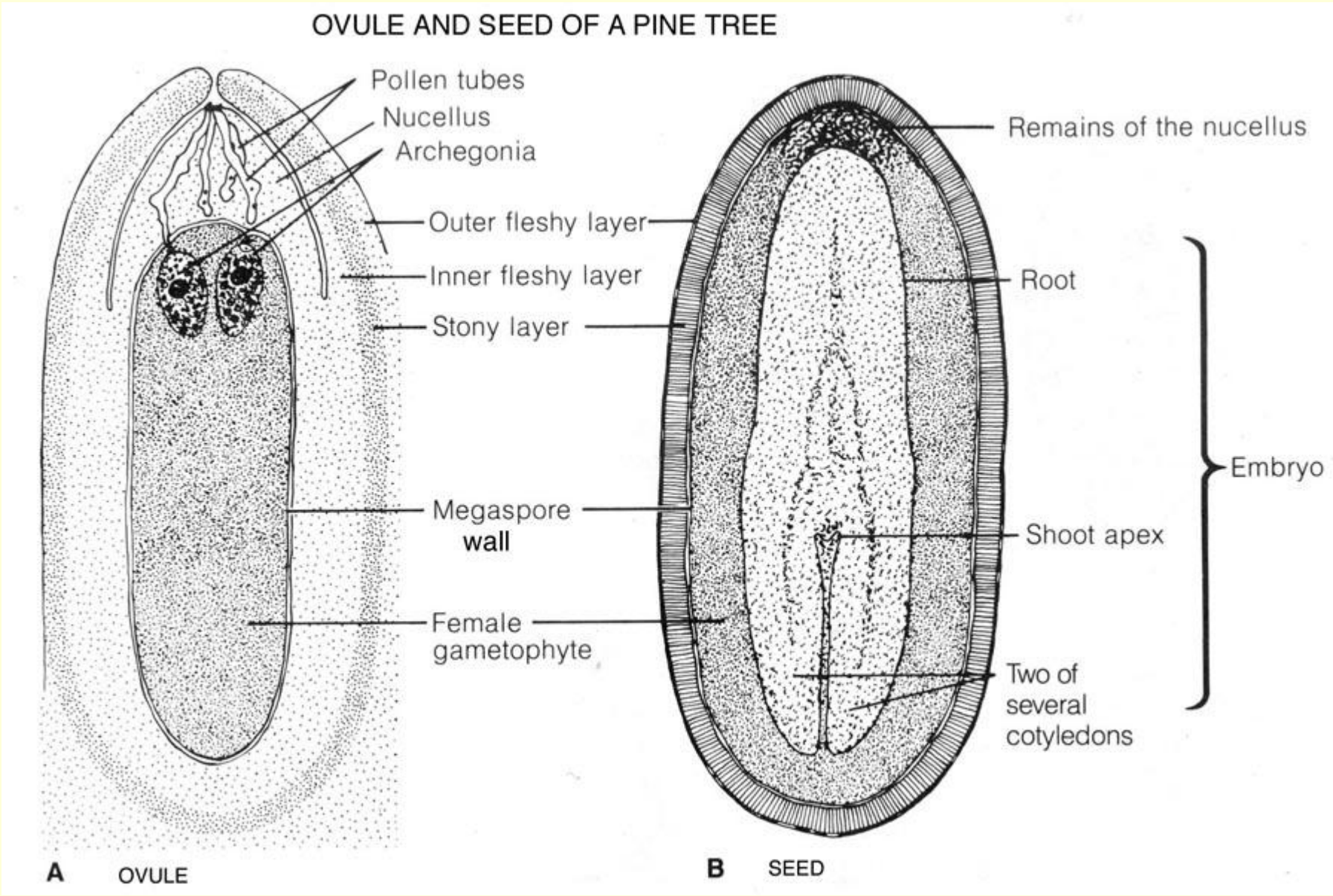
Megastrobils are collected in female cones (Ovulate cone)



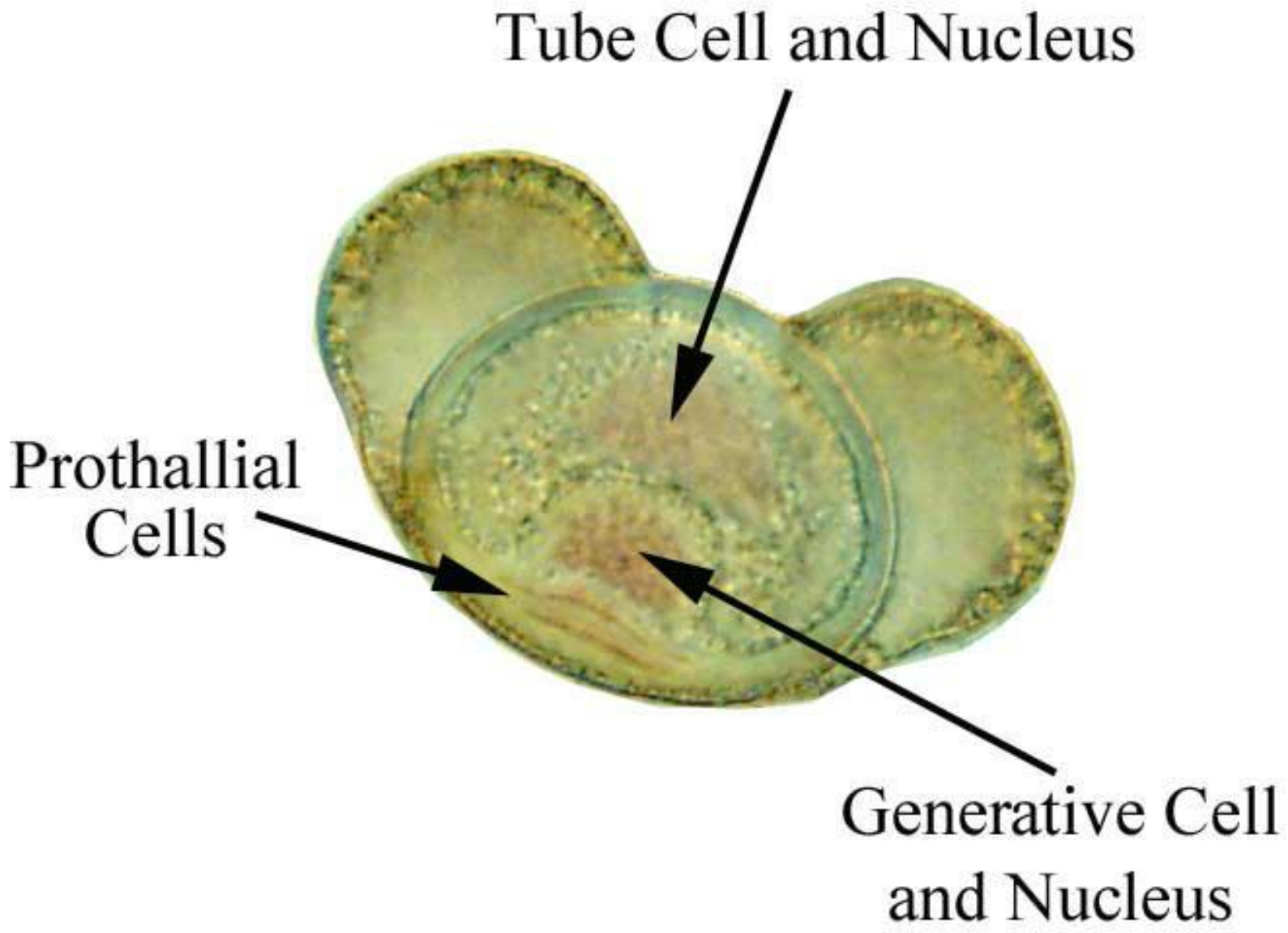


Female cone of *Pinus*


sterile bract
ovuliferous scale
cone axis
ovule
megaspore

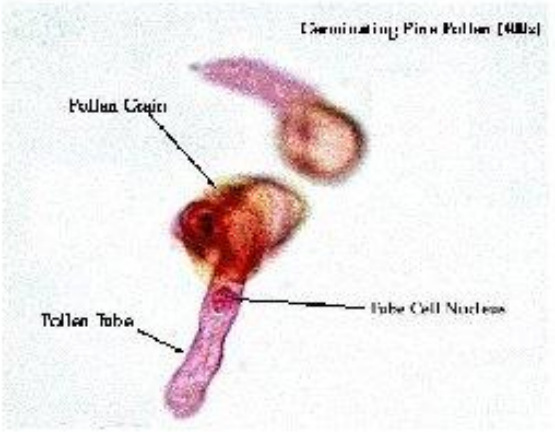

OVULE AND SEED OF A PINE TREE
Pollen tubes
Nucellus
Archegonia
Outer fleshy layer
Inner fleshy layer
Stony layer
Megaspore wall
Female gametophyte
Remains of the nucellus
Root
Shoot apex
Two of several cotyledons
Embryo
A OVULE
B SEED

Task 3. The structure of the pollen of the common pine tree.


Tube Cell and Nucleus
Prothallial Cells
Generative Cell and Nucleus

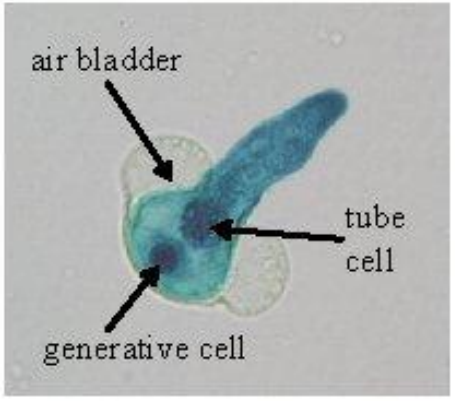
Pollination

- MITOSIS within the pollen grain produces **three cells** – 2 small cells (which degenerate) and **one large cell**
- this large cell divides to form: **a generative cell and a tube cell**
- the tube cell elongates to form the pollen tube
- the generative cell forms 2 sperm

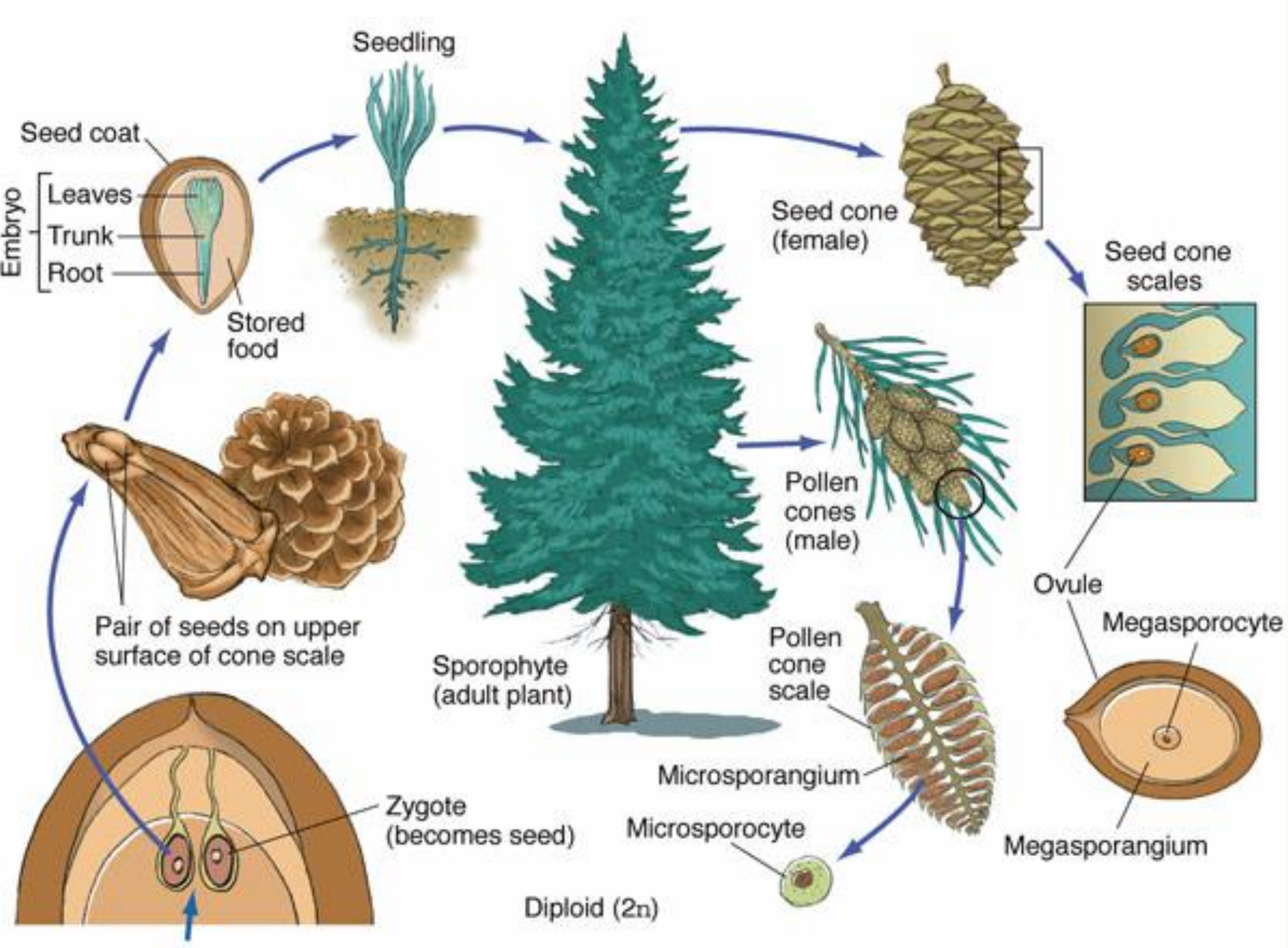


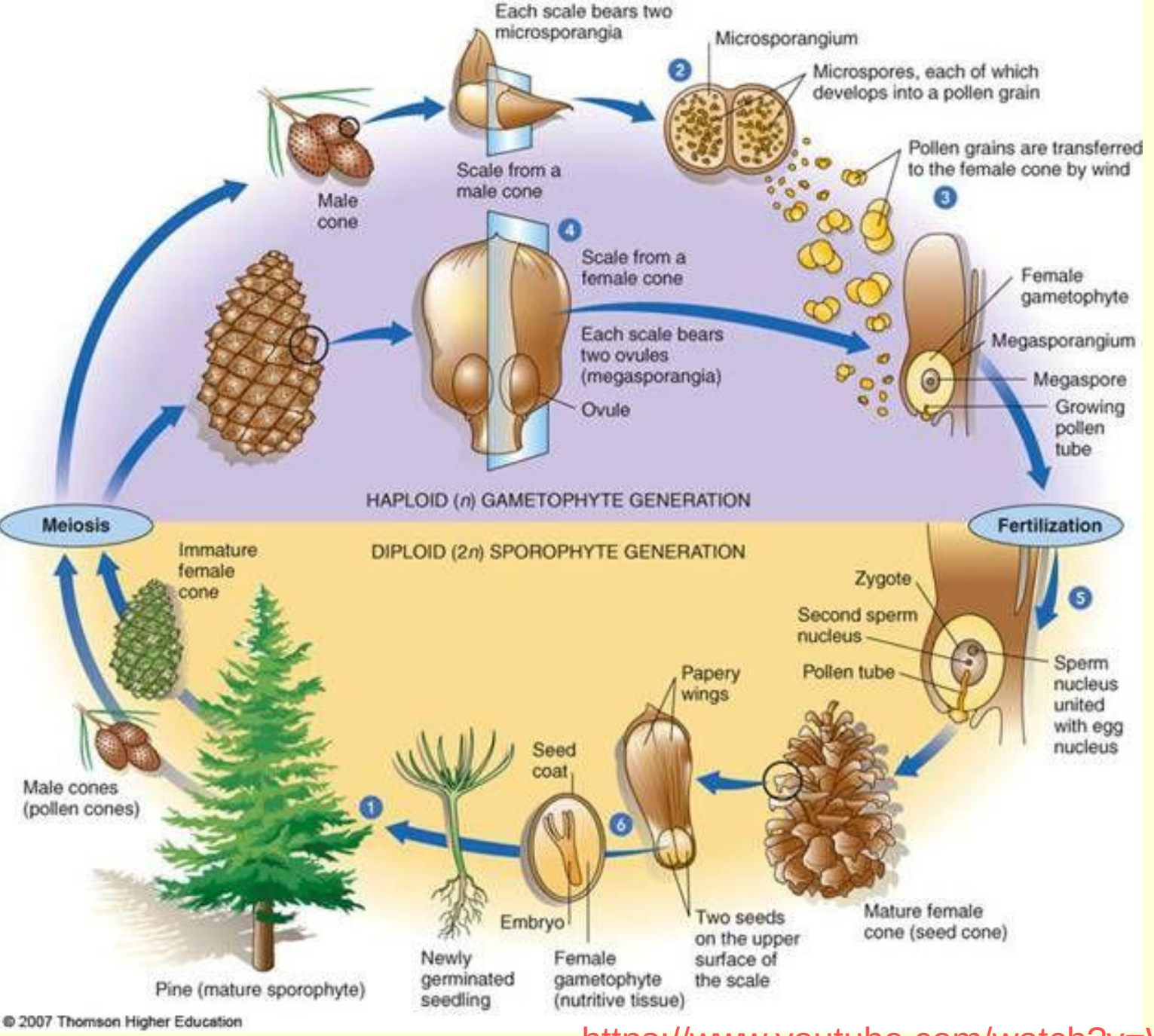
germinating pollen grains with pollen tube

- as the eggs mature – the pollen tube is developing its two sperm cells
- **so the eggs and sperm mature at the same time**



Task 4: Study the development cycle of Gymnosperms using the example of Scots pine.


Seedling
Seed coat
Embryo
Leaves
Trunk
Root
Stored food
Seed cone (female)
Seed cone scales
Pollen cones (male)
Ovule
Megasporocyte
Pair of seeds on upper surface of cone scale
Sporophyte (adult plant)
Pollen cone scale
Microsporangium
Zygote (becomes seed)
Microsporocyte
Megasporangium
Diploid (2n)



https://www.youtube.com/watch?v=WqGhmkYXcdM