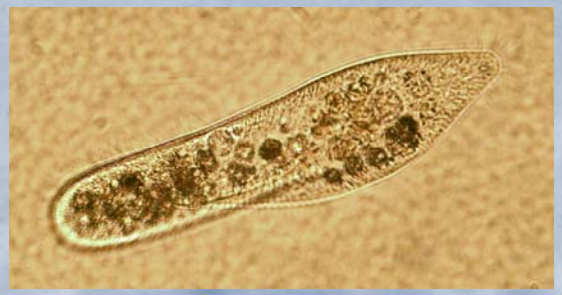
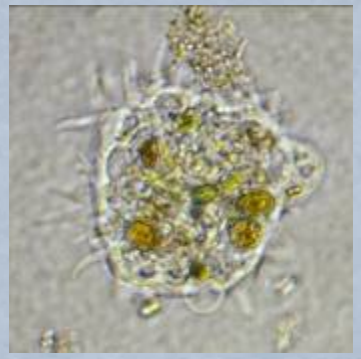
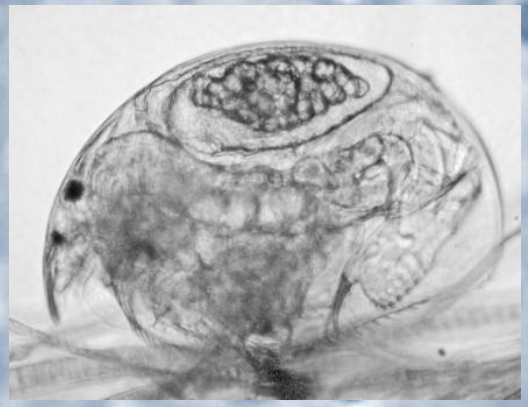


Fresh Water *Microscopic* Pond Life , Lakewood Ranch, Florida



Mikrogeo



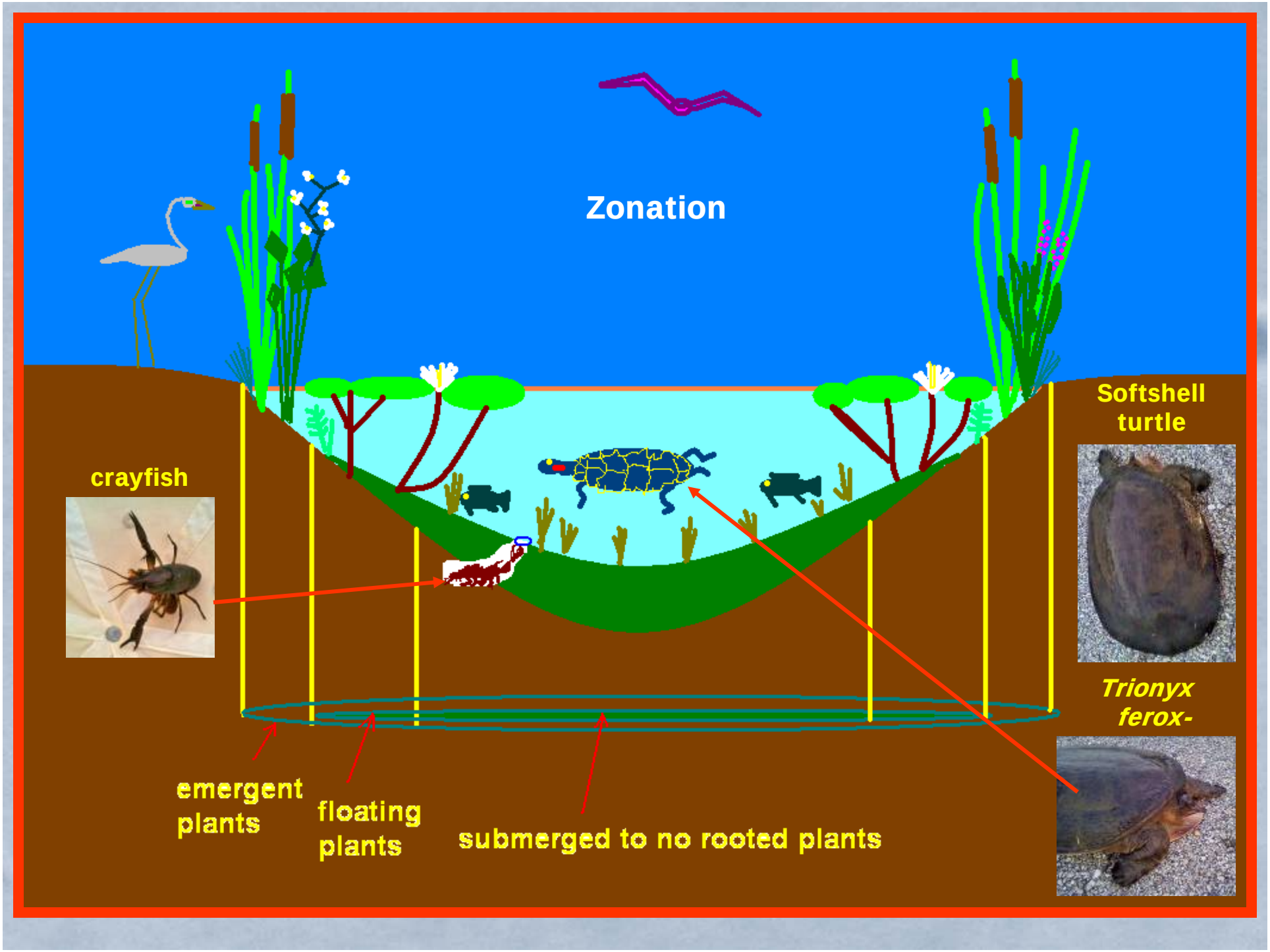
mikrogeo.com

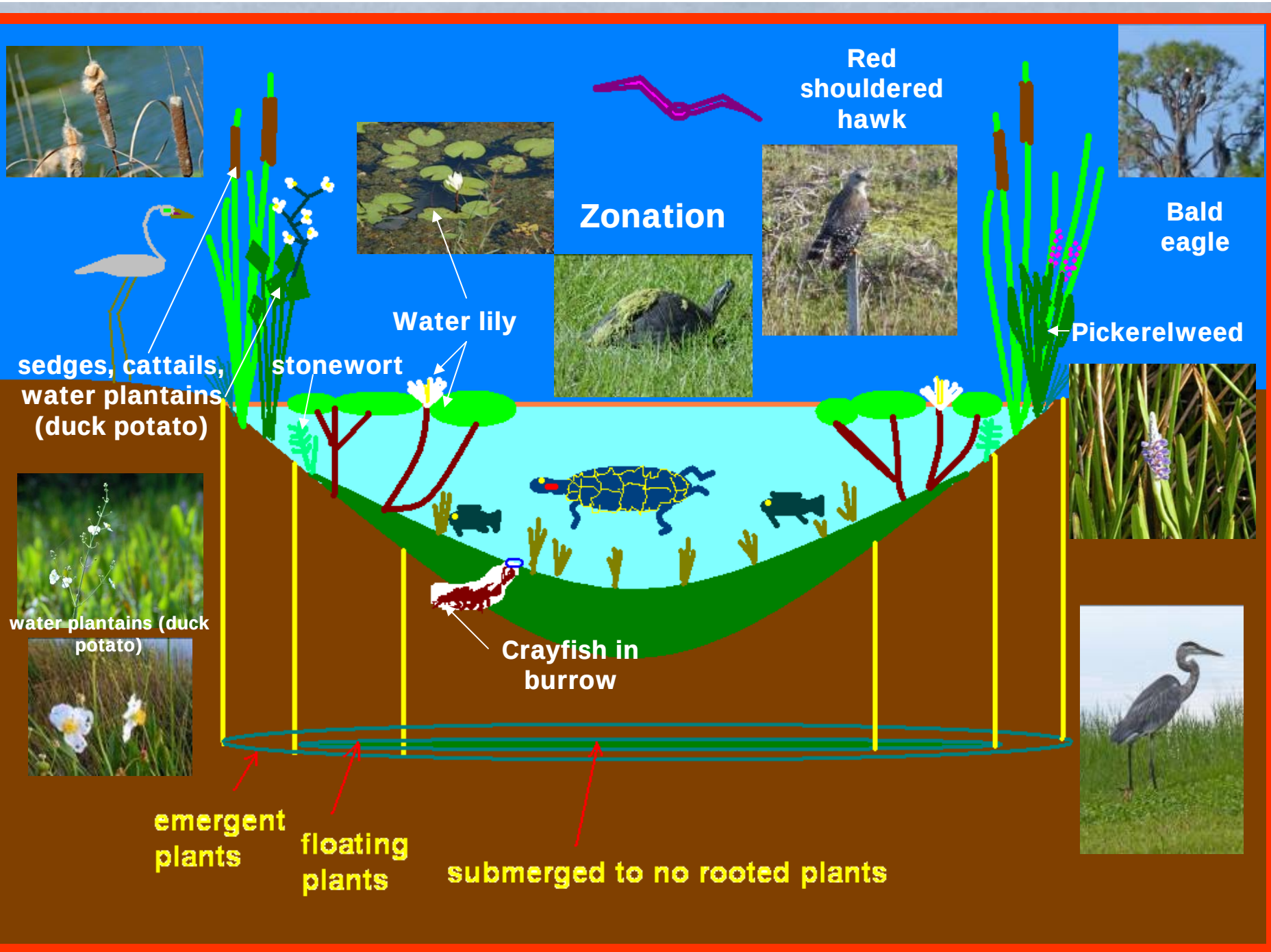
John E.B. Baker

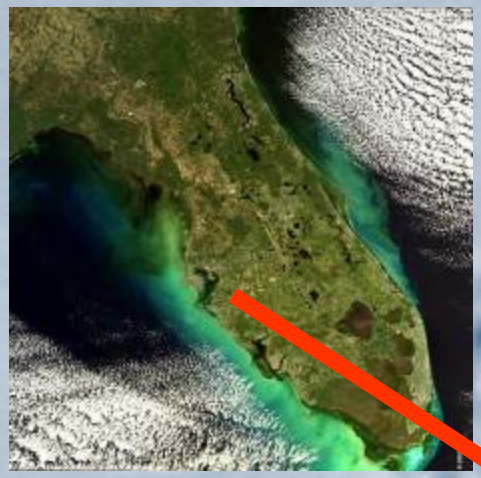
I have added 1-3 minute videos on many of the critters here photographed: just go to YouTube and search the name mikrogeo to find about 35 movies, or click links on individual slides

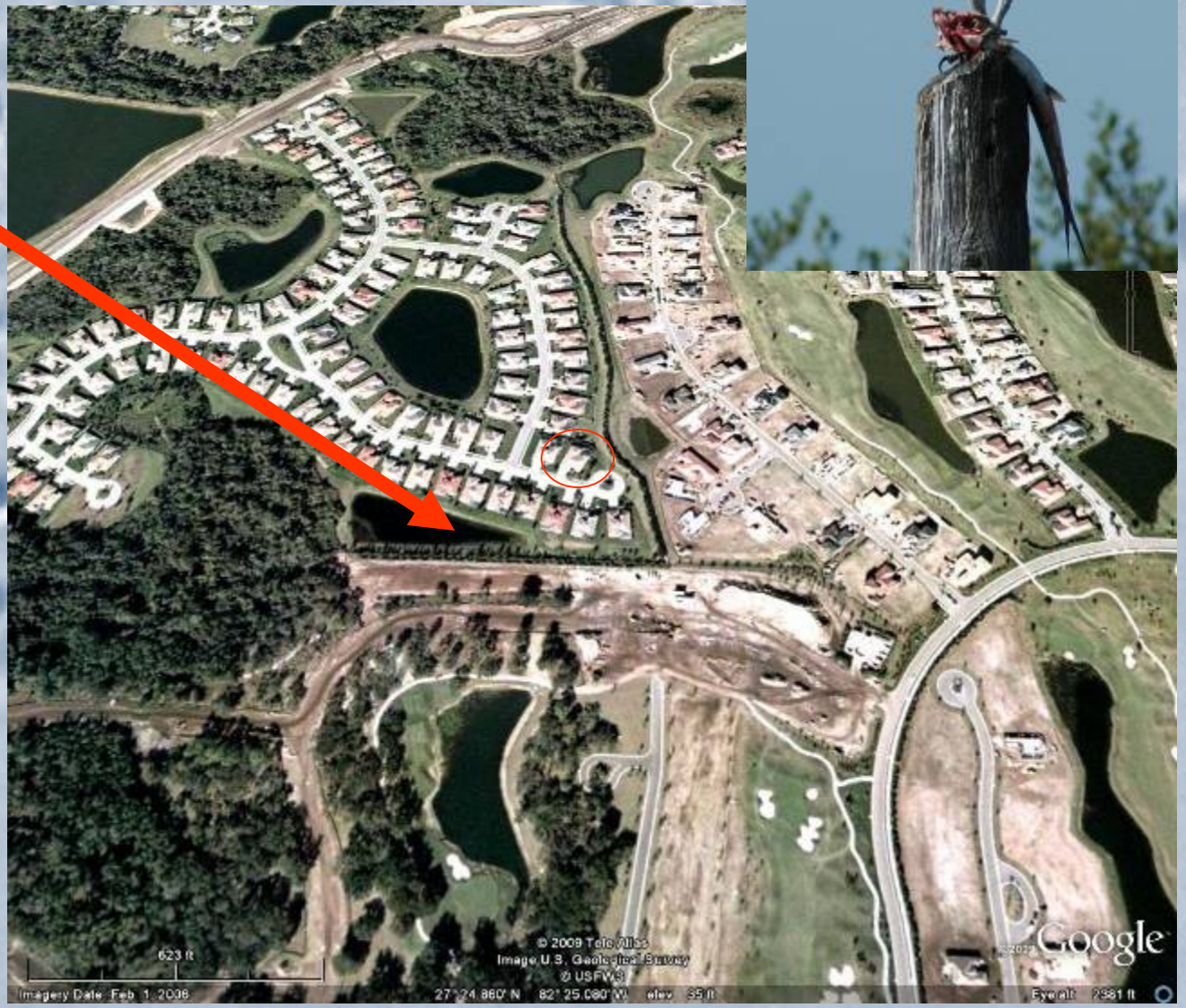
http://www.youtube.com

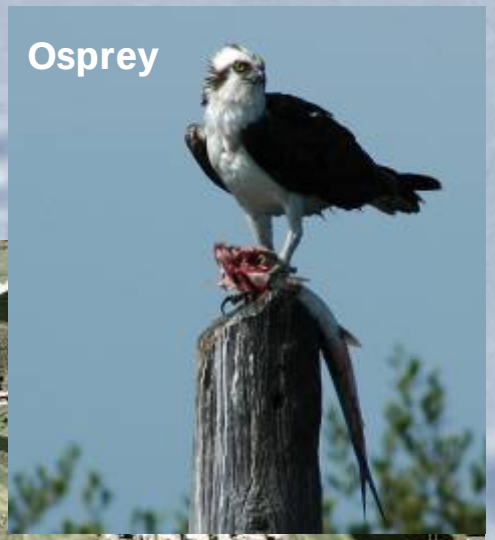
http://www.youtube.com/watch?v=i3AR5ZDRyWE


Zonation
crayfish
Softshell turtle
Trionyx ferox-
emergent plants
floating plants
submerged to no rooted plants


Zonation
Red shouldered hawk
Bald eagle
Water lily
sedges, cattails, water plantains (duck potato)
stonewort
Pickerelweed
water plantains (duck potato)
Crayfish in burrow
emergent plants
floating plants
submerged to no rooted plants







Small pond south of Lobelia Terrace in Lakewood Ranch FL (note modern taxonomy & phylogenetic hierarchy has been largely ignored for simplicity)

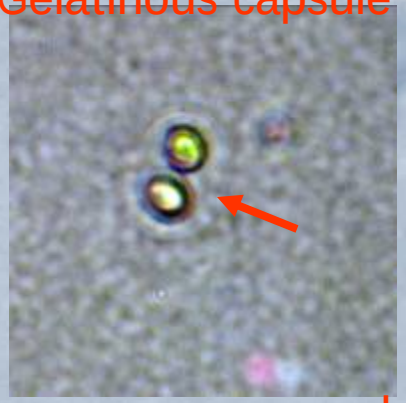
Anton Van Leeuwenhoek's single lens microscope ca 1670, Delft. – my collection- he discovered almost all these creatures

Protista & Unicellular 'Algae'

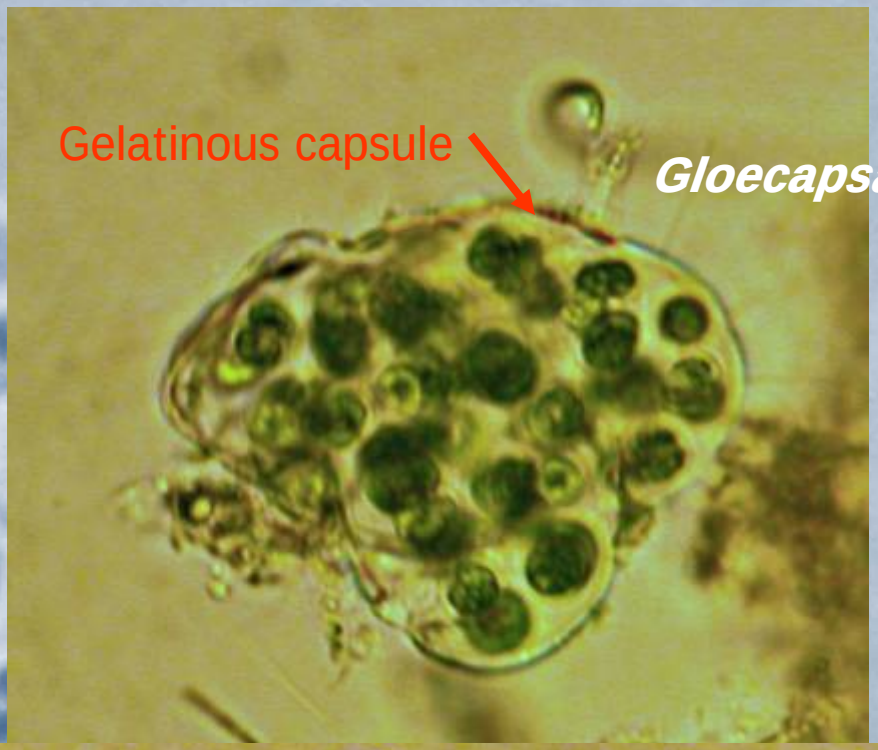
heterocyst

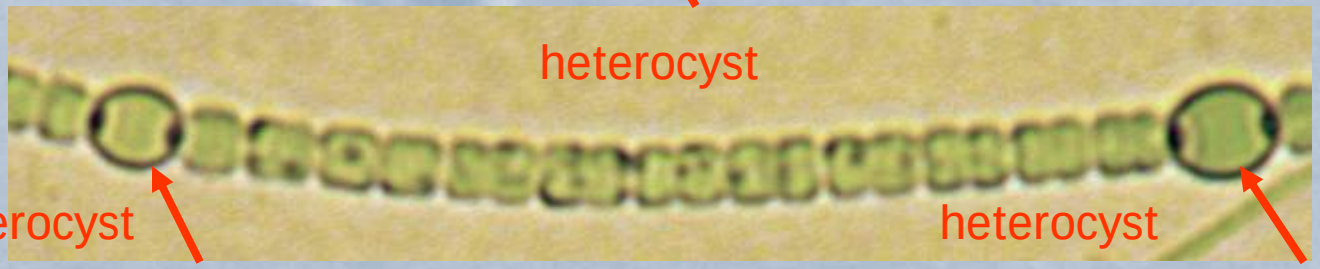
‘blue-green’ Cyanobacteria , no nucleus, no chloroplasts

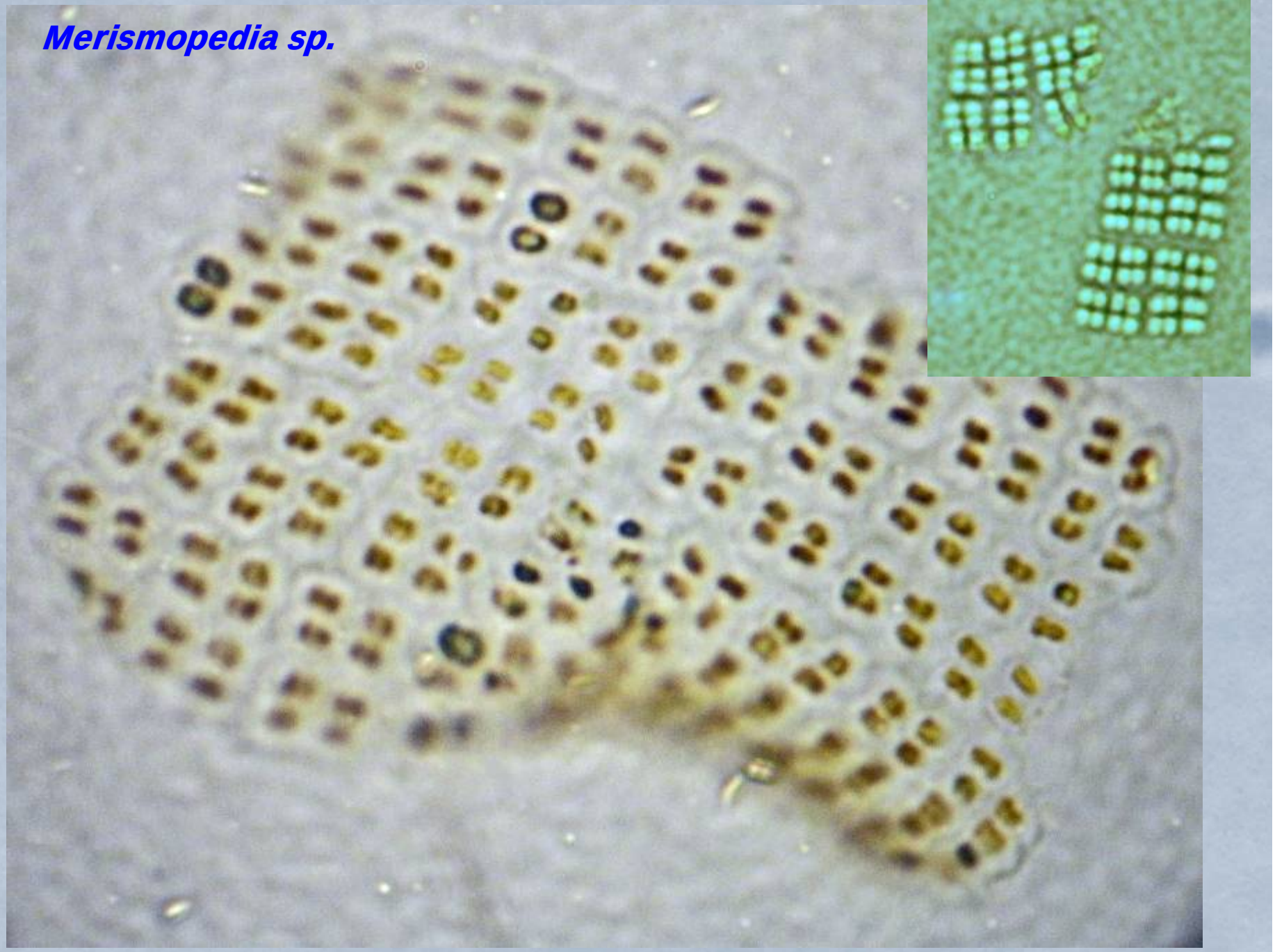
Gelatinous capsule

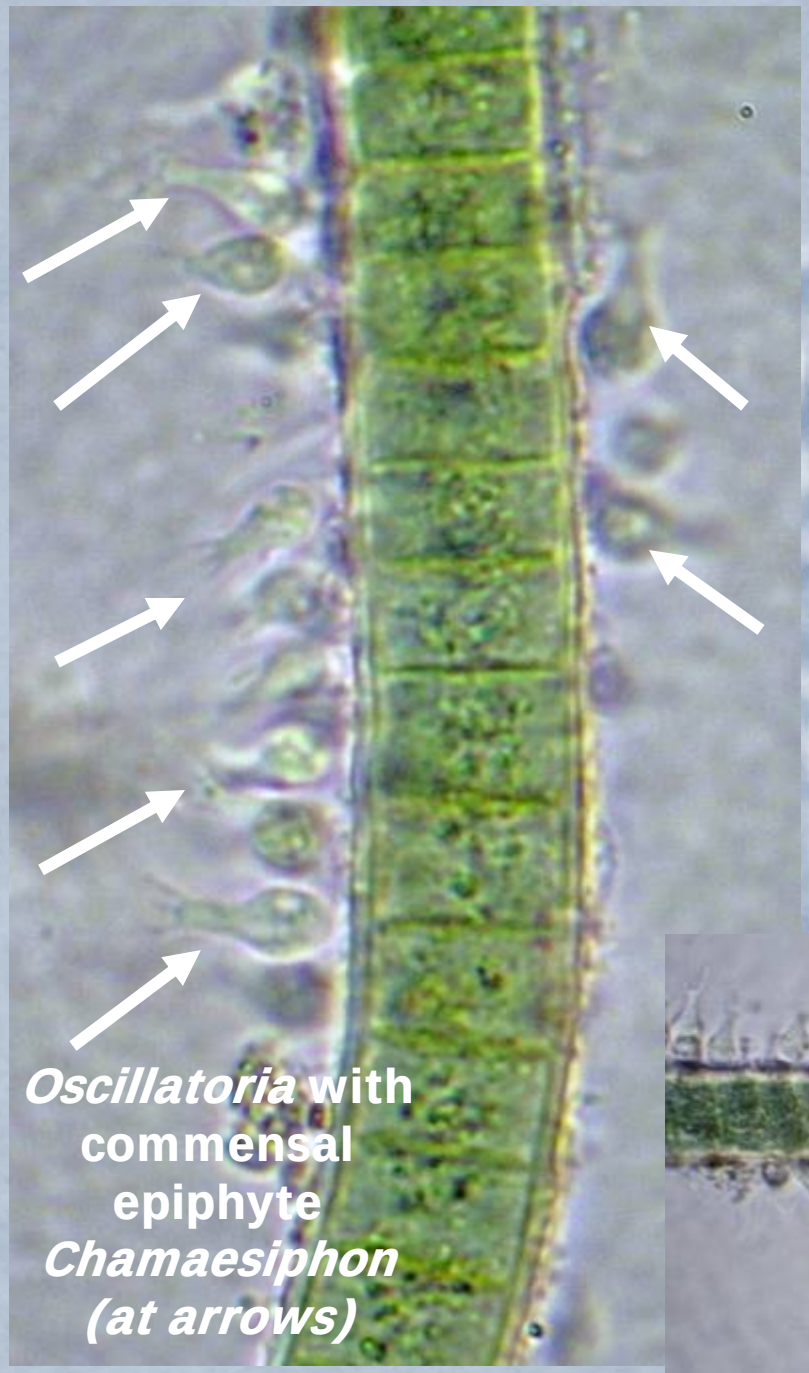


heterocyst

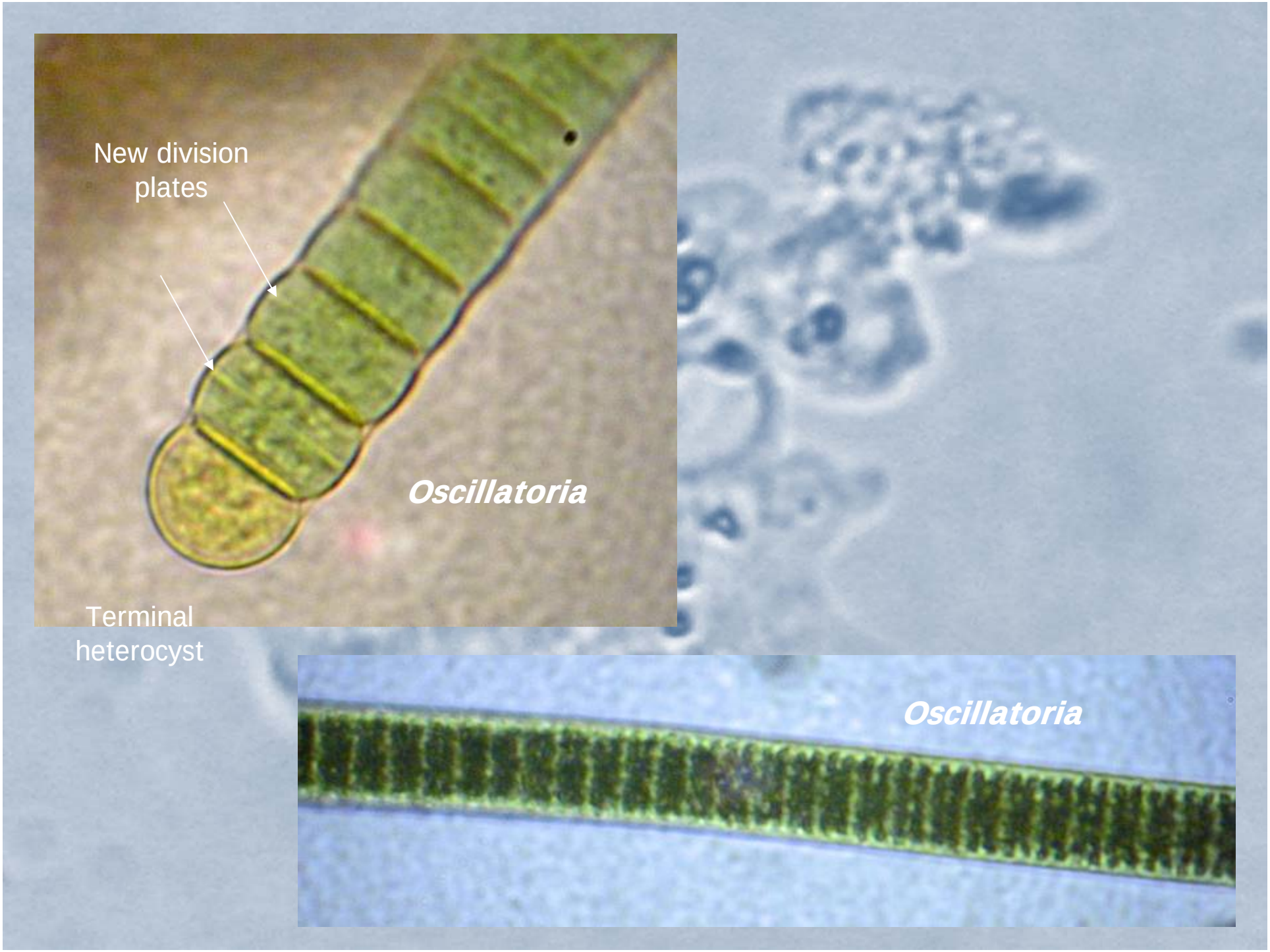


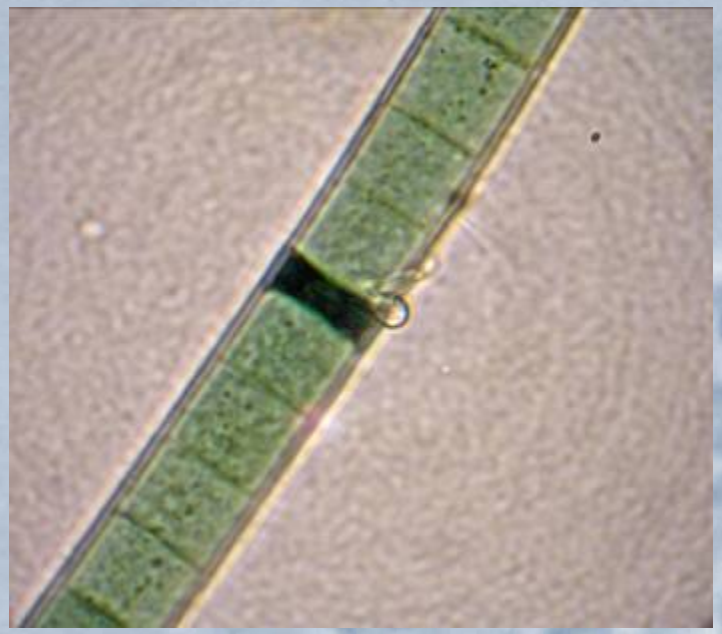



Merismopedia sp.



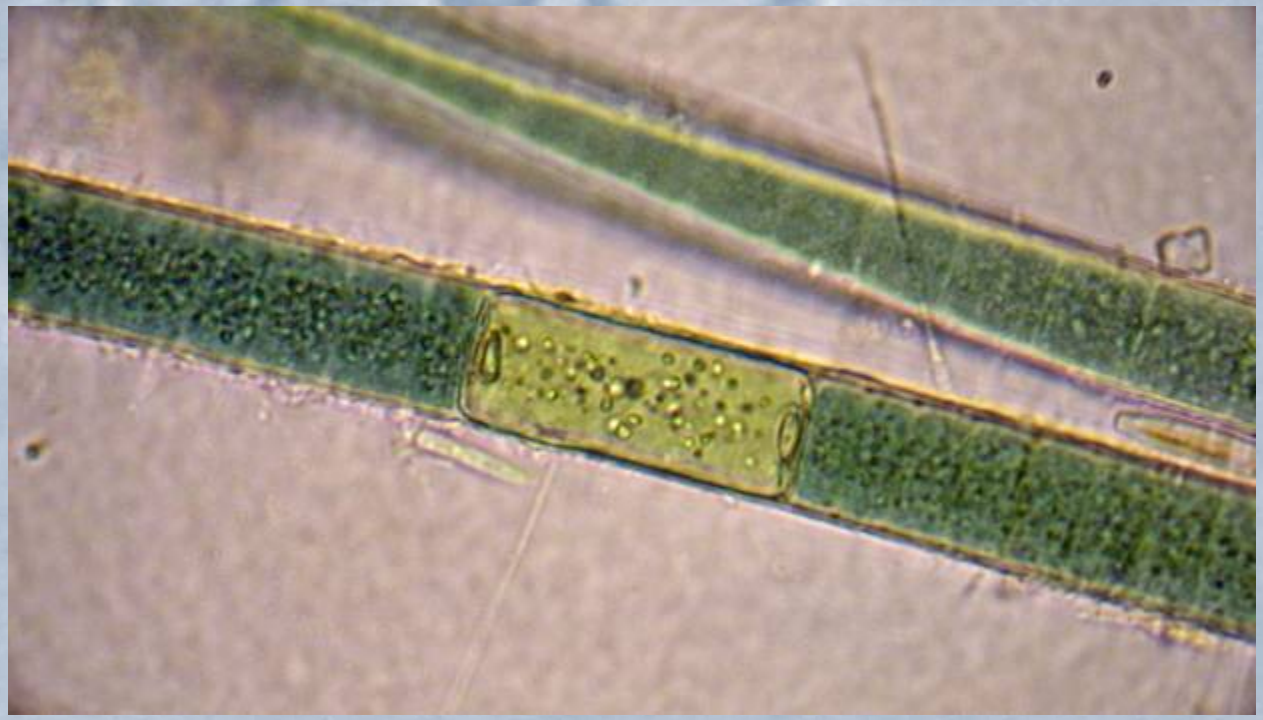
Oscillatoria with commensal epiphyte *Chamaesiphon* (at arrows)

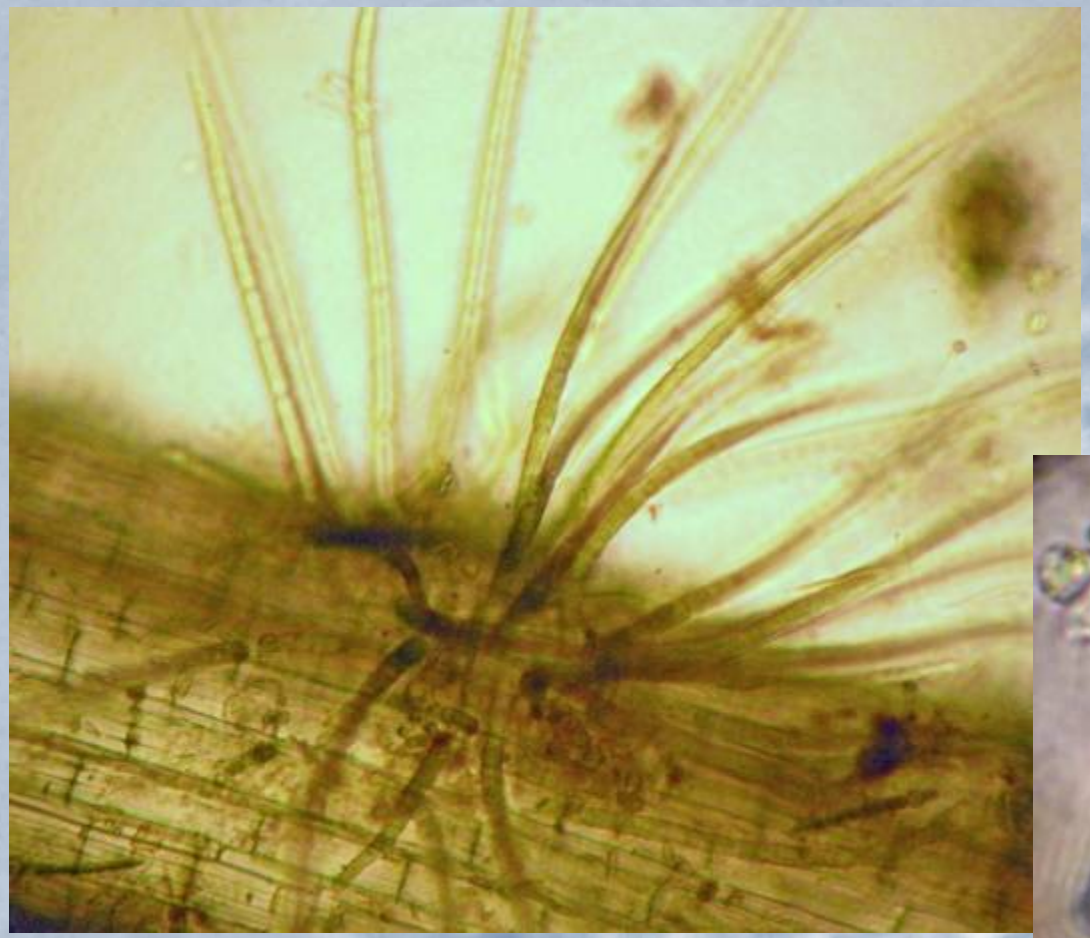

New division plates
Oscillatoria
Terminal heterocyst
Oscillatoria



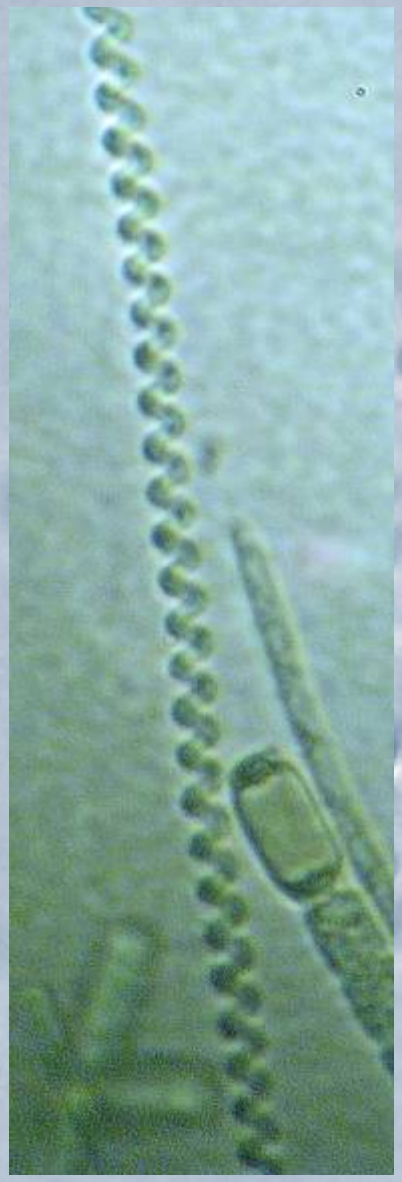
Oscillatoria

Note blue-green color of thes non-nucleate, non-chloroplast Prokaryotes

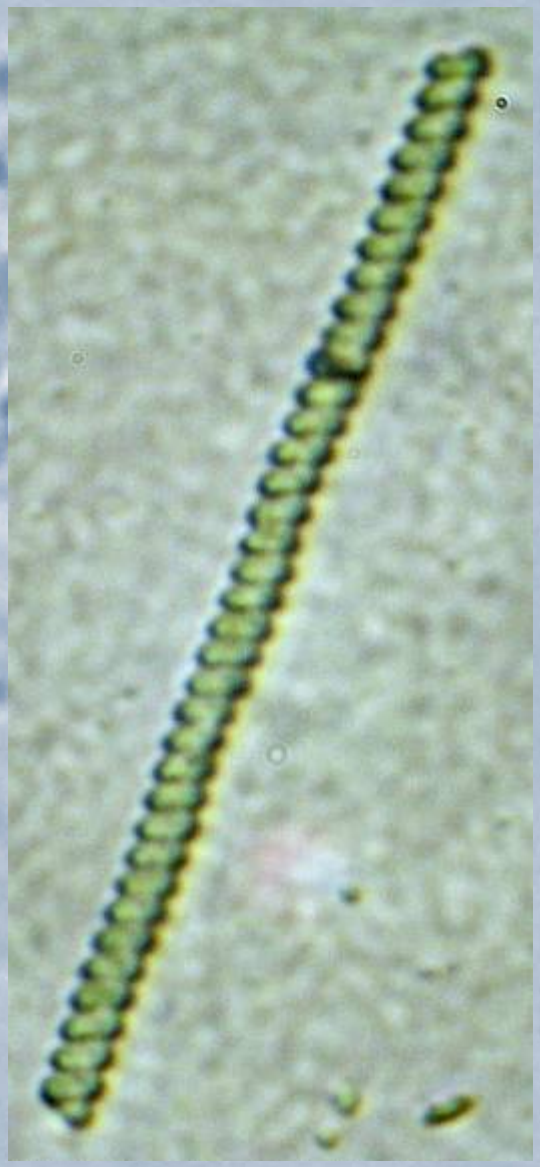


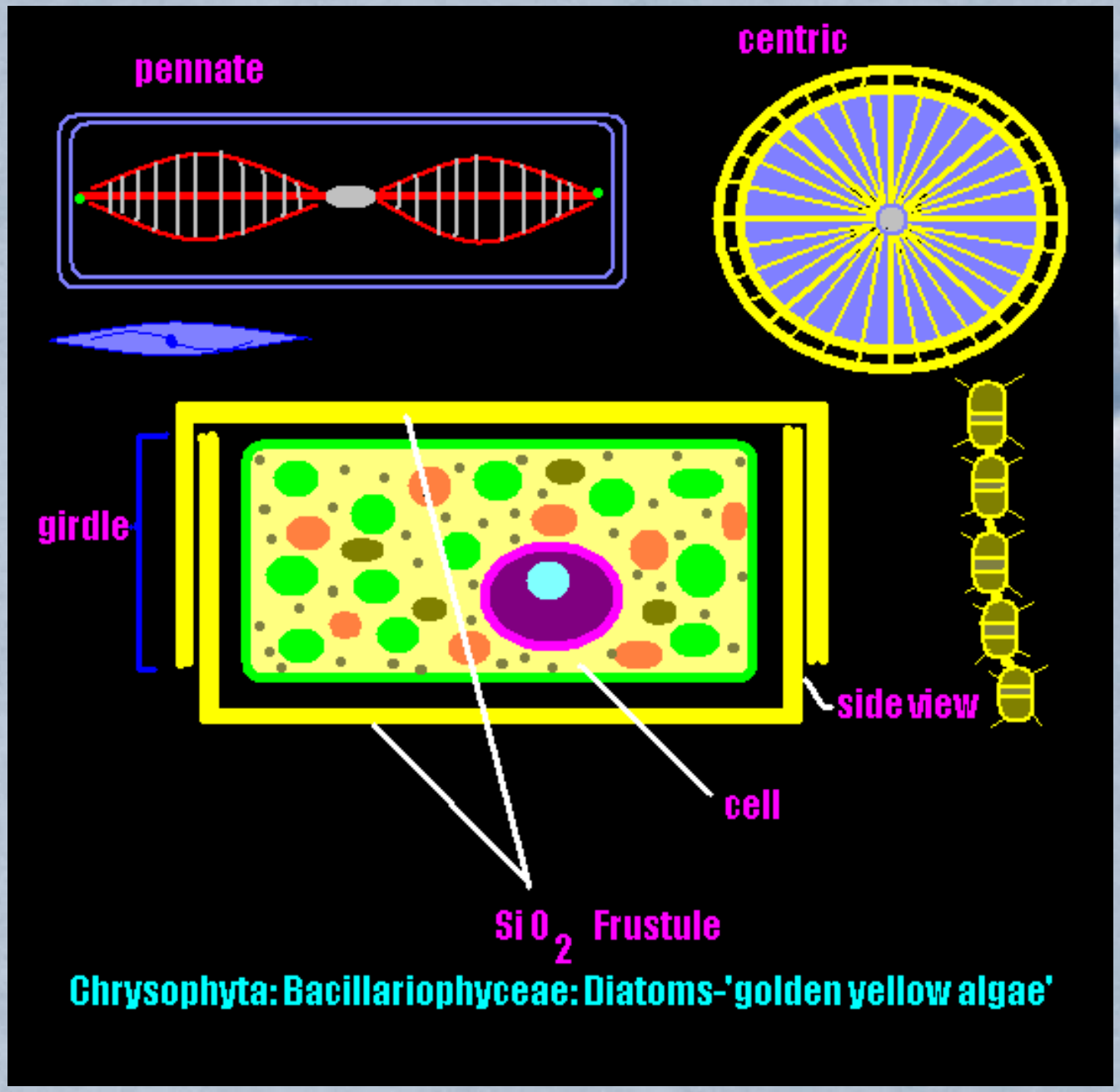


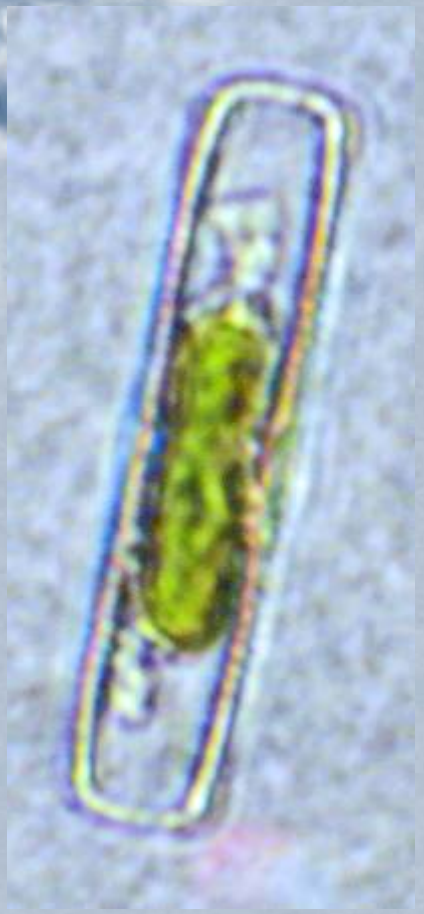
Cyanobacteria: Rivulariaceae – tapering trichome with heterocyst at base



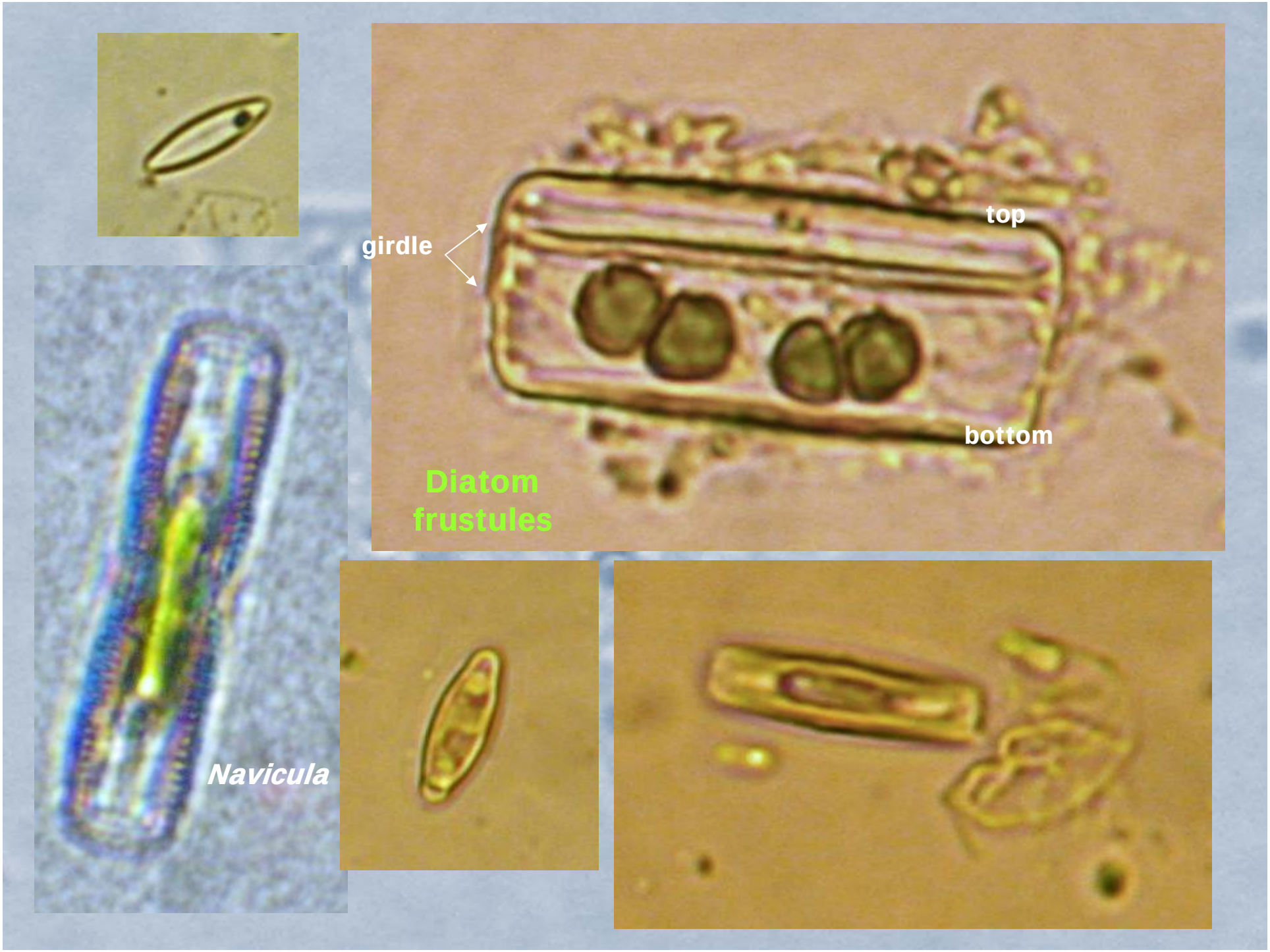
Spirulina

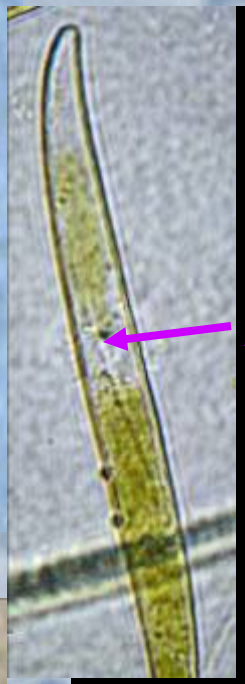


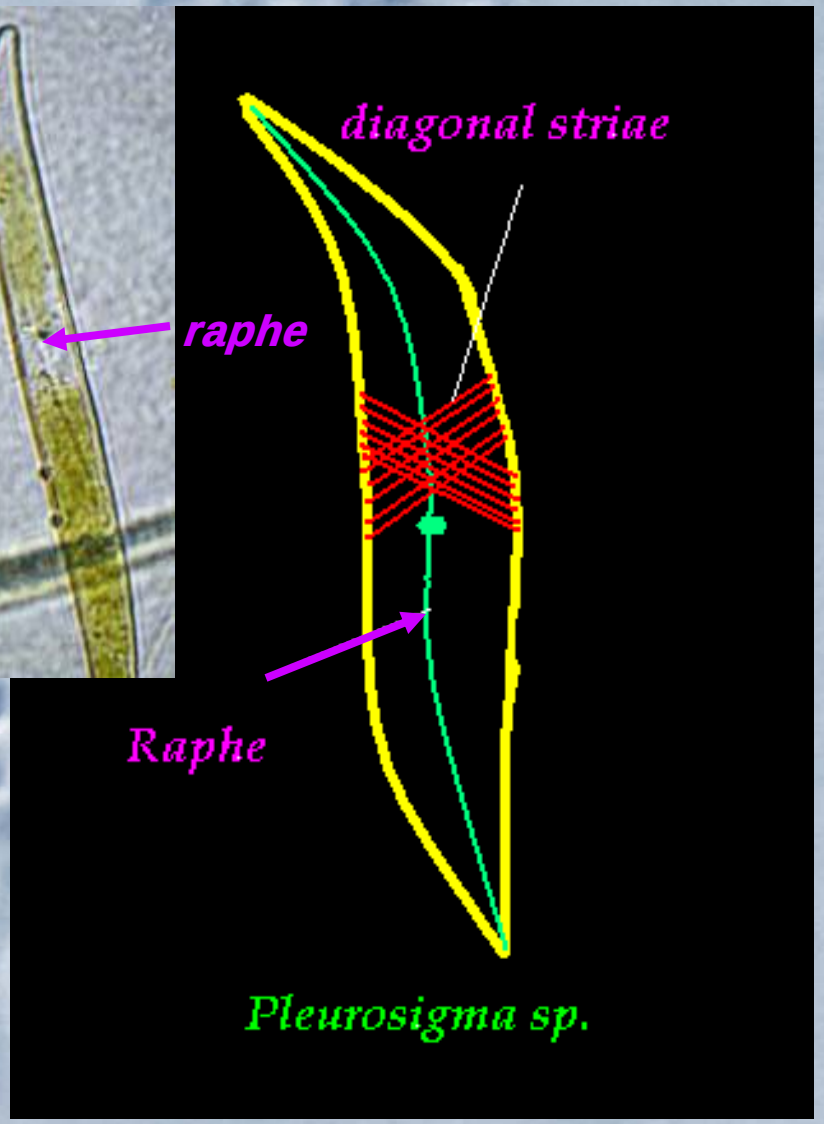

pennate
centric
girdle
side view
cell
Si O 2 Frustule
Chrysophyta: Bacillariophyceae: Diatoms-'golden yellow algae'

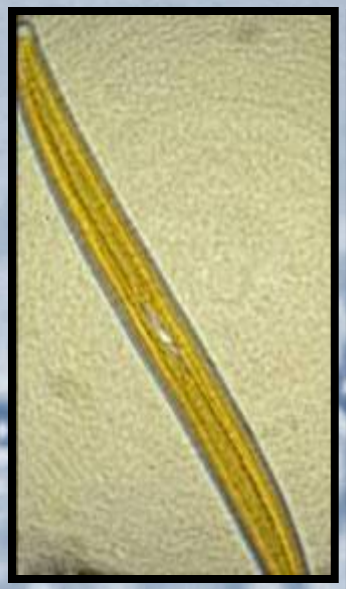


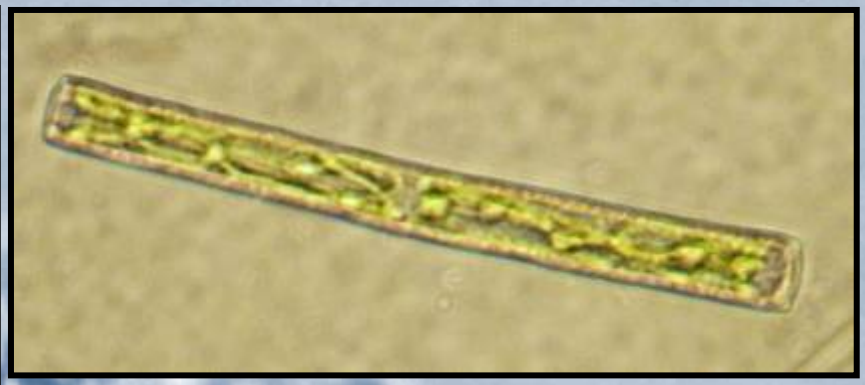

Diatom 'Bloom'
Anomoeoneis sp?

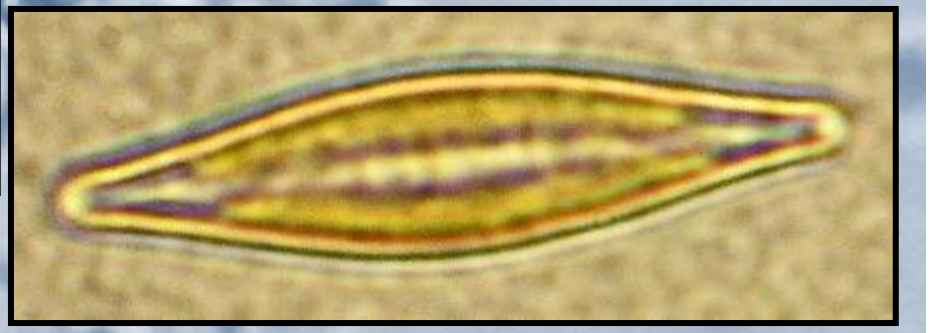

girdle
top
bottom
Diatom
frustules
Navicula



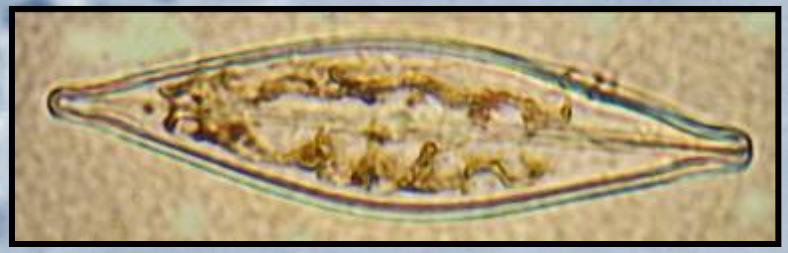

diagonal striae
raphe
Raphe
Pleurosigma sp.



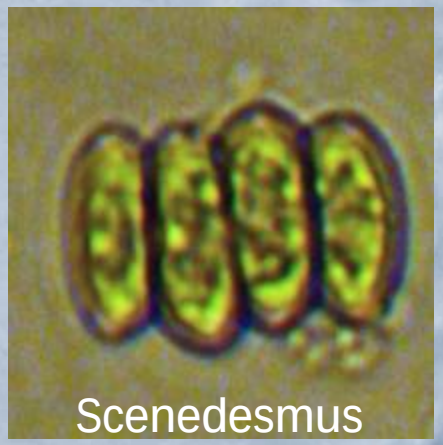




More Pennate Diatoms-
note golden yellow- color



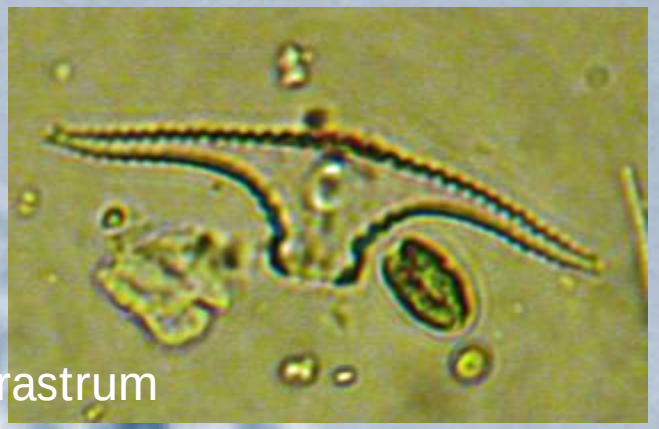
Scenedesmus



Scenedesmus

Scenedesmus

Scenedesmus



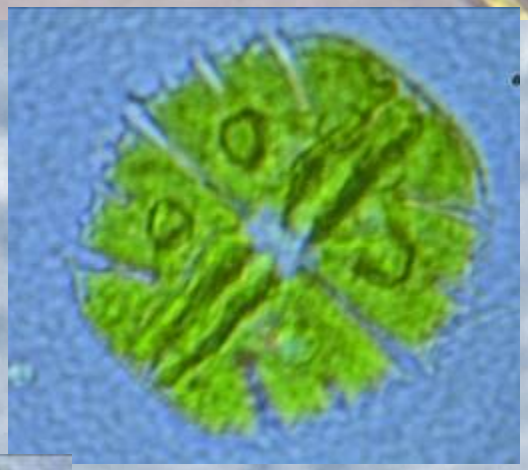
Staurastrum

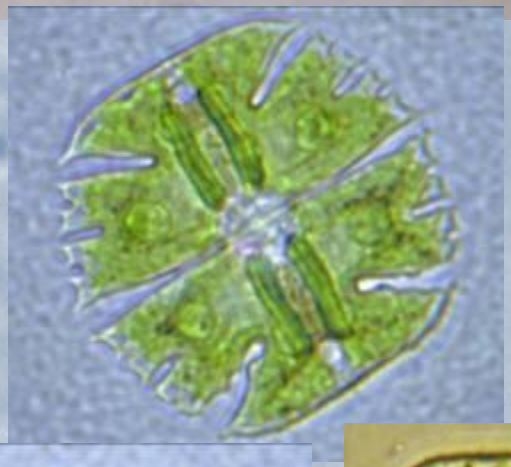
DESMIDS:
green alga

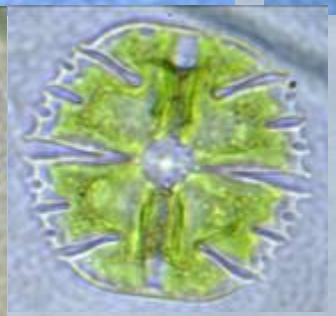
Cosmarium


DESMIDS:
green alga
Closterium
Moving
gypsum
xls

Another *Closterium*

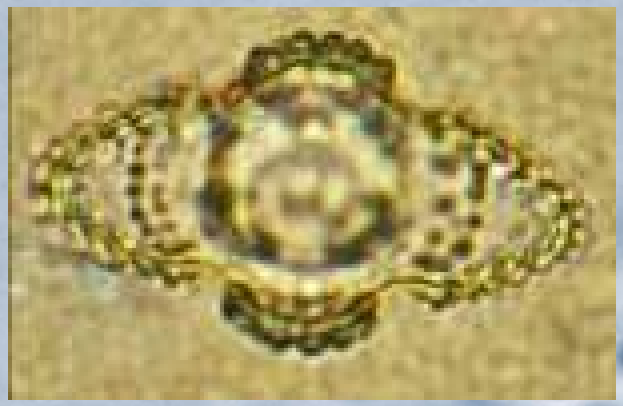


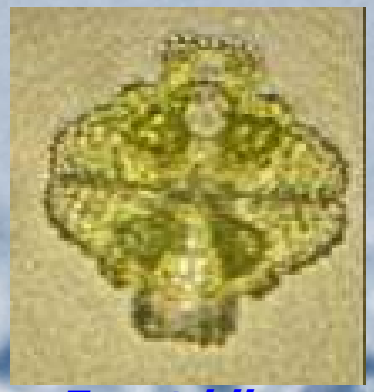




Micrasterias

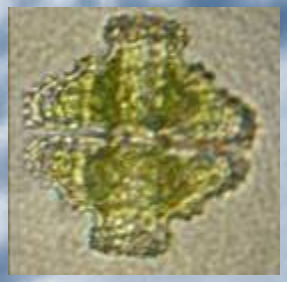
DESMIDS:
green alga





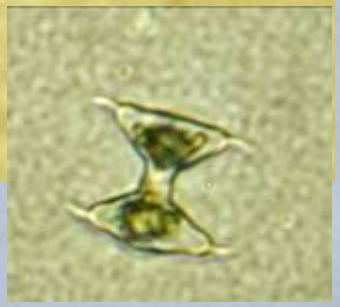
Euastridium

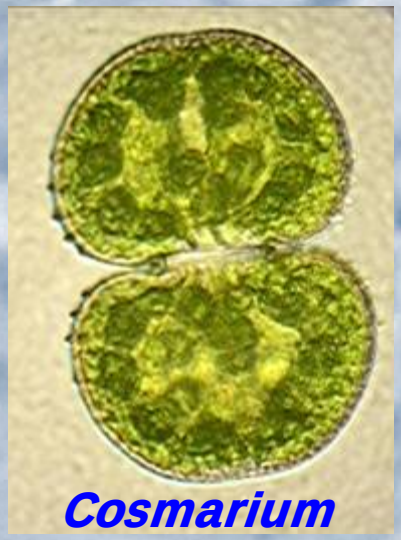
Filamentous desmid: ?*Sphaerozosoma*



More Desmids

Tetraedron

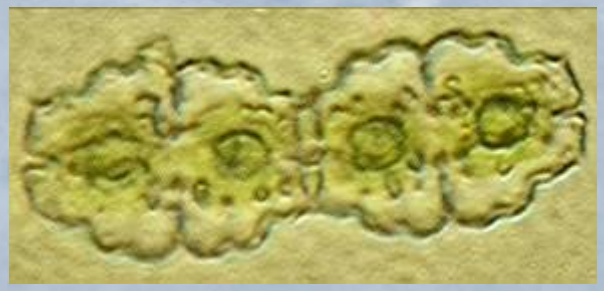


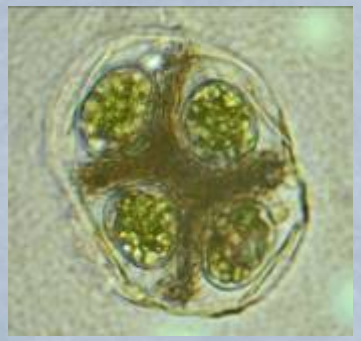


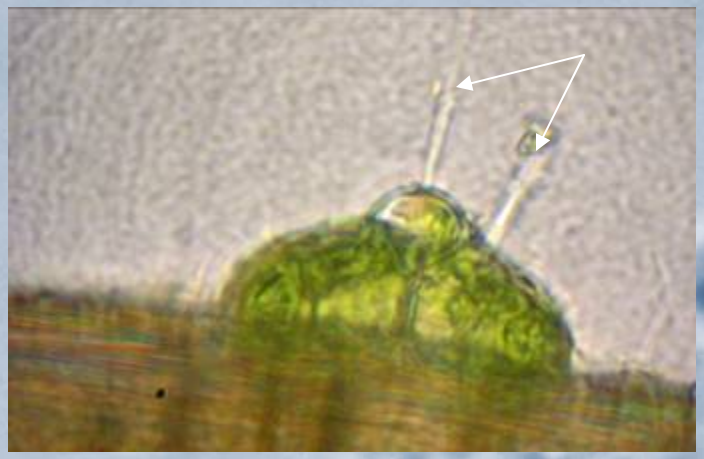
Cosmarium

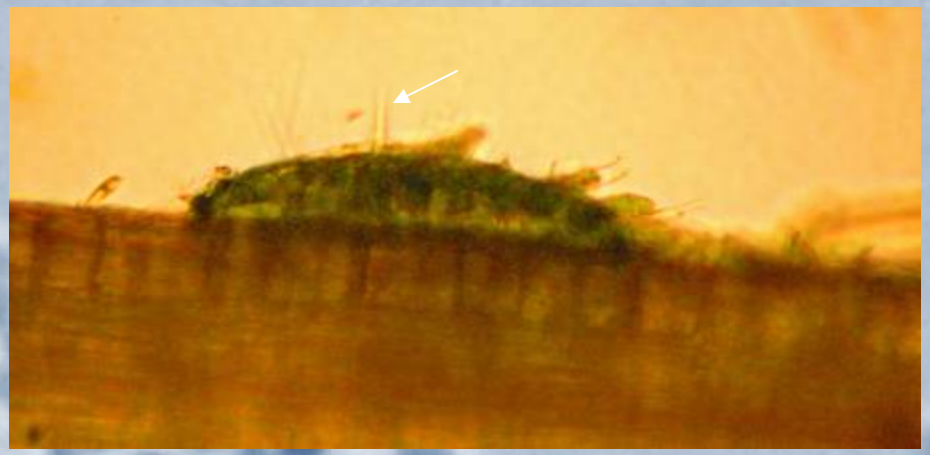
Staurastrum

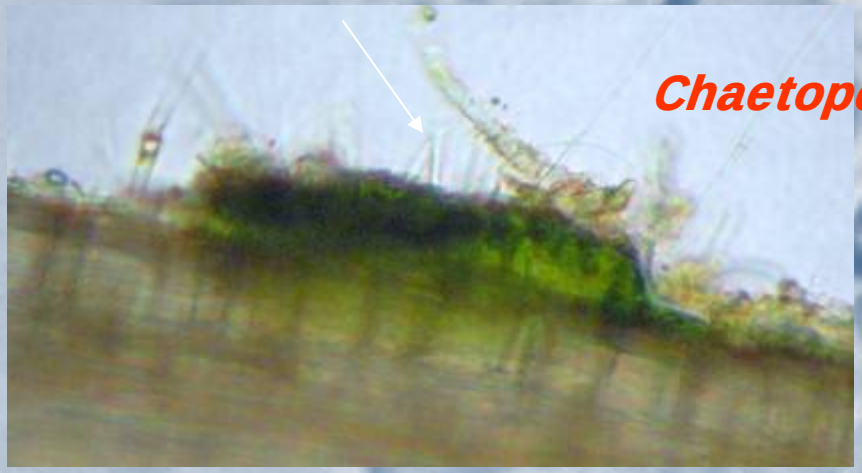
Gloeotaenium



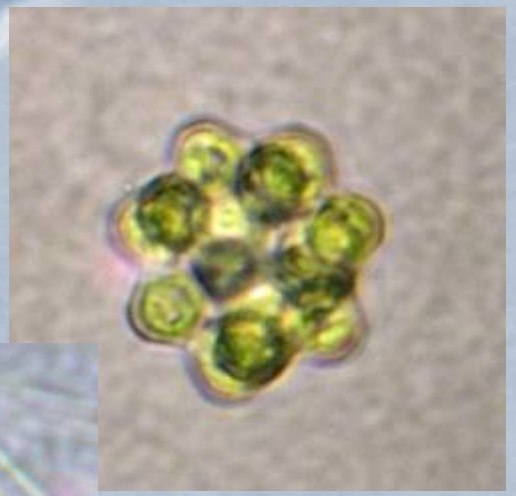


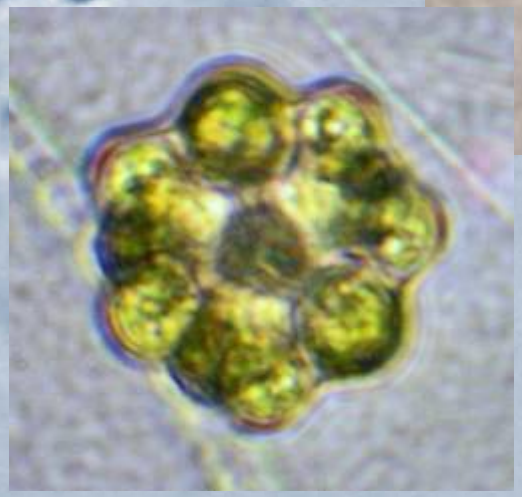






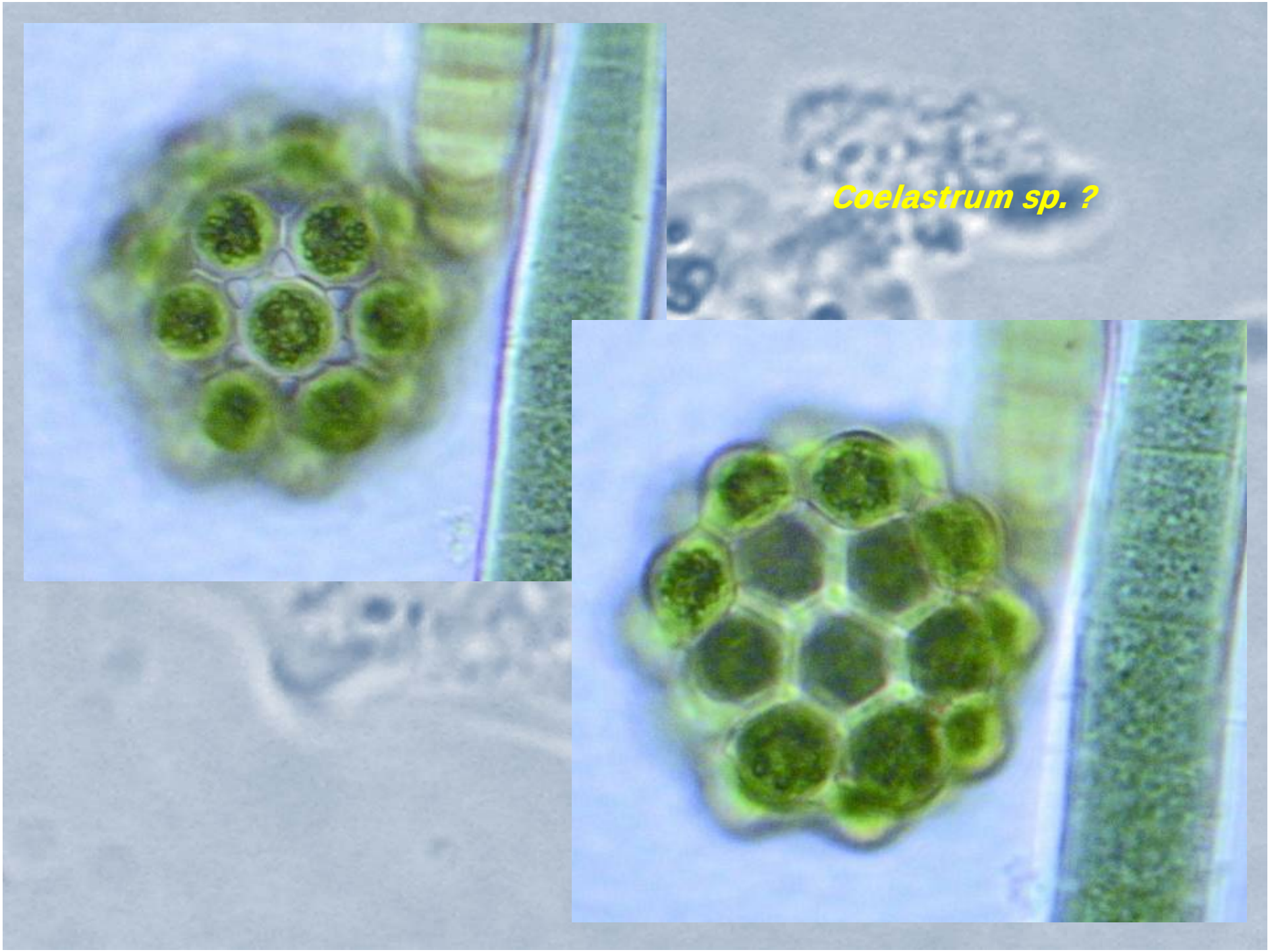
Chaetopeltis

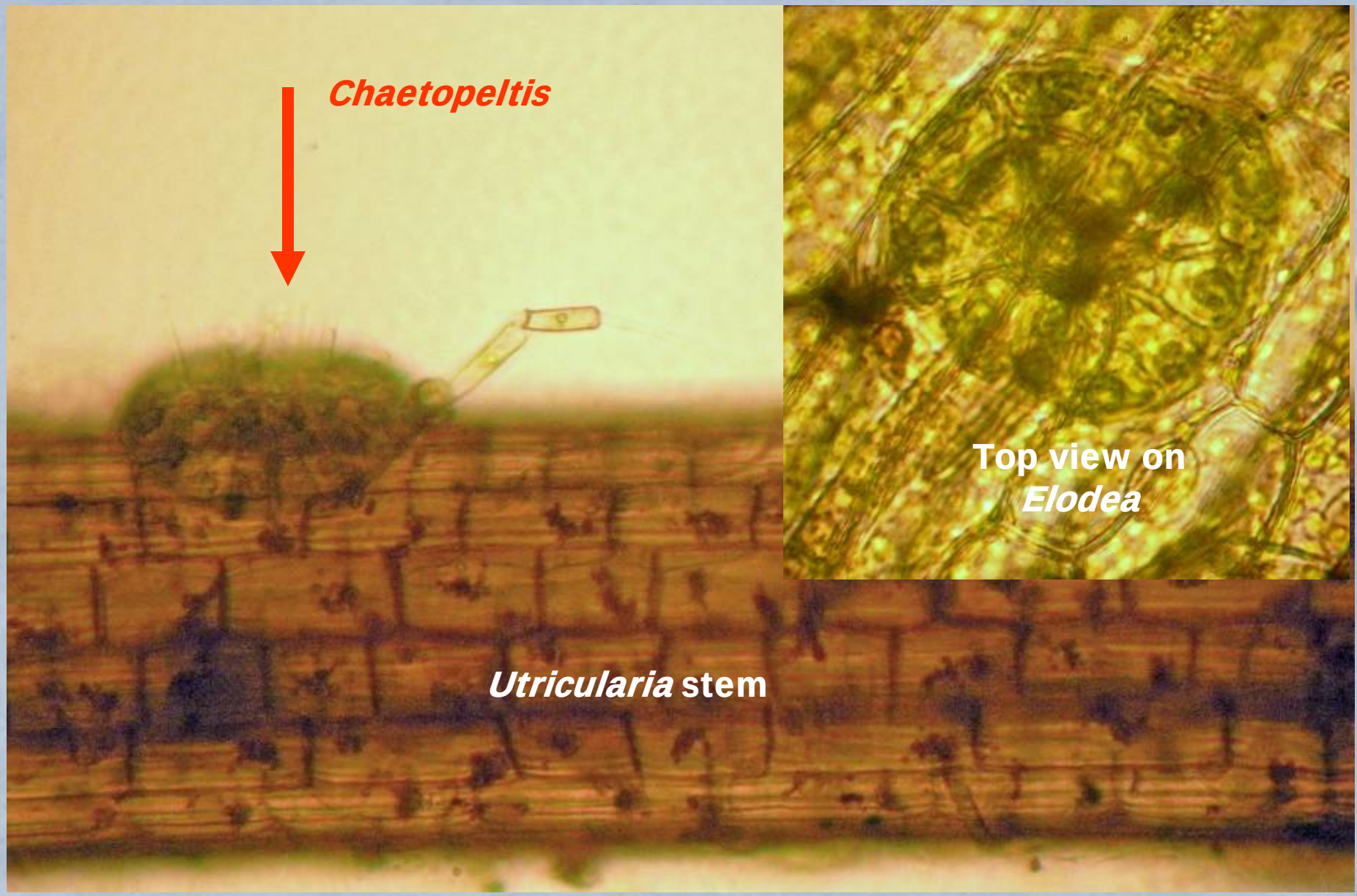




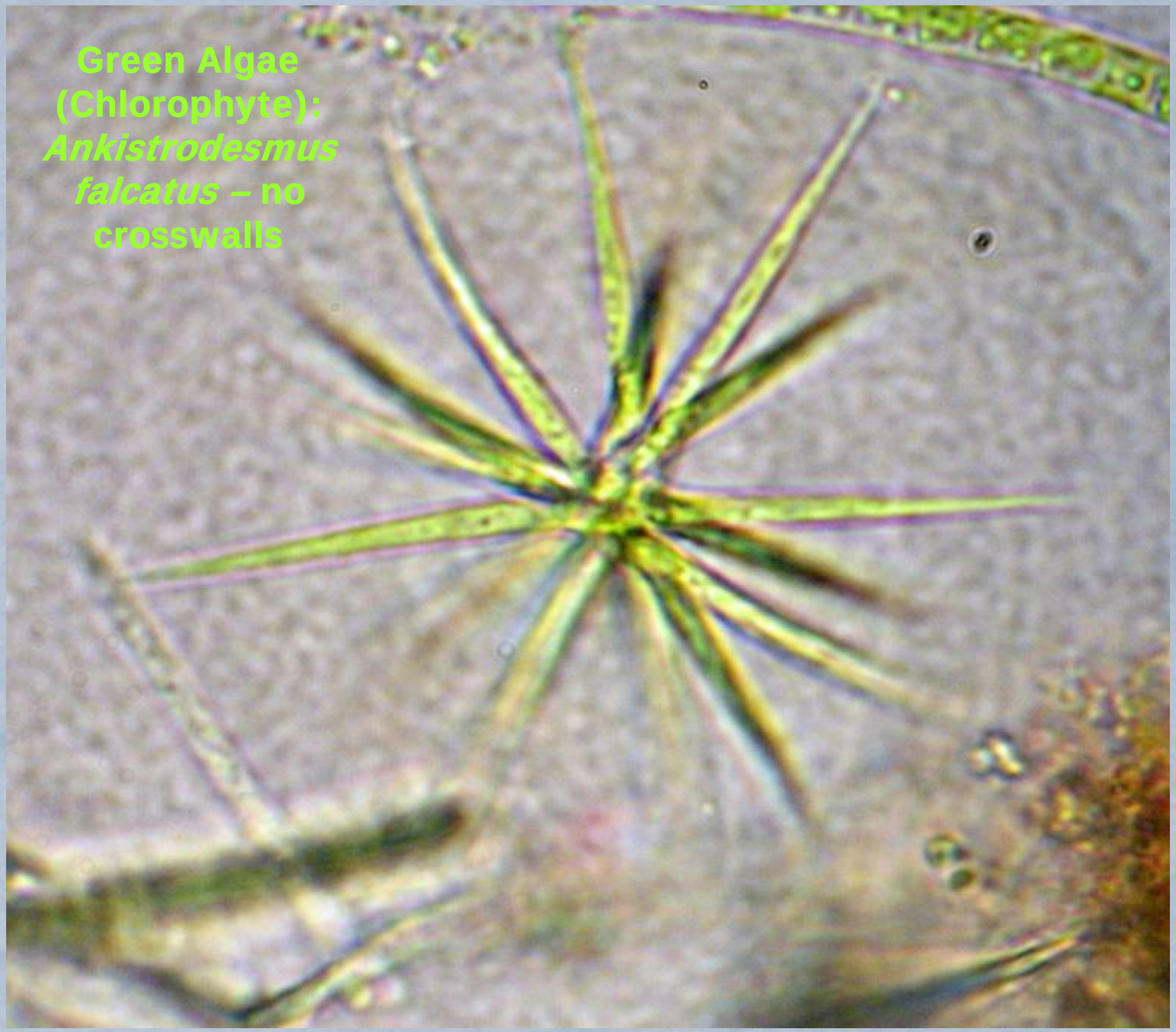
Encrusting green algae with radiating filaments (arrows)

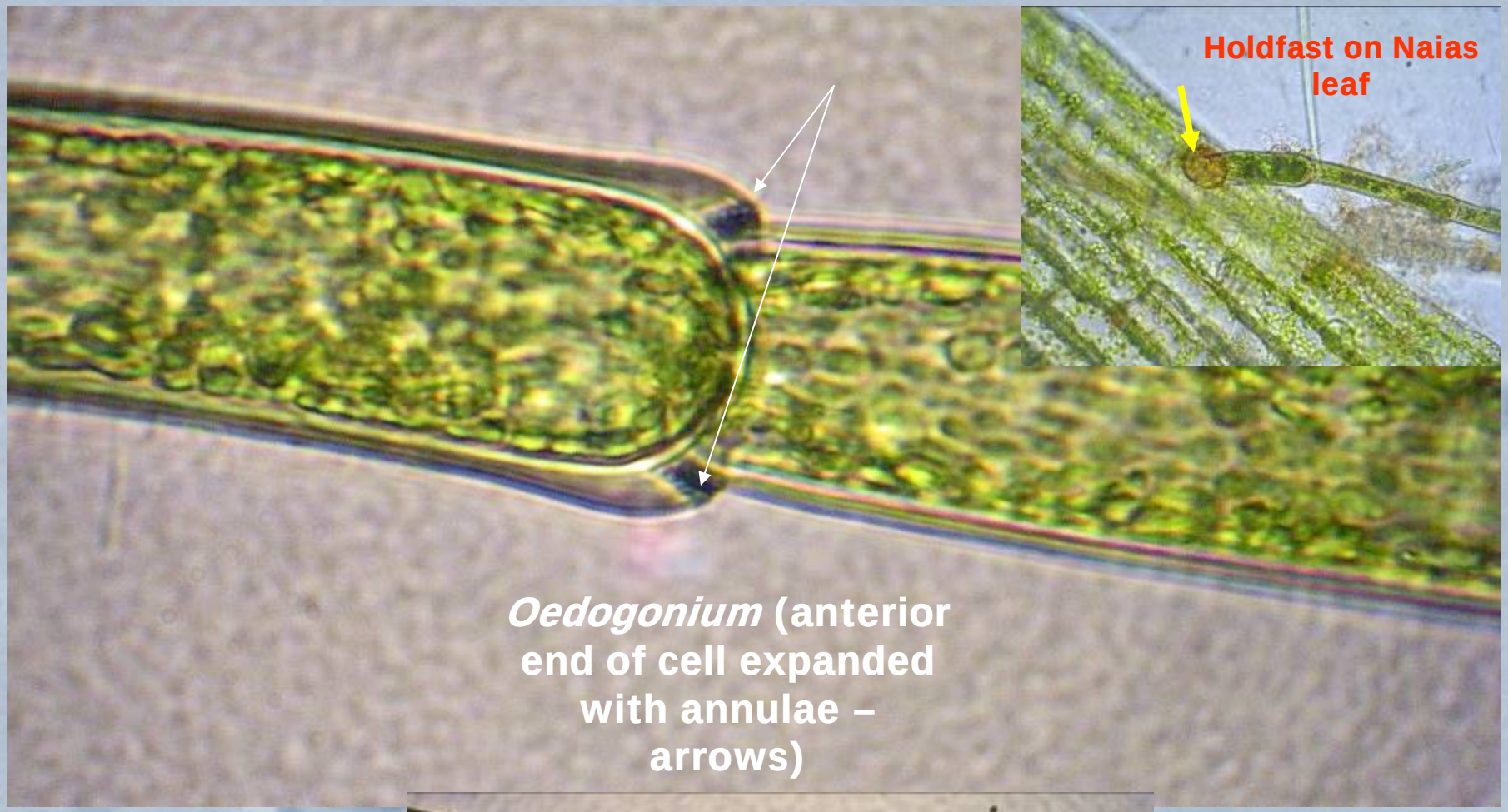
***Pandorina* a tumbler**


Coelastrum sp. ?


Chaetopeltis
Top view on
Elodea
Utricularia stem

Pleurotaenium


Green Algae (Chlorophyte): *Ankistrodesmus falcatus* – no crosswalls

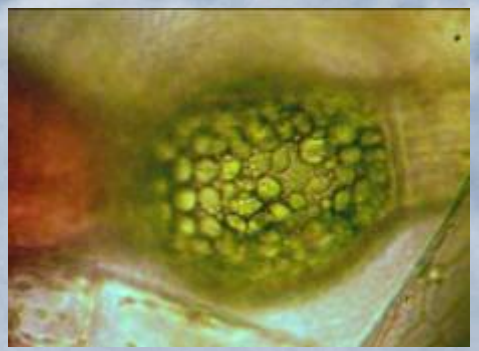


Oedogonium **(anterior end of cell expanded with annulae – arrows)**

filamentous green alga

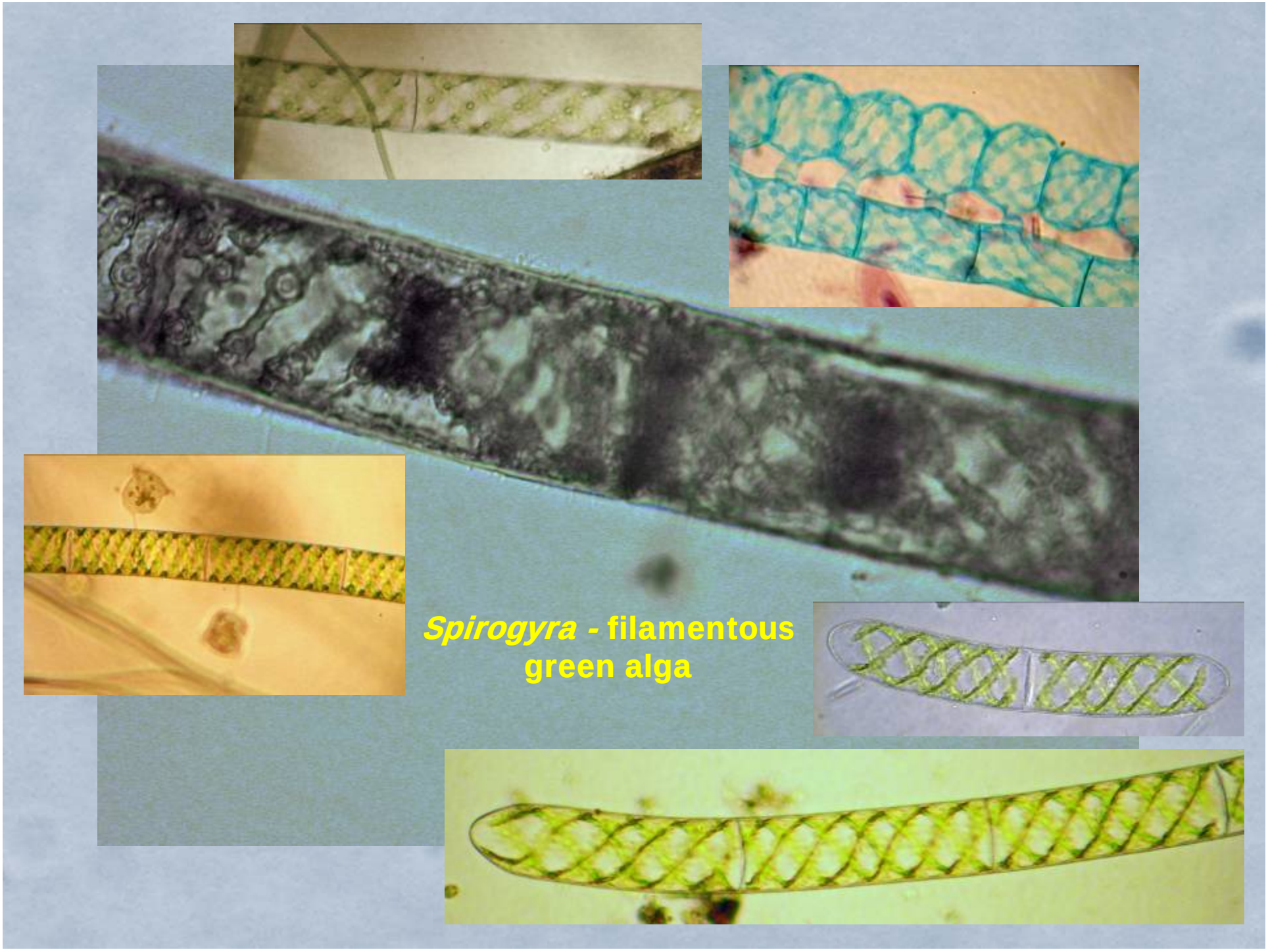

Oedogonium

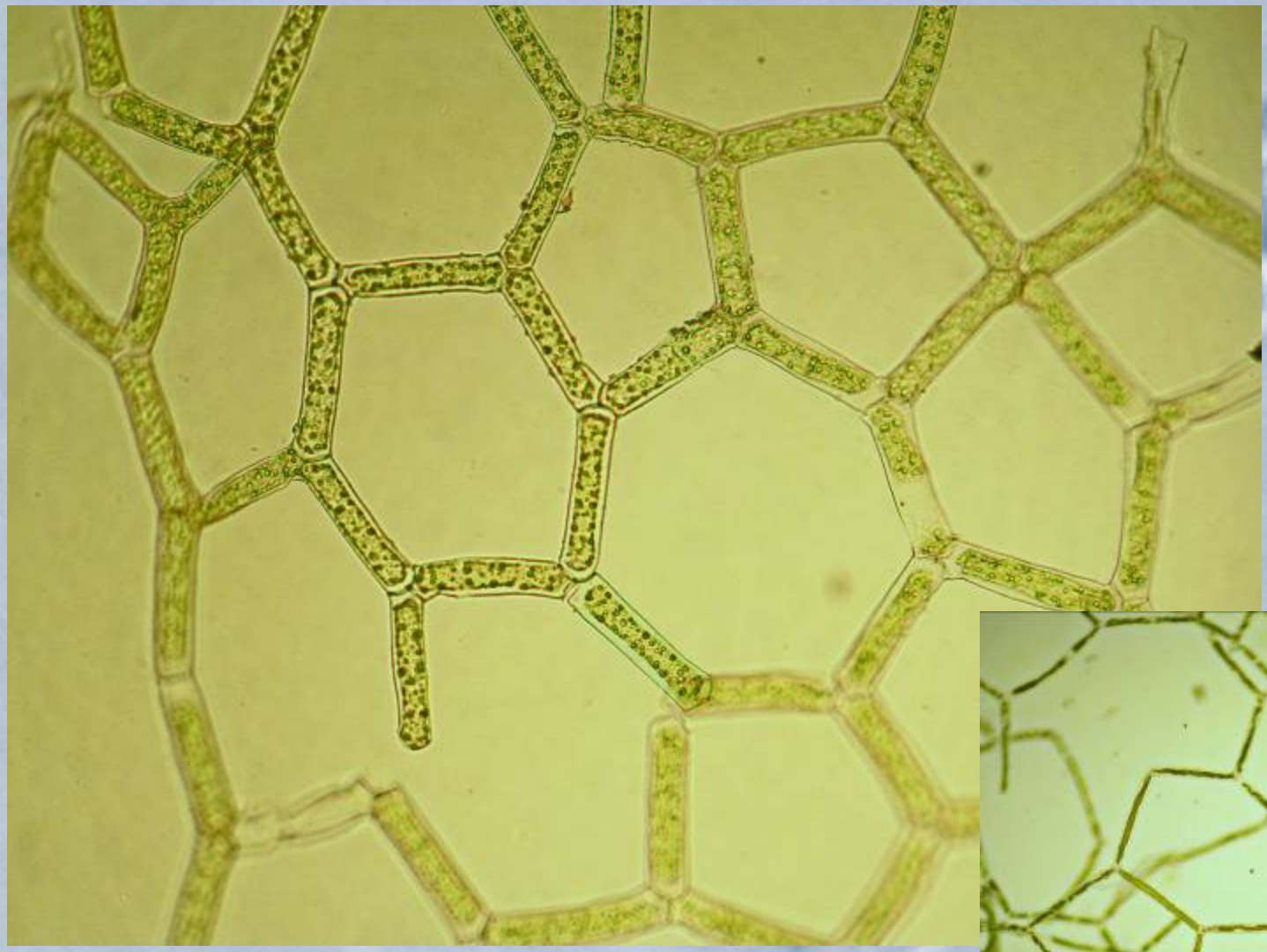

rings



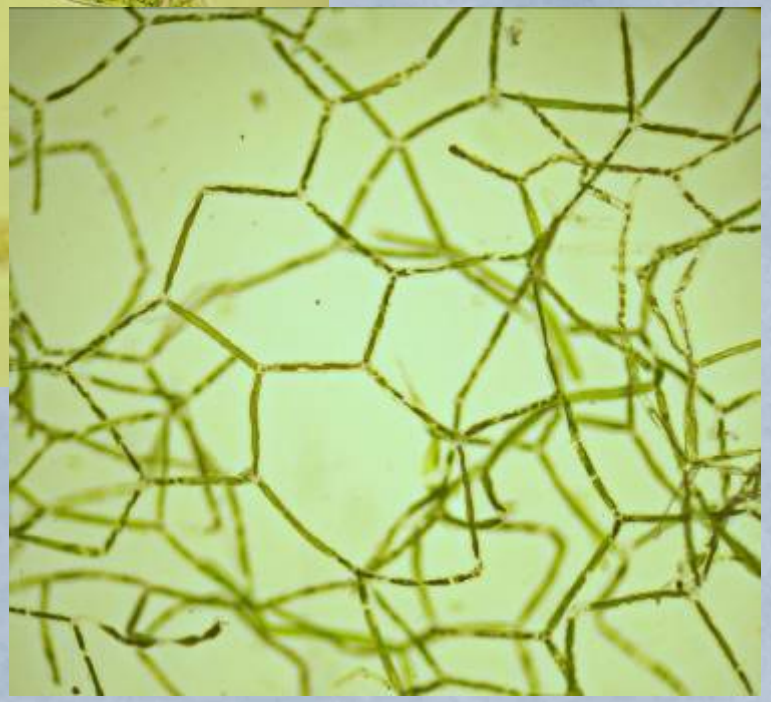

'eggs' (oogonia)
on 'female'


antheridia


Spirogyra - filamentous
green alga

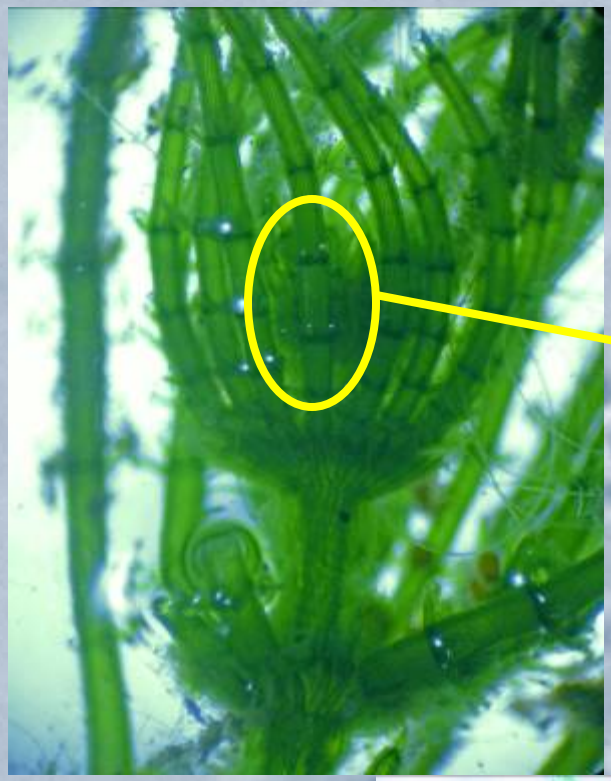


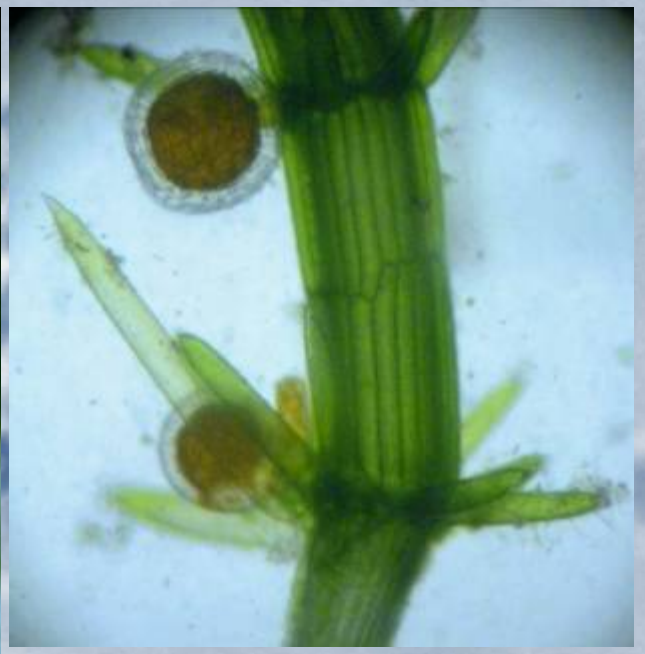
On left, a smaller net that grows and breaks away from the larger net on lower right (~ 6 X smaller)

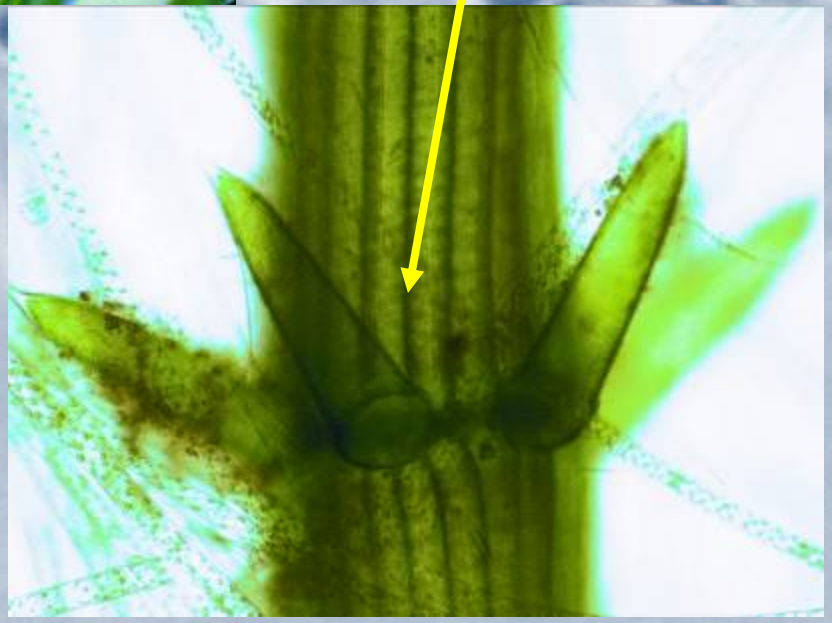


Hydrodictyon reticulatum:

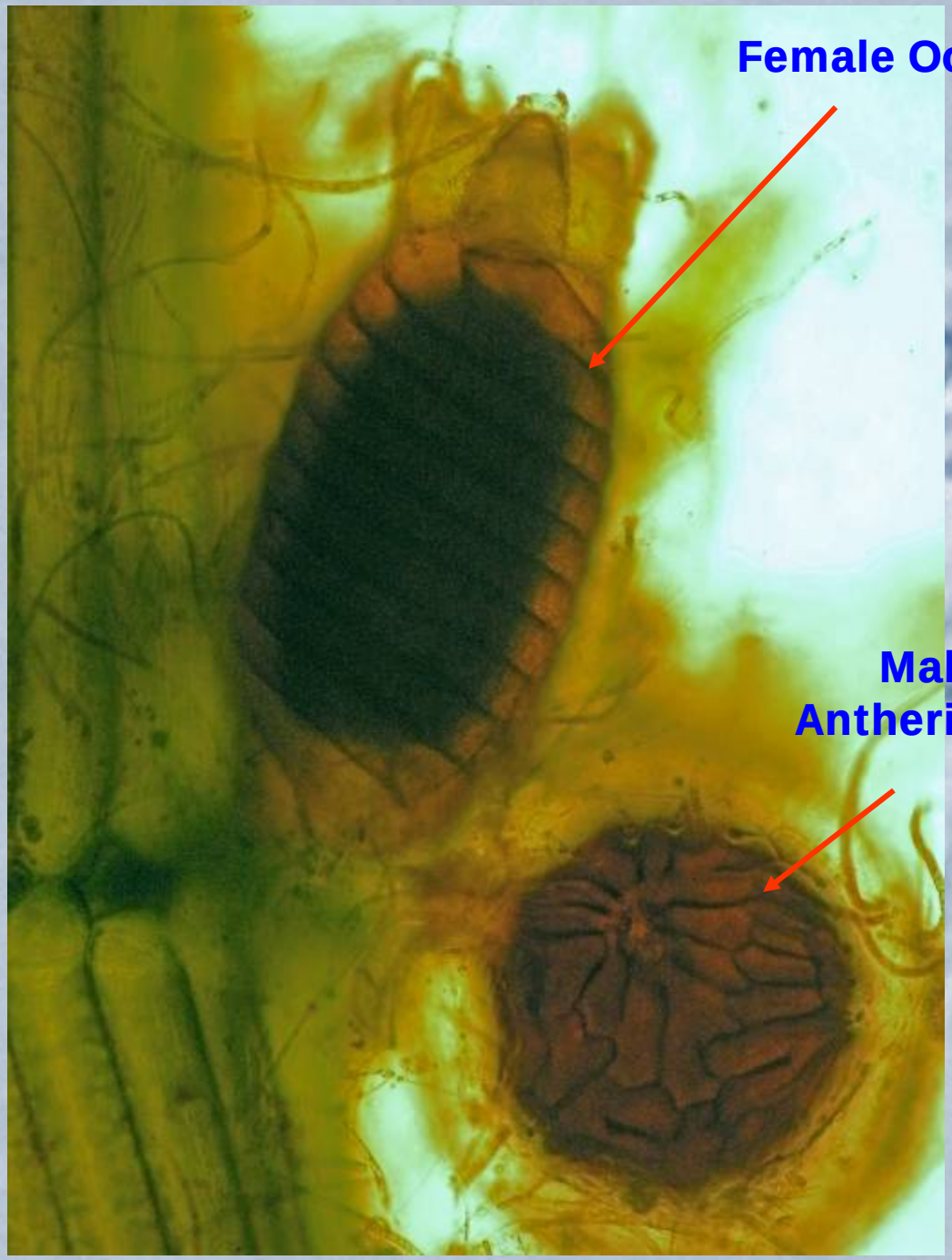
'water net'



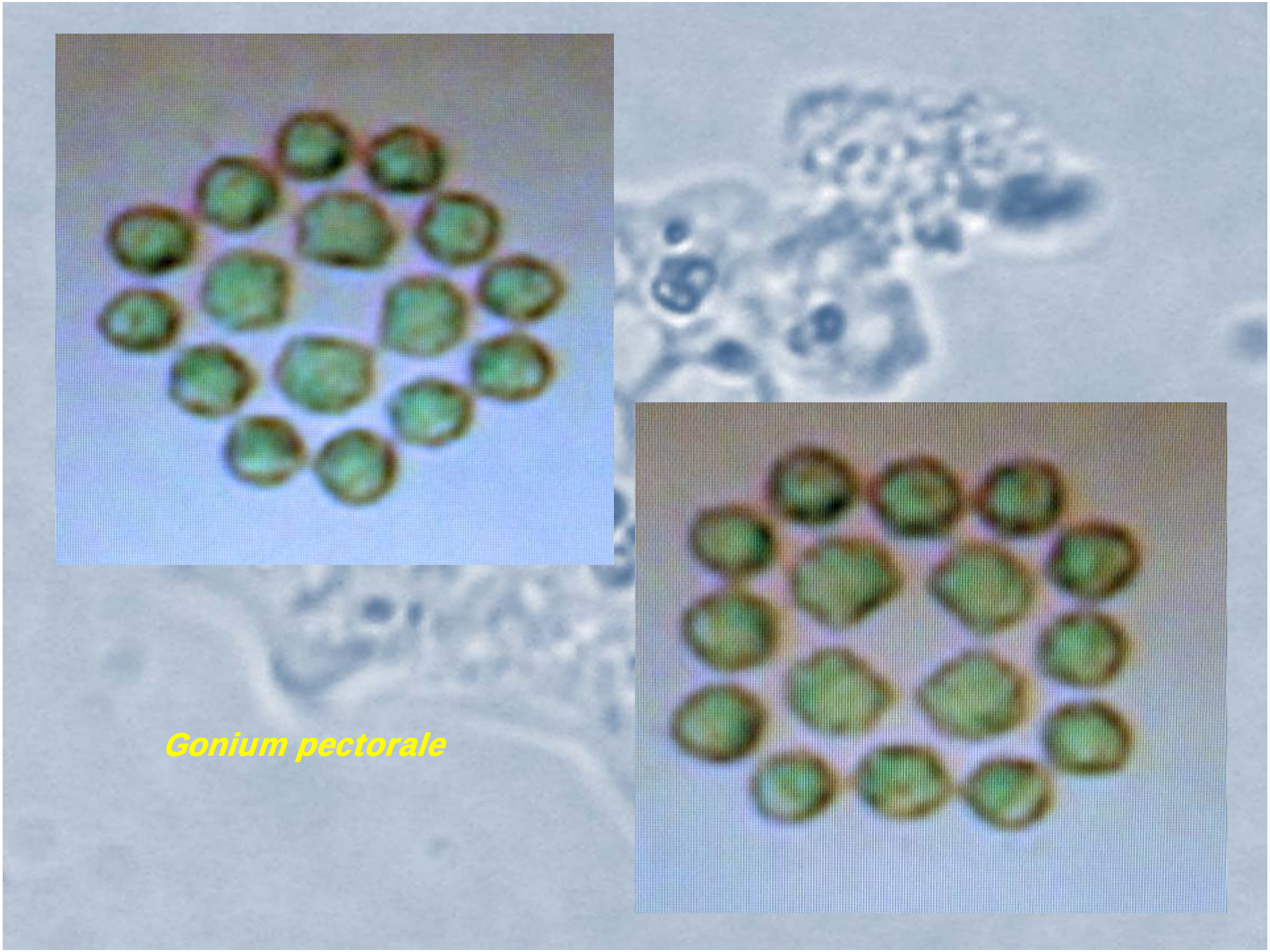




Green algae:
Charaphyceae: *Chara*
the 'stonewort'

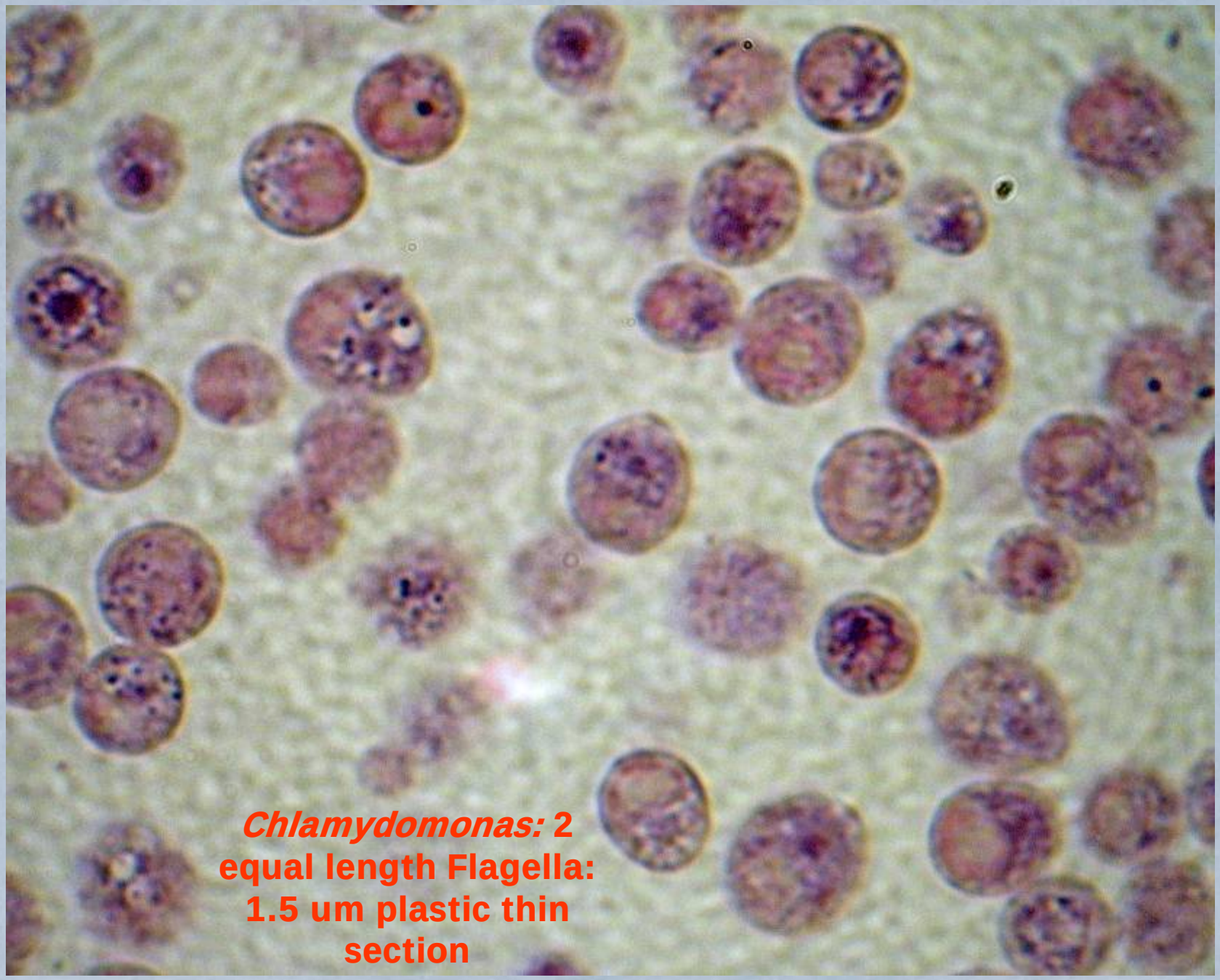


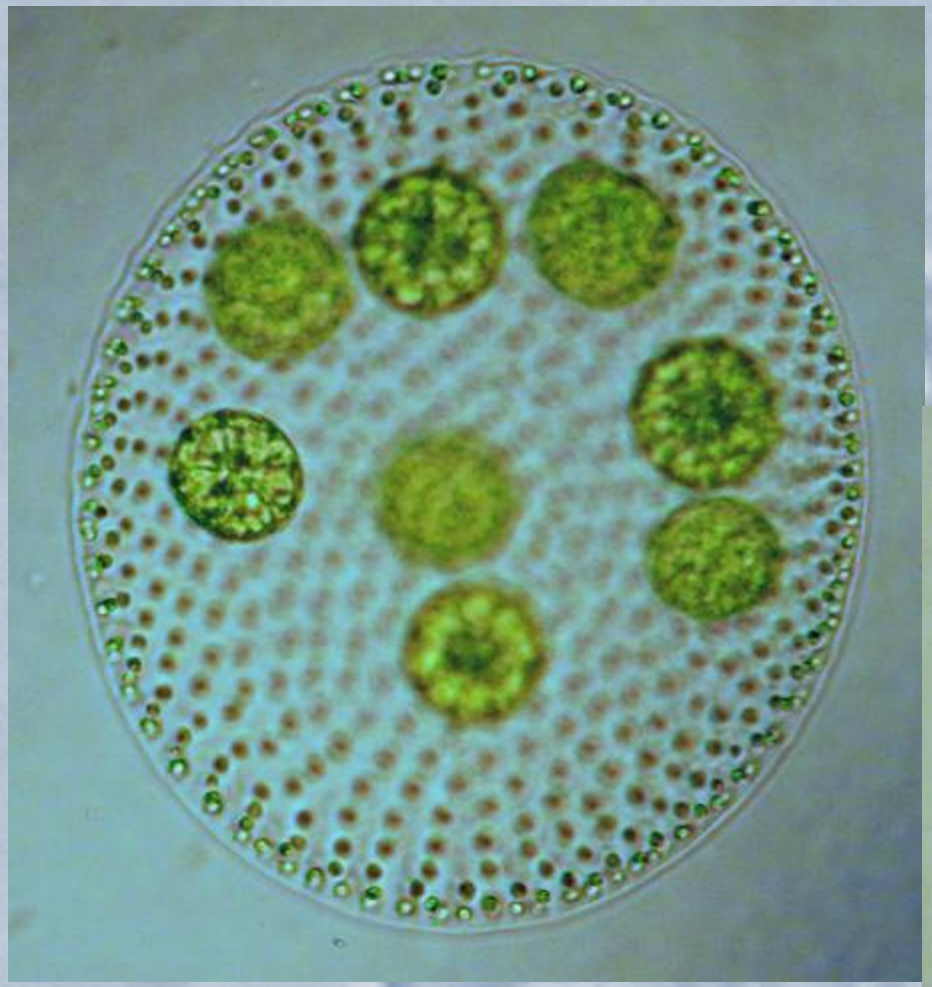
Green algae:
Charaphyceae: *Chara*
the 'stonewort'



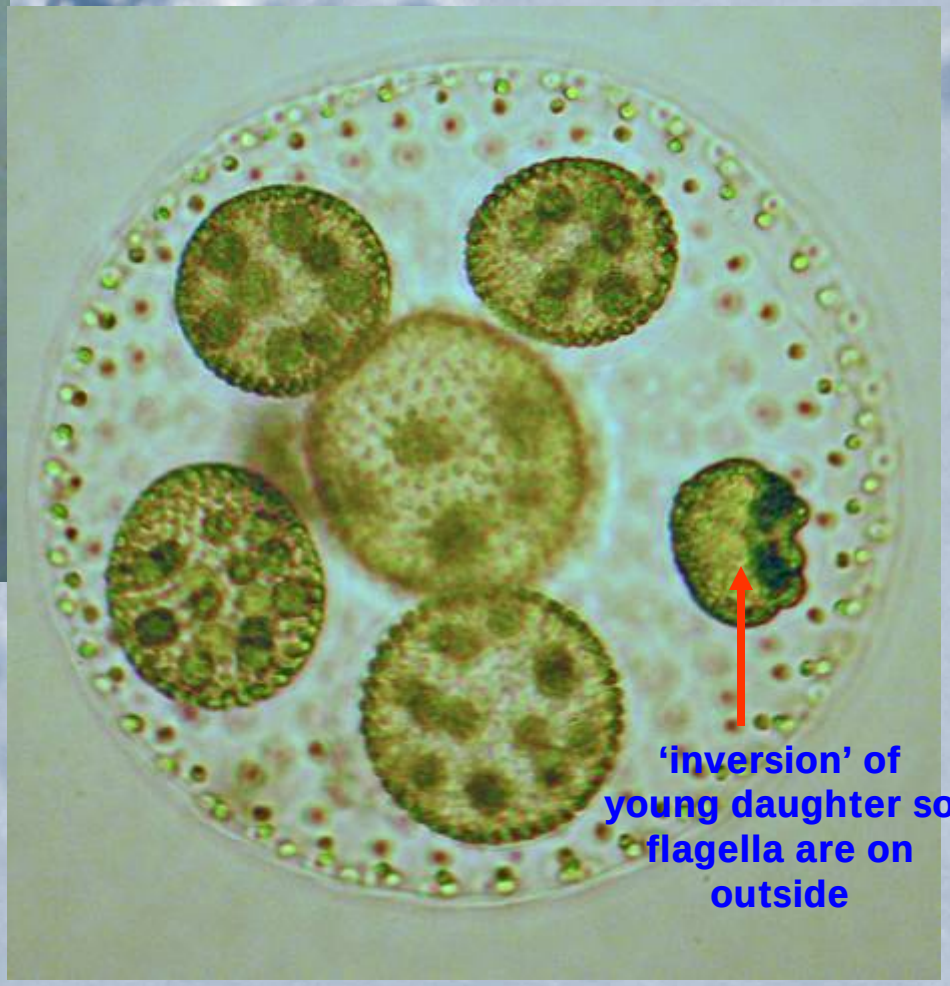
Gonium pectorale


capsules
Chlamydomonas: 2
equal length Flagella

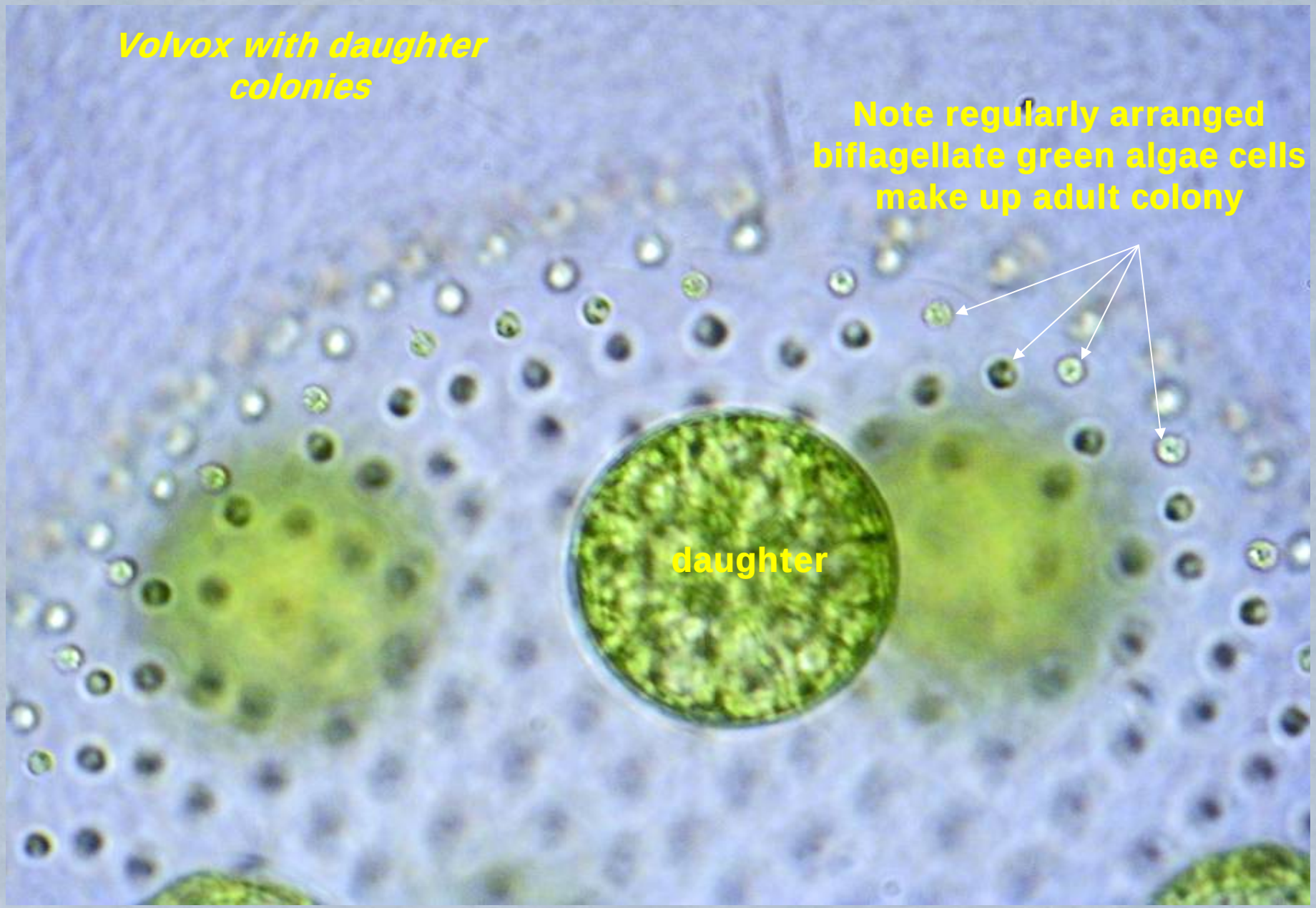

Chlamydomonas: 2
equal length Flagella:
1.5 um plastic thin
section

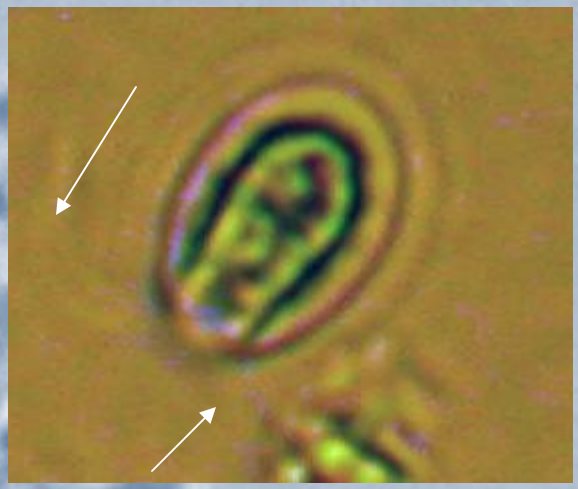


Volvox **with daughter colonies in various stages of development – note on right daughter colonies within older daughter colonies**



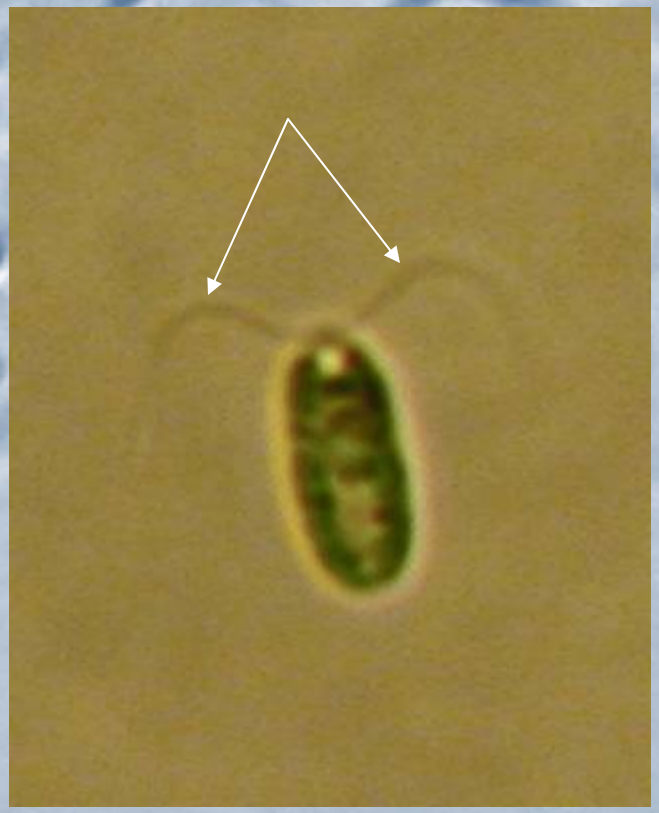
‘inversion’ of young daughter so flagella are on outside

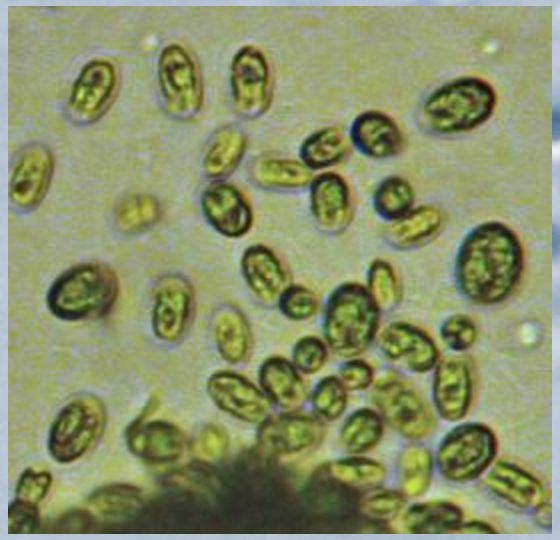

Volvox with daughter colonies
Note regularly arranged biflagellate green algae cells make up adult colony
daughter

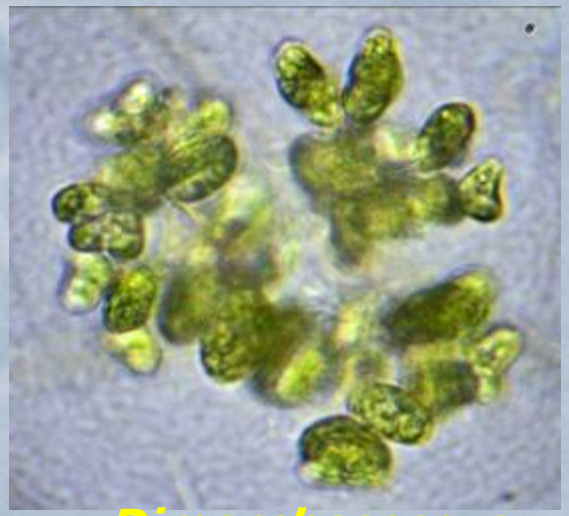


Chlamydomonas

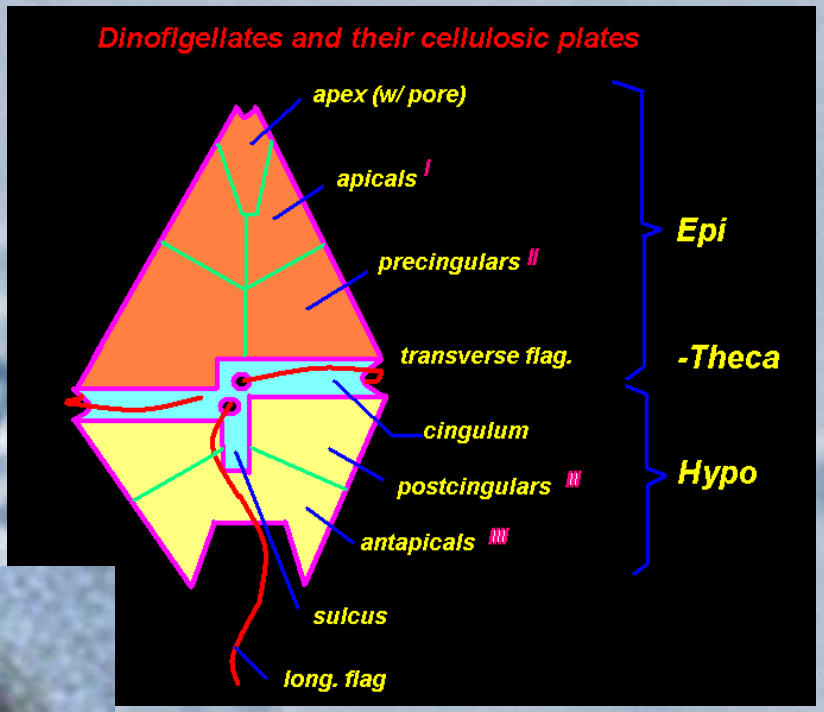
Note 2 equal-length flagella

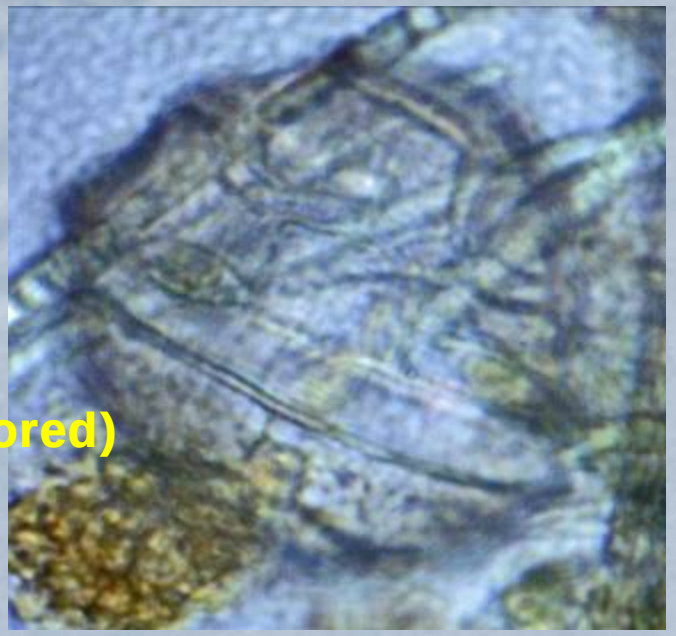






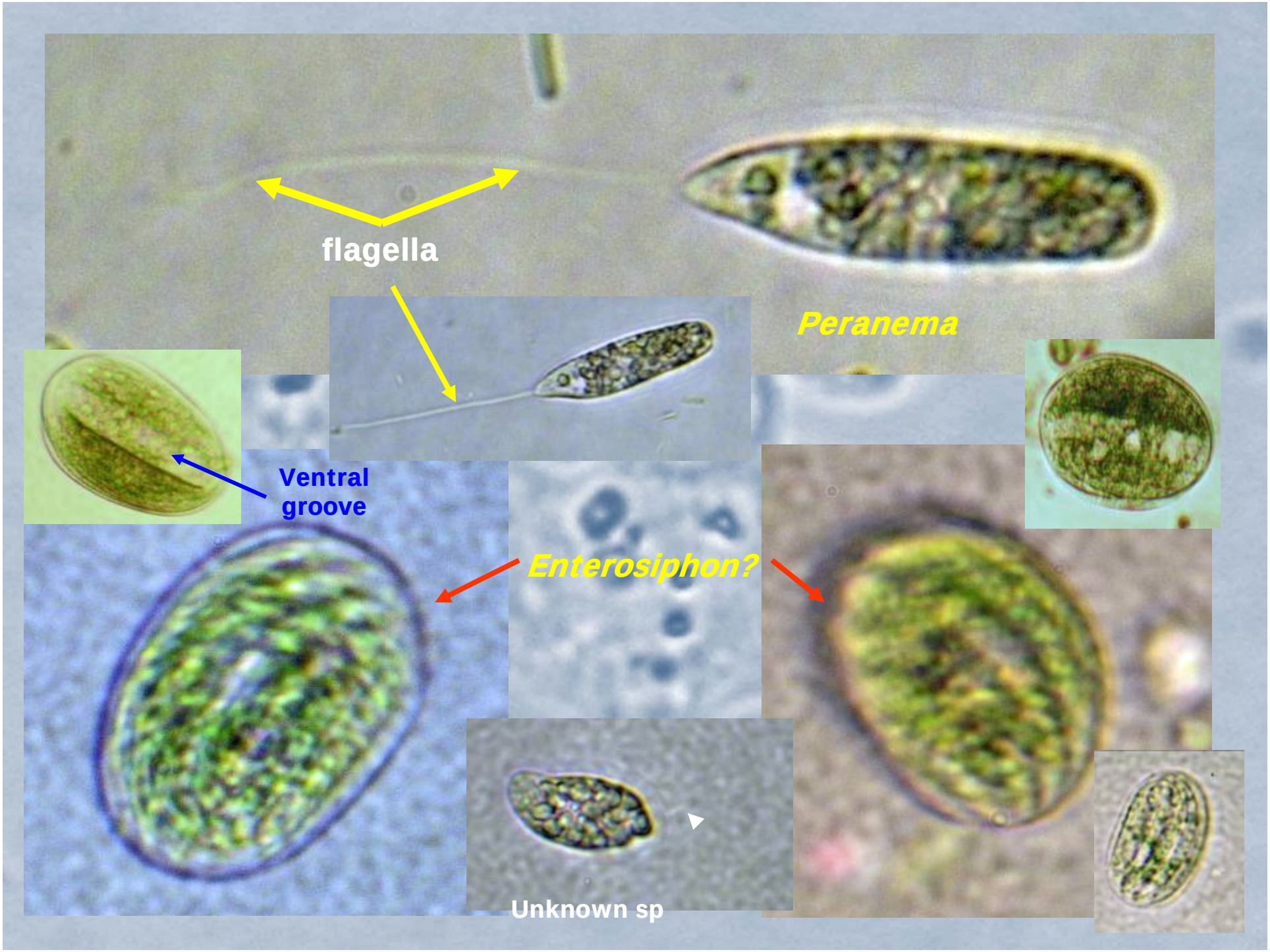
Dimorphococcus

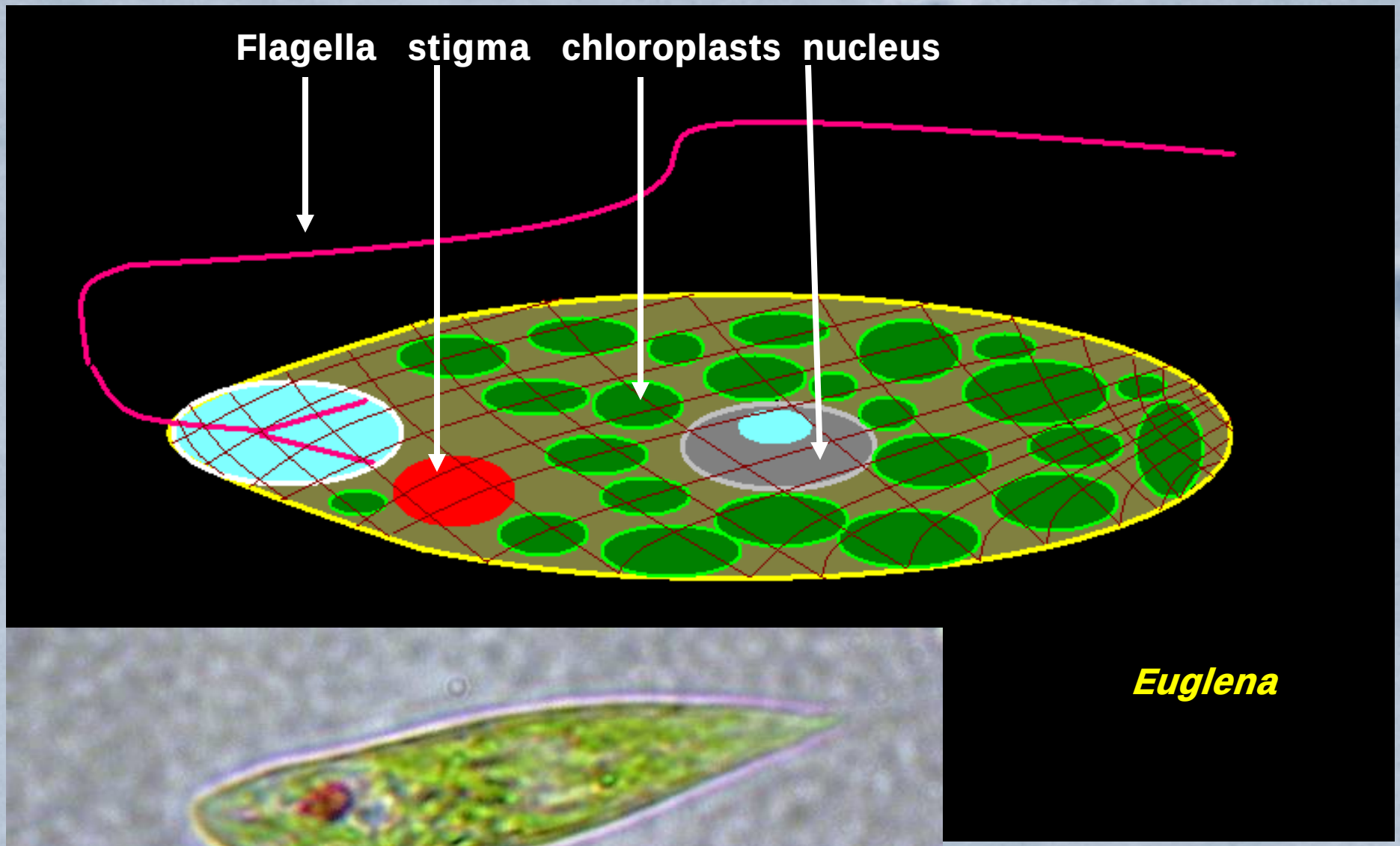




Dinoflagellate- thecate (armored) freshwater *Gonyaulax*

Gonyaulax


flagella
Peranema
Ventral groove
Enterosiphon?
Unknown sp



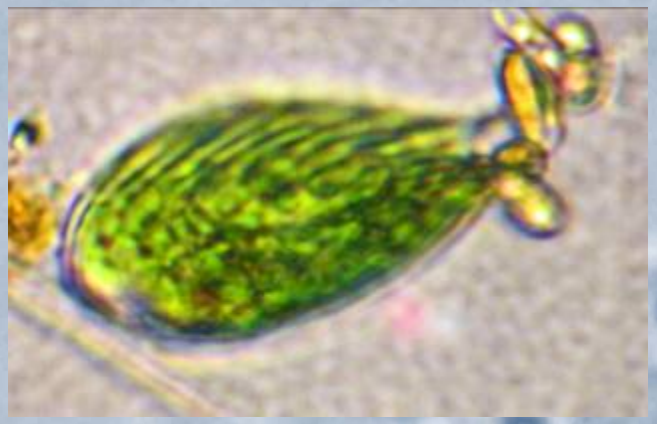
Euglena

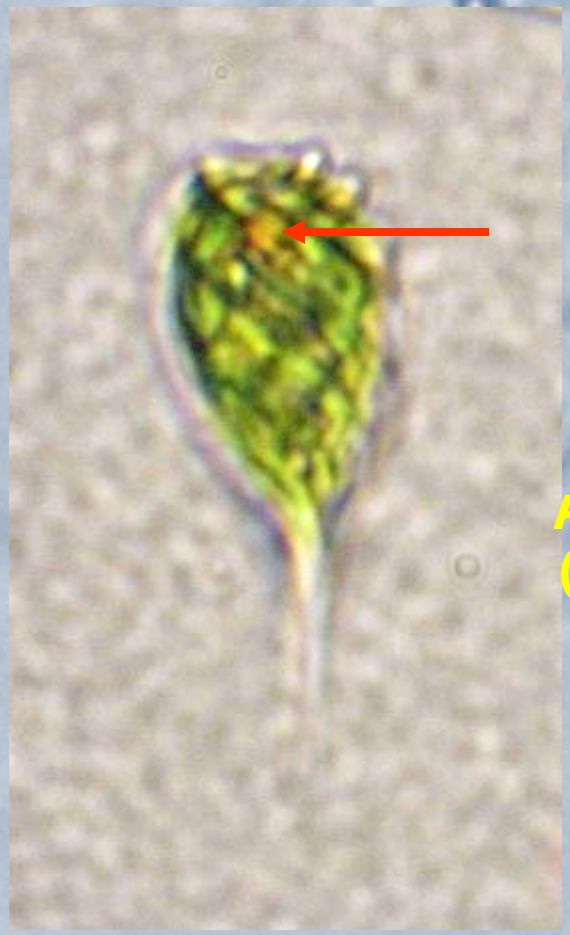

Euglena


?

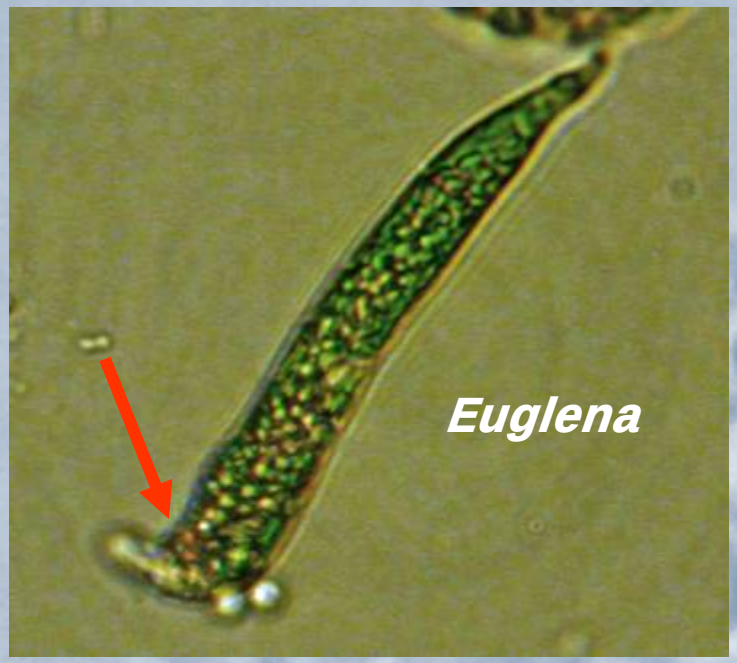

Euglena

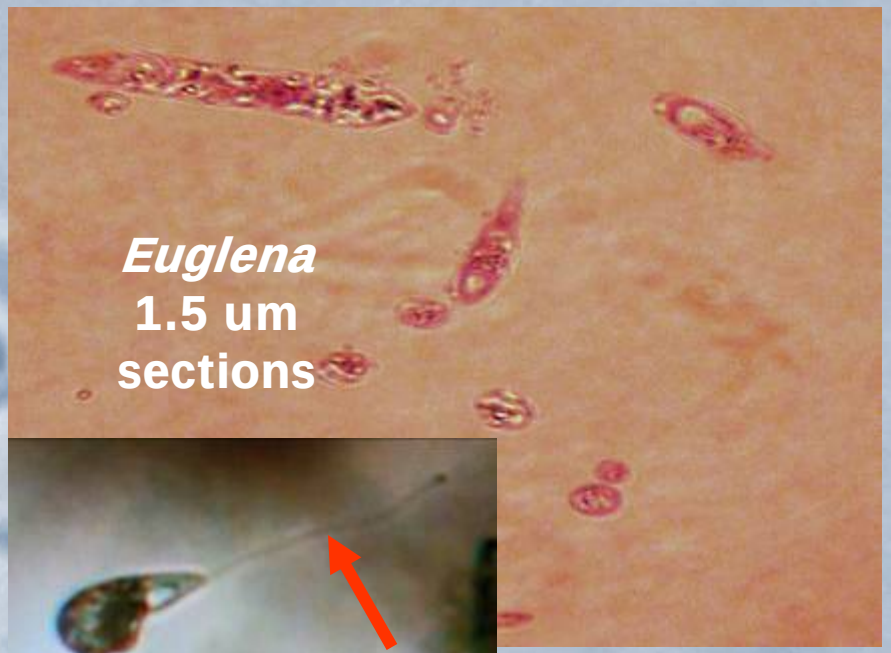
Euglena – note ornamentation on pellicle





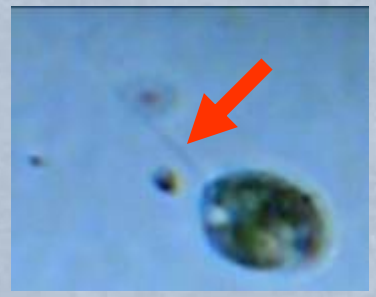
Phacus pyrum
(note stigma)

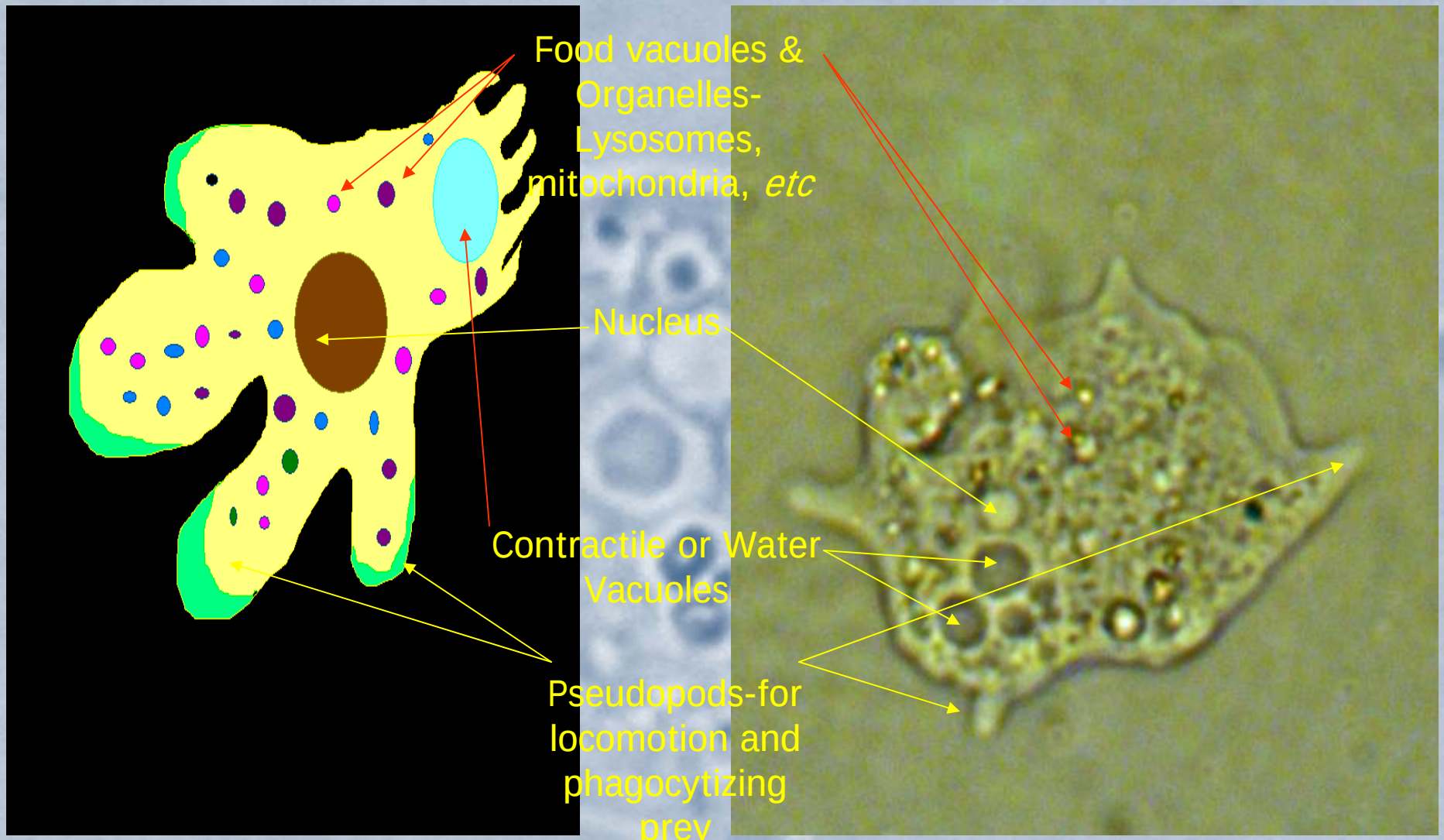




Flagellated Euglenoids with red stigma (‘eye’)

http://www.youtube.com/watch?v=8sHuSVqQFzo



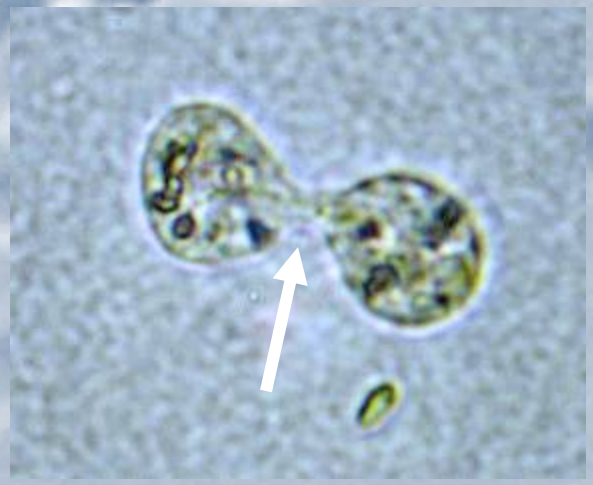


Amoeba: **Sarcodina –note freshwater protists constantly form & release excess water from their unicellular 'body' because their cytoplasm solutes attract water from a lower solute concentration outside the cell via osmosis. This is accomplished with Contractile vacuoles, which are not found in marine protists.**

http://www.youtube.com/watch?v=58AiIrxlahc

http://www.youtube.com/watch?v=AEDAfJAuVHc

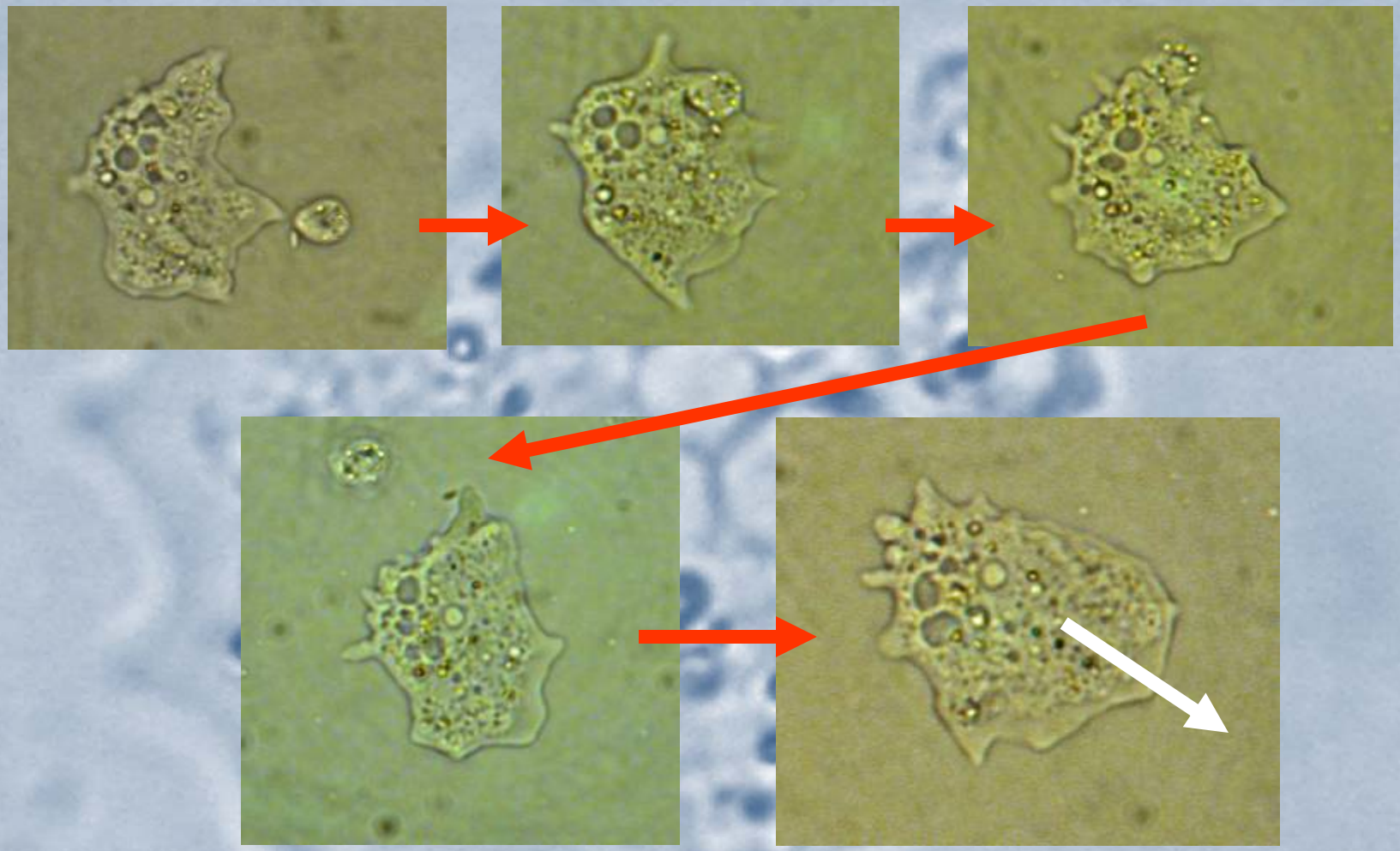
Water vacuole



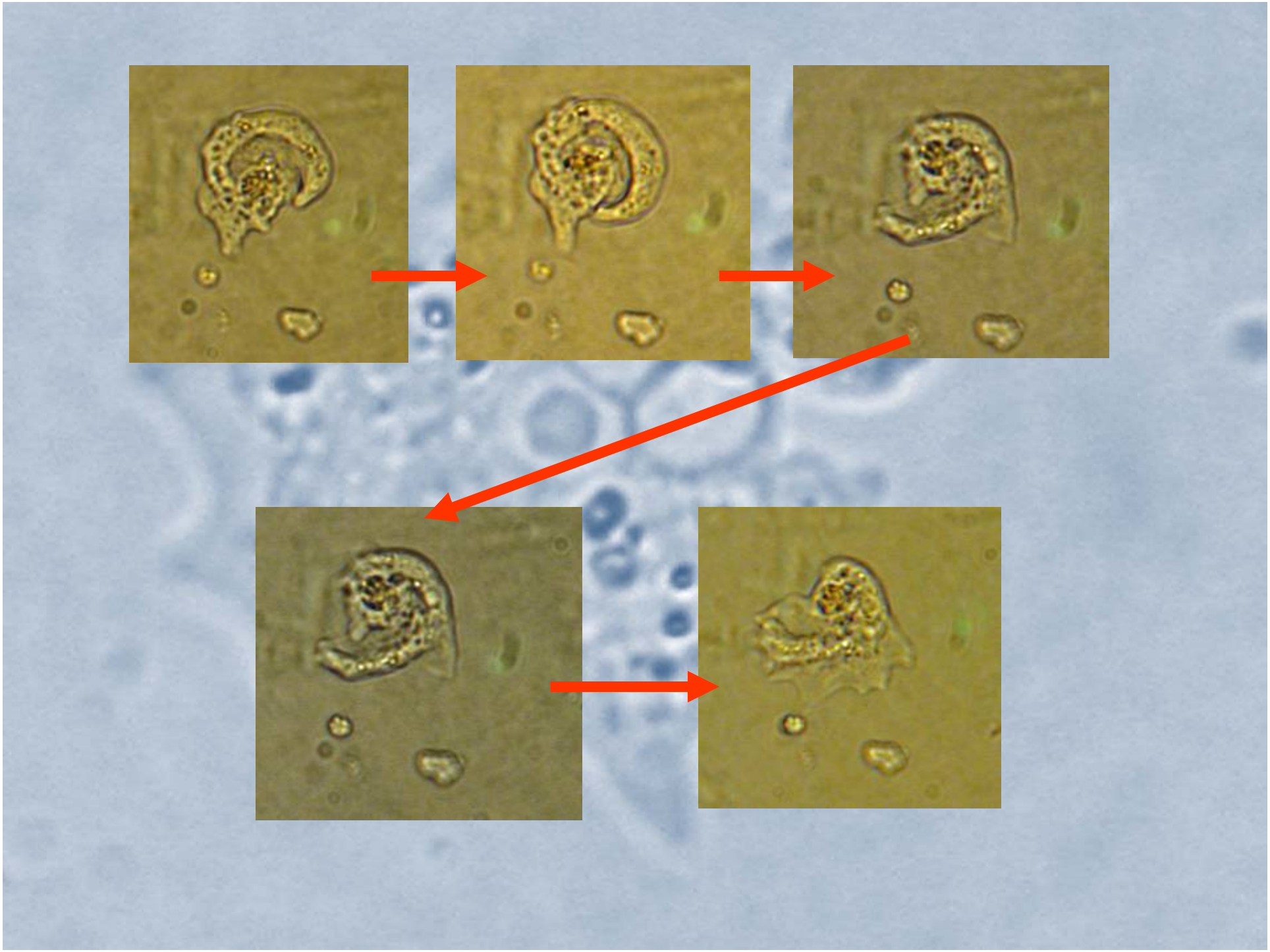
Amoeba dividing

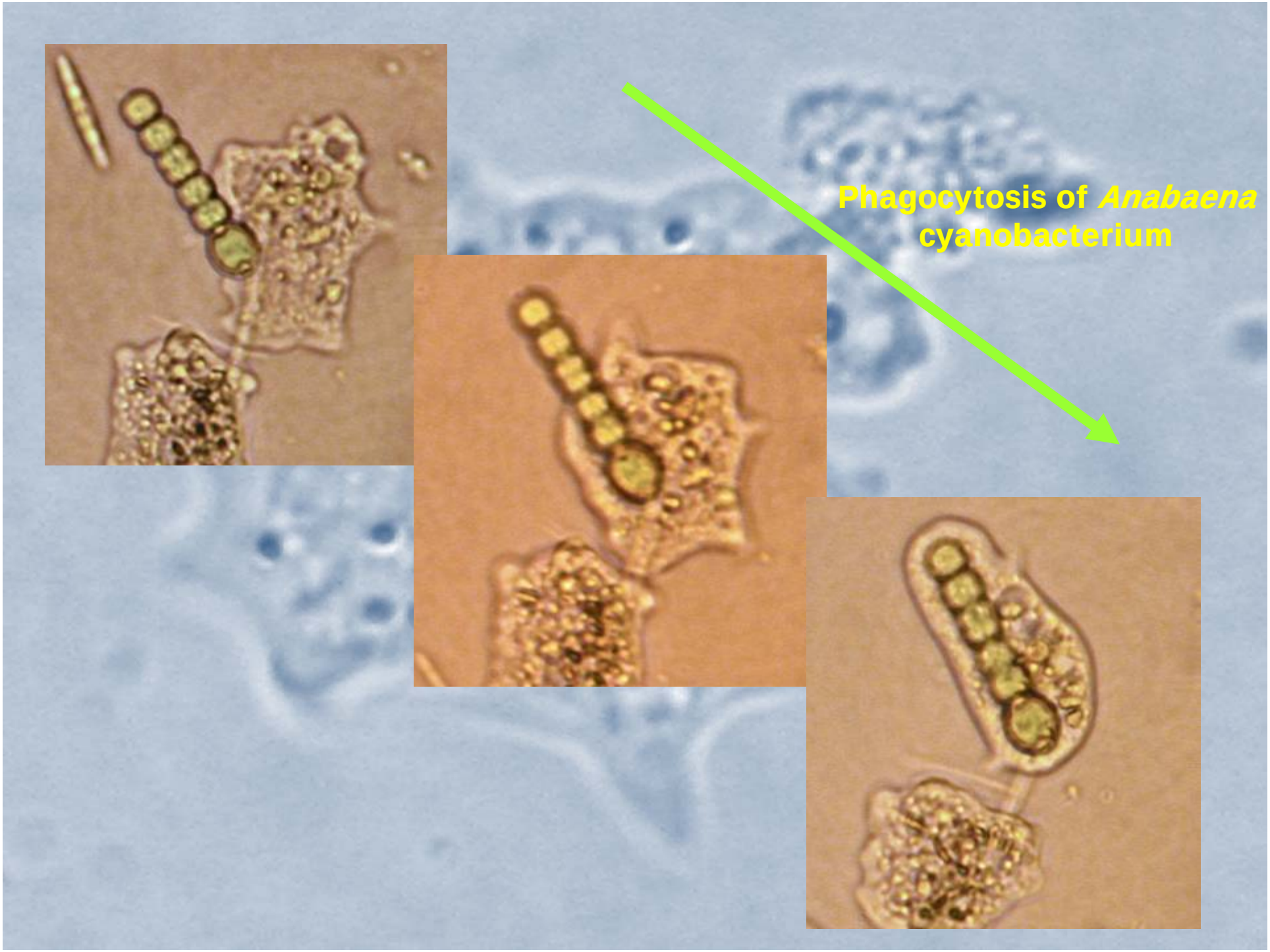
Nucleus

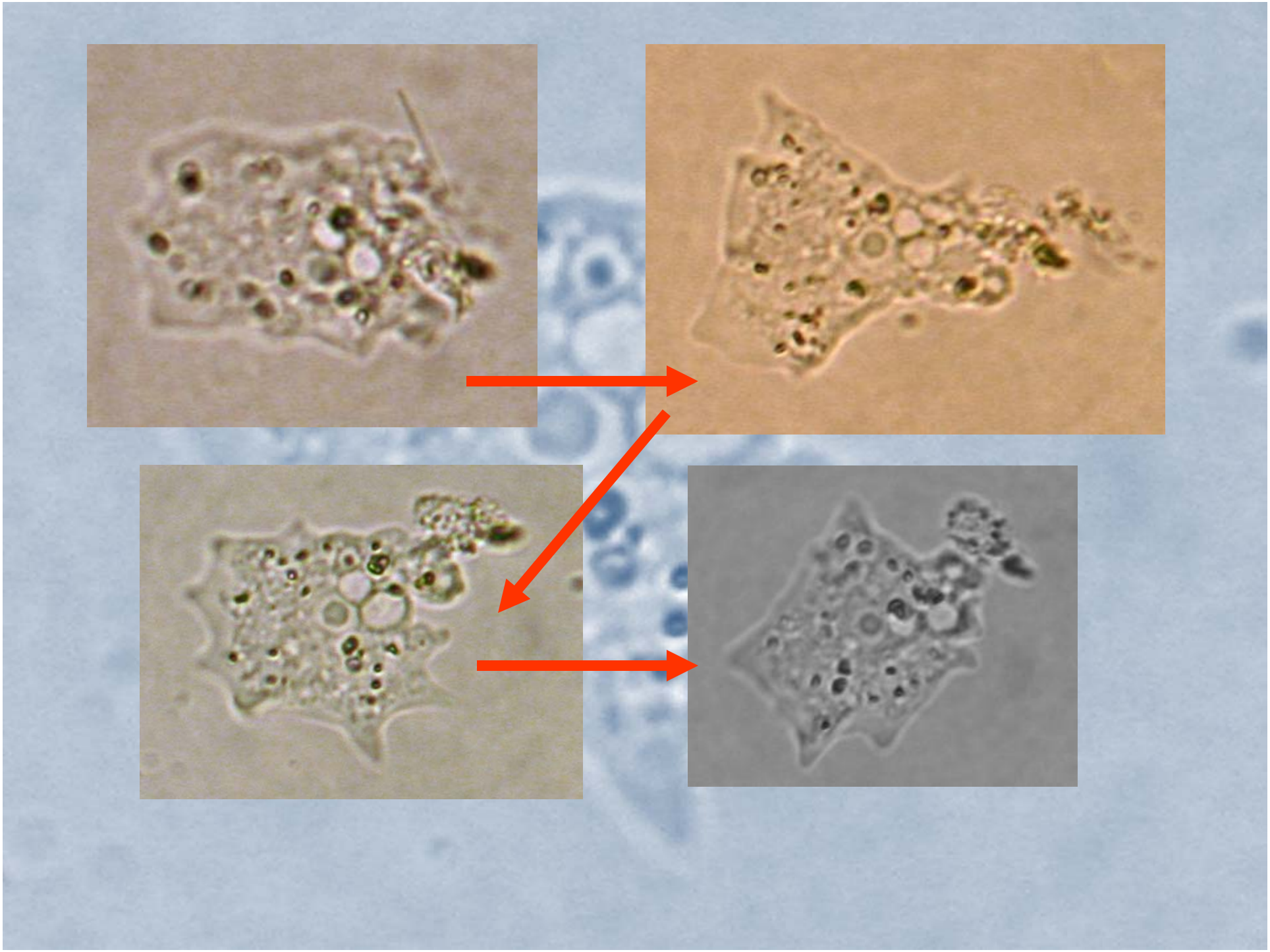
Pseudopods

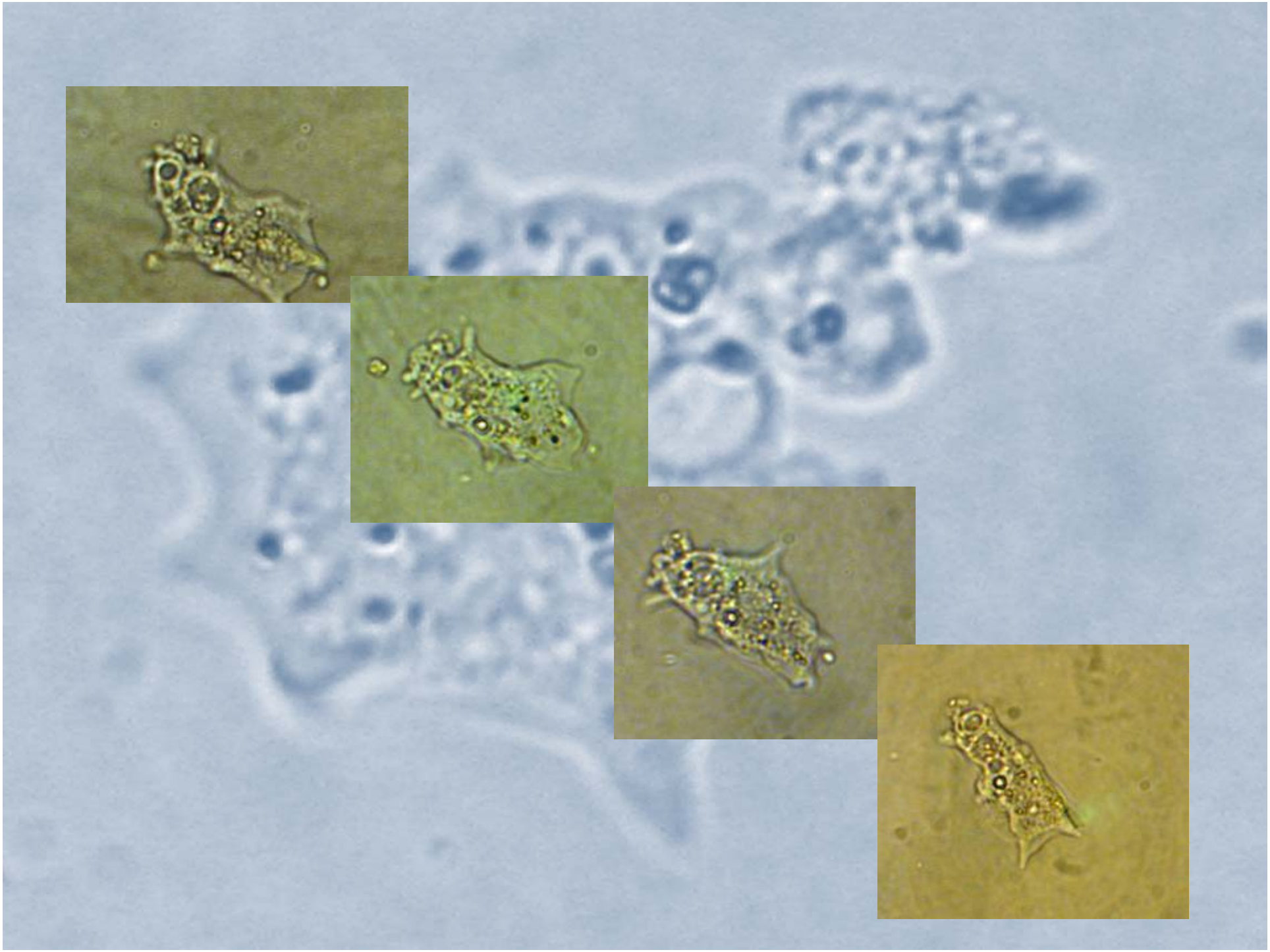


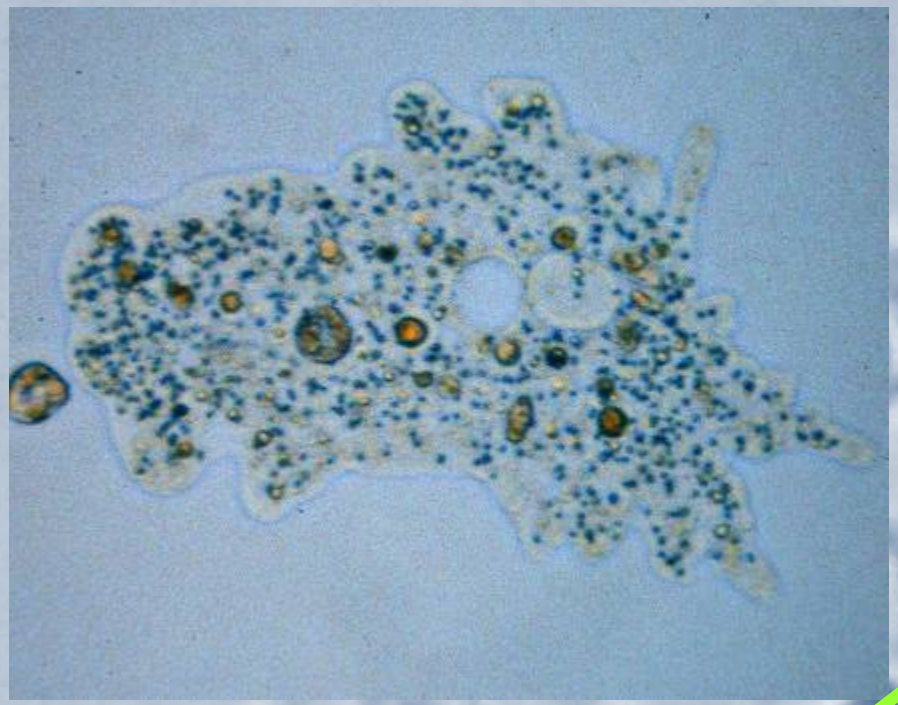
Same *Amoeba* over several minutes moving down & to the right

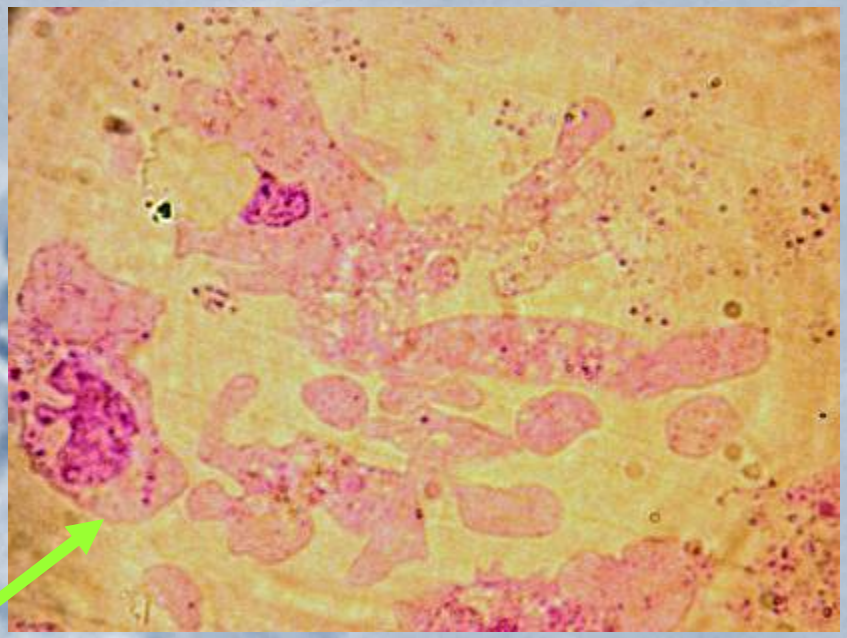


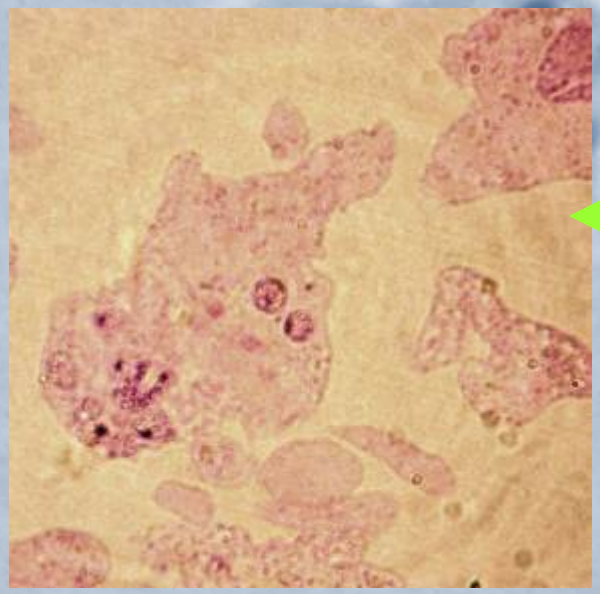

Phagocytosis of *Anabaena* cyanobacterium



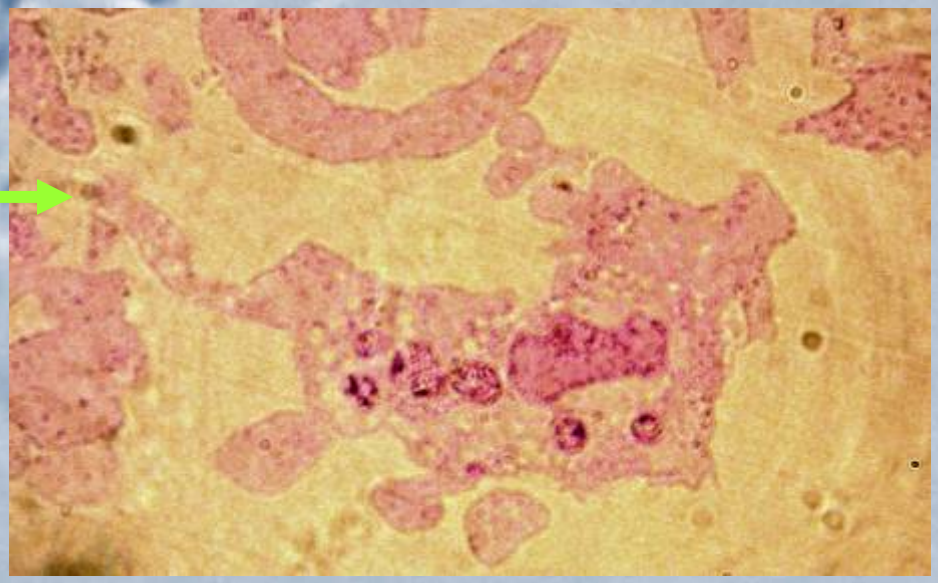


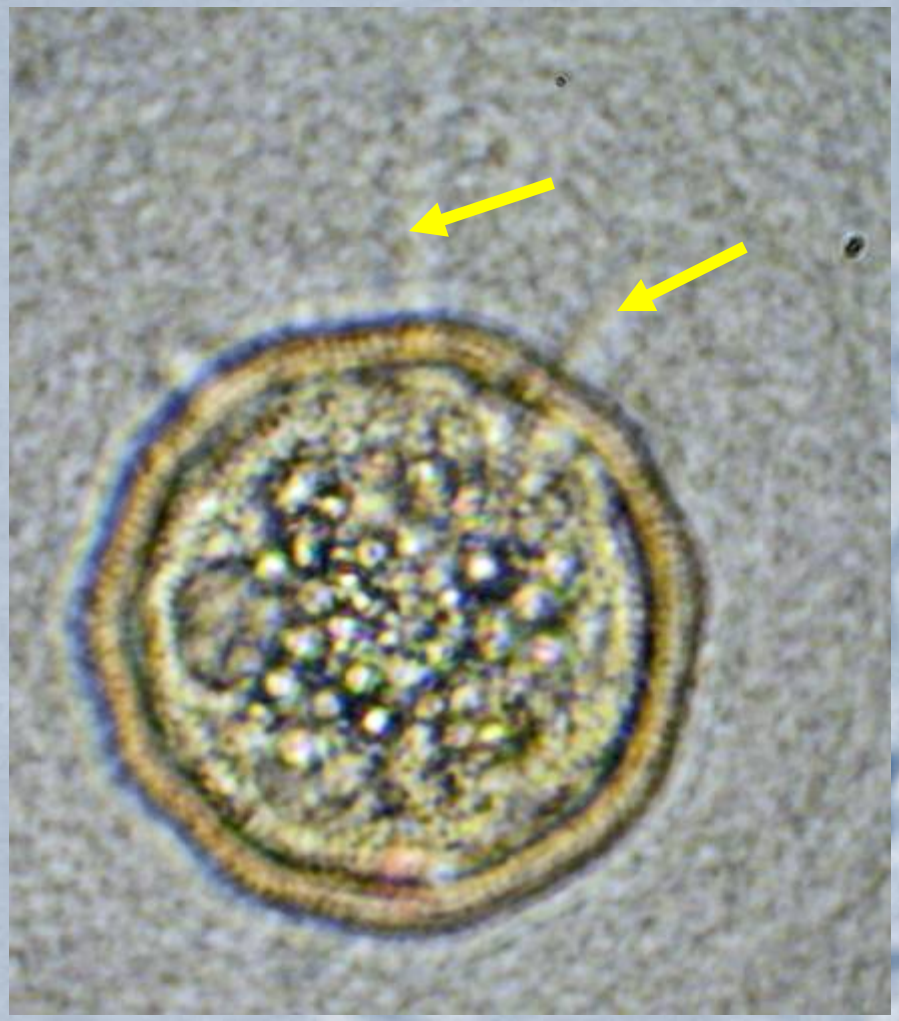


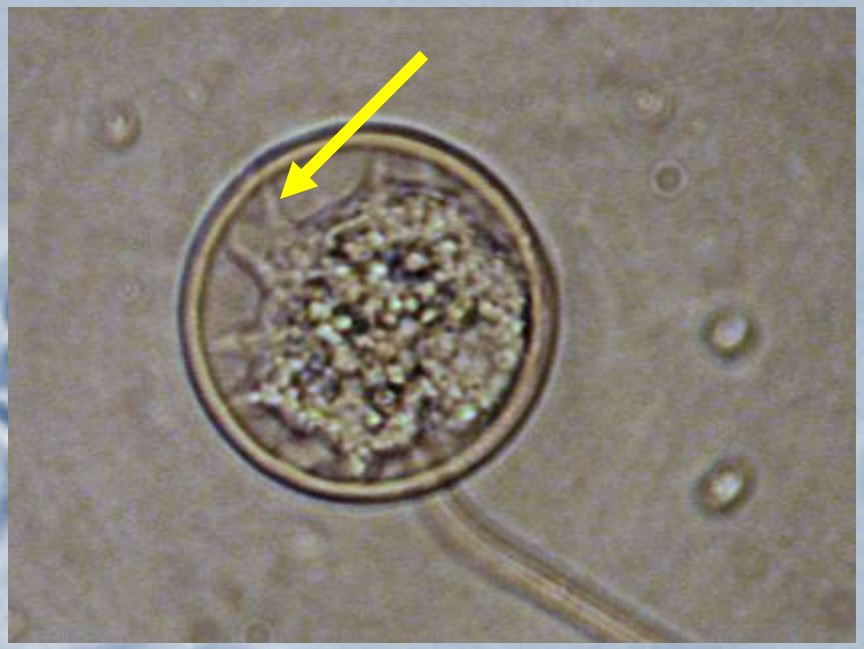




1.5 um thick plastic sections of an *Amoeba*

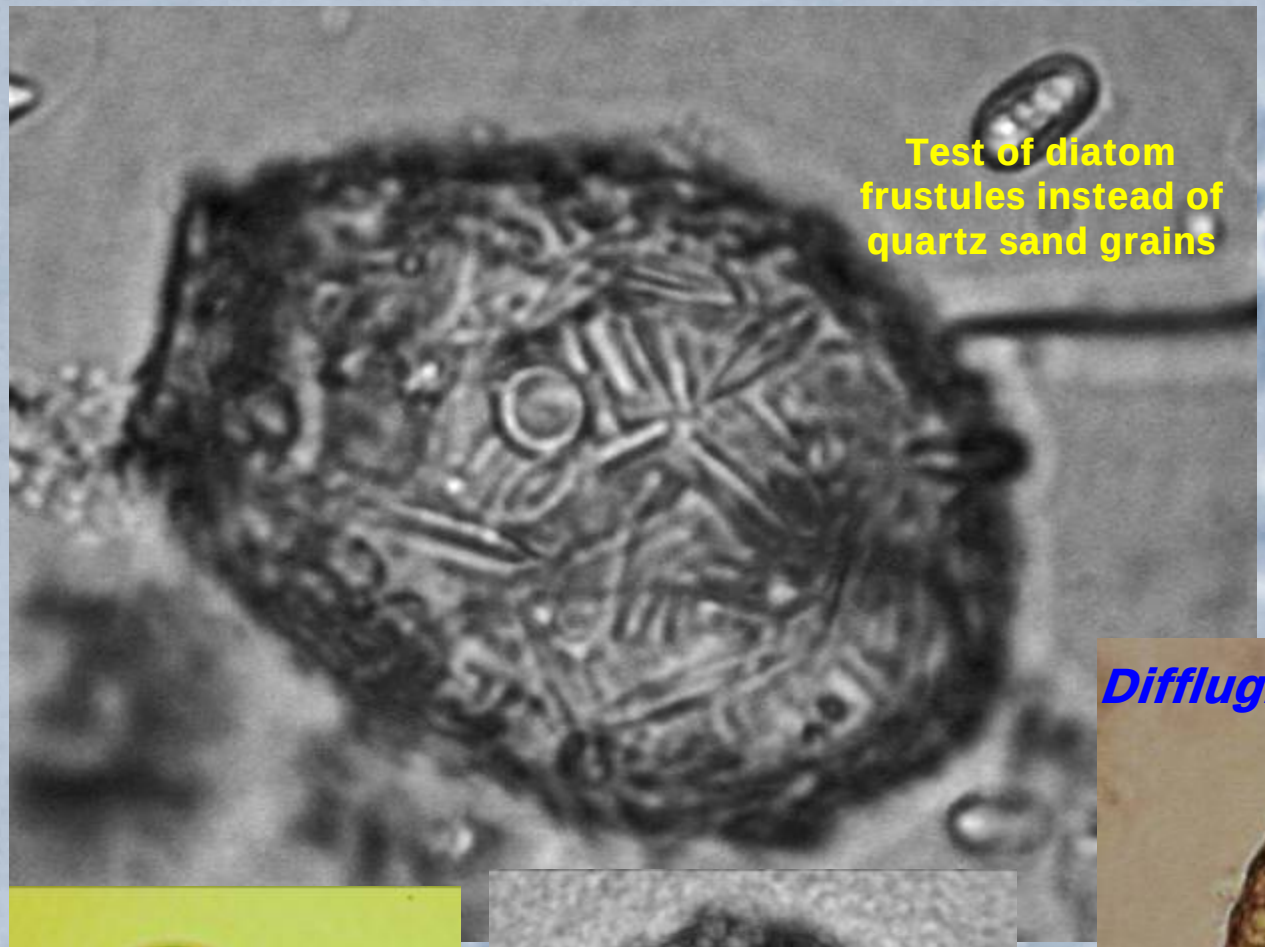


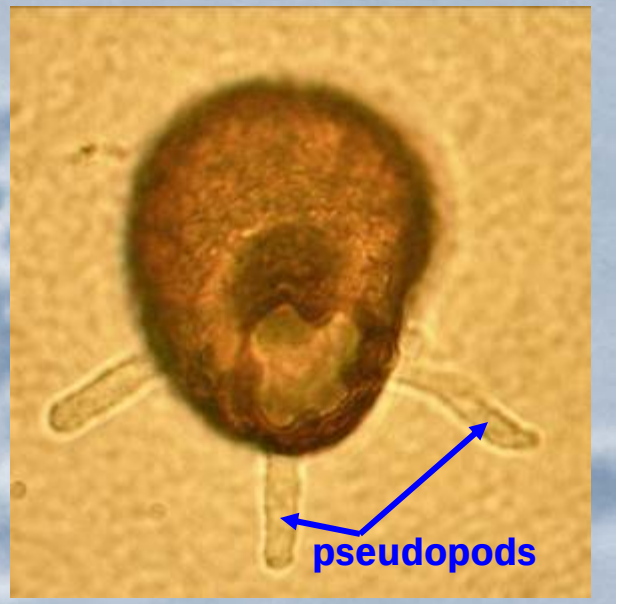


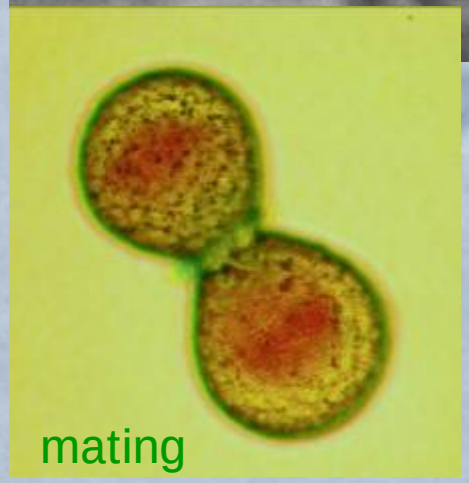


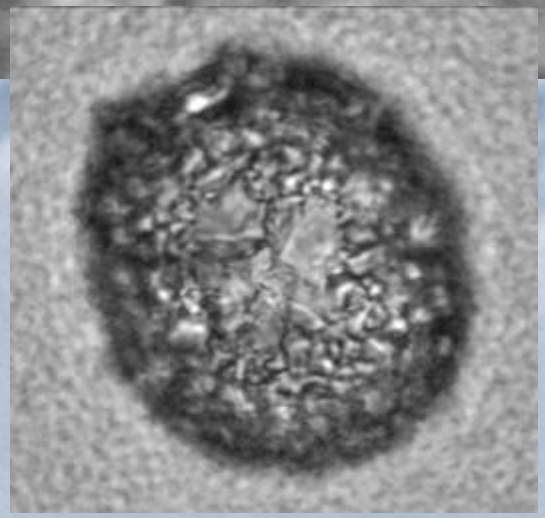
Arcella is an amoeba that secretes a 'chitin-like' test or shell around itself- note pseudopods at arrows

http://www.youtube.com/watch?v=Z1fiO0dOkGI


Test of diatom
frustules instead of
quartz sand grains


pseudopods

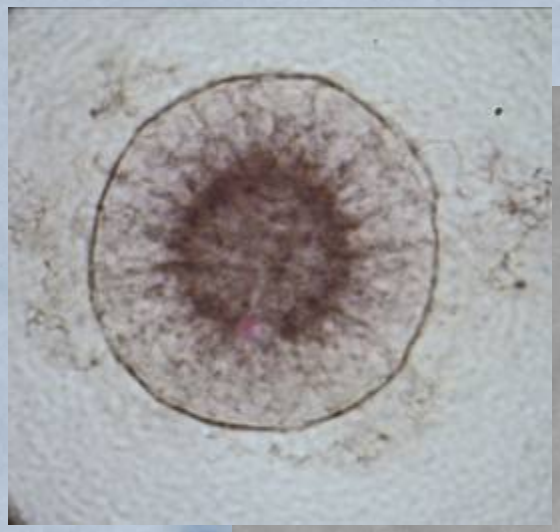

mating

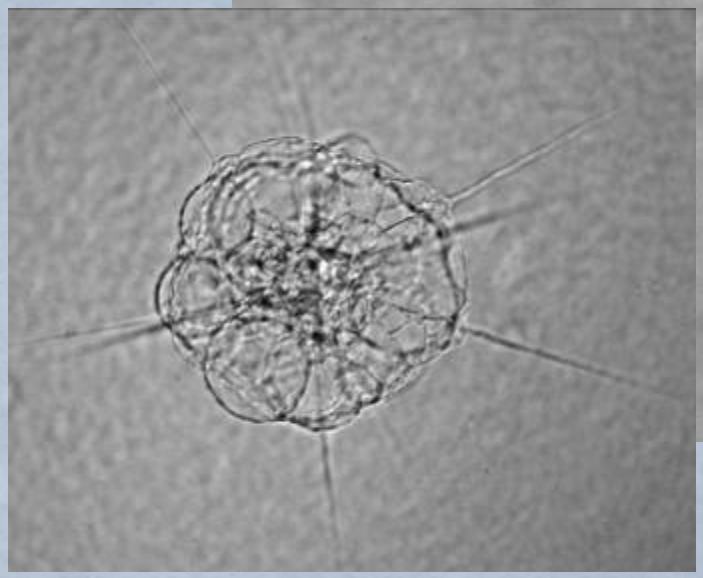


Difflugia

Centropyxis
(note spines)

Sarcodina:
Actinosphaera

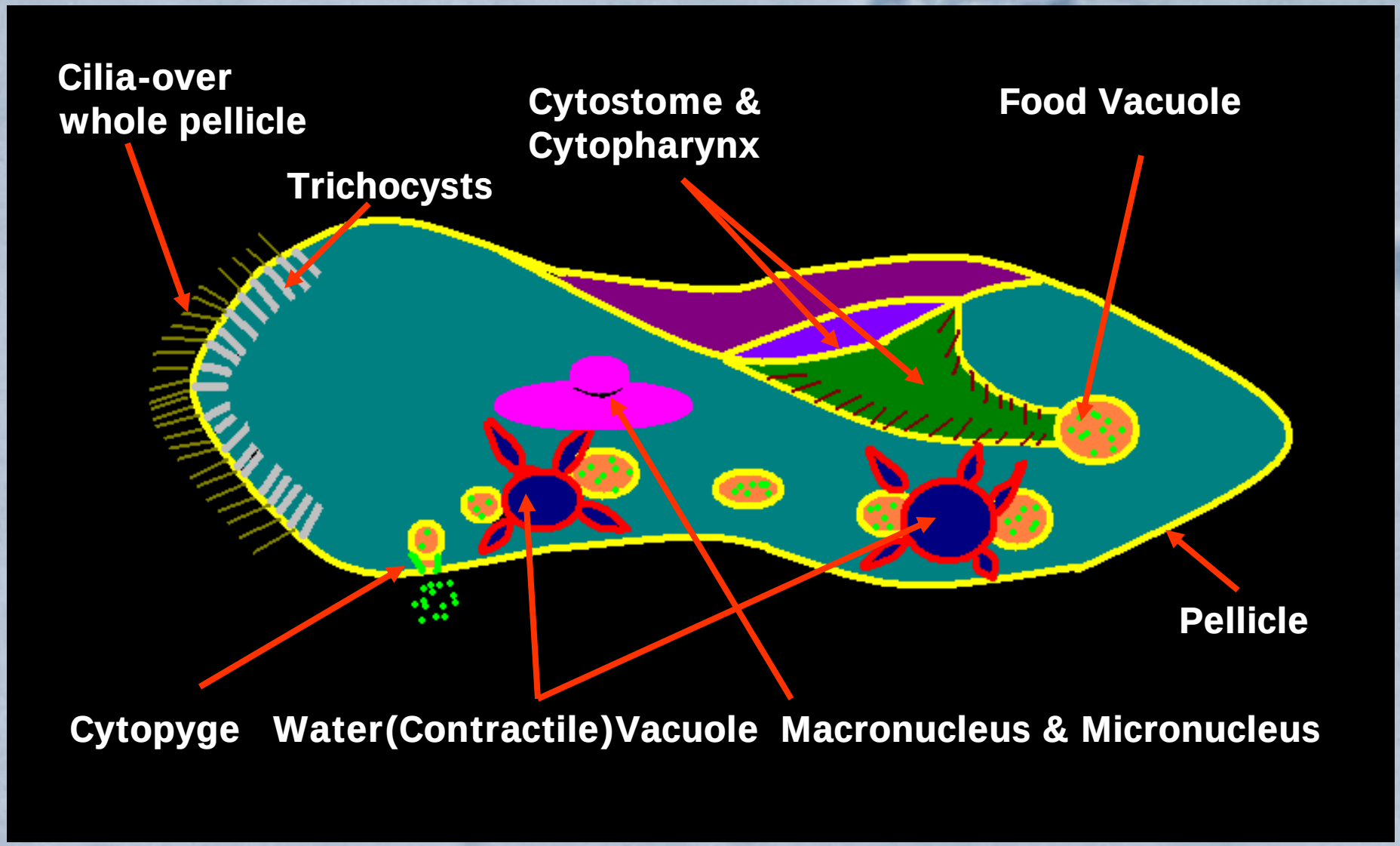


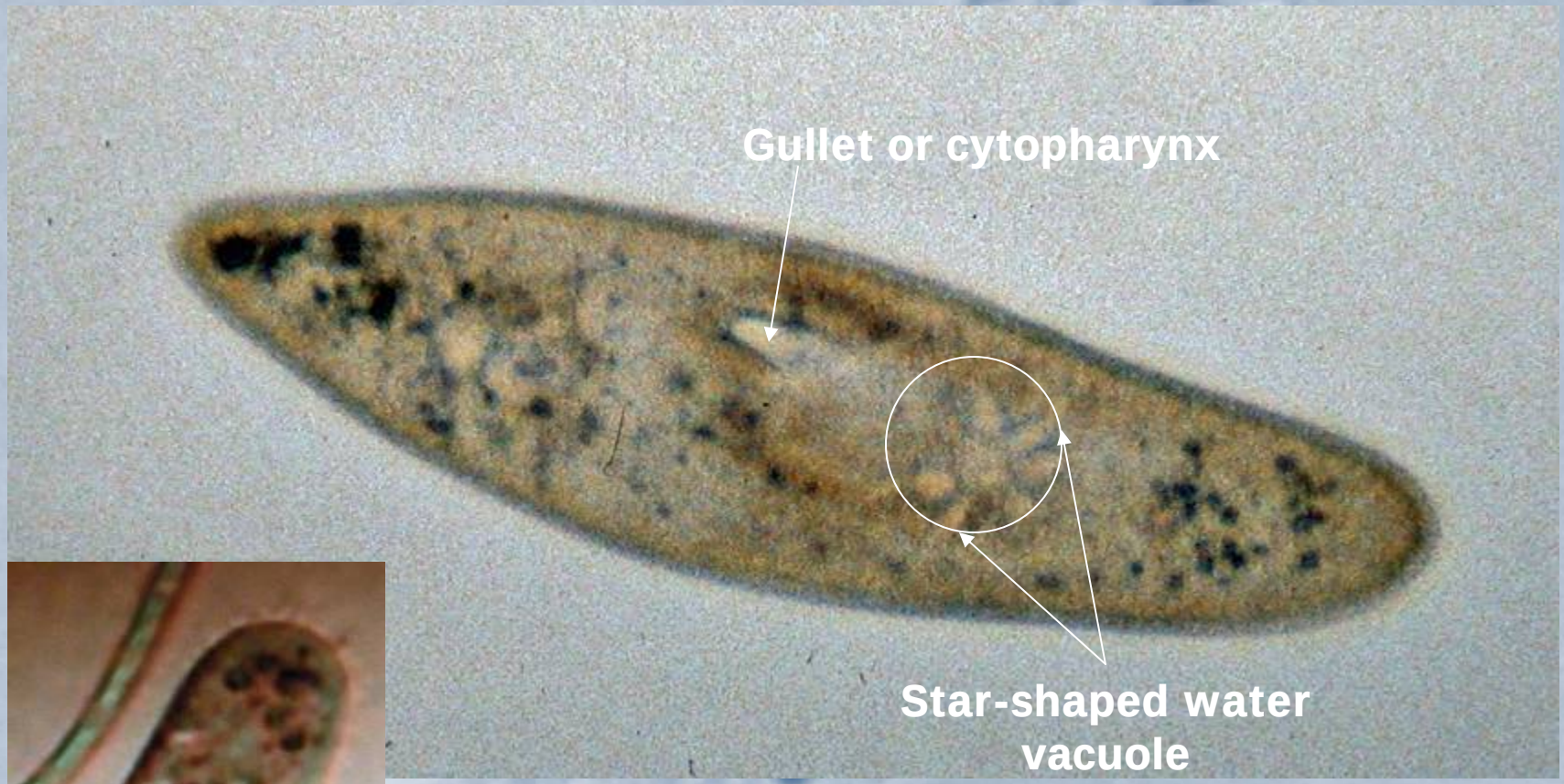


axopodium

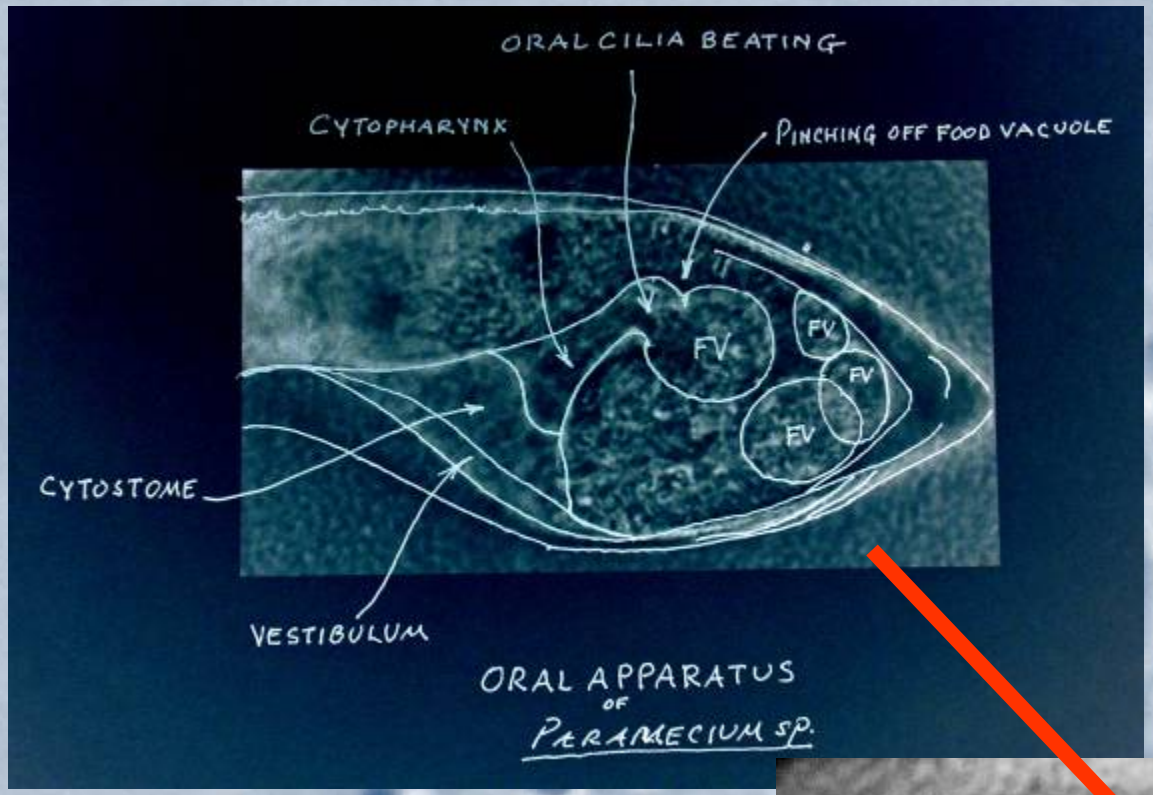
Water vacuole

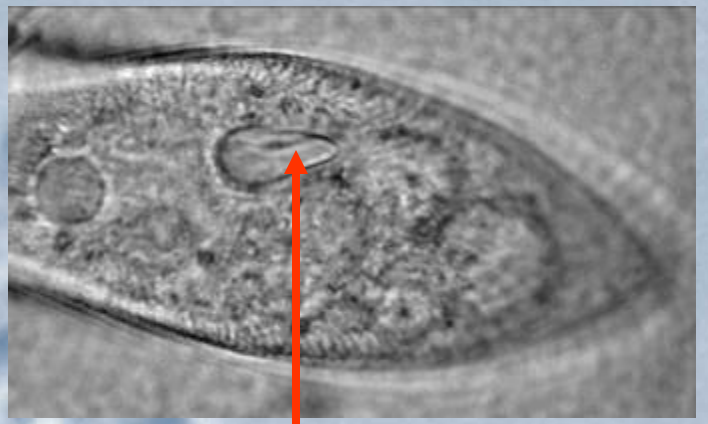
Paramecium, a CILIATE



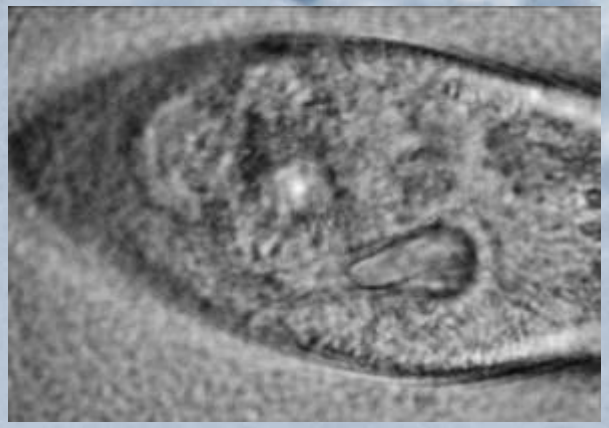

Gullet or cytopharynx
Star-shaped water vacuole

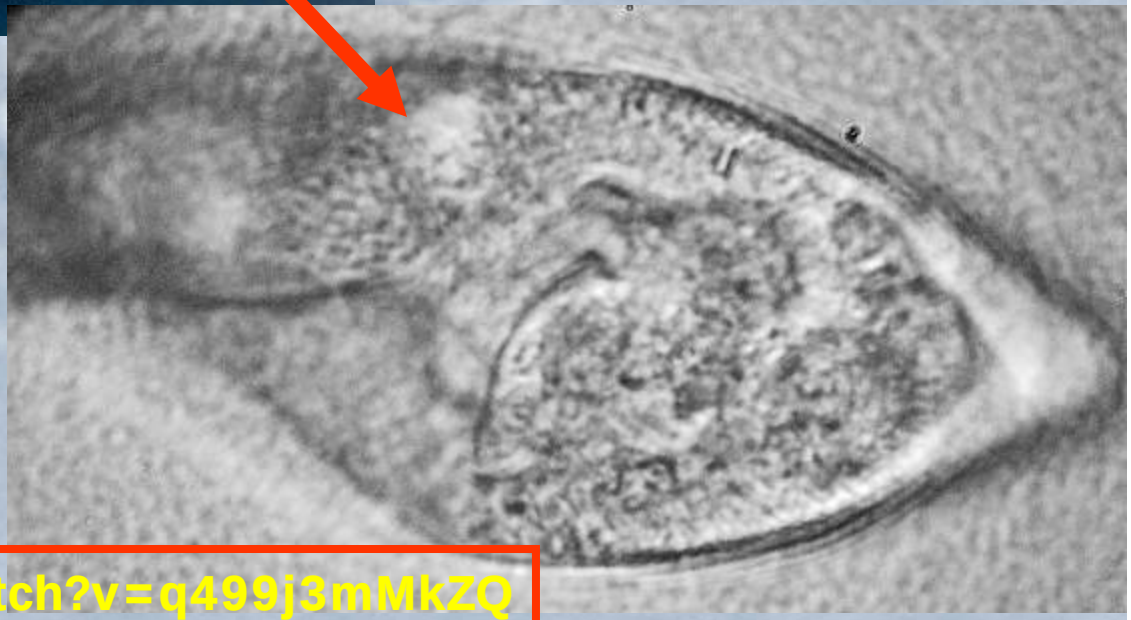

http://www.youtube.com/watch?v=jjvgi_C4axs



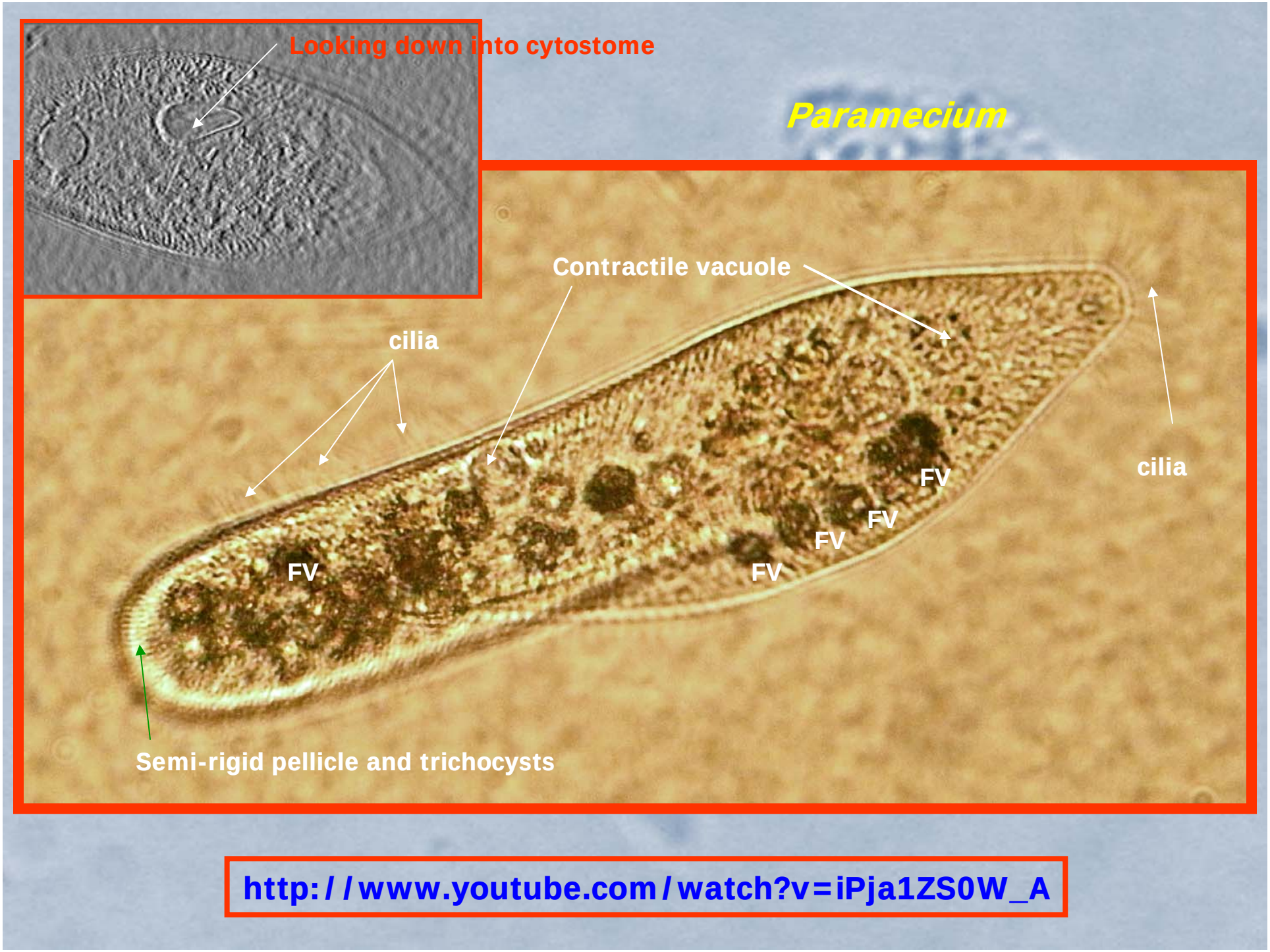


Looking down
into cytostome



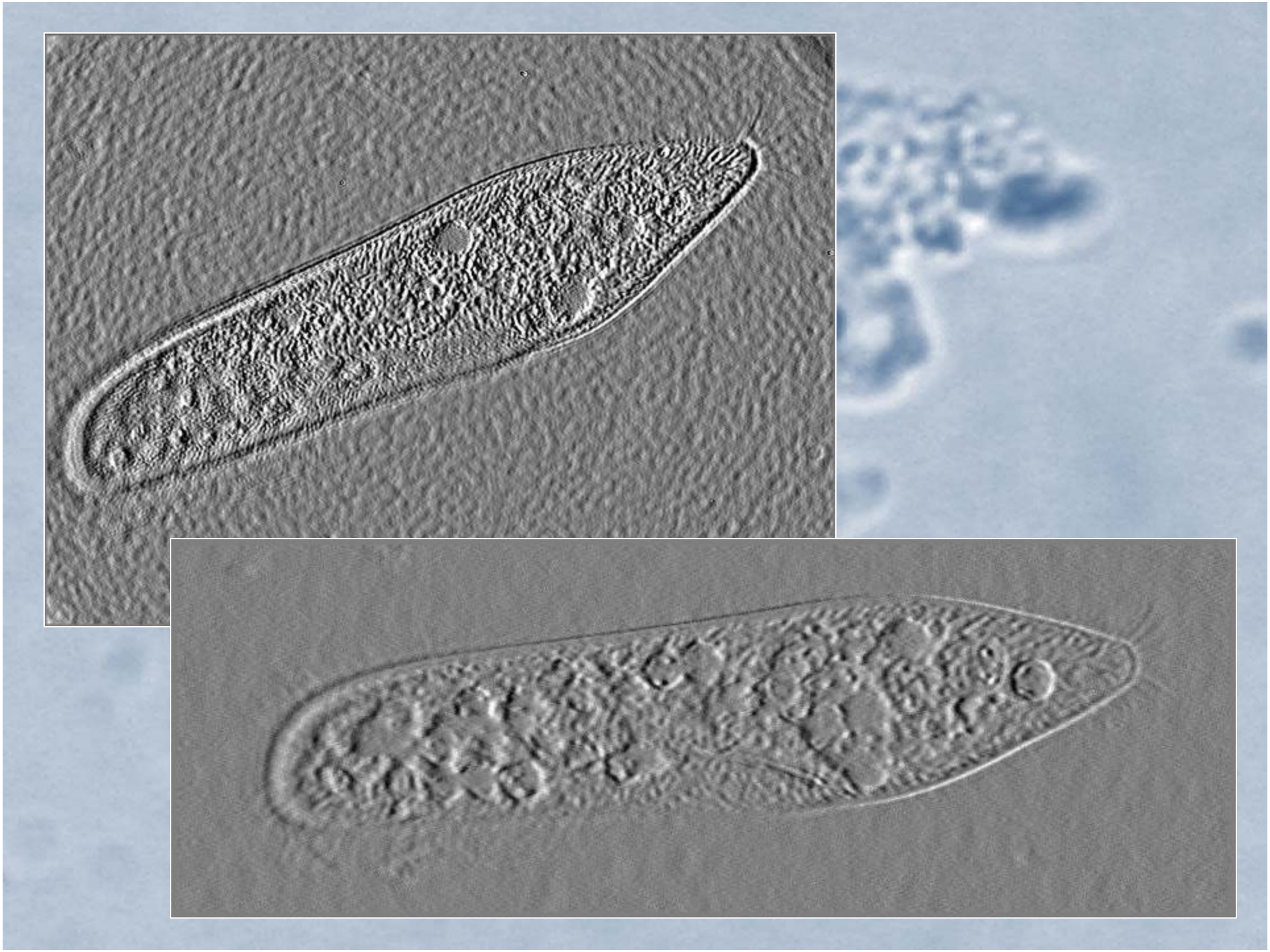


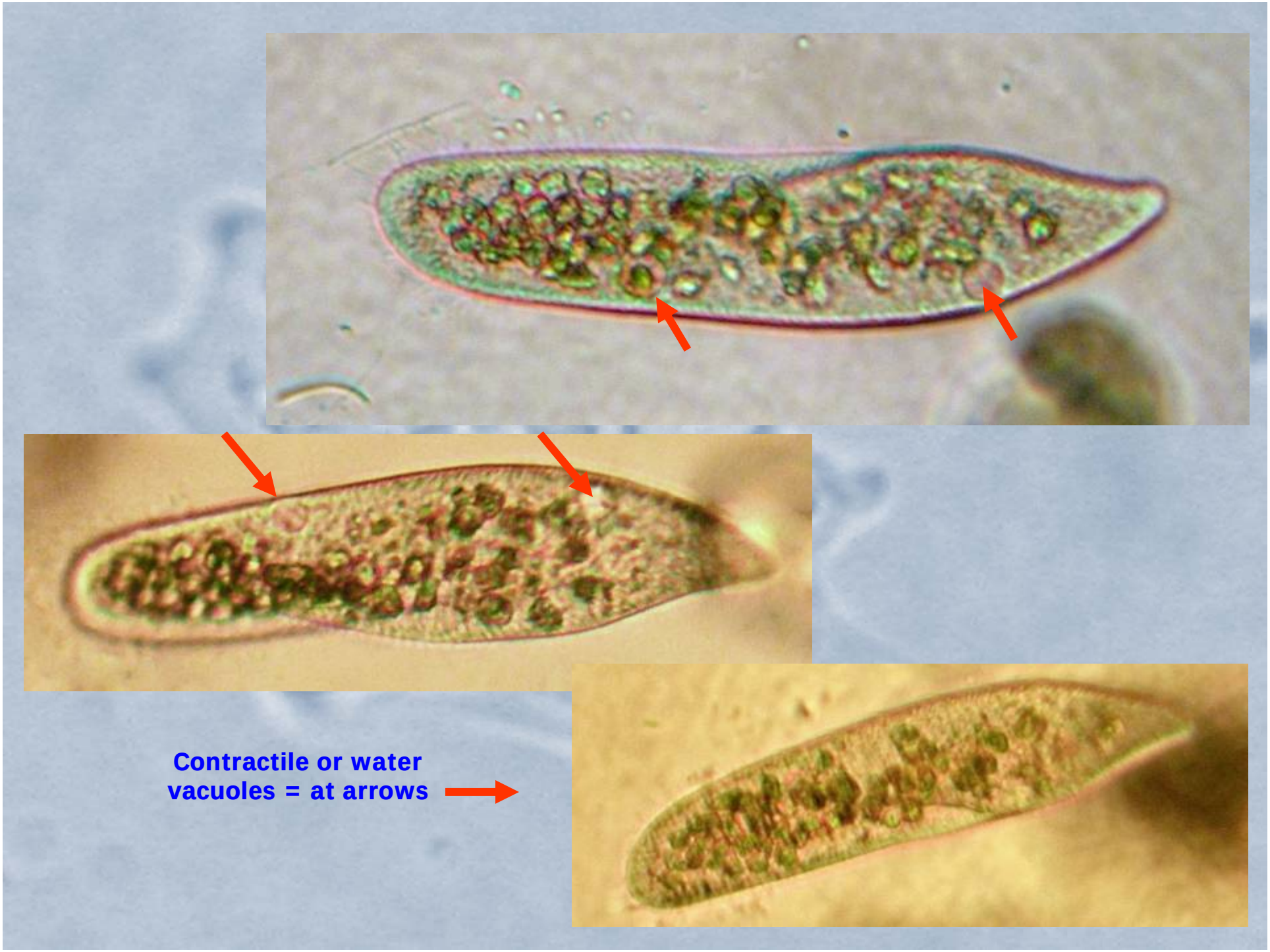
http://www.youtube.com/watch?v=q499j3mMkZQ

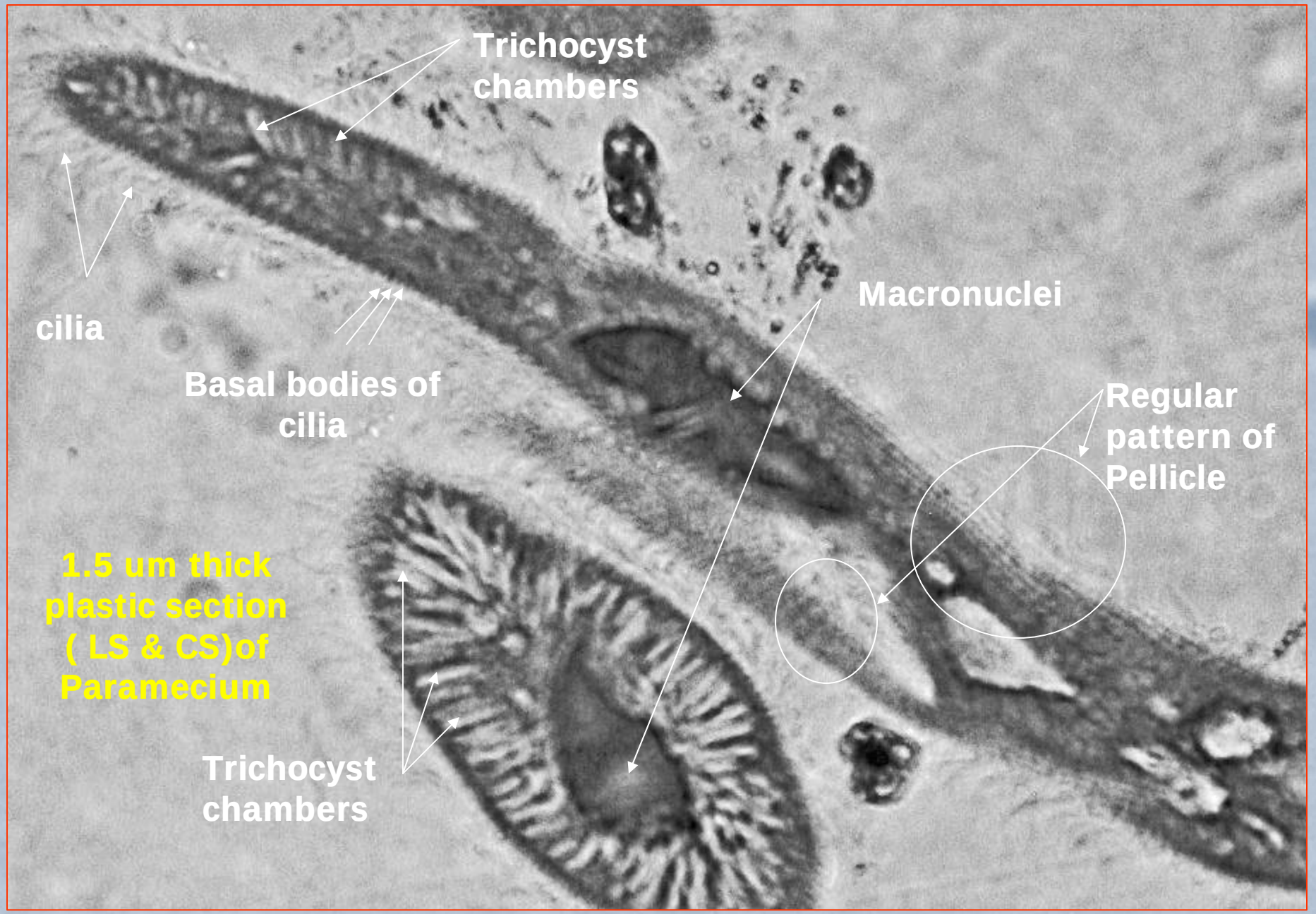


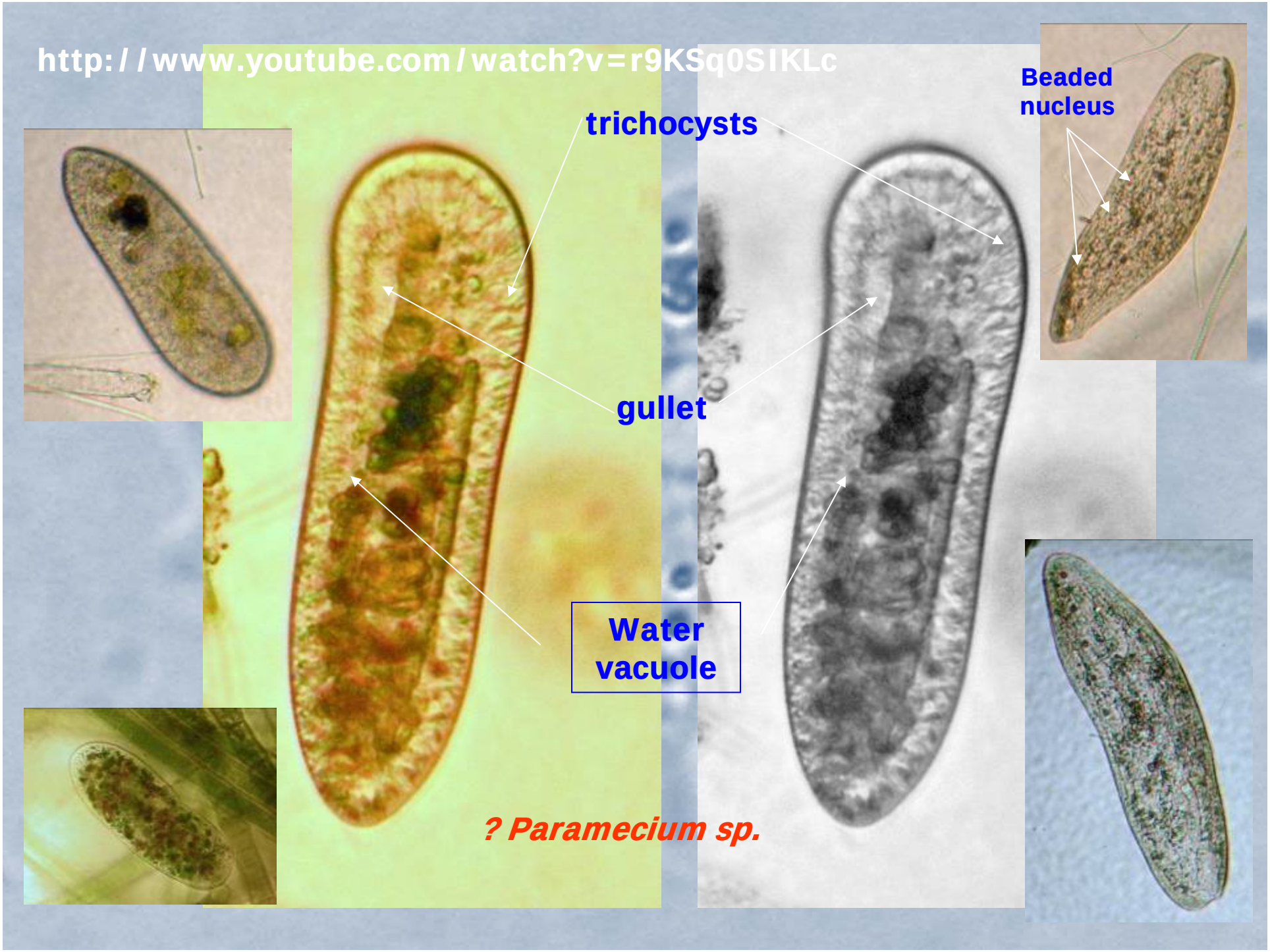
http://www.youtube.com/watch?v=iPja1ZS0W_A

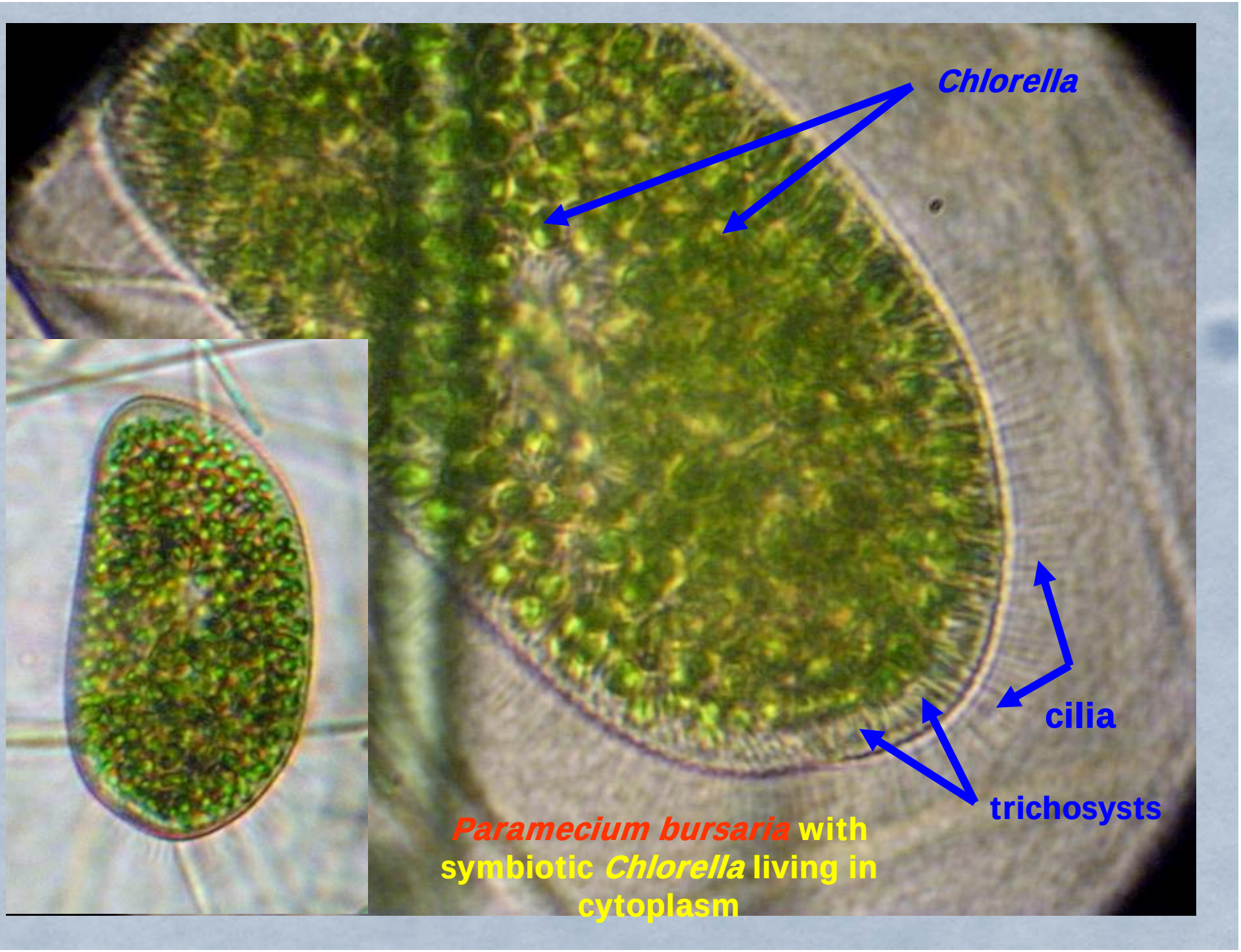
http://www.youtube.com/watch?v=iPja1ZS0W_A



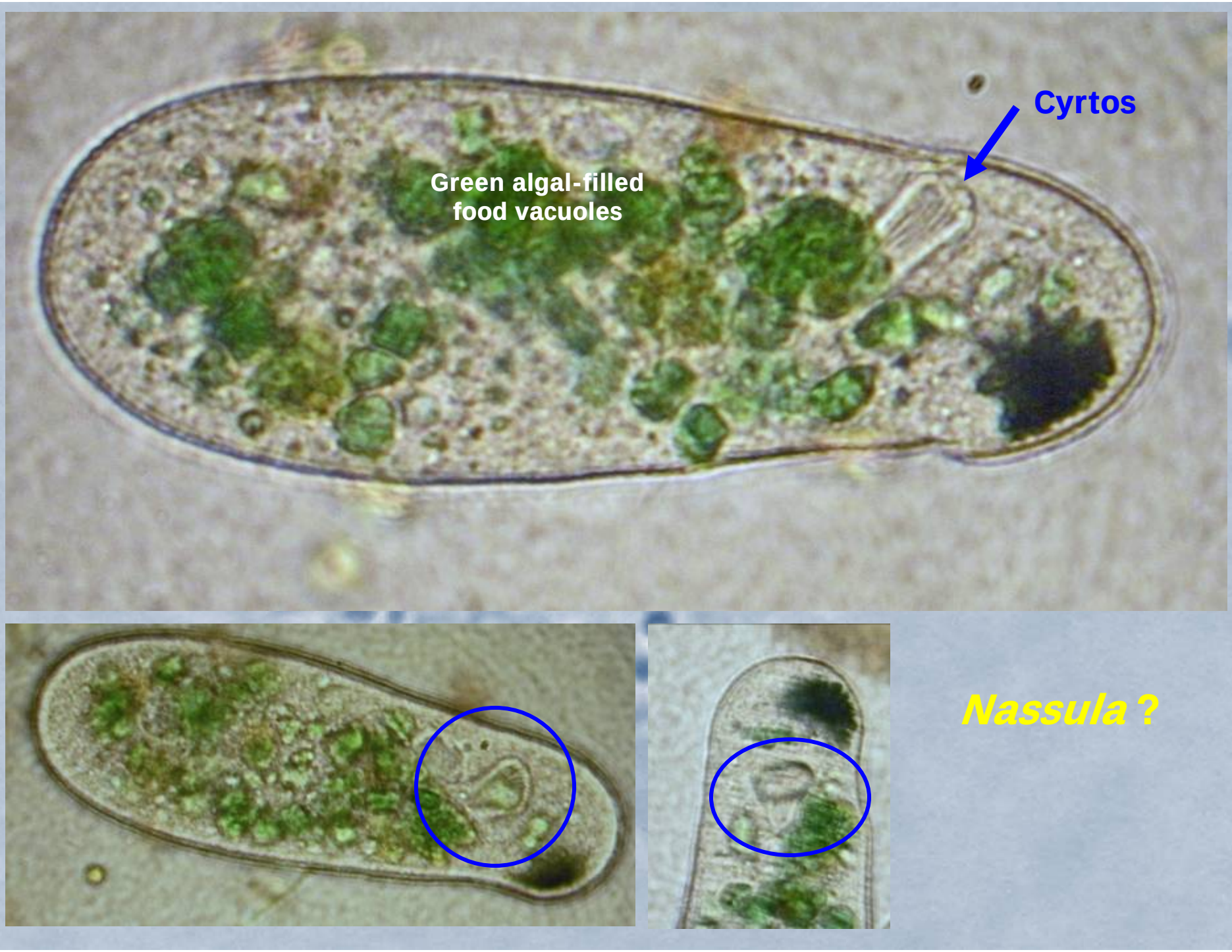

Contractile or water
vacuoles = at arrows

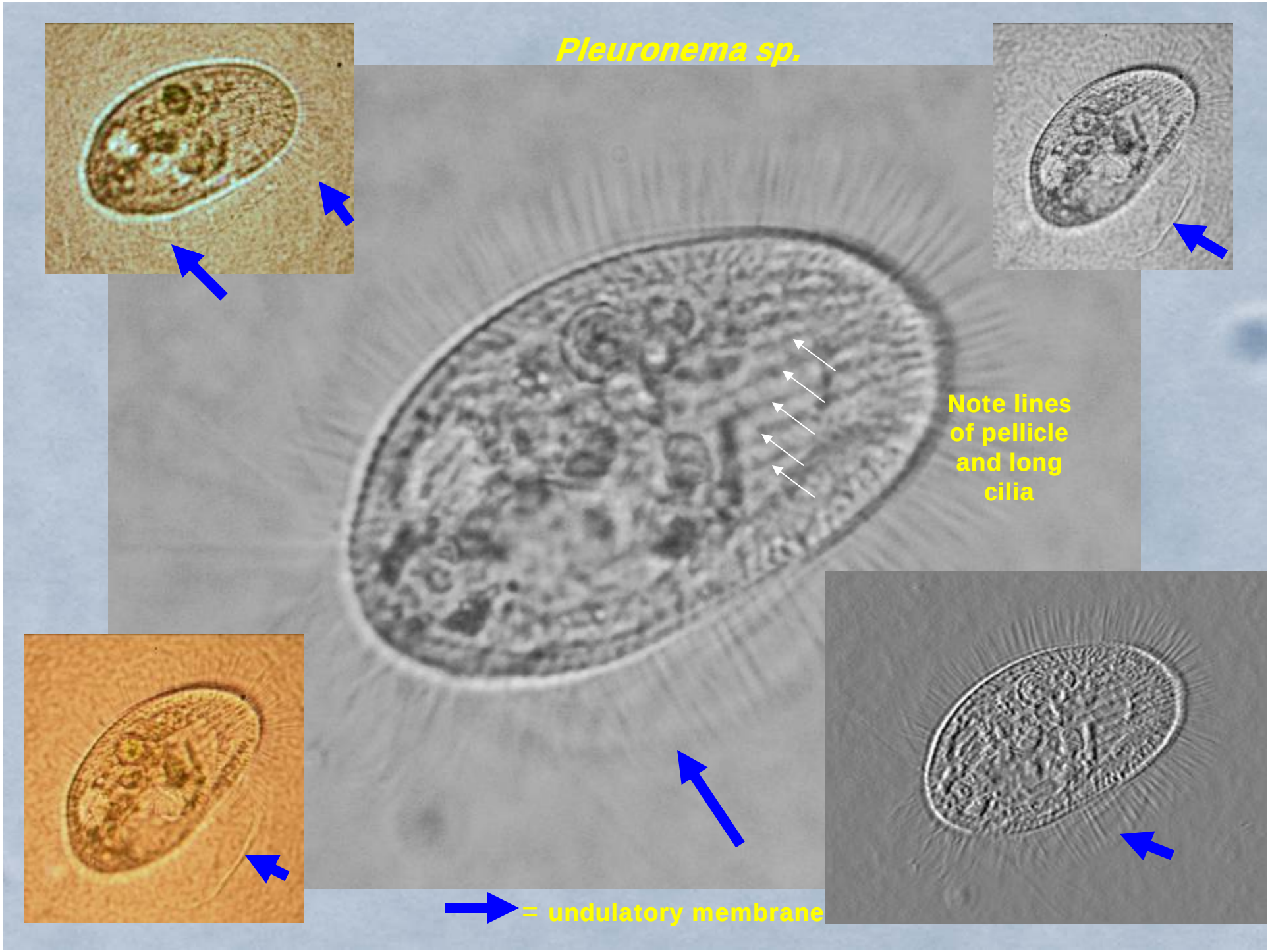

Trichocyst chambers
cilia
Basal bodies of cilia
Macronuclei
Regular pattern of Pellicle
1.5 um thick plastic section (LS & CS)of Paramecium
Trichocyst chambers


http://www.youtube.com/watch?v=r9KSq0SIKLc
trichocysts
Beaded nucleus
gullet
Water vacuole
? Paramecium sp.


Chlorella
cilia
trichosysts
Paramecium bursaria with symbiotic *Chlorella* living in cytoplasm


Chilodonella sp.
Pharyngeal basket
or 'Cyrtos'


Cyrtos
Green algal-filled
food vacuoles
Nassula ?

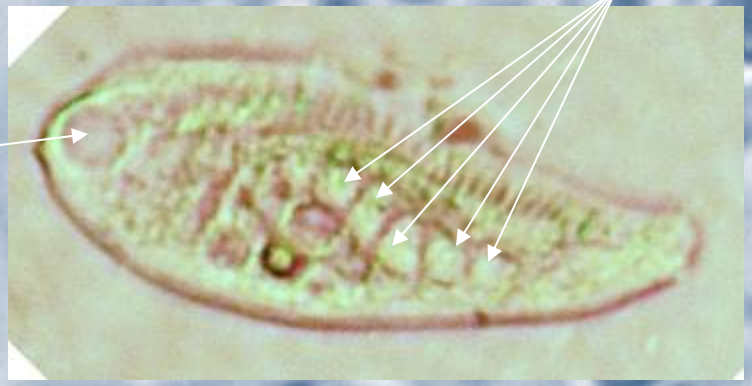

Pleuronema sp.
Note lines of pellicle and long cilia
= undulatory membrane

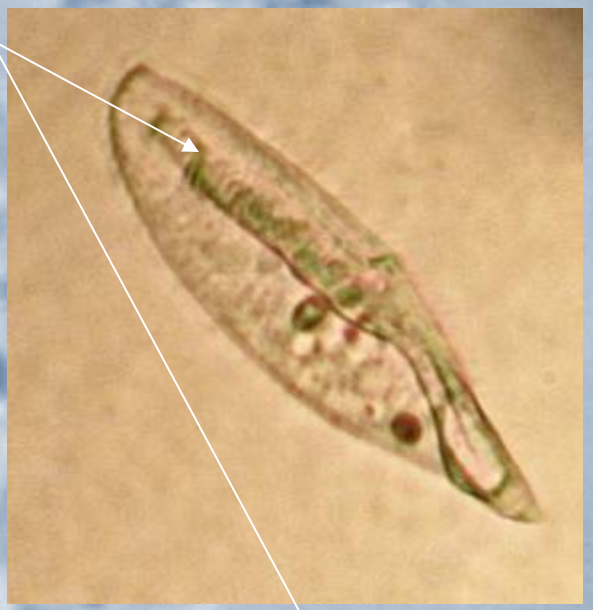
Blepharisma

Oral cilia

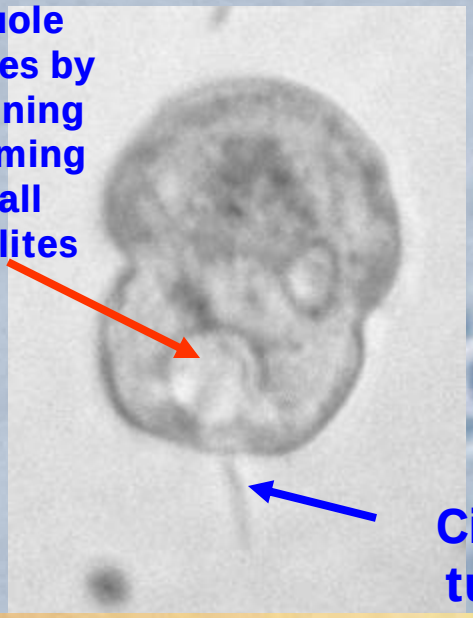
Beaded nuclei

Water vacuole





Contractile vacuole empties by flattening & forming small satellites



Urocentrum

Cilia tuft

Dividing while spinning

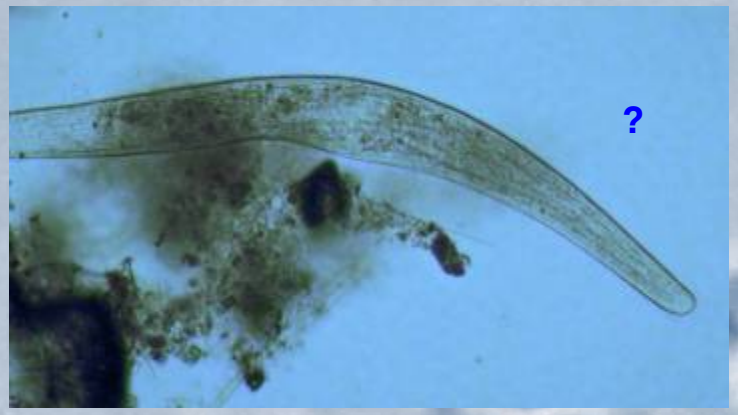
Ciliate: *Urocentrum*

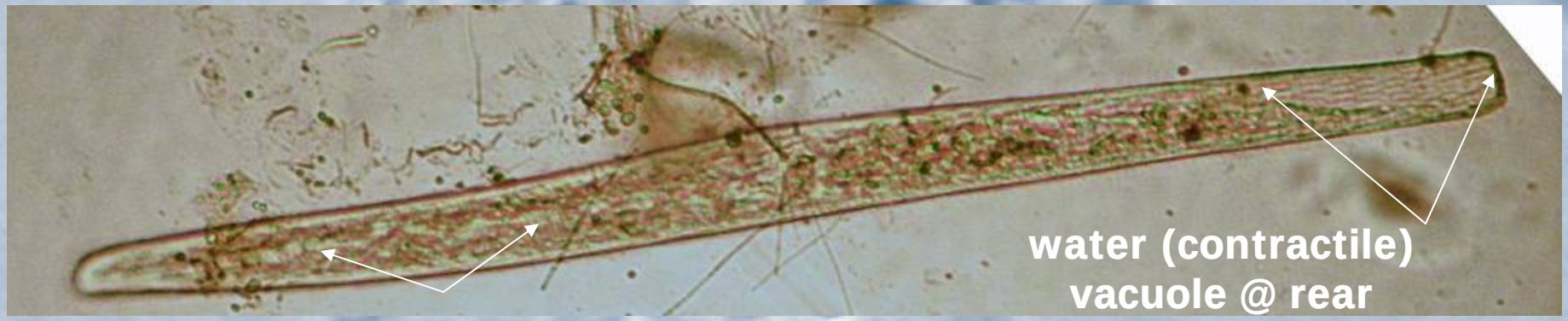
http://www.youtube.com/watch?v=8F4iBnf9fhI

division

http://www.youtube.com/watch?v=NpYQF2tmjy8

Loxodes

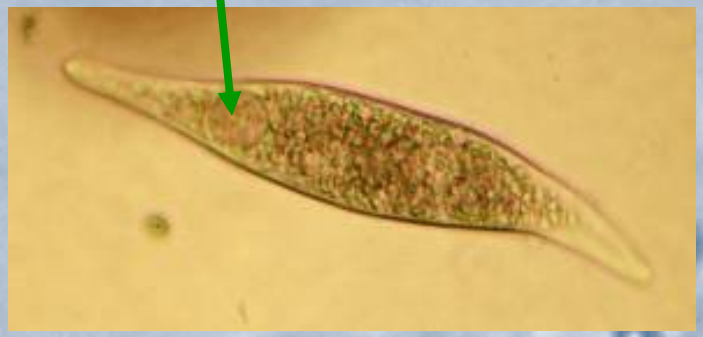




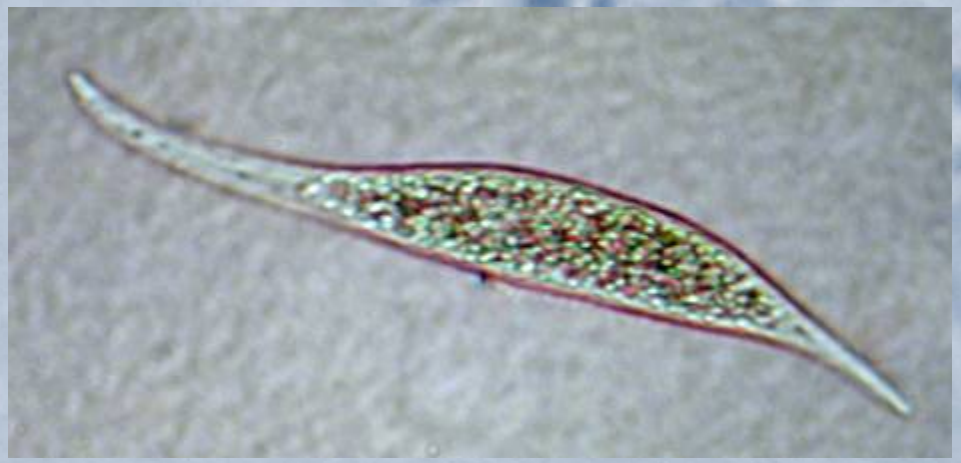
Long beaded nucleus

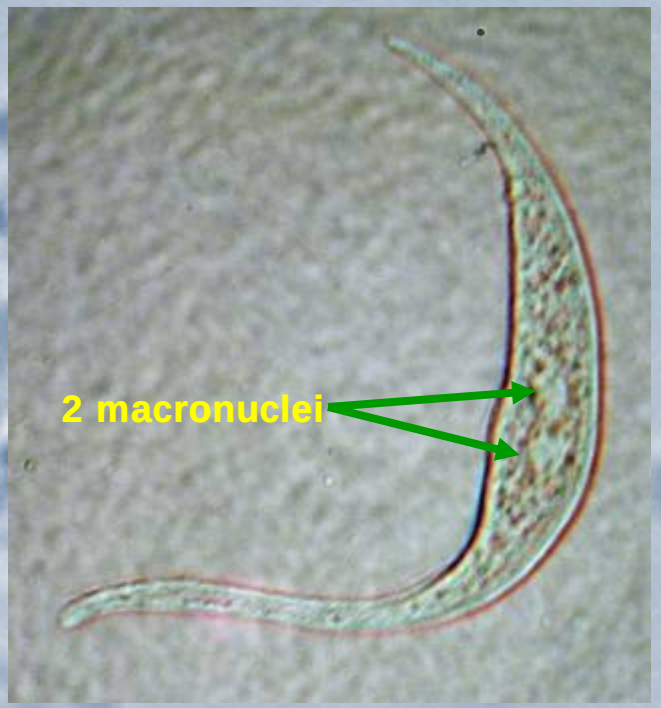
A very long ciliate: ***Spirostomum***

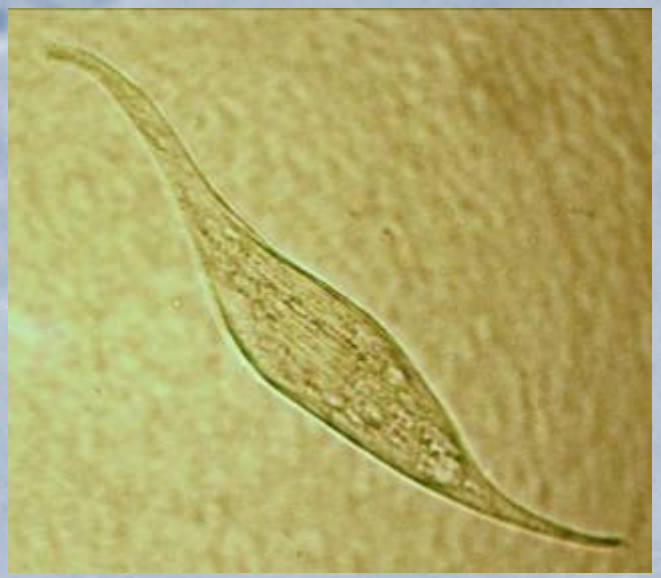
Posterior WV (CV)



Trachelophyllum

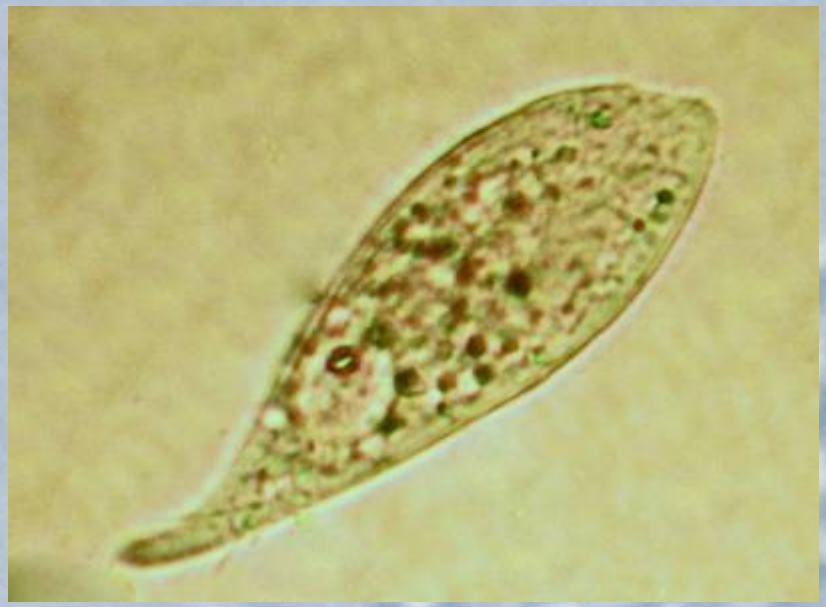


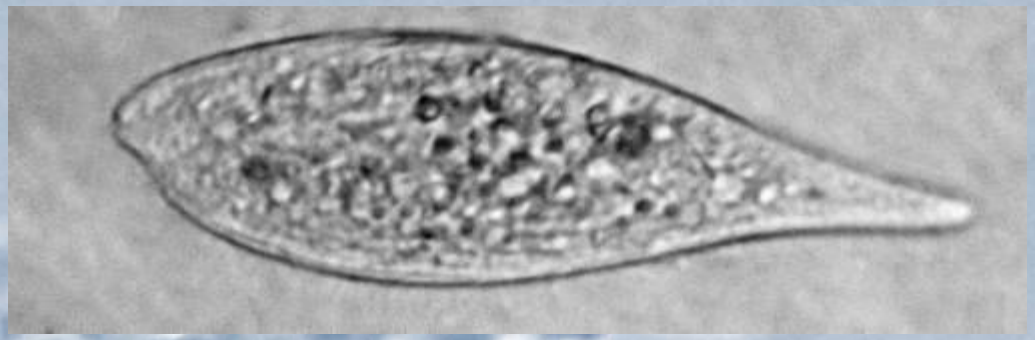




http://www.youtube.com/watch?v=TaHx7w-j_8c

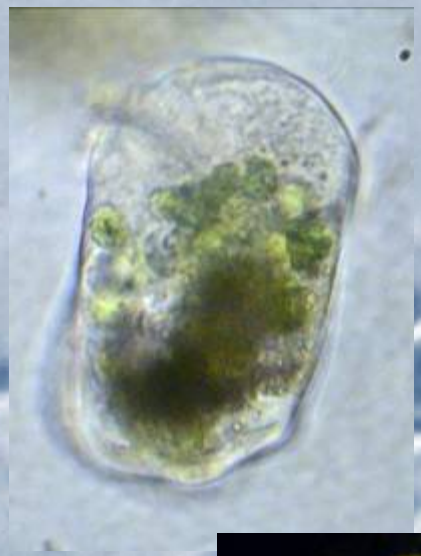
Litonotus





Litonotus

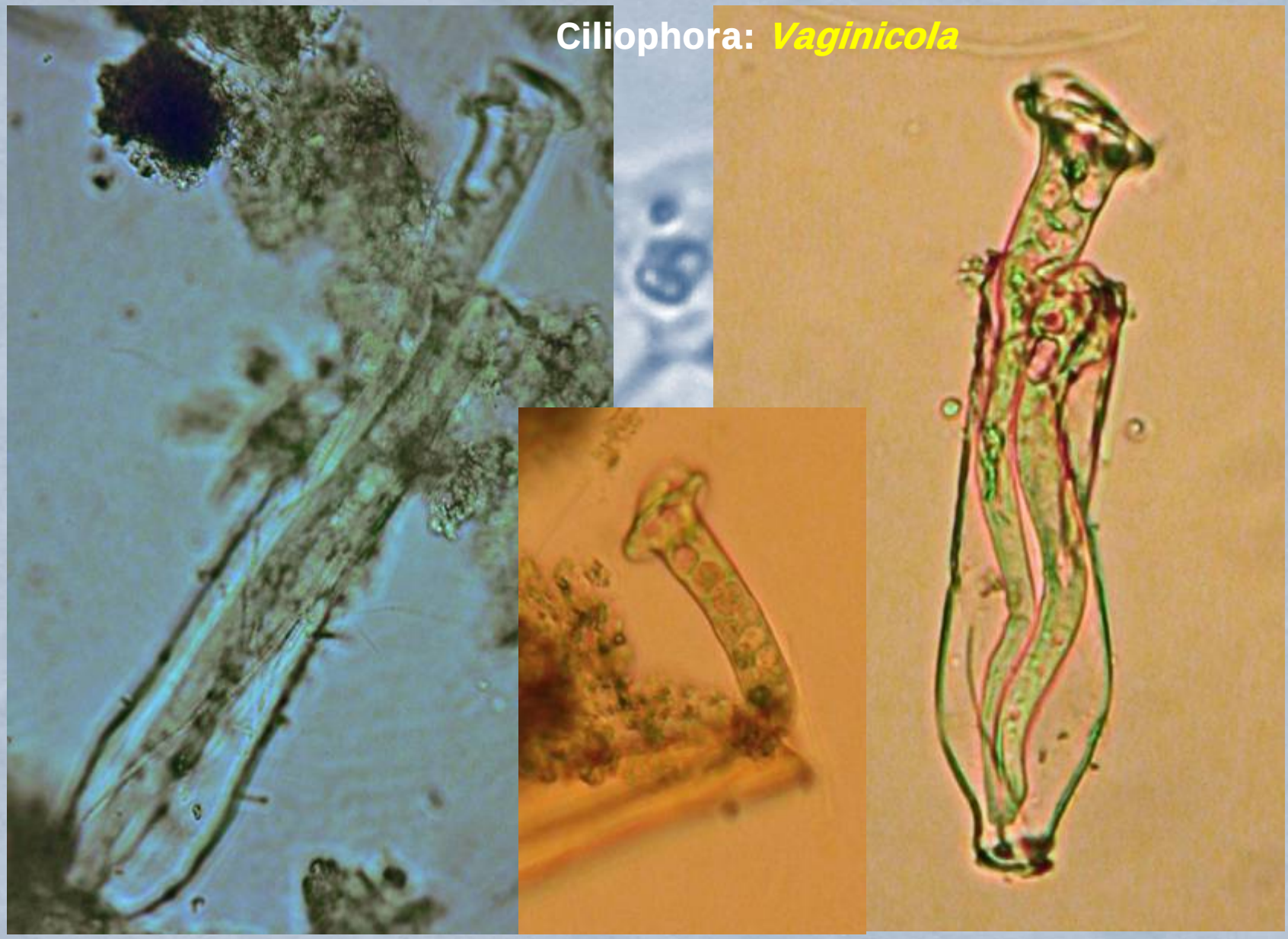
***Coleps*, another ciliophoran**



A ‘swarm’ of
ciliates

Ciliophora: *Vaginicola*

Ciliophora: *Vaginicola*



Ciliophora: ***Vaginicola***

http://www.youtube.com/watch?v=bQpIFvpSlEE



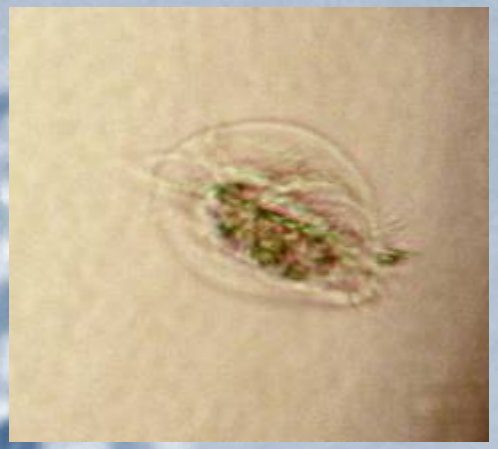


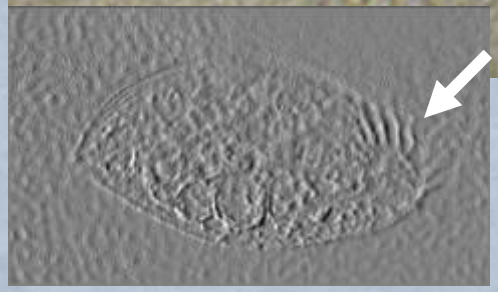
Ciliophora: Hypotricha –
Euplotes* or *Stylonychia

http://www.youtube.com/watch?v=8sHuSVqQFzo





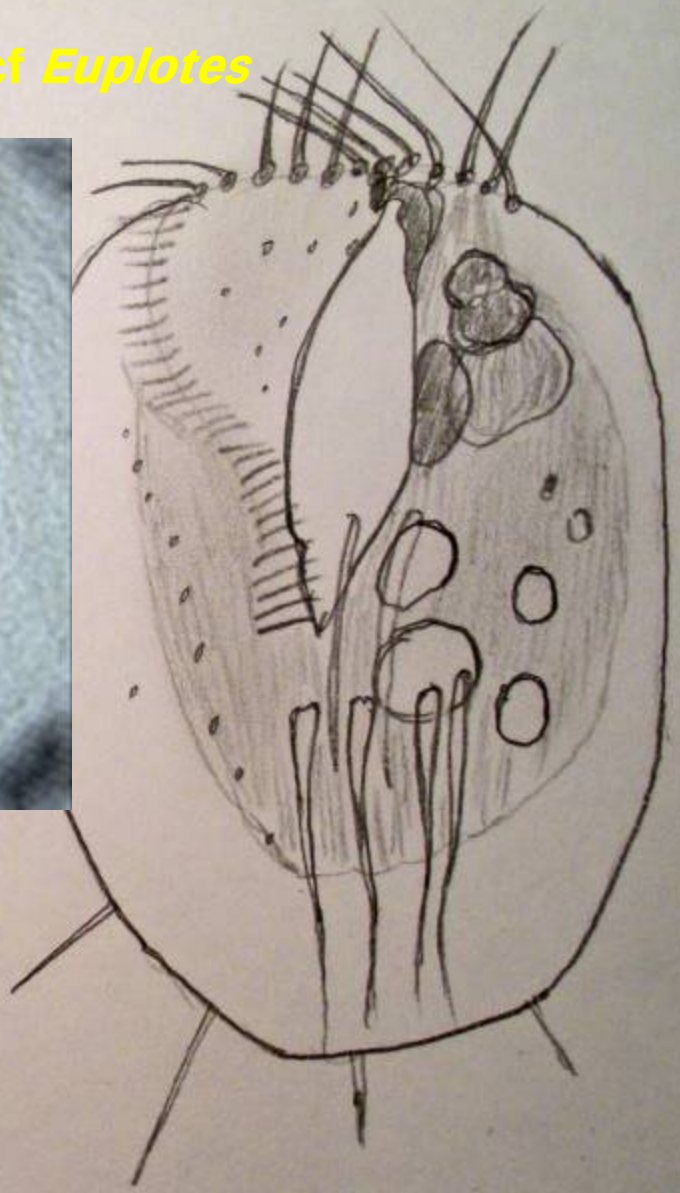




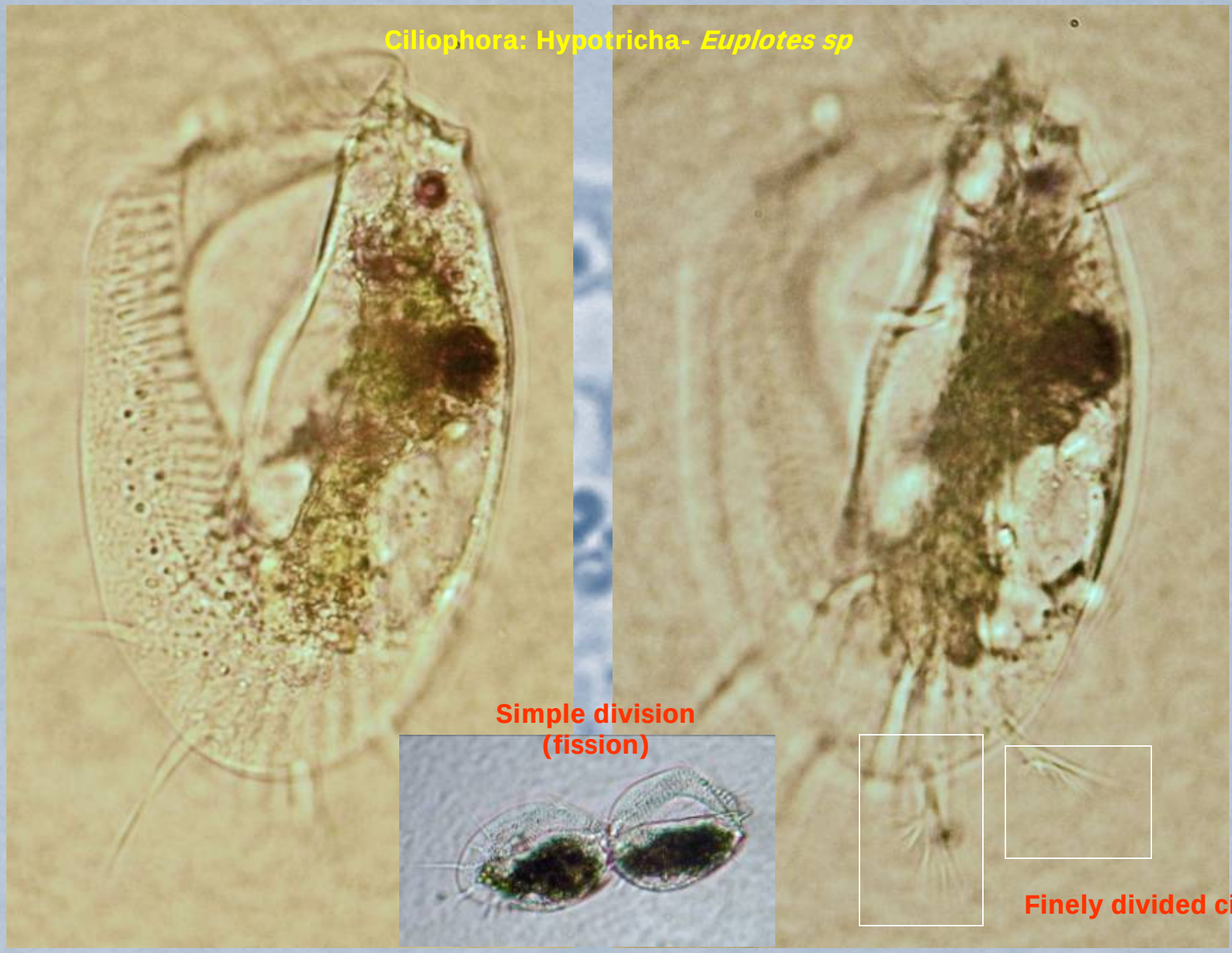
Ciliophora: Hypotricha – cf *Euplotes*

http://www.youtube.com/watch?v=9NNdfmzRB10

Ciliophora: Hypotricha – cf *Euplotes*

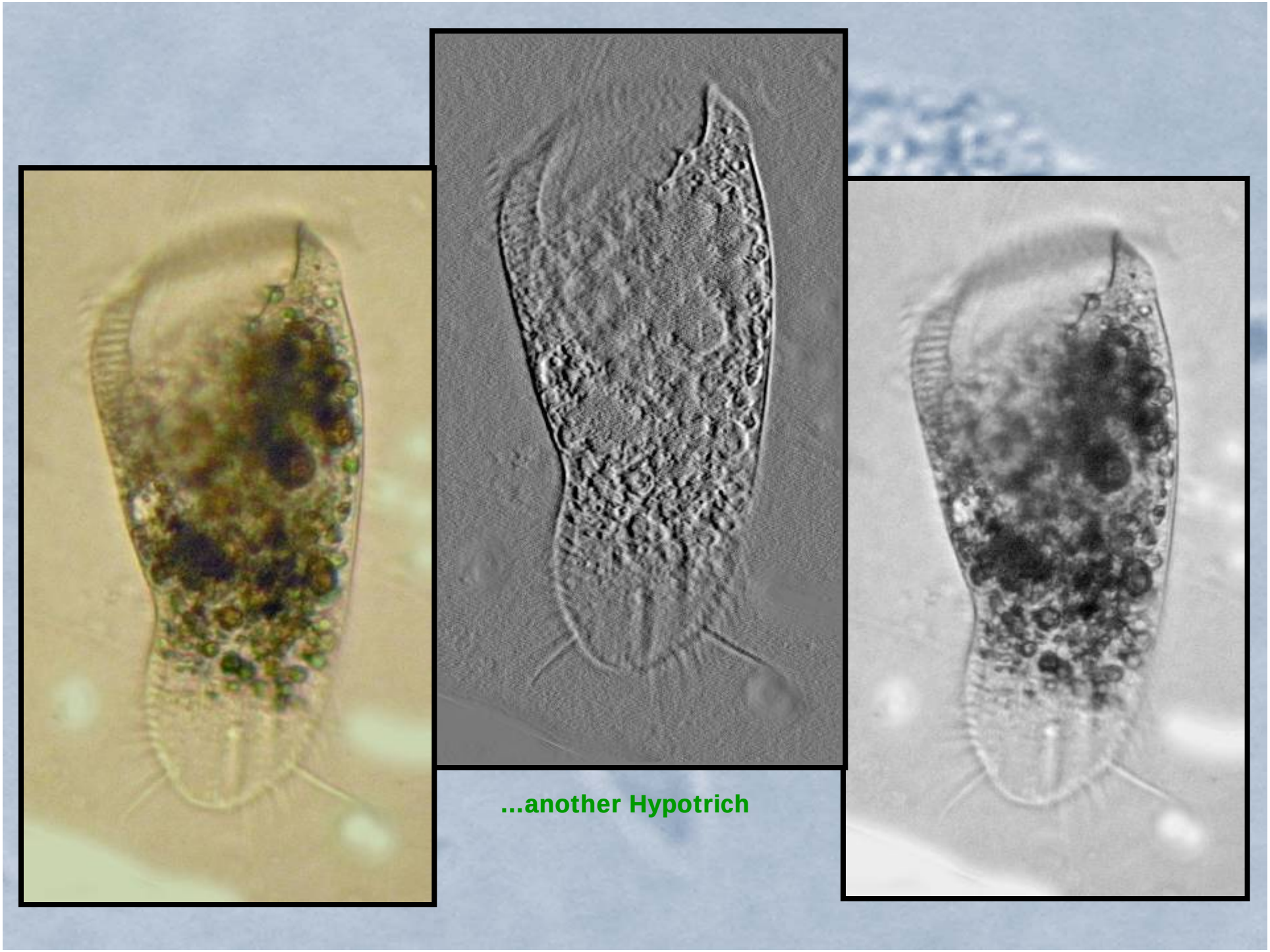


Ciliophora: Hypotricha- *Euplotes sp*

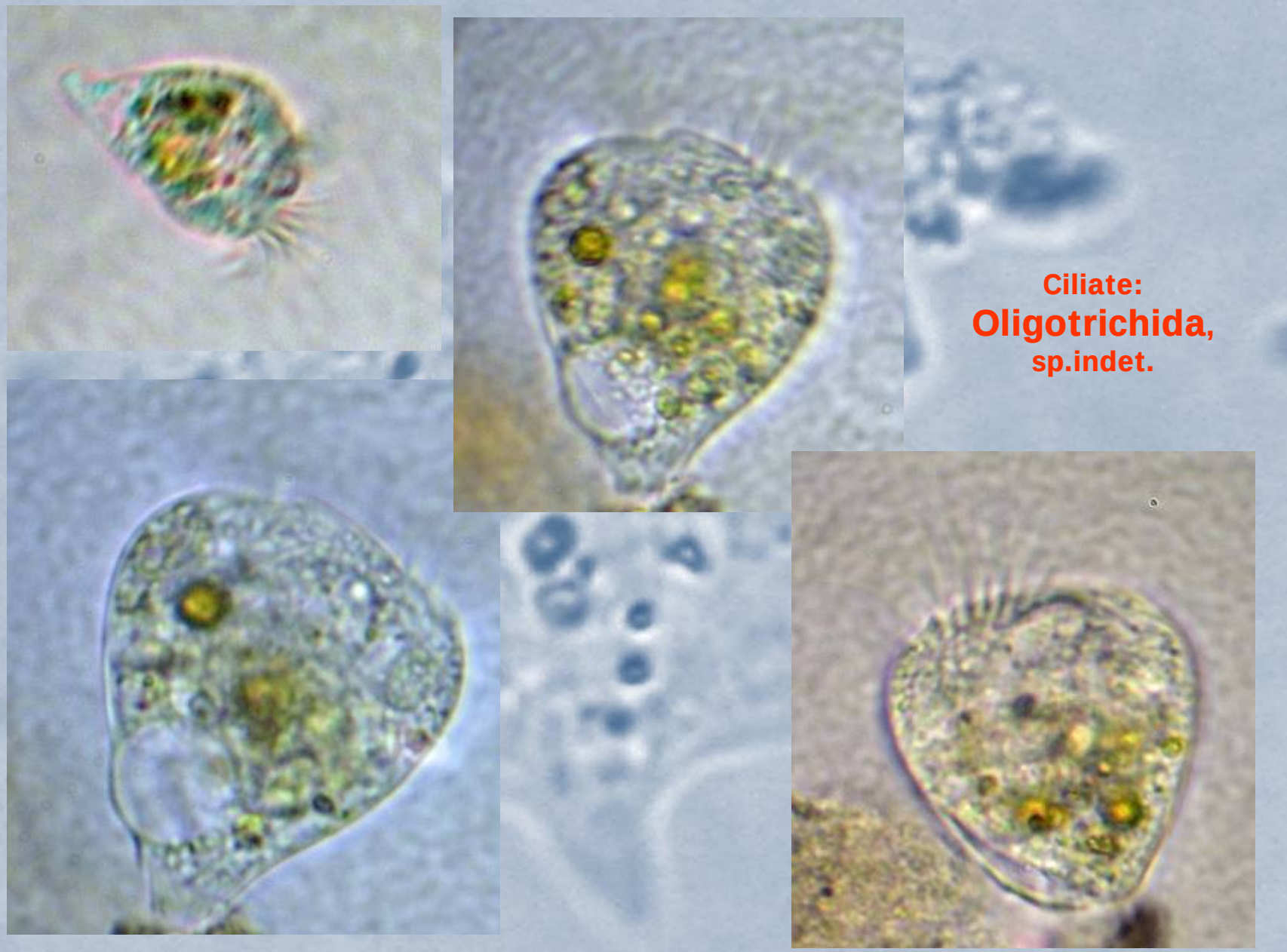


Simple division (fission)

Finely divided cirri



...another Hypotrich



Ciliate:
Oligotrichida,
sp.indet.

Ciliophora (Peritricha): *Vorticella*

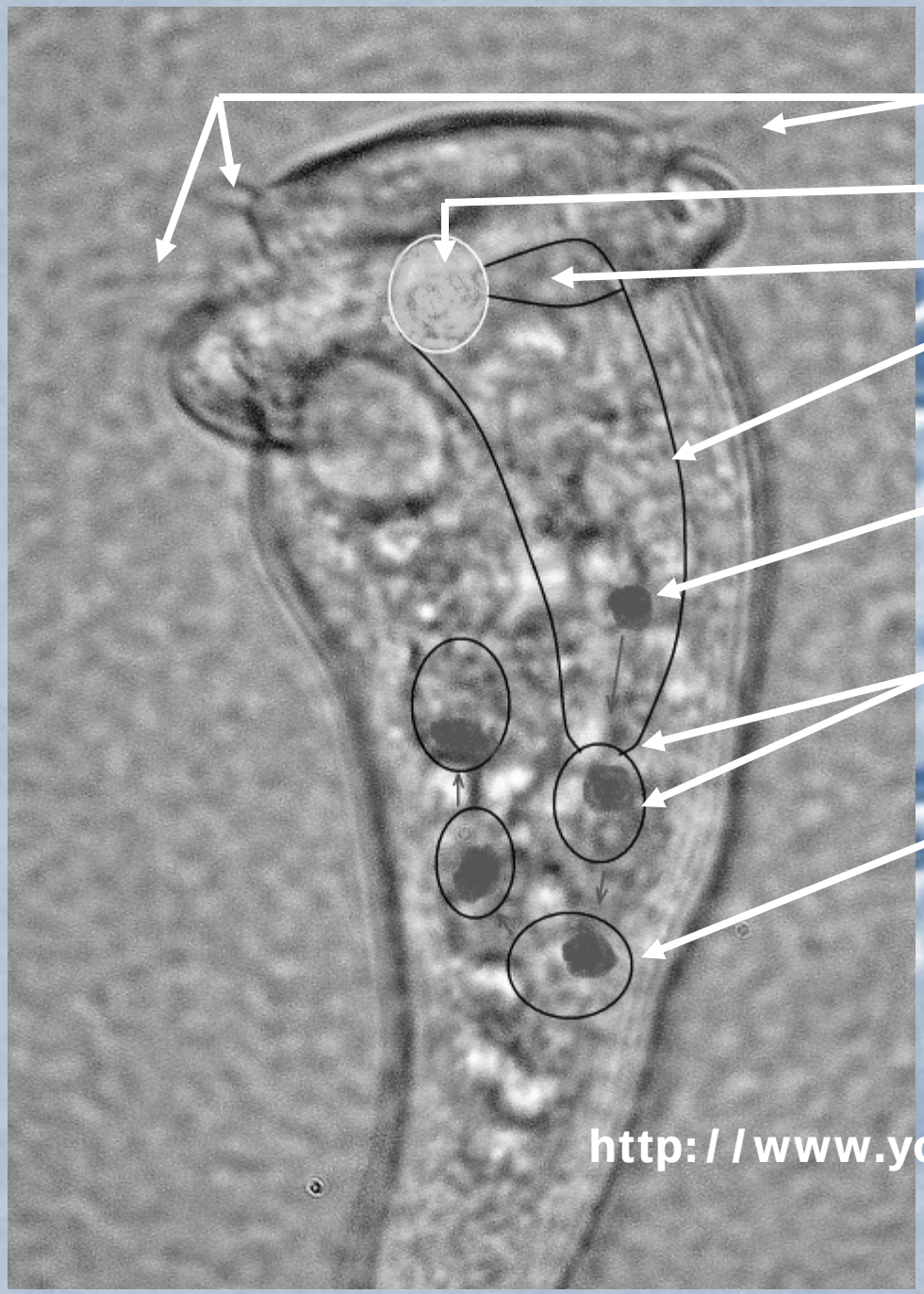
http://www.youtube.com/watch?v=yIQpEse6_-4


Vorticella
Note stalk coiled during retraction
http://www.youtube.com/watch?v=3Cf207FbfYk

http://www.youtube.com/watch?v=BkCD1-4dqJQ

Carchesium

http://www.youtube.com/watch?v=hc6J4j3lwAw



Cilia

Contractile (Water) Vacuole

Vestibulum

Cytopharynx

Food

Food Vacuole, pinching-off

Food vacuoles assemble with Lysosomes which digest food in vacuole while it moves through cytoplasm in circular fashion-'cyclosis'

http://www.youtube.com/watch?v=hc6J4j3lwAw

Carchesium

***Stentor* attached & stretched**

http://www.youtube.com/watch?v=SsJganTsstE

***Stentor* moving note cilia at arrow**

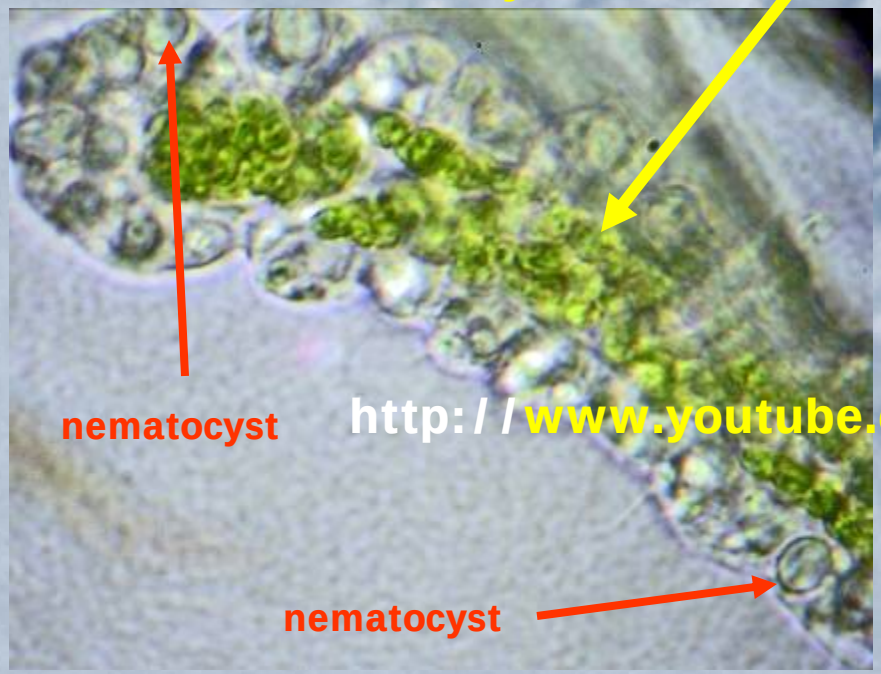
http://www.youtube.com/watch?v=SsJganTsstE

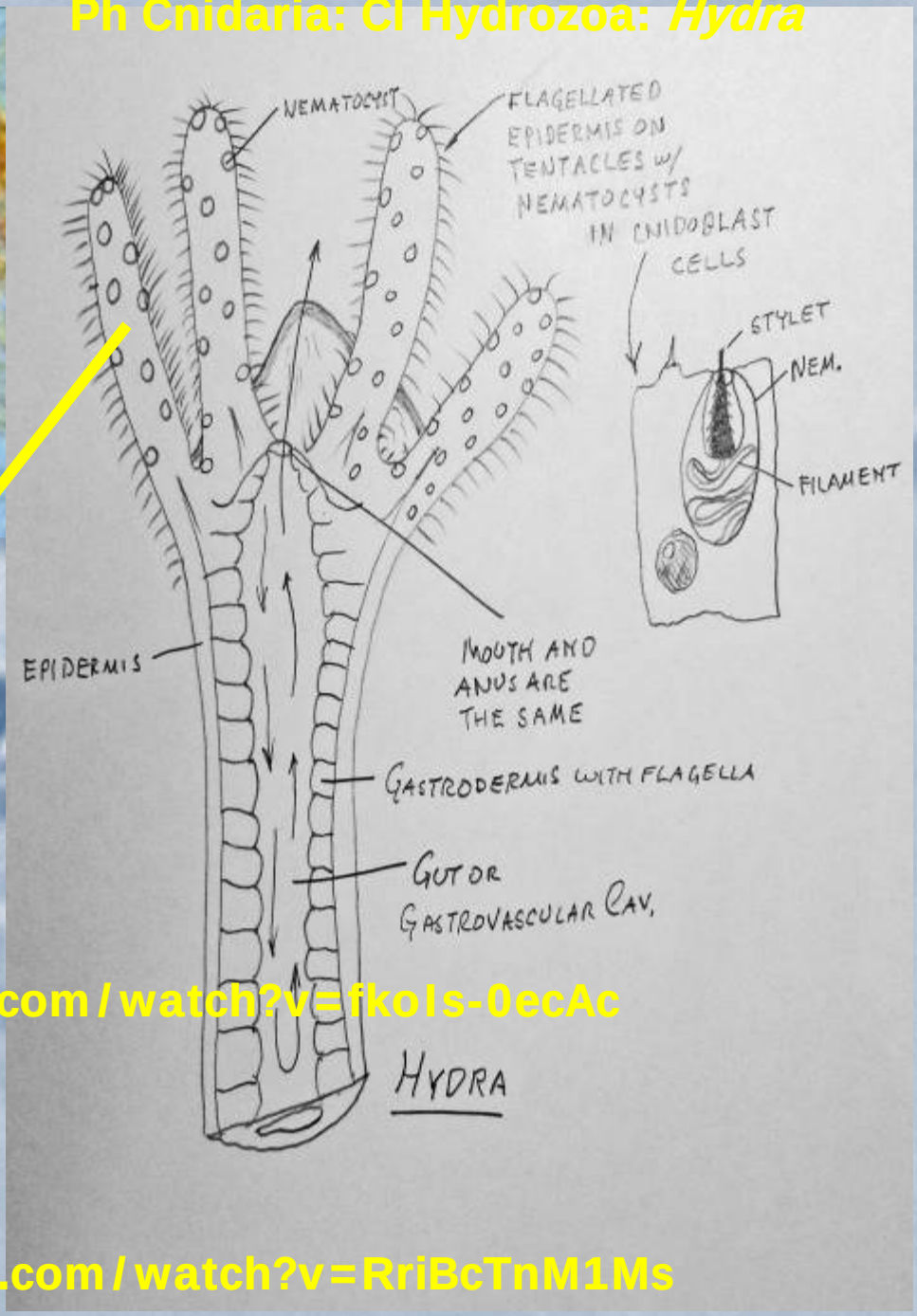
http://www.youtube.com/watch?v=4AaisHXQzAI

Multicellular Animals

Ph Cnidaria: Cl Hydrozoa: *Hydra*

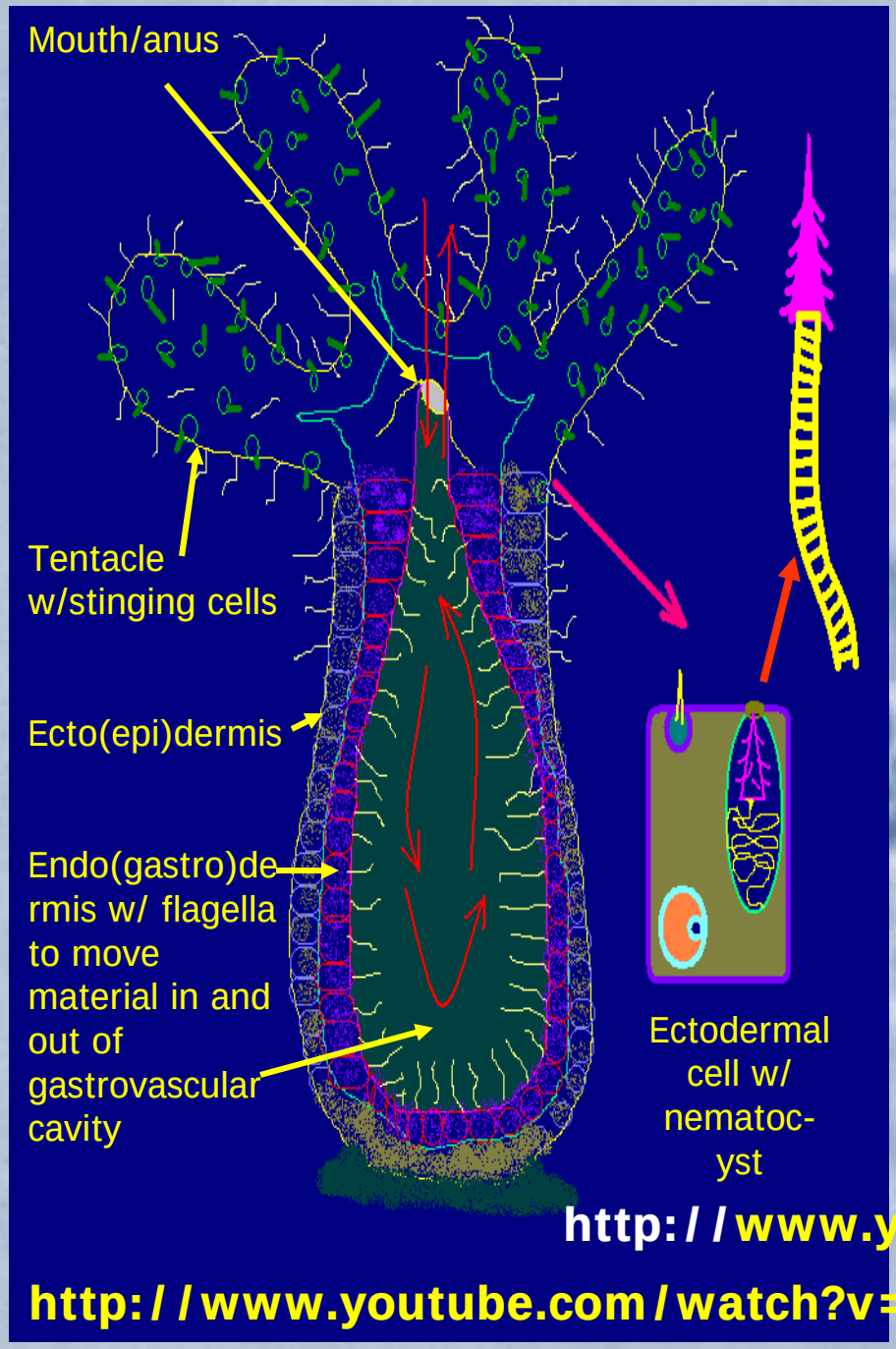
Stinging cells with nematocysts in epidermis (ectodermis) of Hydra



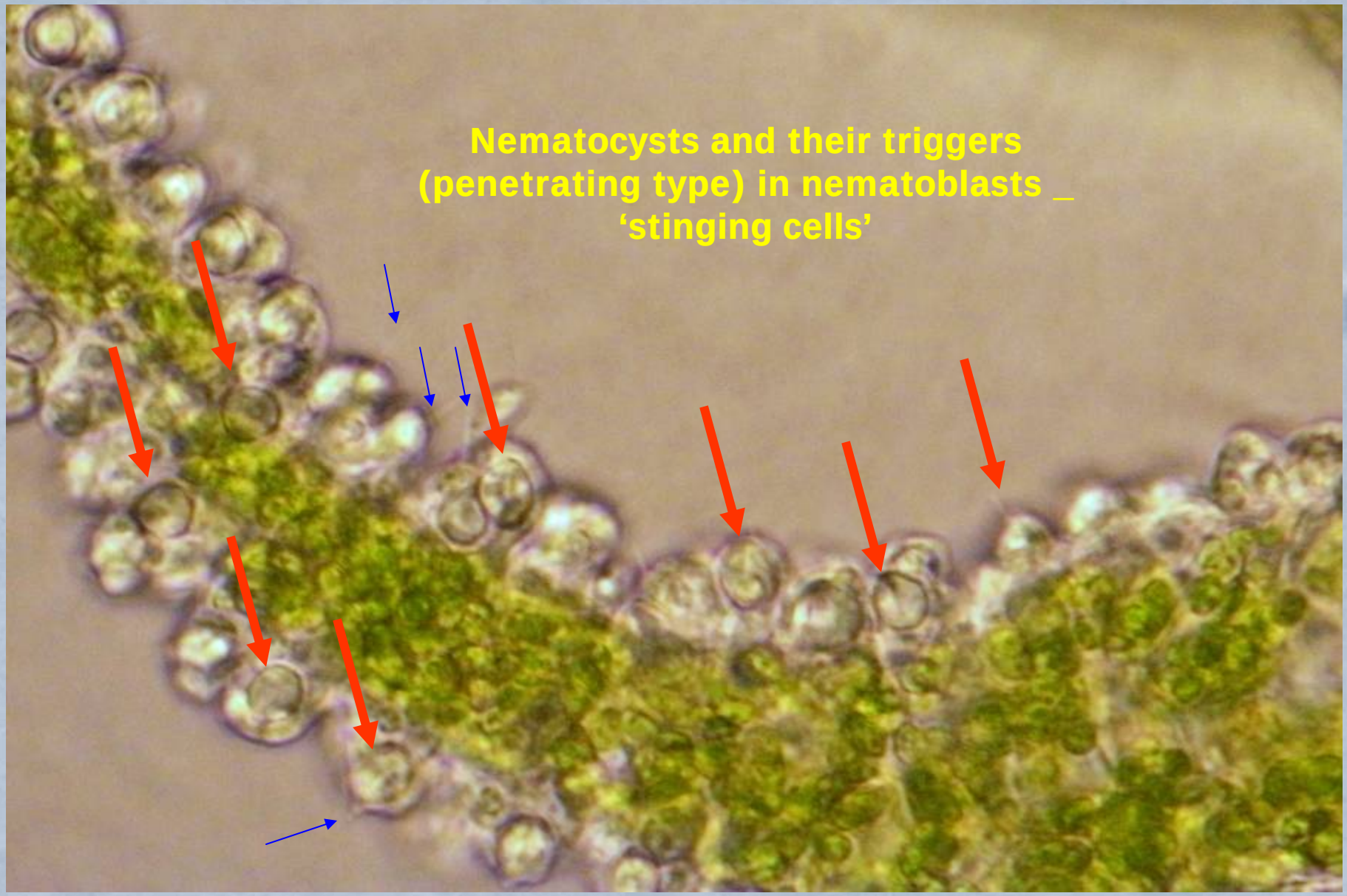


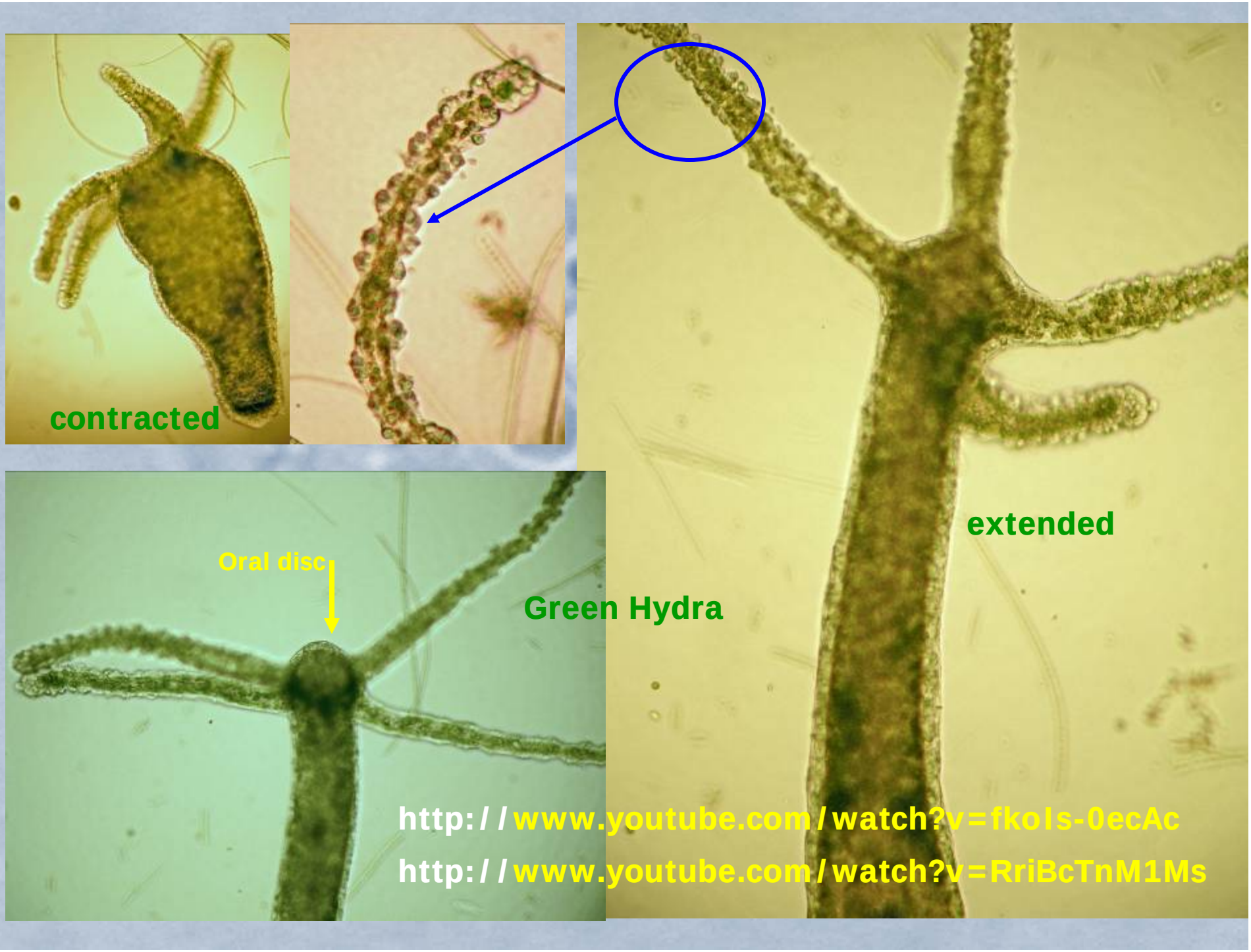
http://www.youtube.com/watch?v=fkoIs-0ecAc

http://www.youtube.com/watch?v=RriBcTnM1Ms

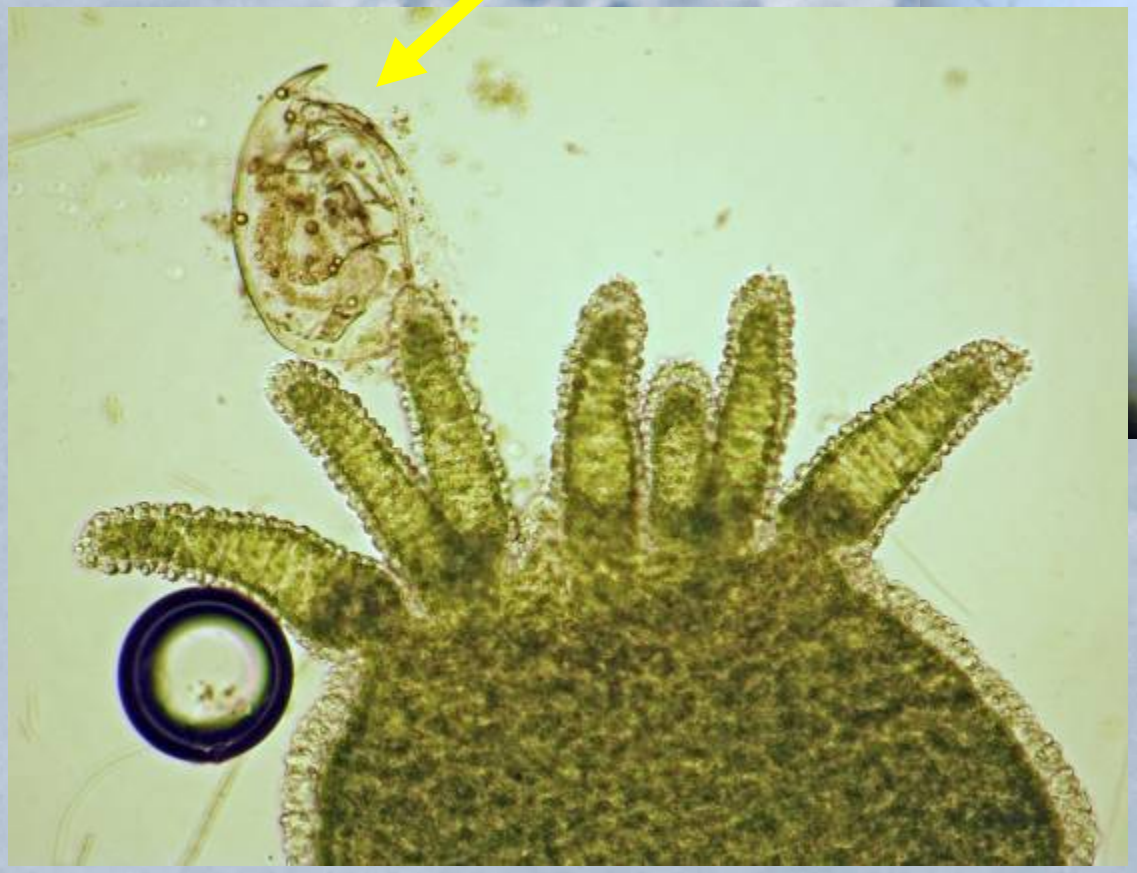


http://www.youtube.com/watch?v=RriBcTnM1Ms


Nematocysts and their triggers
(penetrating type) in nematoblasts _
‘stinging cells’


contracted
extended
Oral disc
Green Hydra
http://www.youtube.com/watch?v=fkoIs-0ecAc
http://www.youtube.com/watch?v=RriBcTnM1Ms

A green *Hydra* throws-up or regurgitates a cladoceran exoskeleton after digestion in its gastrovascular cavity

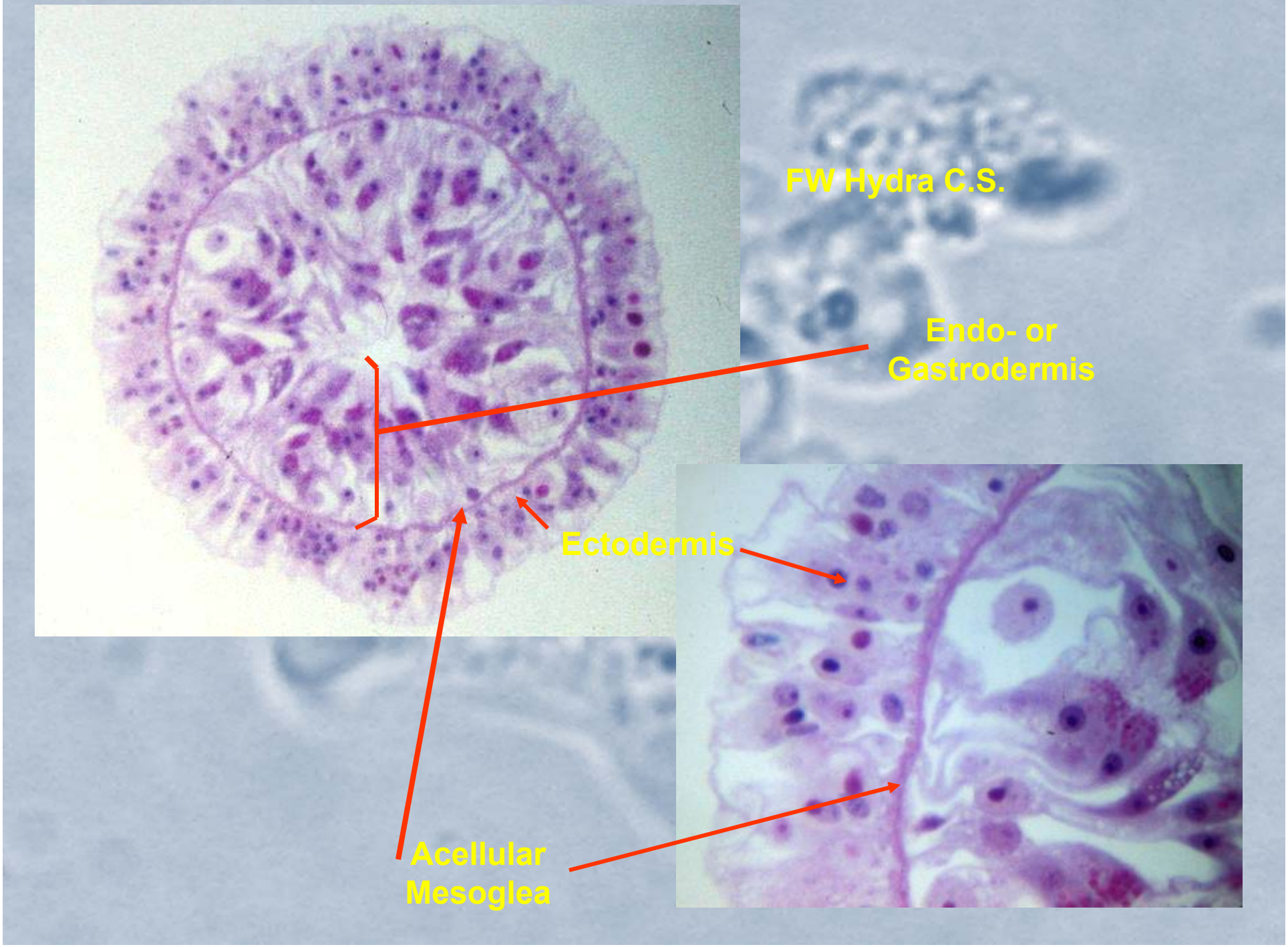


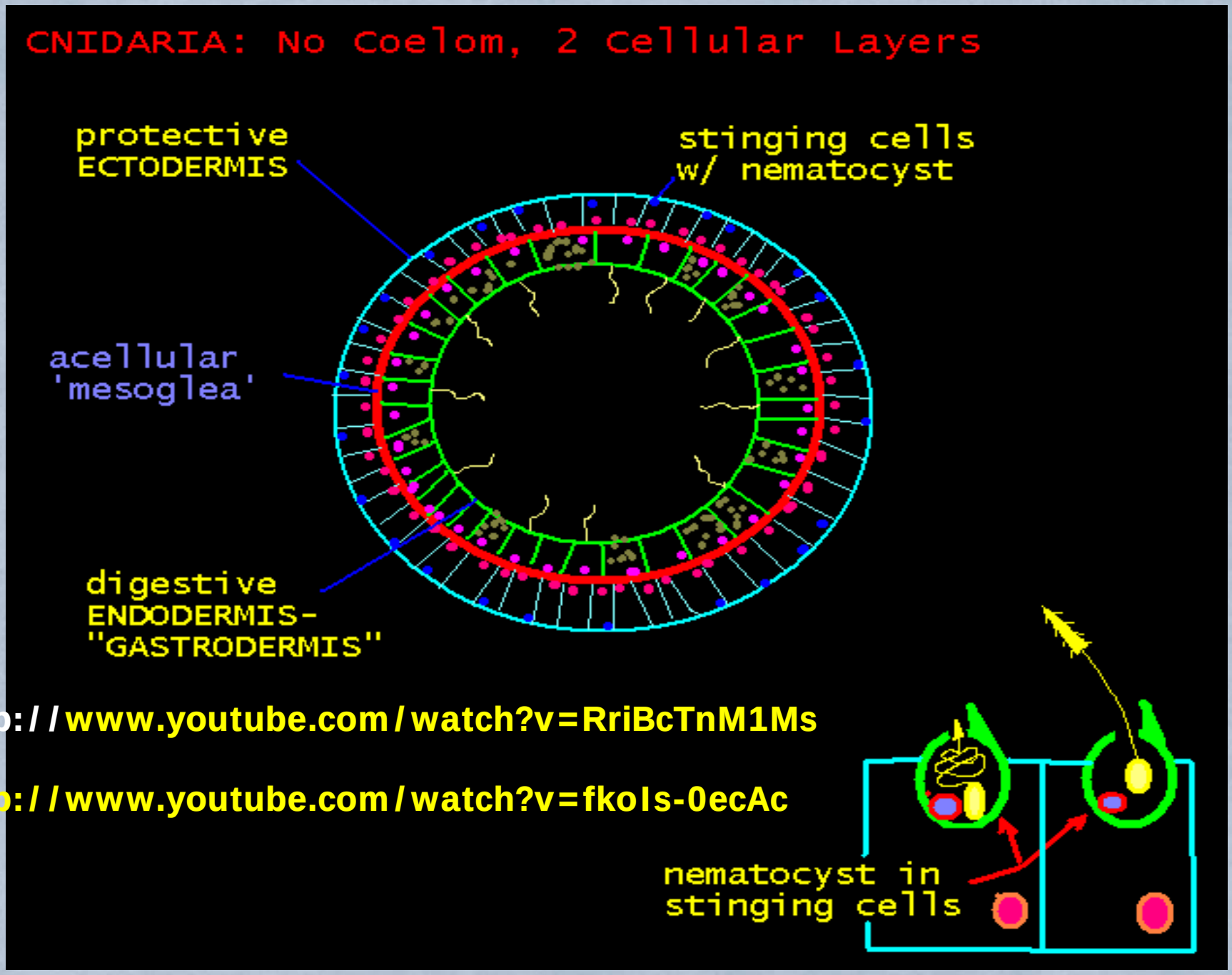
Green *Hydra* with an asexual 'bud' on its side – almost ready to break off

http://www.youtube.com/watch?v=qPcIzPjqtR0

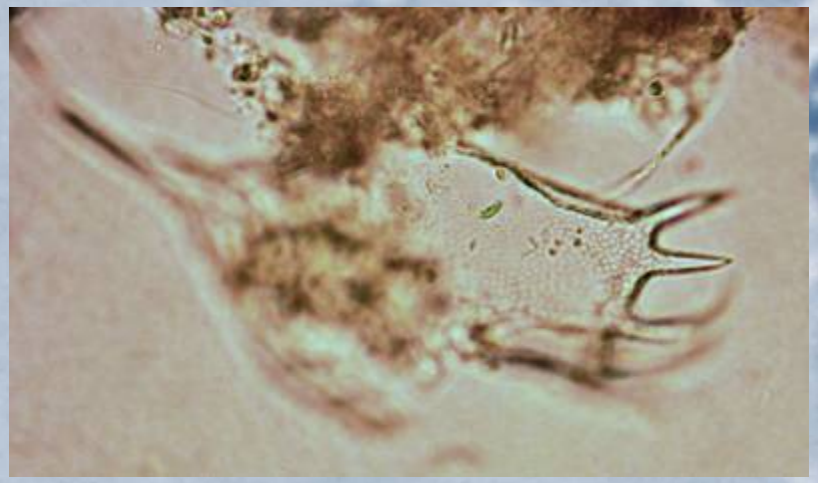
http://www.youtube.com/watch?v=qPcIzPjqtR0

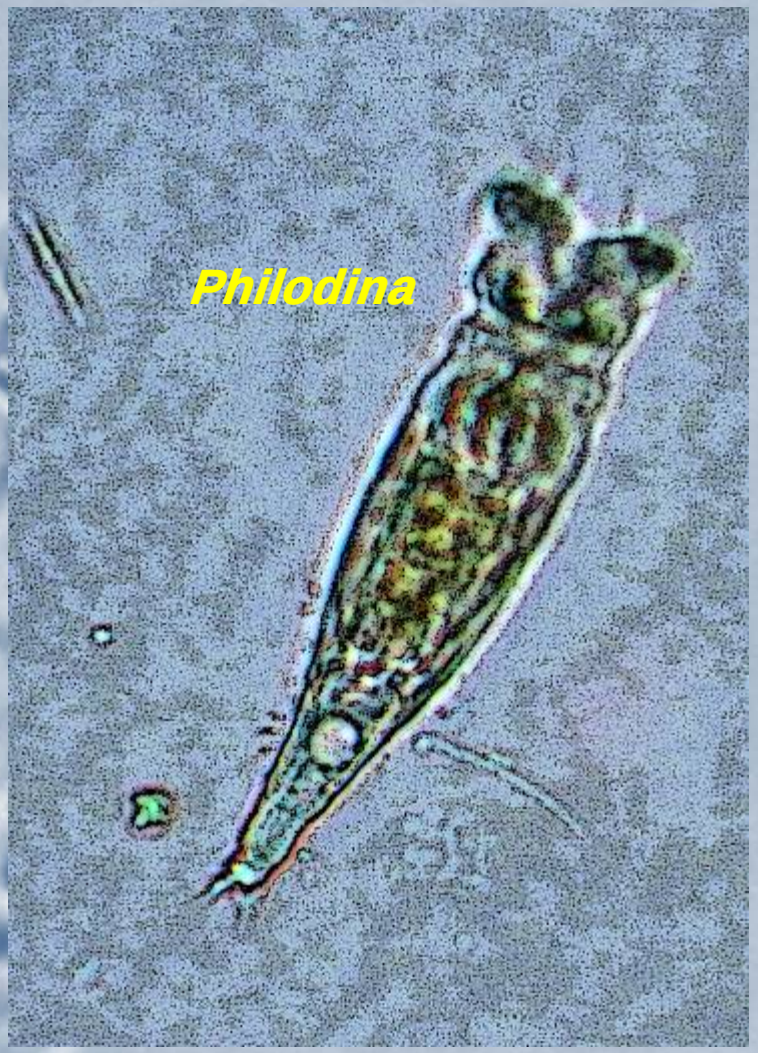
Young, newly budded green hydra (color from symbiotic algae living in gastodermal cells) note radial symmetry; height 300 *u* m


FW Hydra C.S.
Endo- or
Gastrodermis
Ectodermis
Acellular
Mesoglea

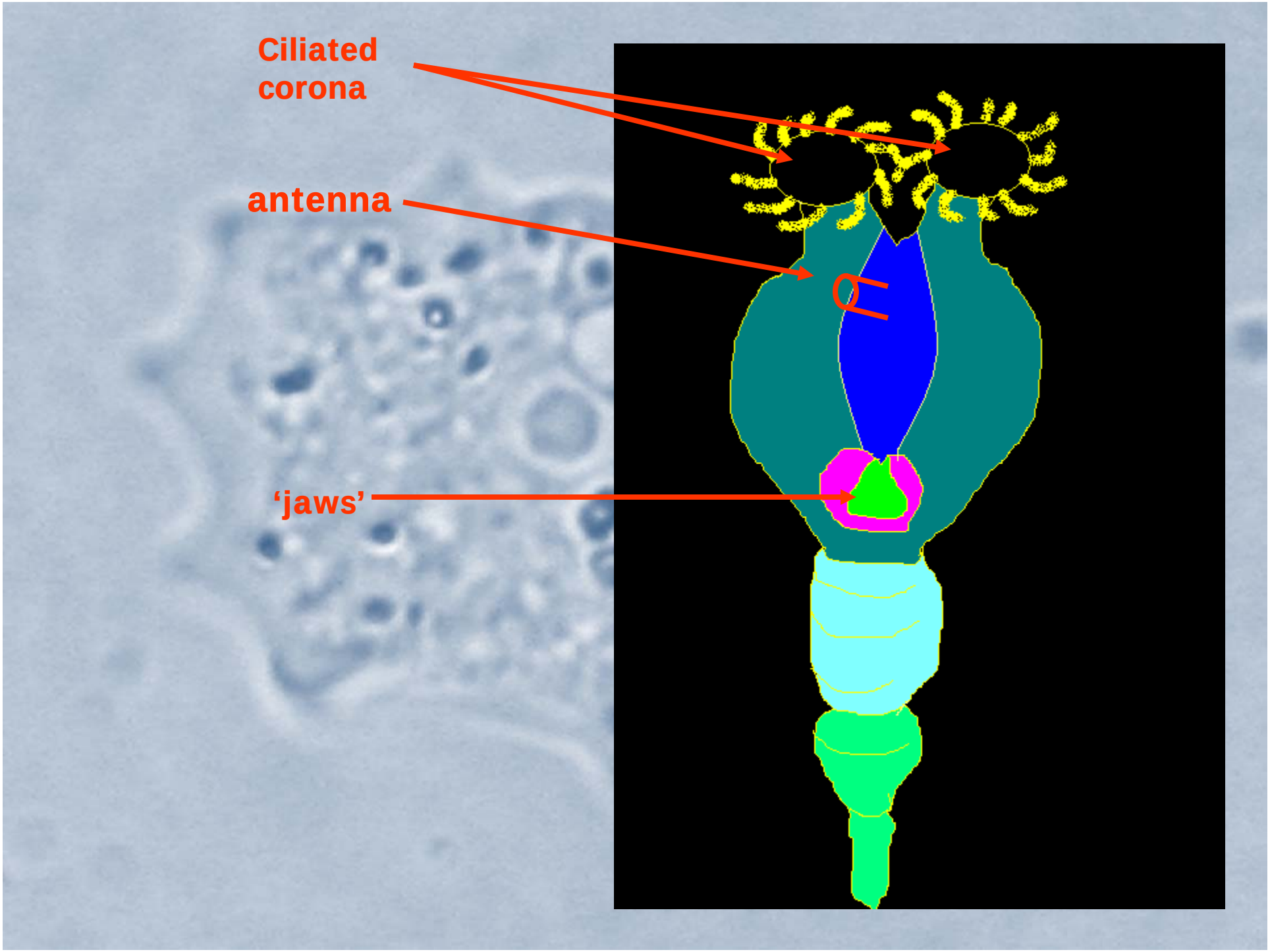

CNIDARIA: No Coelom, 2 Cellular Layers
protective
ECTODERMIS
stinging cells
w/ nematocyst
acellular
'mesoglea'
digestive
ENDODERMIS-
"GASTRODERMIS"
http://www.youtube.com/watch?v=RriBcTnM1Ms
http://www.youtube.com/watch?v=fkoIs-0ecAc
nematocyst in
stinging cells

Keratella



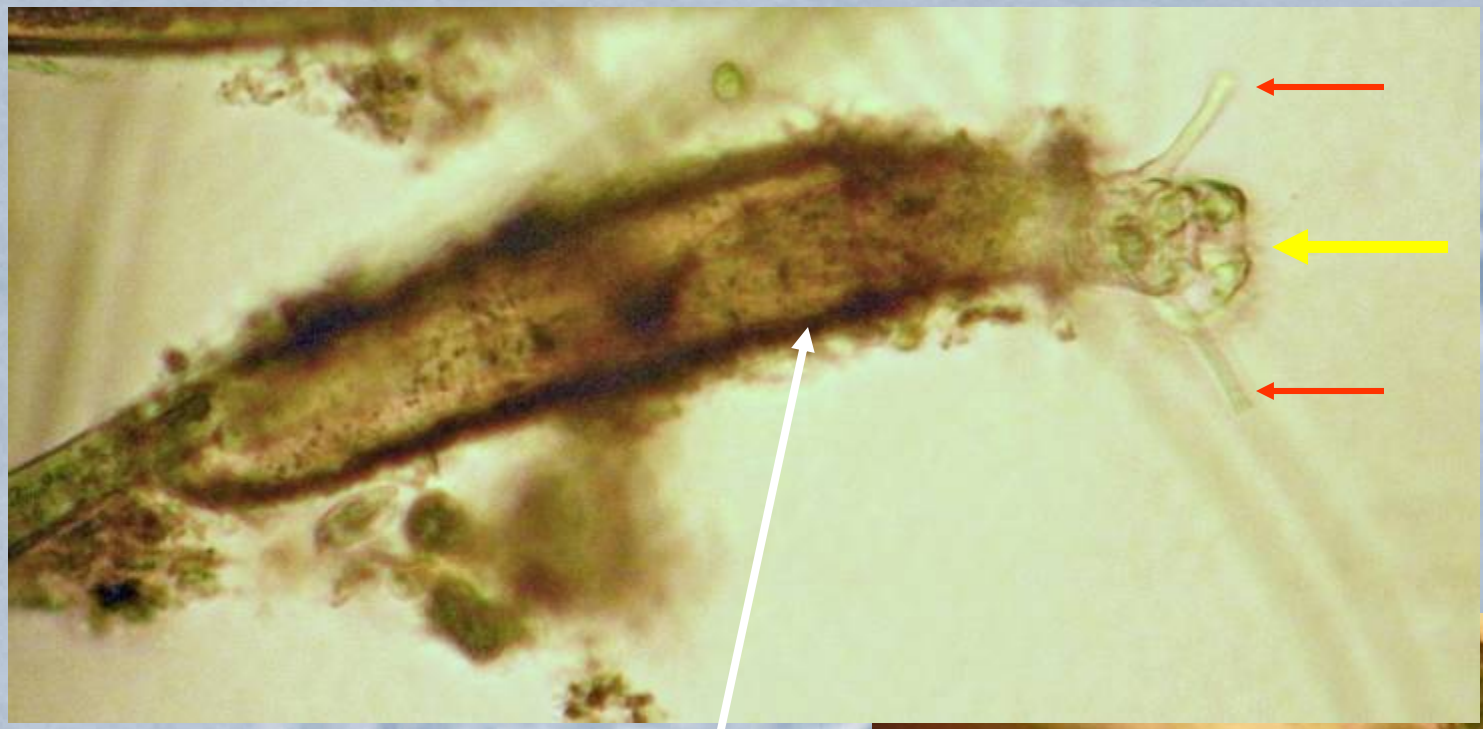


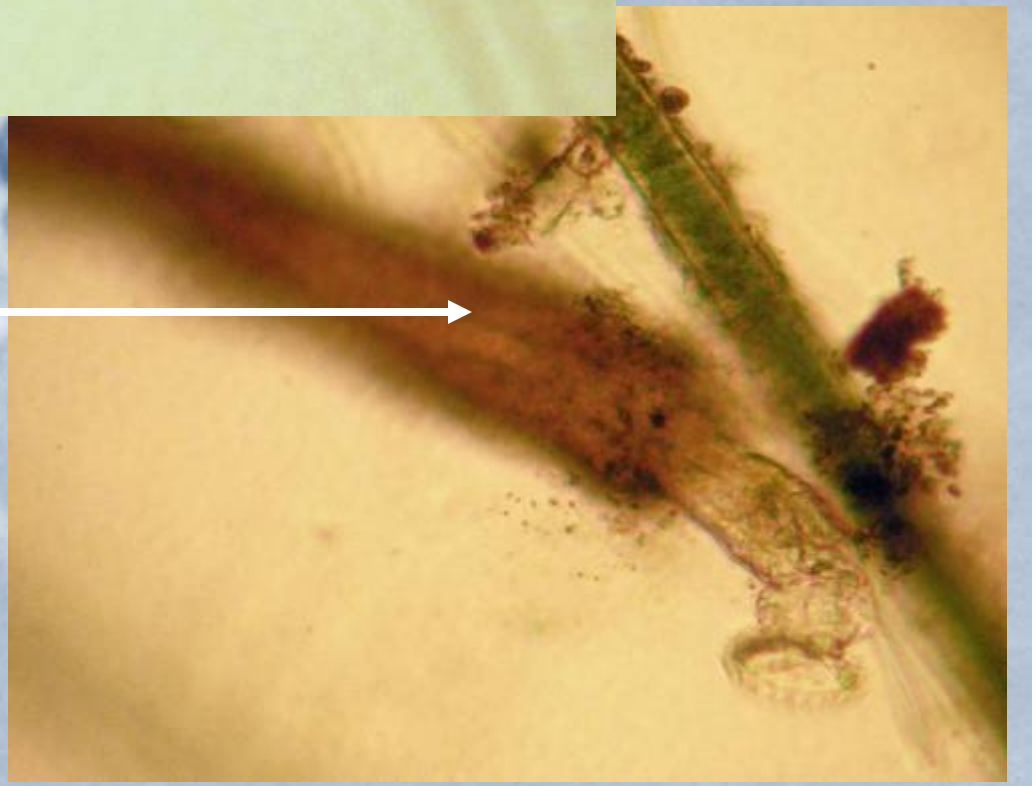
Phylum Rotatoria (‘Rotifers‘)


Ciliated corona
antenna
‘jaws’

http://www.youtube.com/watch?v=iaY-gJuIcFs

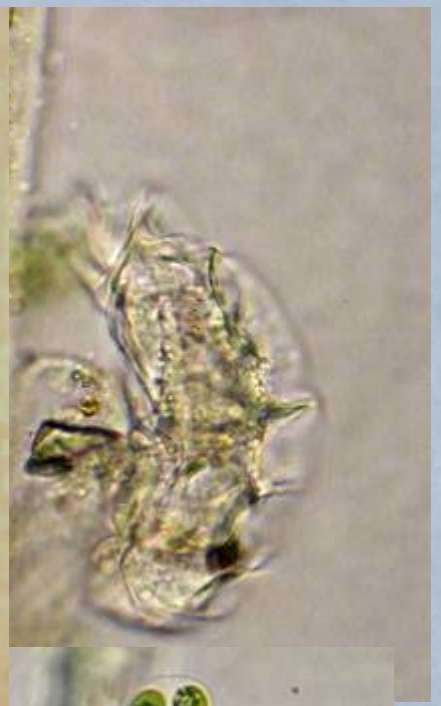
http://www.youtube.com/watch?v=CQ6S9z2nxNY



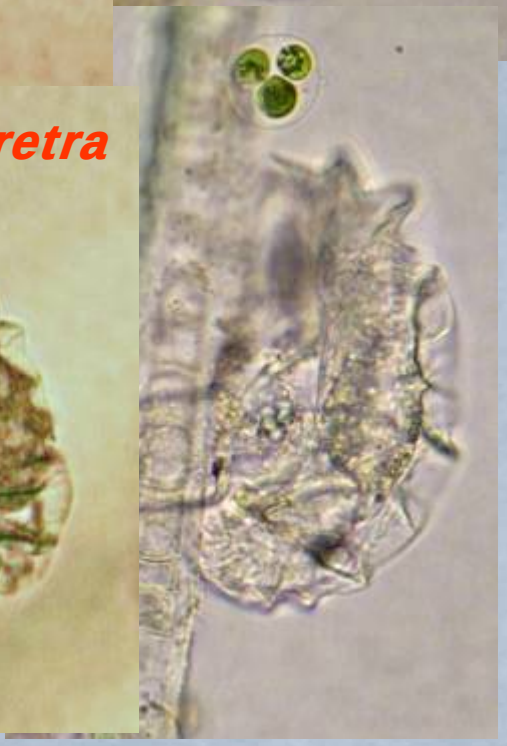


***Ptygura* – 2 antennae in a brown 'test'**

Another rotifer

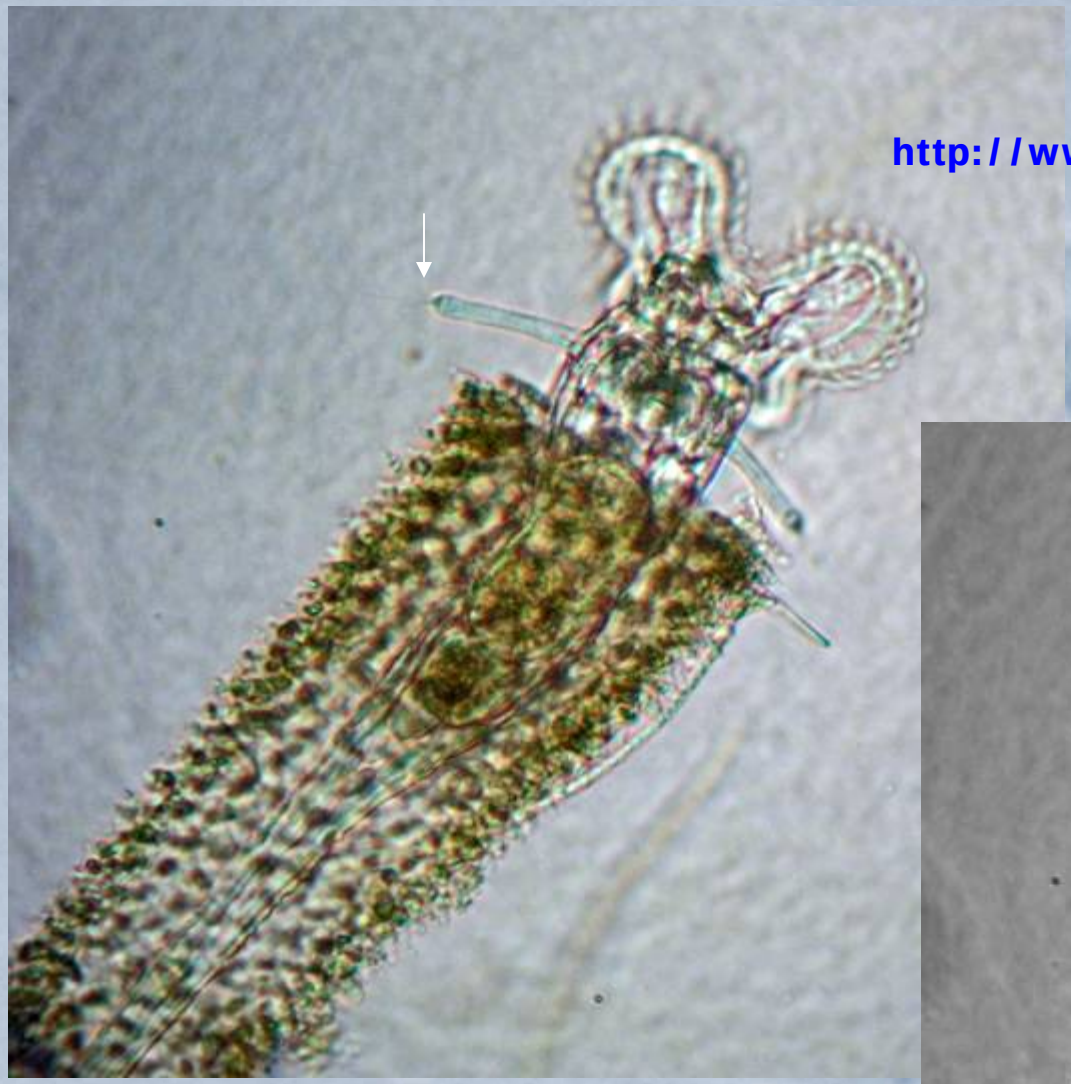


Pleuretra



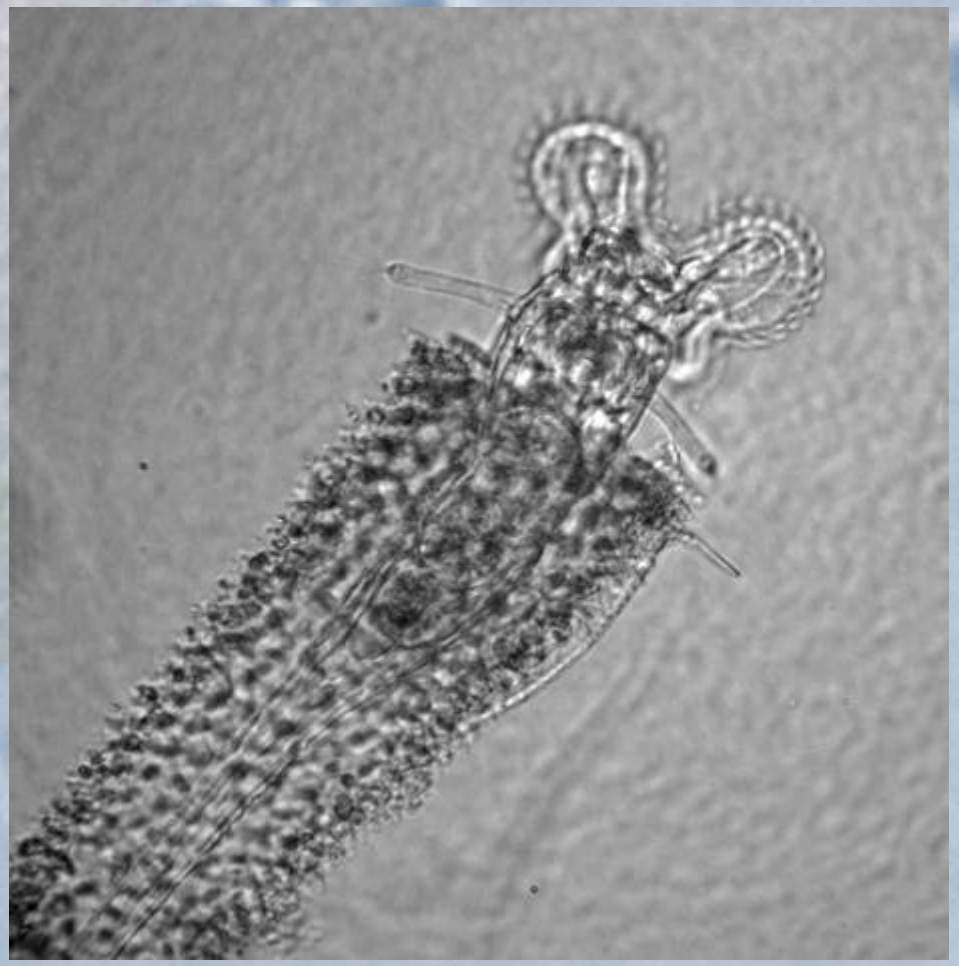
Another rotifer called *Collotheca sp.* Has 5 finger-like tufts of setae instead of cilia on its corona

http://www.youtube.com/watch?v=FAAqF8WGTso



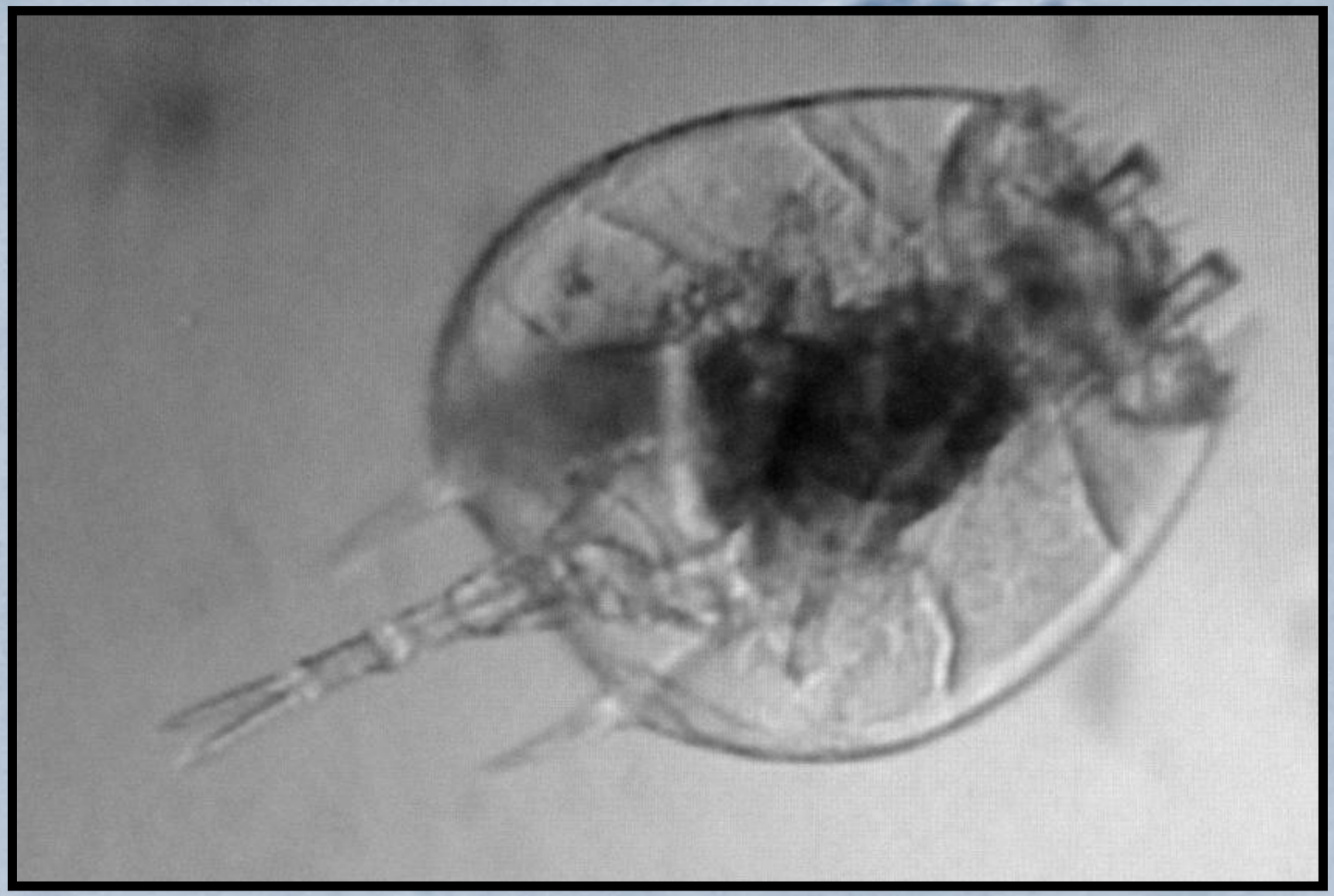
Floscularia

http://www.youtube.com/watch?v=Of-og0pwG4o

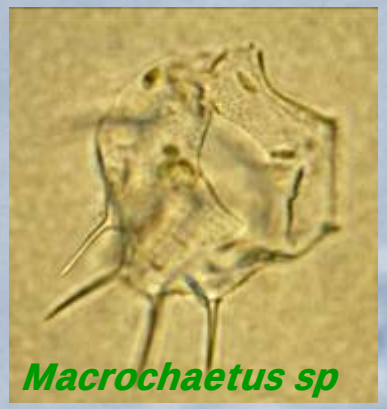


Note test made of pellets secreted from butterfly-shaped head and its 2 antennae with hair-like sensors

Platyias quadricornis



http://www.youtube.com/watch?v=WDiY06H5eTE



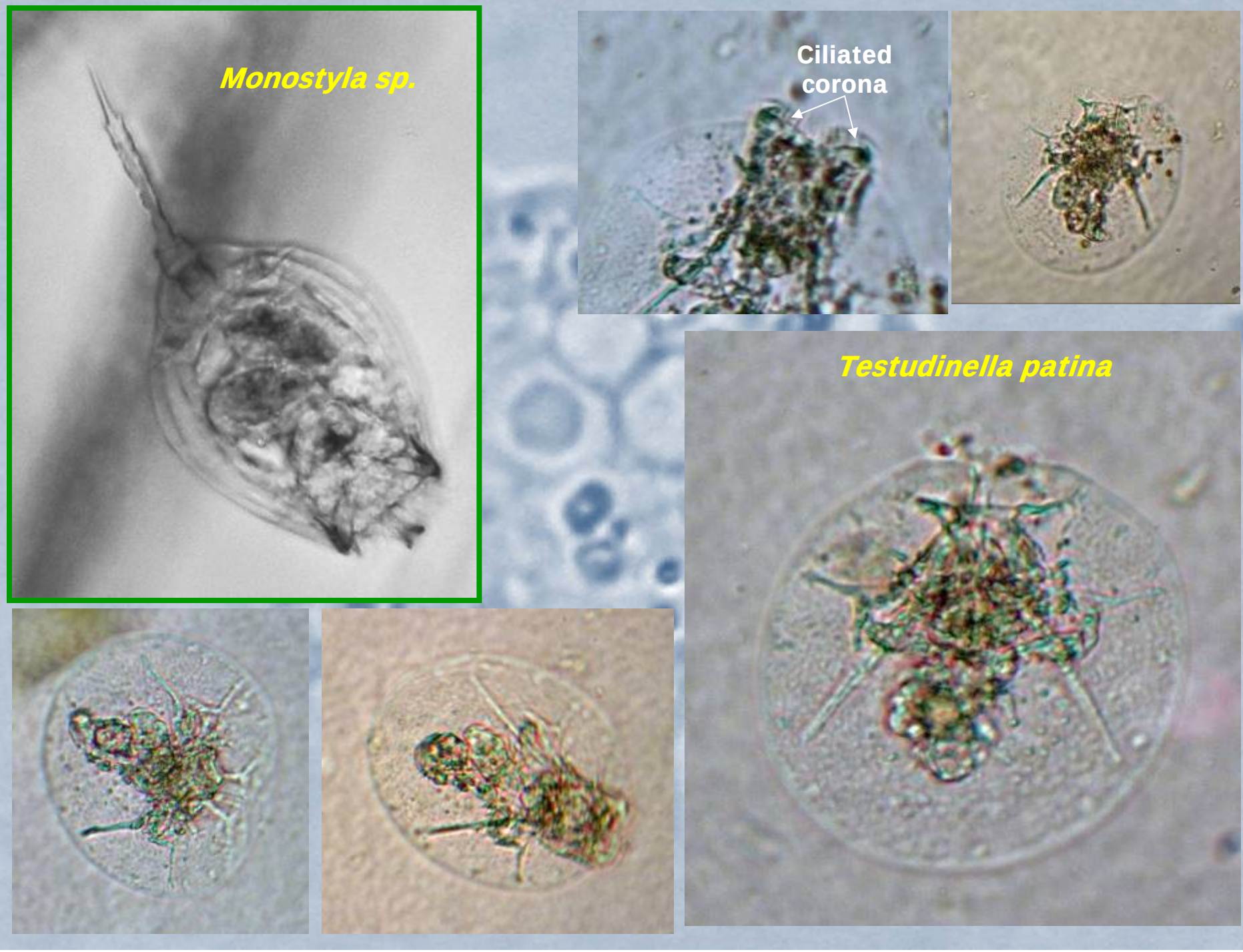
Macrochaetus sp

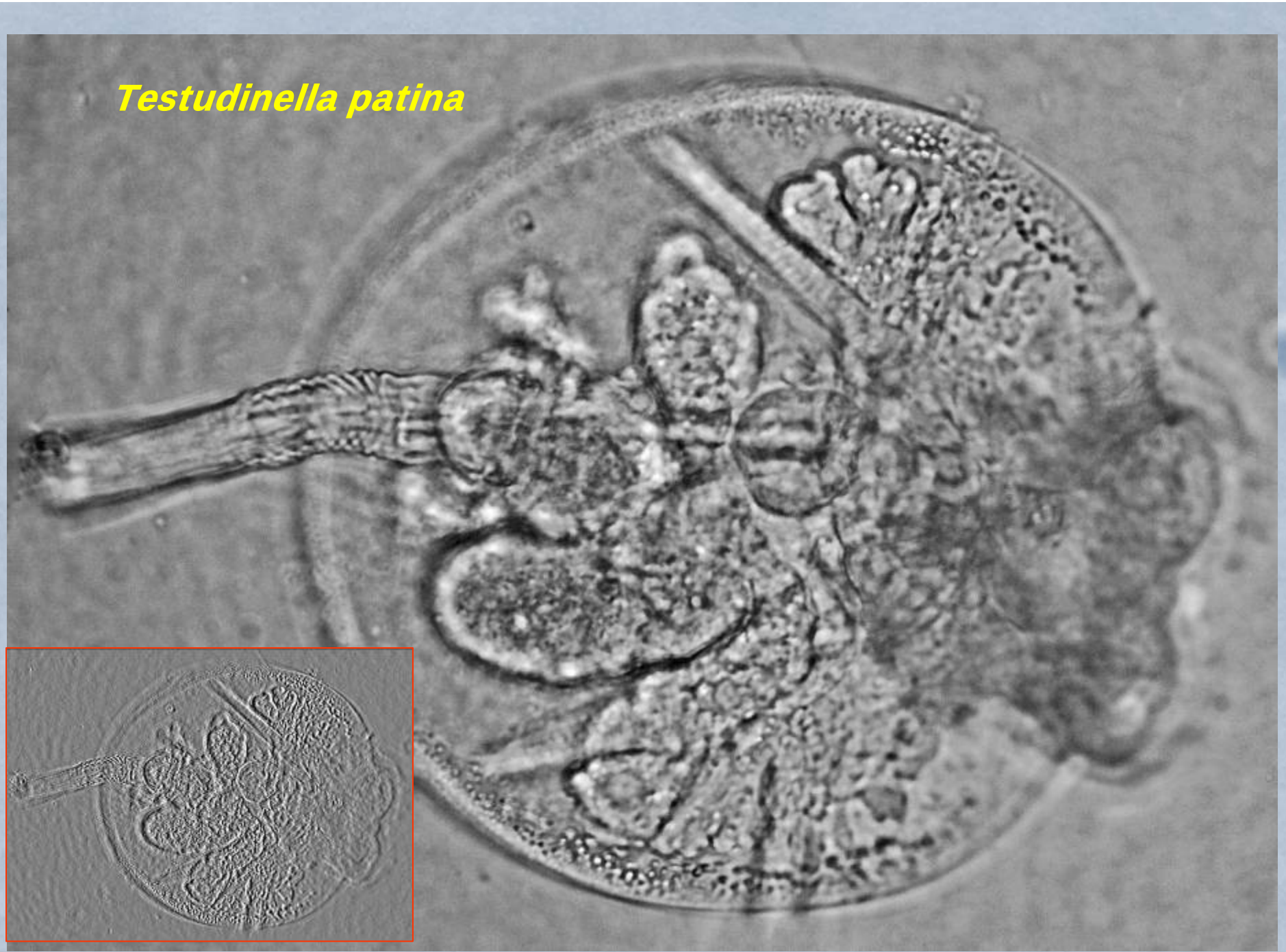
Keratella sp

Notommata sp

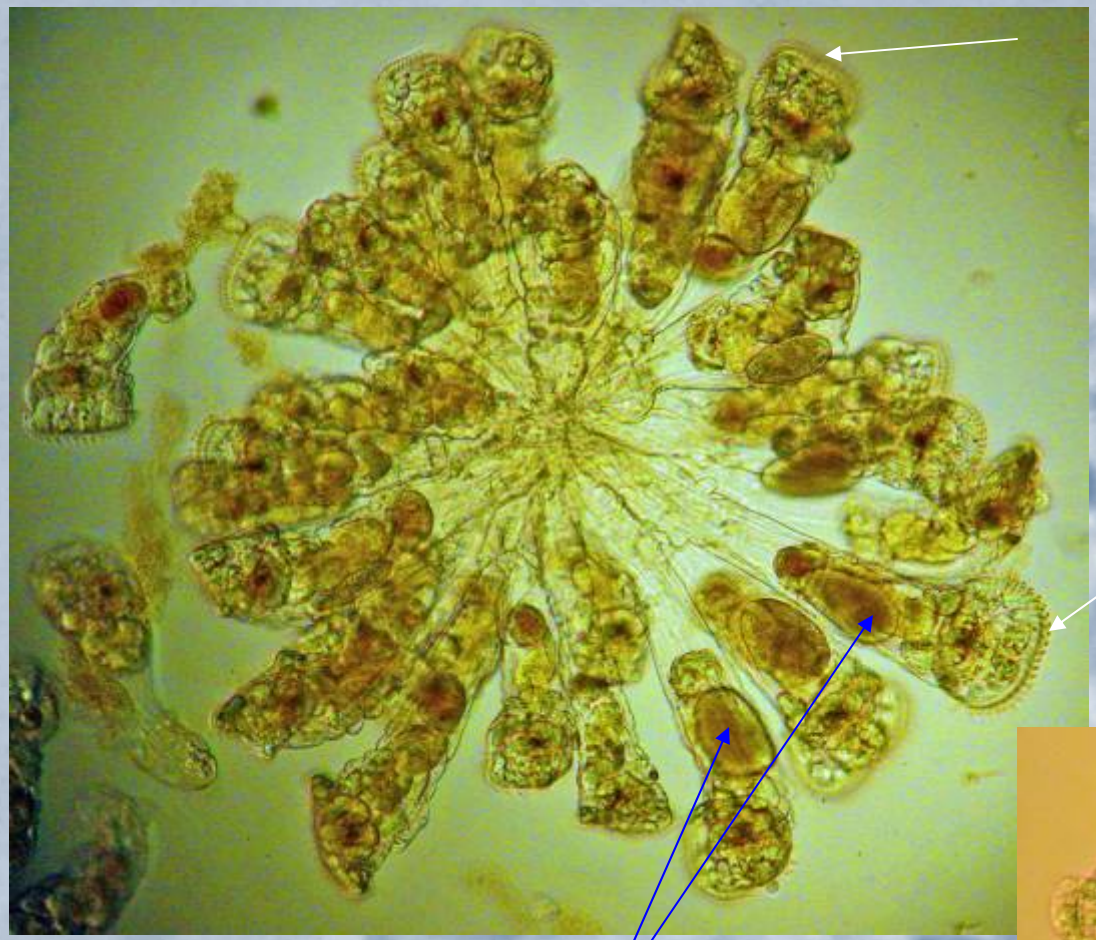
Macrochaetus sp

Macrochaetus sp


Monostyla sp.
Ciliated corona
Testudinella patina


Testudinella patina

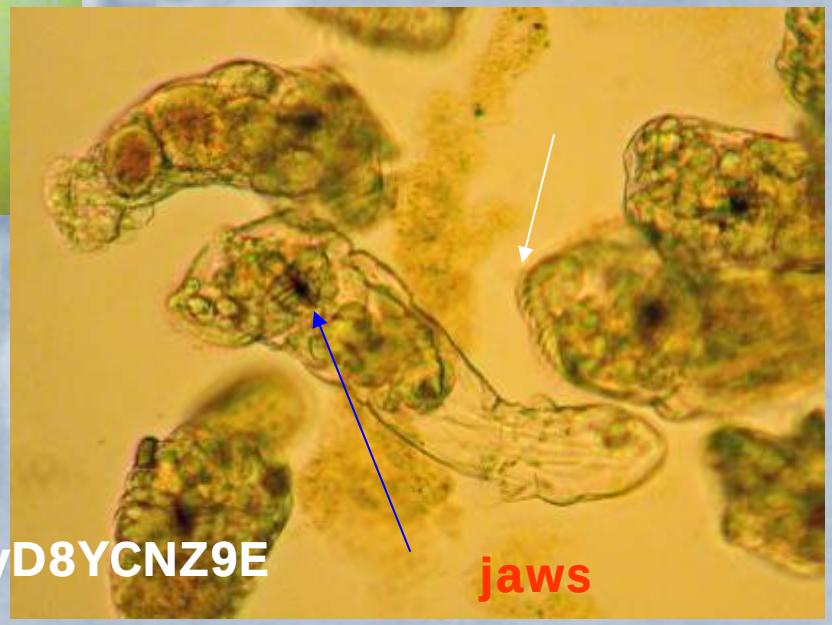

Colonial Rotifer:
Conochilus
http://www.youtube.com/watch?v=_8yD8YCNZ9E



Arrows point to cilia on coronas

Colonial Rotifer:
Conochilus

eggs



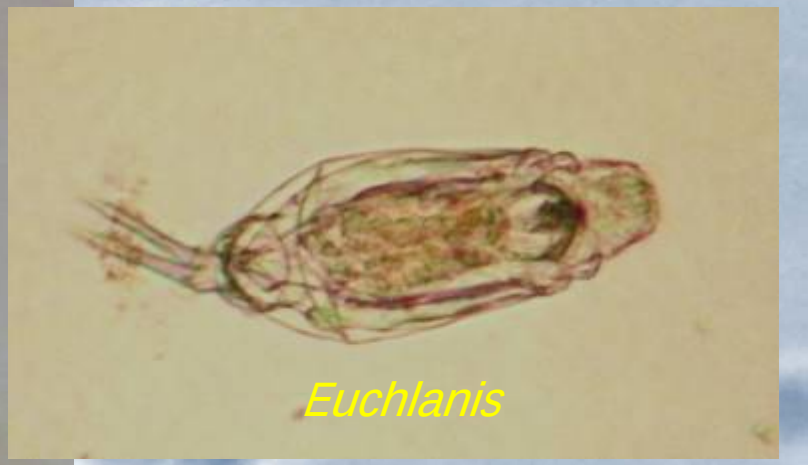
jaws

http://www.youtube.com/watch?v=_8yD8YCNZ9E

The rotifer *Limnia* ; note chitinous, annulated sheath

More Rotifers

Euchlanis



Euchlanis

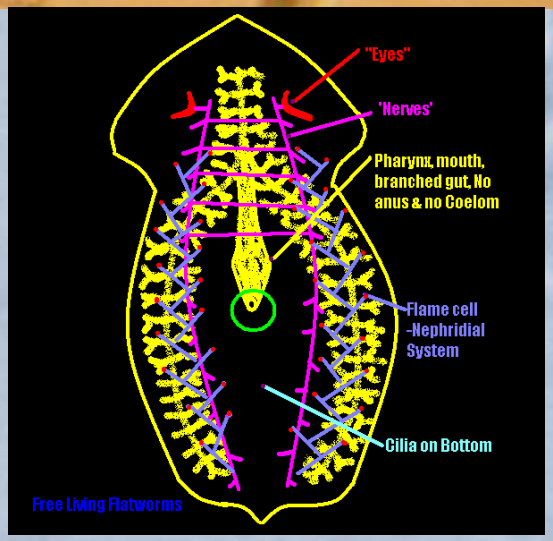
Euchlanis

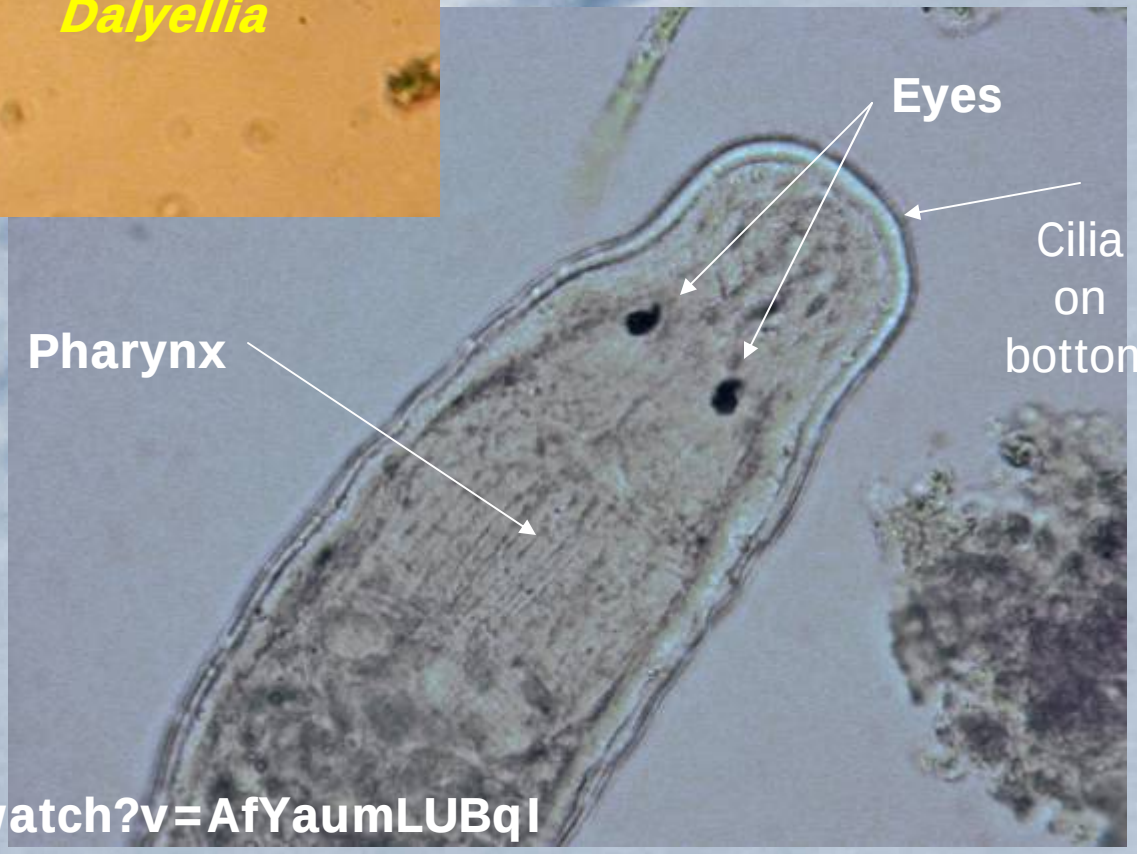
Enteroplea

Philodina - contracted

http://www.youtube.com/watch?v=4IDUQ9KH5Ho

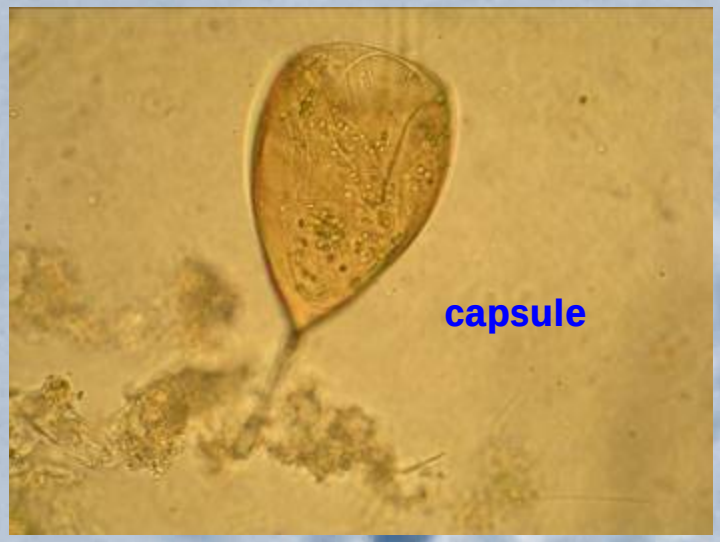
Phyl.Platyhelminthes, Class Trurbellaria : *Dalyellia*



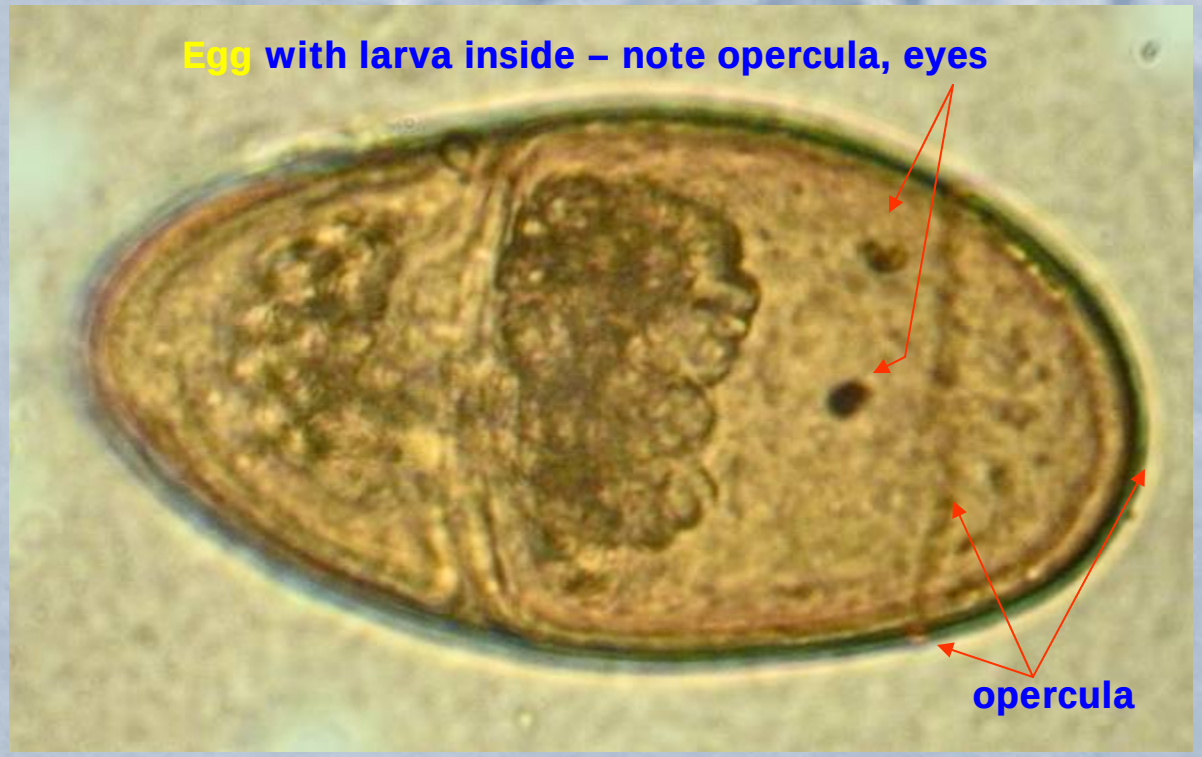


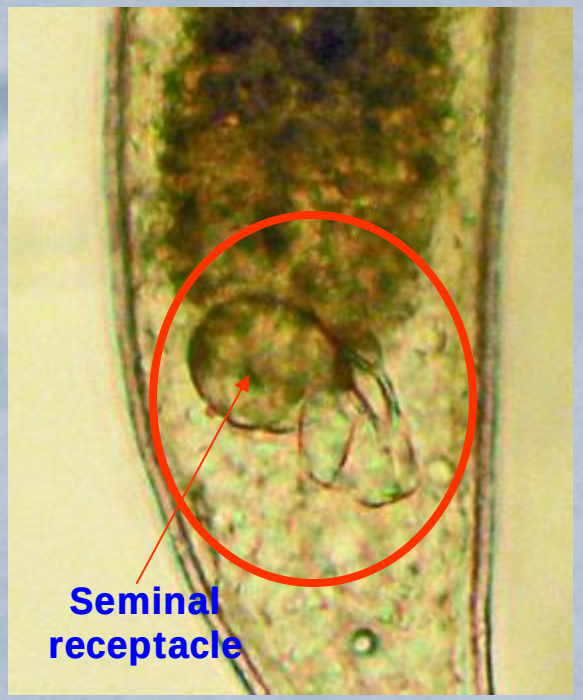
http://www.youtube.com/watch?v=AfYaumLUBqI

Class Trurbellaria : *Dalyellia* a small flatworm 150-200 *u*m

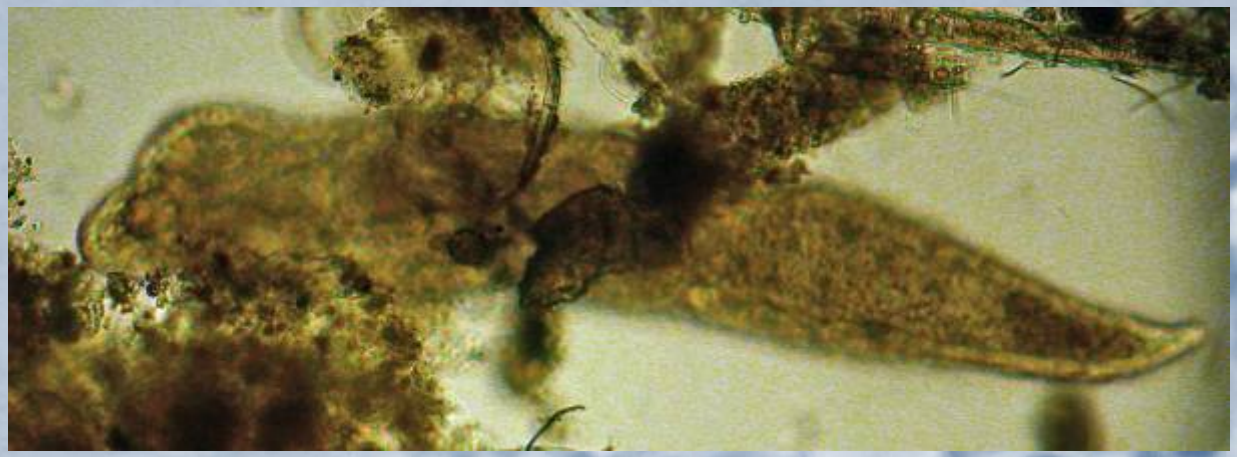


Some Turbellaria produce individual eggs, others produce an egg capsule

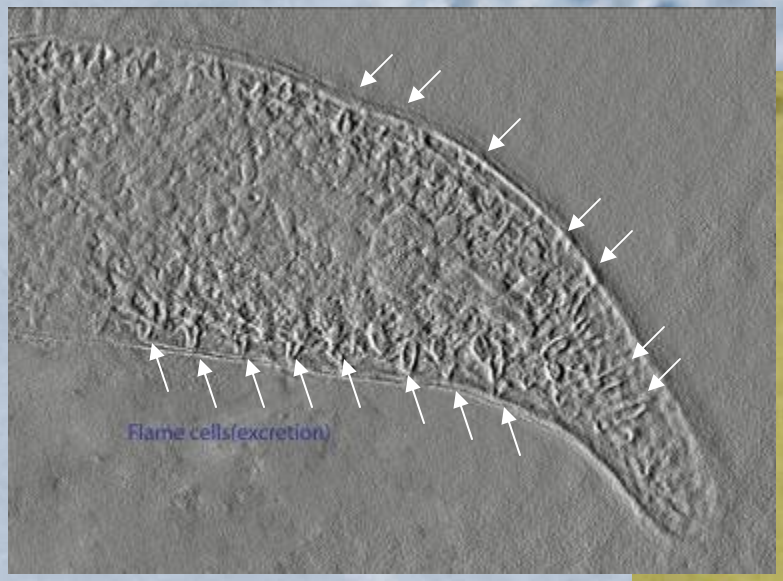




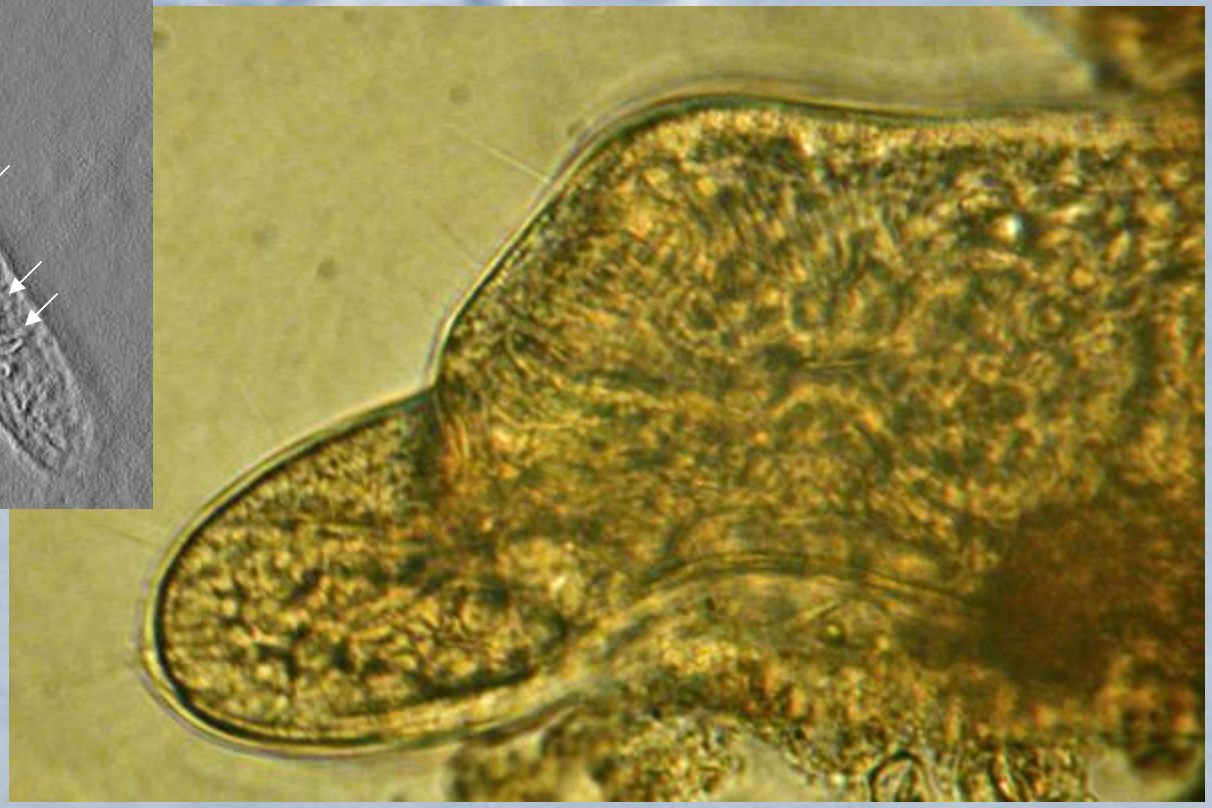
Adult reproductive organs

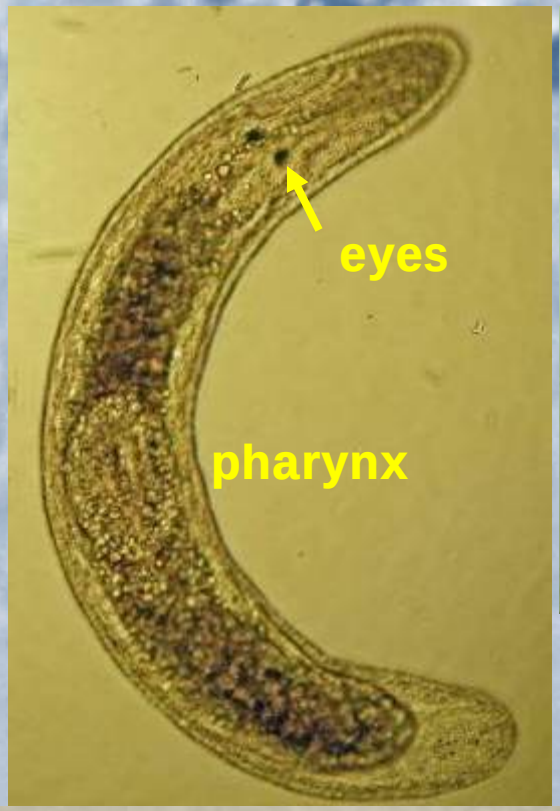


Phyl.Platyhelminthes, Class Trurbellaria : *Stenostomum*

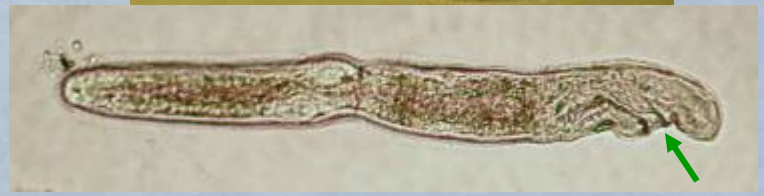


"Flame Cells" for excretion

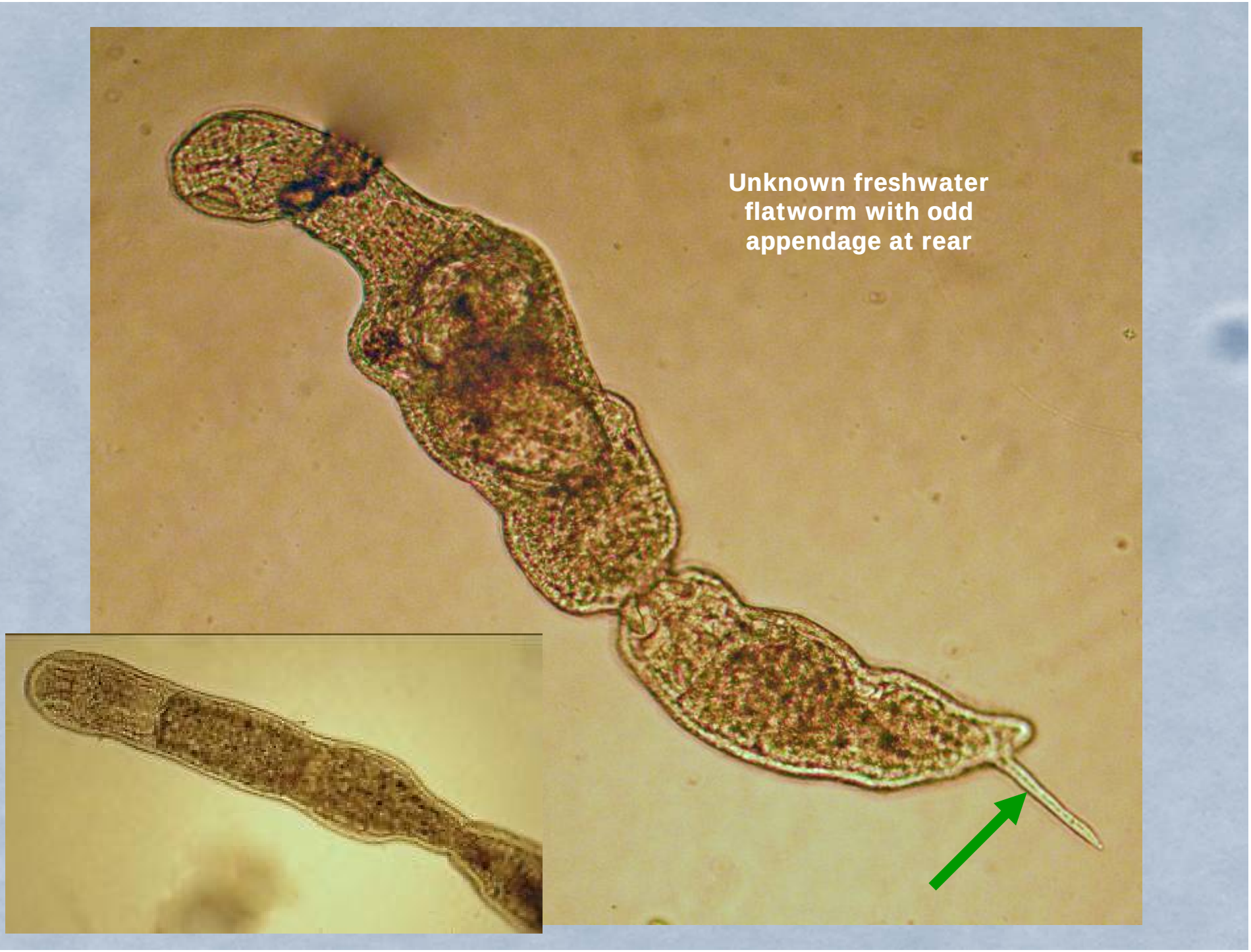


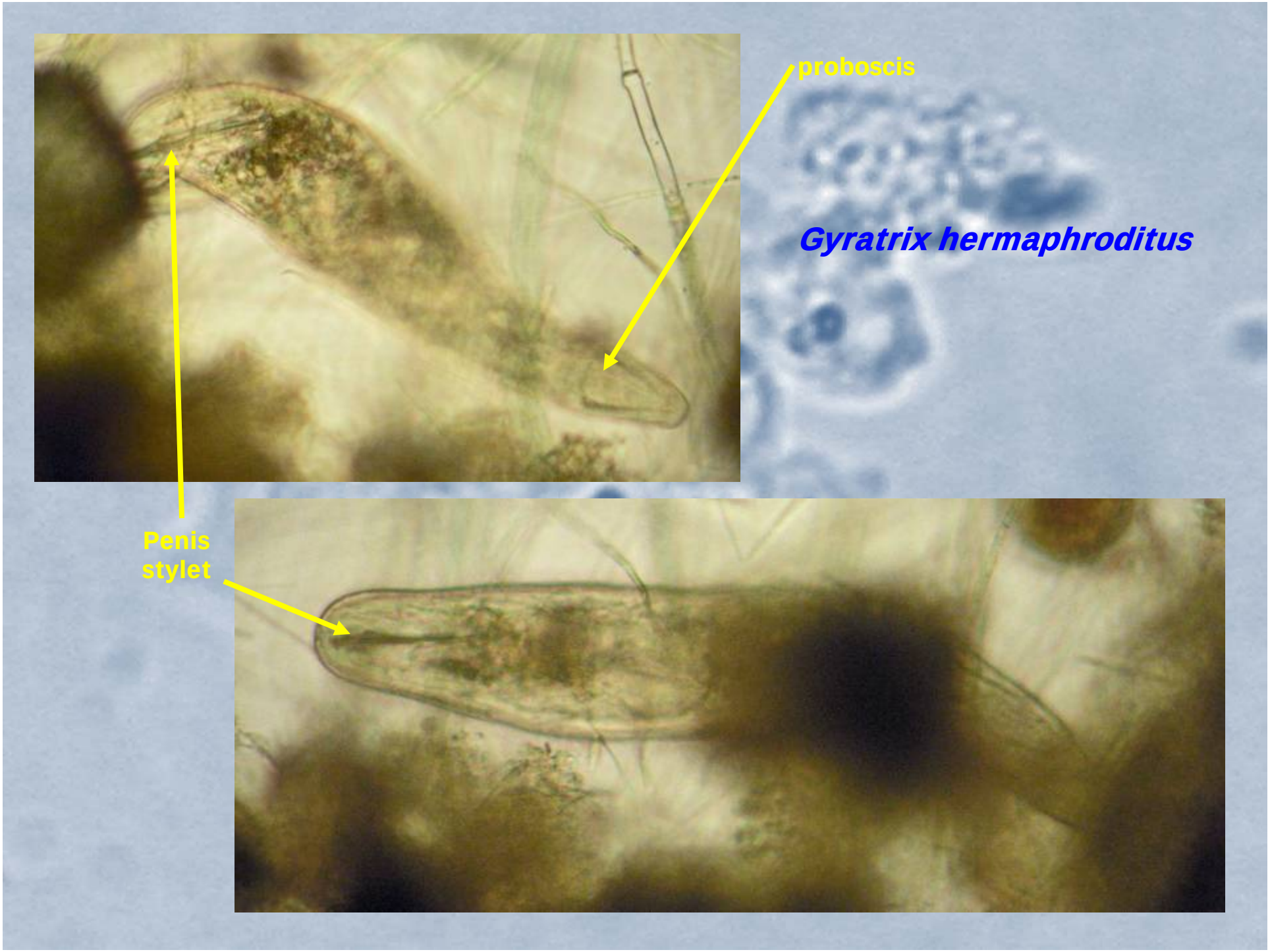


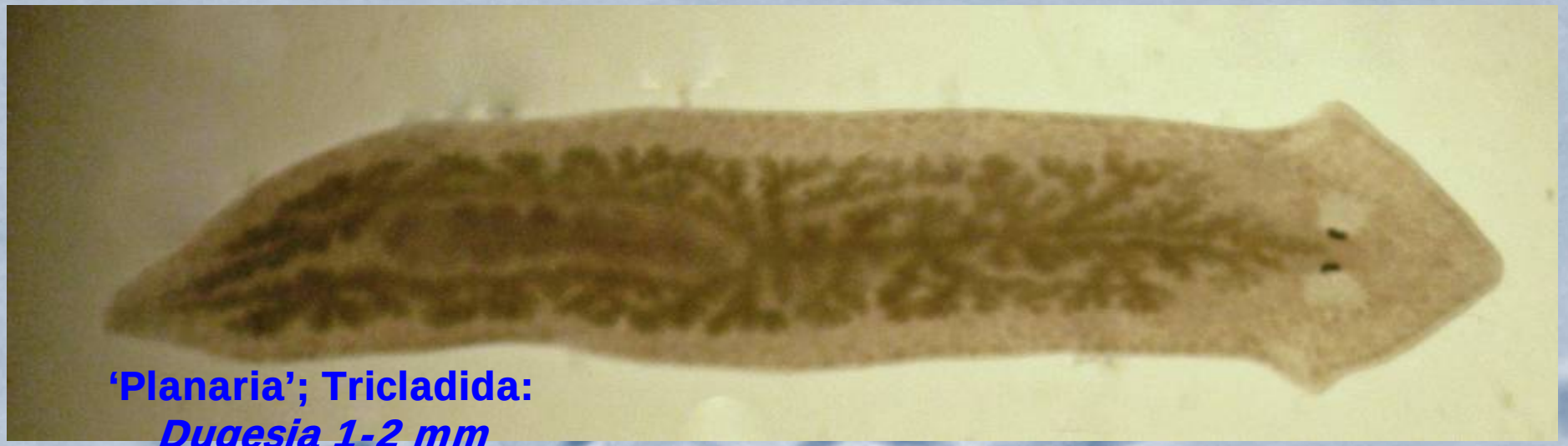
A very small ‘micro’ form



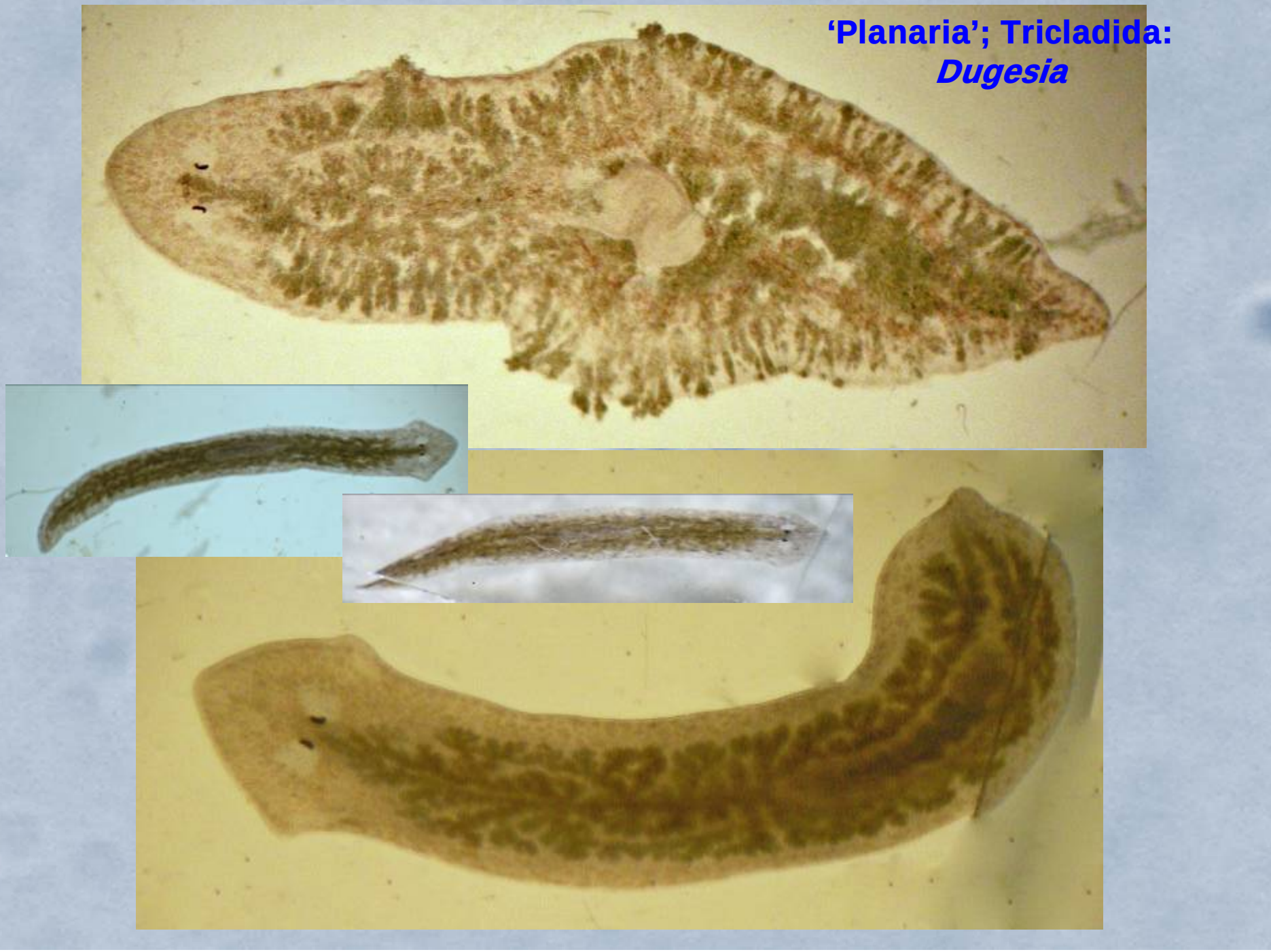
Side view of a CATENULID

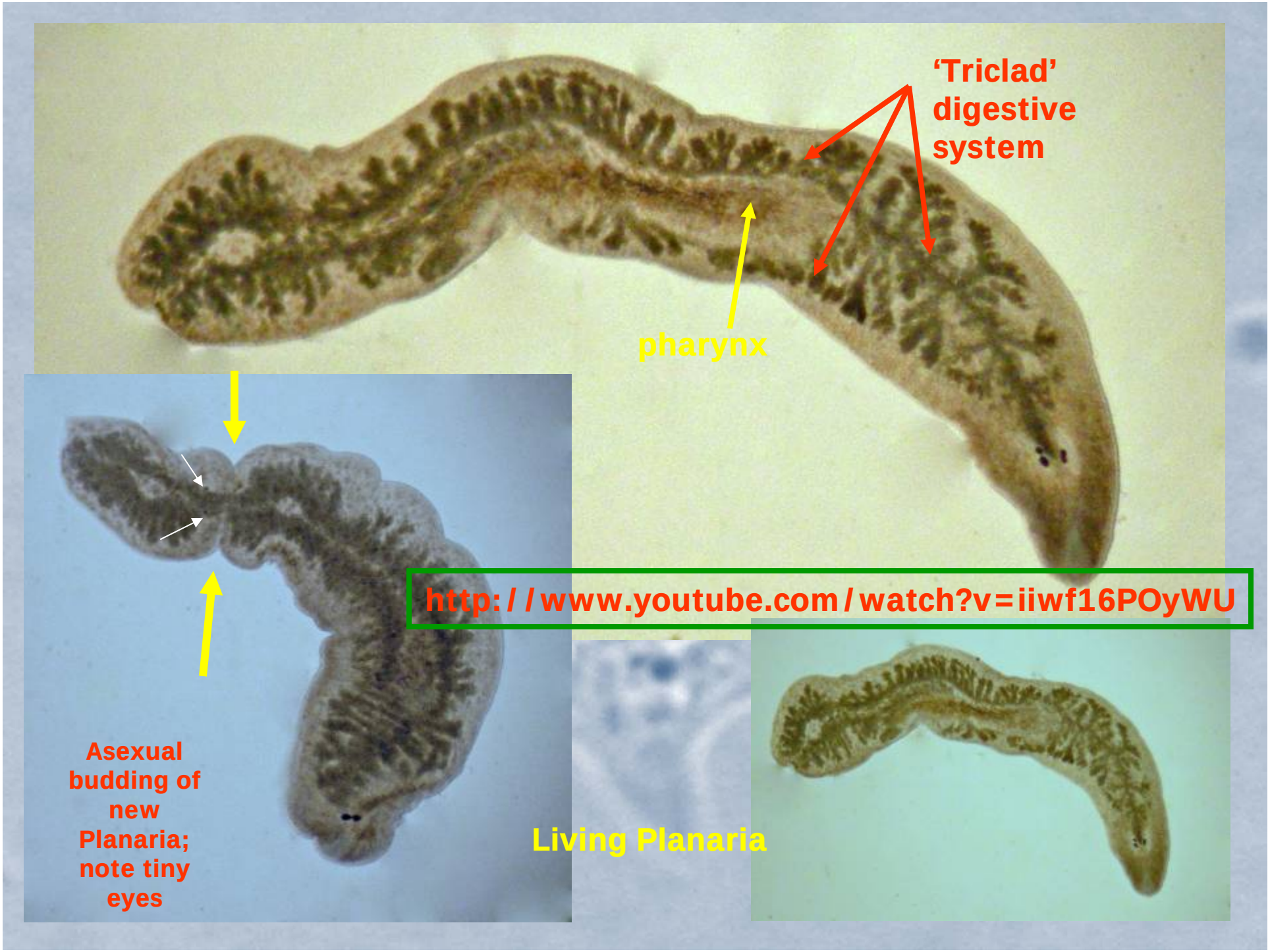

Unknown freshwater
flatworm with odd
appendage at rear

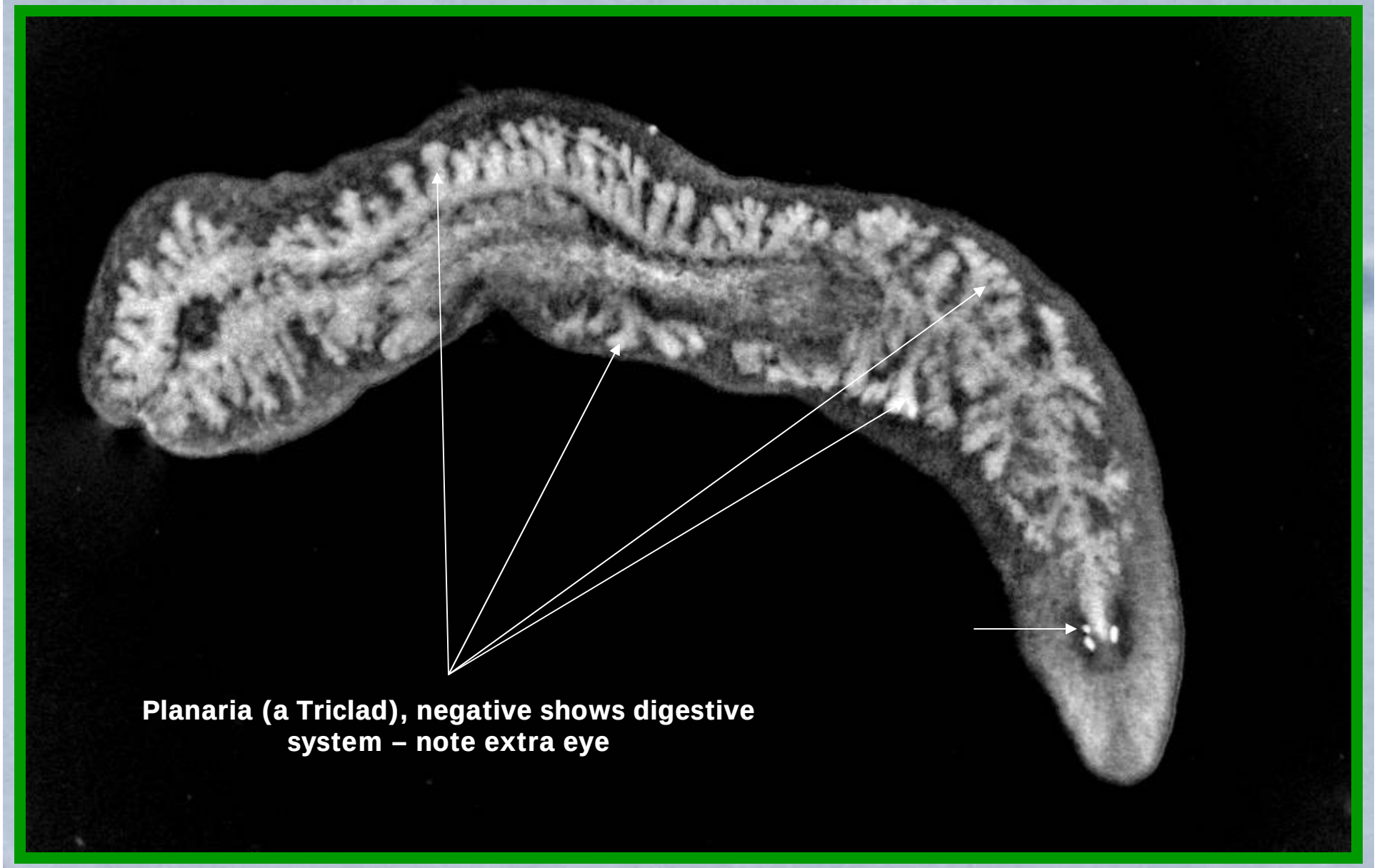

proboscis
Gyratrix hermaphroditus
Penis
stylet



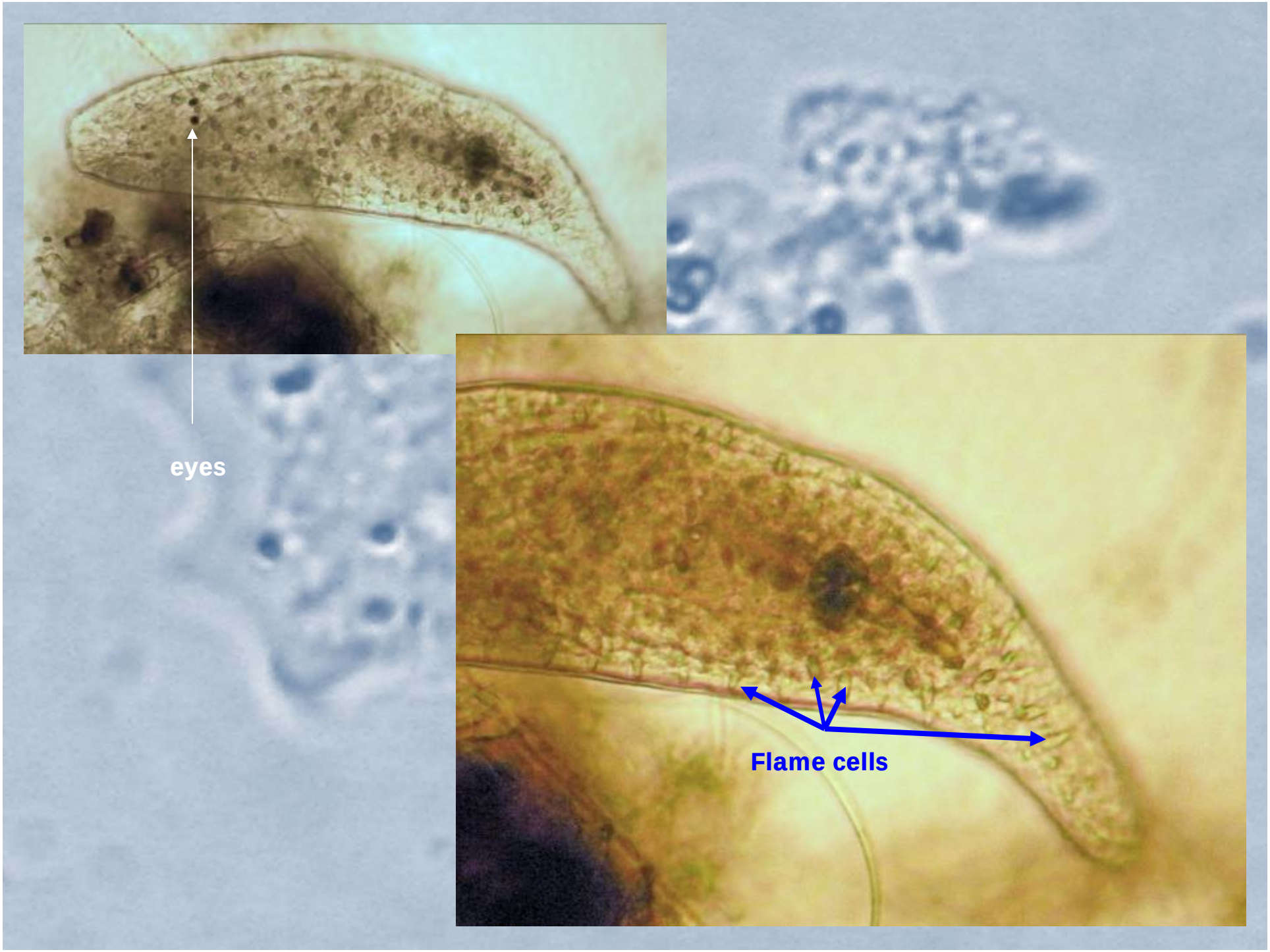
‘Planaria’; Tricladida:
Dugesia 1-2 mm


'Planaria'; Tricladida:
Dugesia

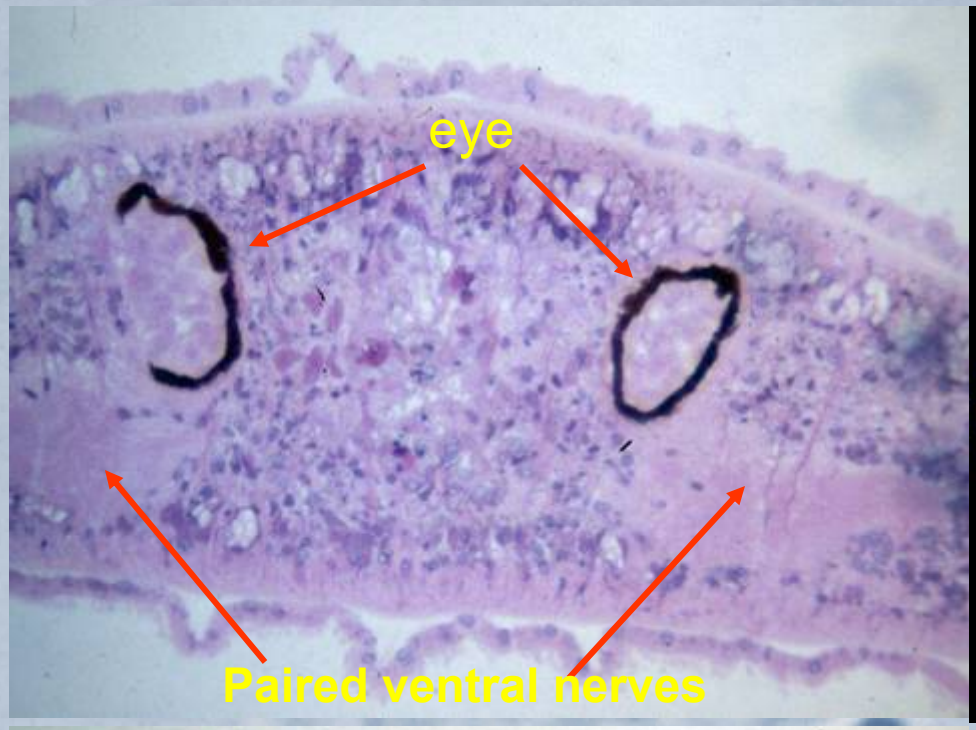

'Triclad' digestive system
pharynx
http://www.youtube.com/watch?v=iiwf16POyWU
Asexual budding of new Planaria; note tiny eyes
Living Planaria

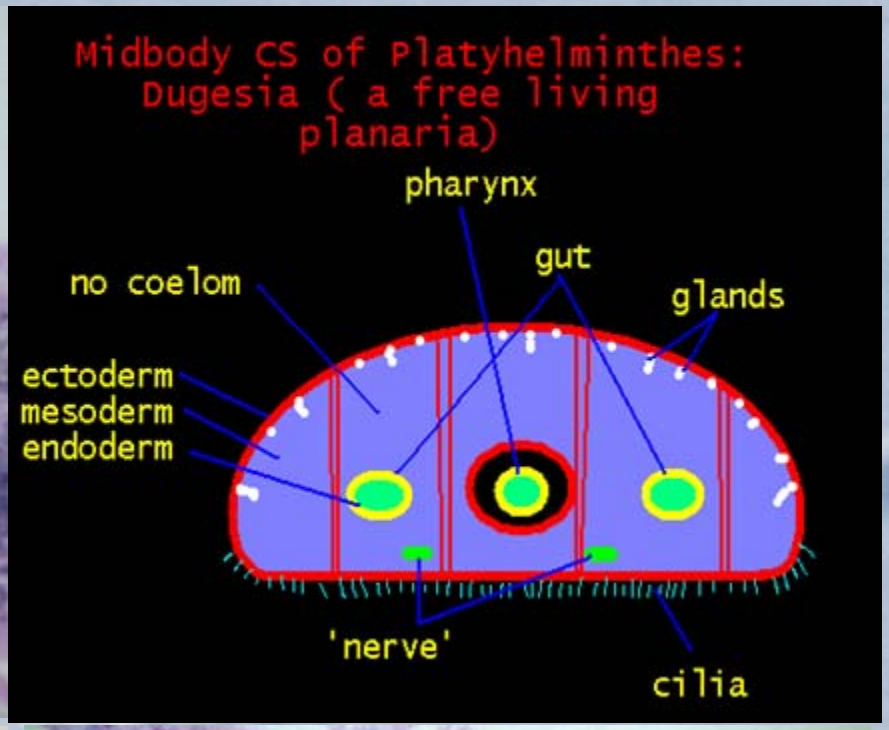


Planaria (a Triclad), negative shows digestive system – note extra eye

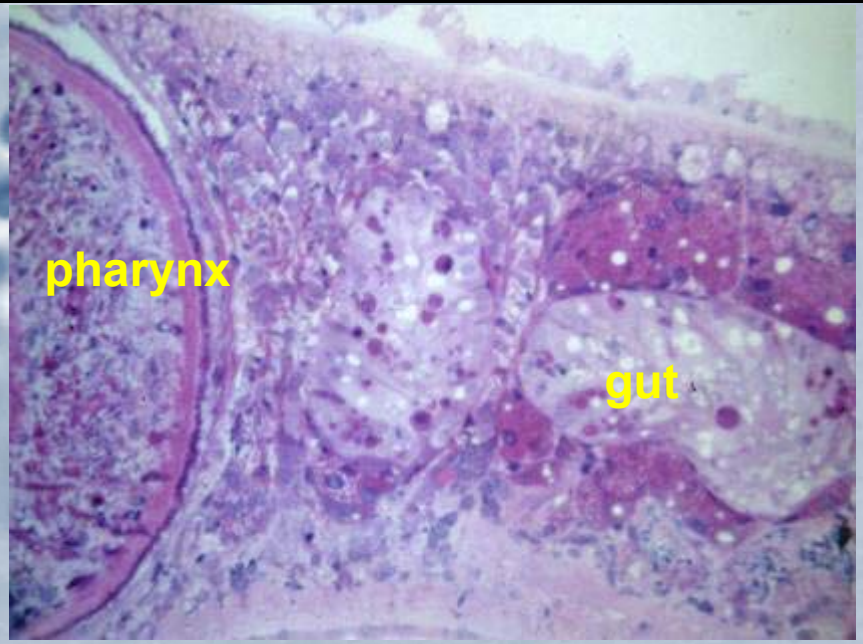

eyes
Flame cells


eyes

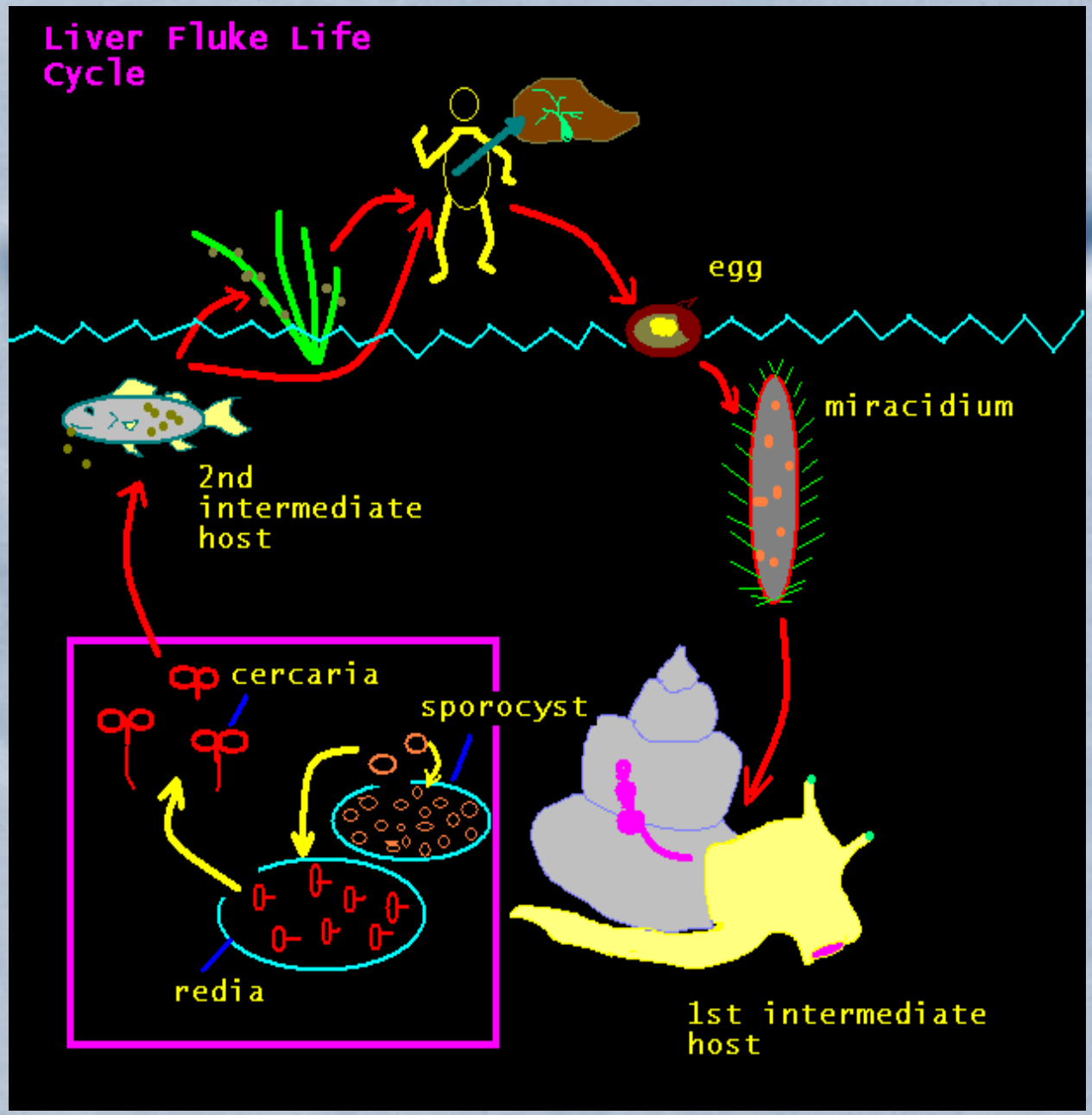

eye
Paired ventral nerves

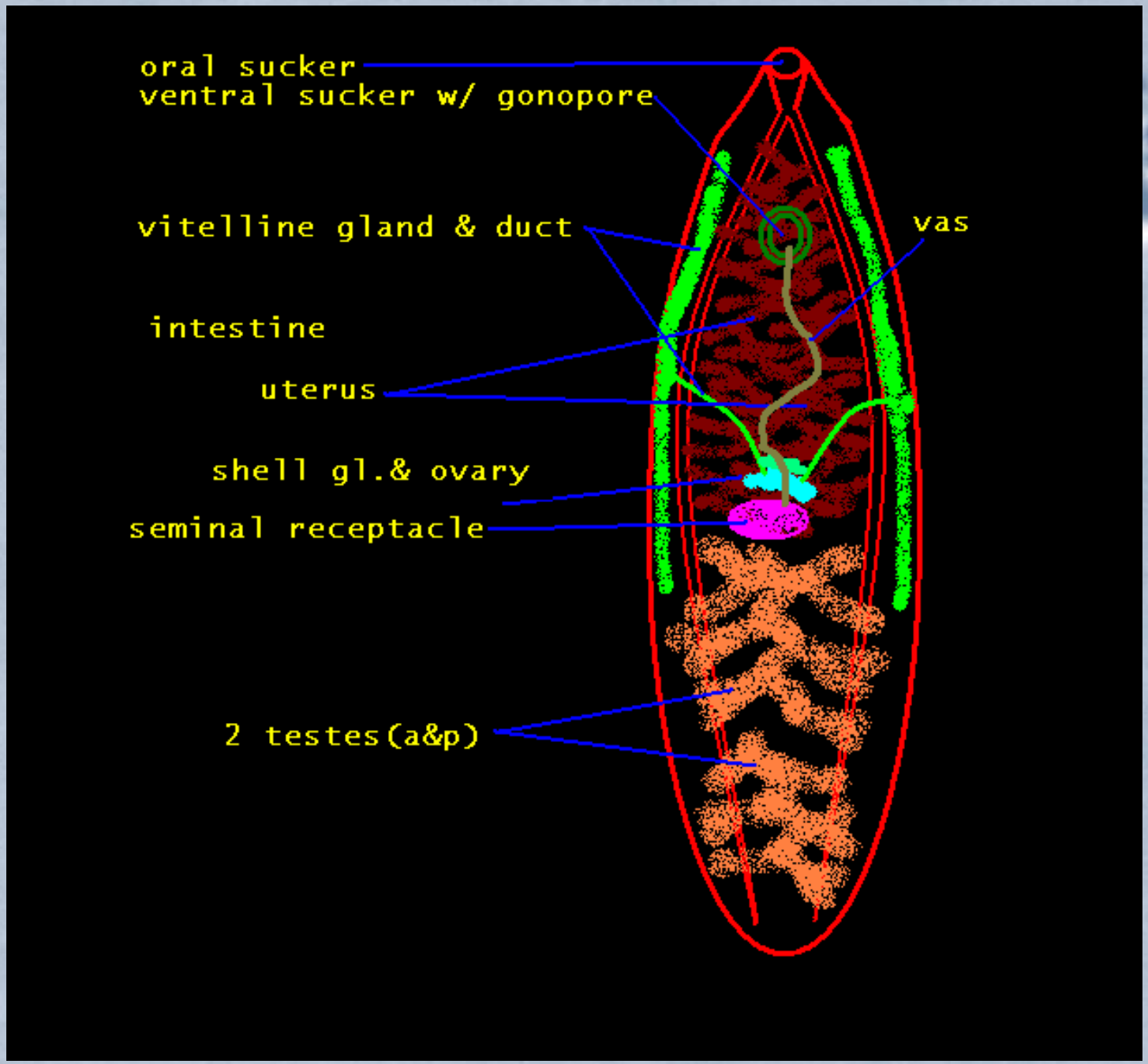

Midbody CS of Platyhelminthes:
Dugesia (a free living
planaria)
pharynx
gut
glands
no coelom
ectoderm
mesoderm
endoderm
'nerve'
cilia

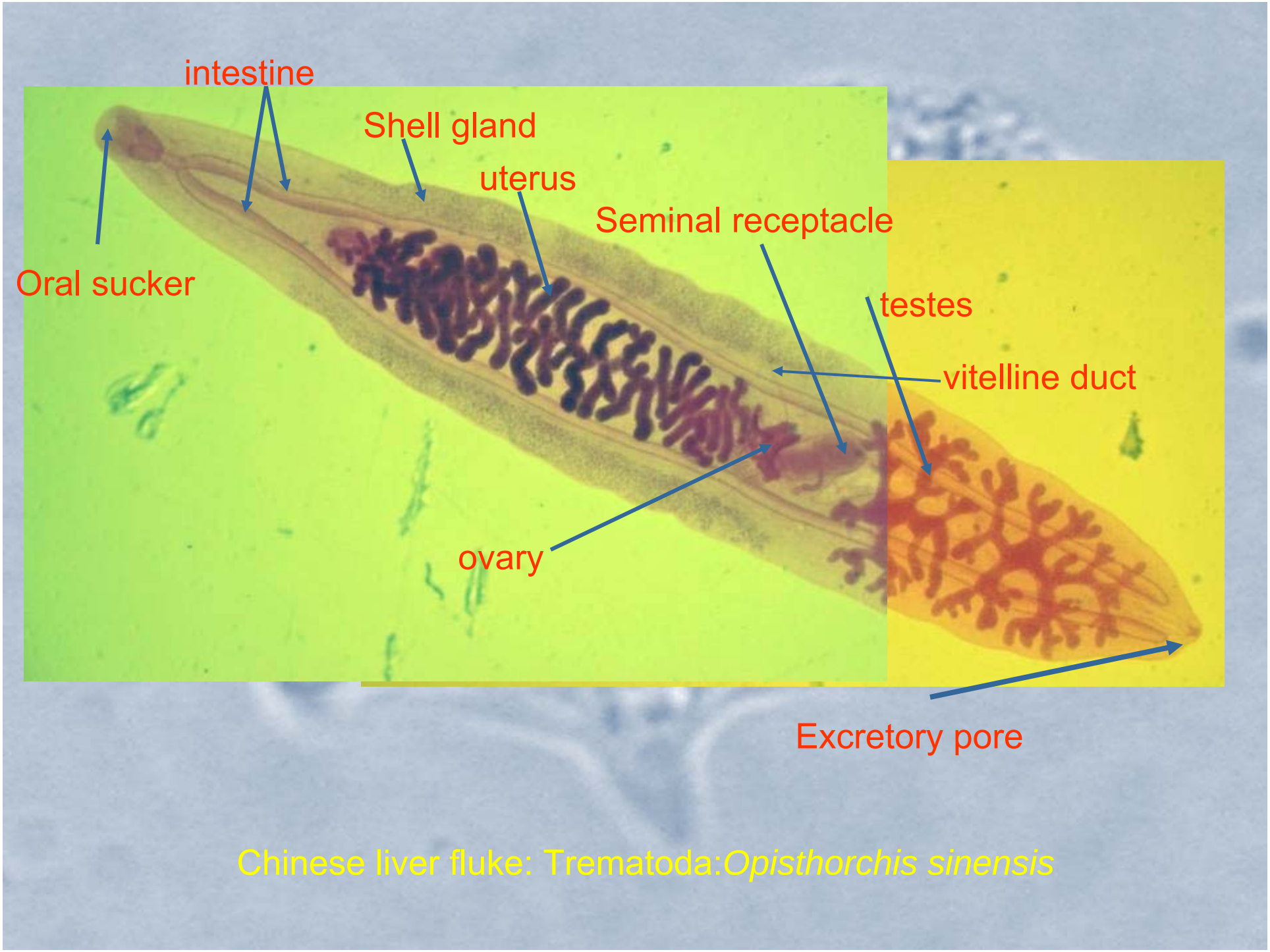

Cilia- on bottom


pharynx
gut

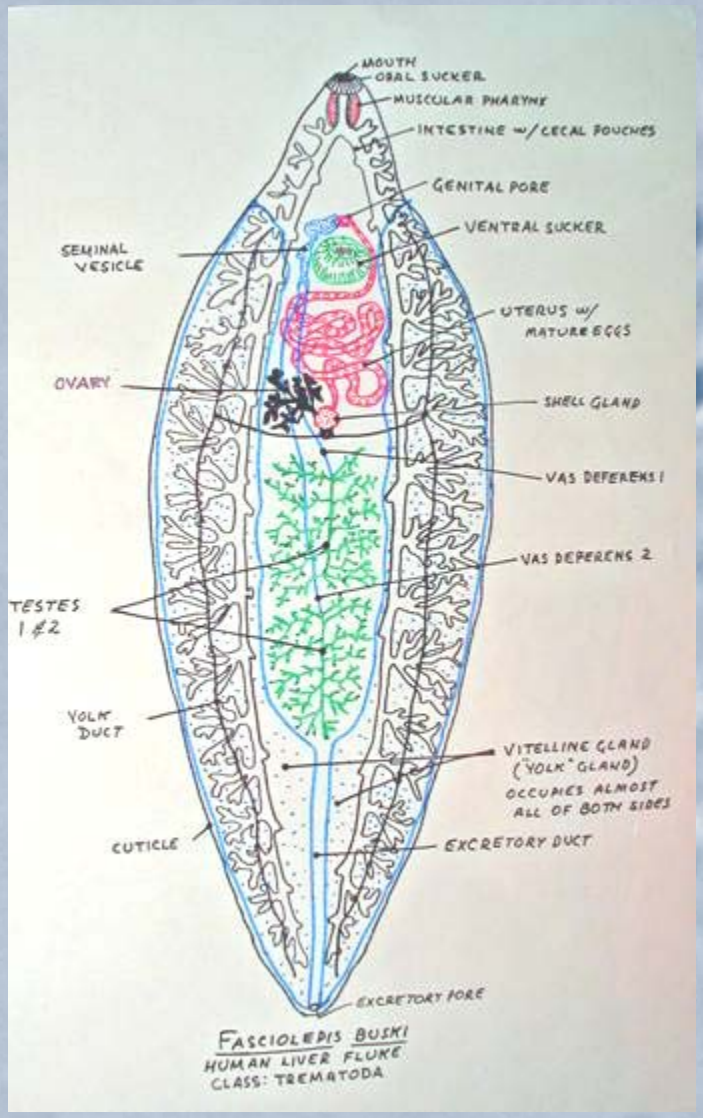
PLATYHELMINTHES-TREMATODA-the FLUKES:These are free swimming CERCARIA (a larva) erupted from the 1st intermediate host (a snail) and now found in pond water. They cause 'swimmers itch' when they penetrate your skin. The adults live in vertebrates lungs, liver, intestines ; but, are species specific and won't turn into an adult unless these are human 'flukes'. I've added a few pictures of adult liver flukes of man as well as a *life cycle,* but,again these are not found in ponds-only the 'larval' forms


Liver Fluke Life Cycle
egg
miracidium
2nd intermediate host
cercaria
sporocyst
redia
1st intermediate host

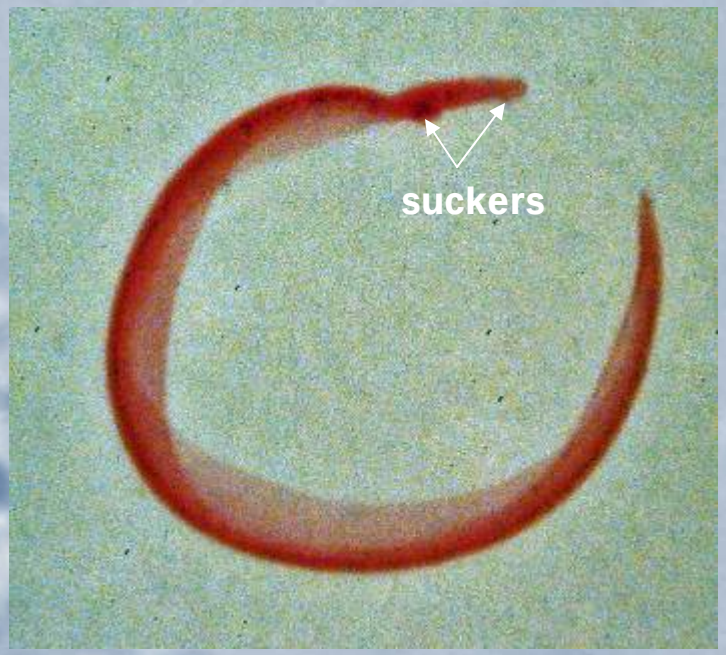

oral sucker
ventral sucker w/ gonopore
vitelline gland & duct
vas
intestine
uterus
shell gl.& ovary
seminal receptacle
2 testes(a&p)



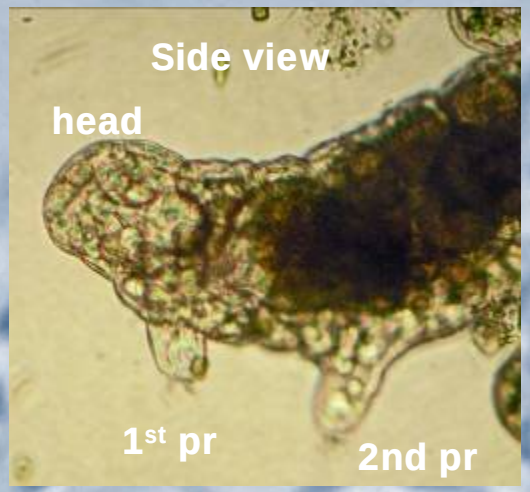
Chinese liver fluke: Trematoda:*Opisthorchis sinensis*

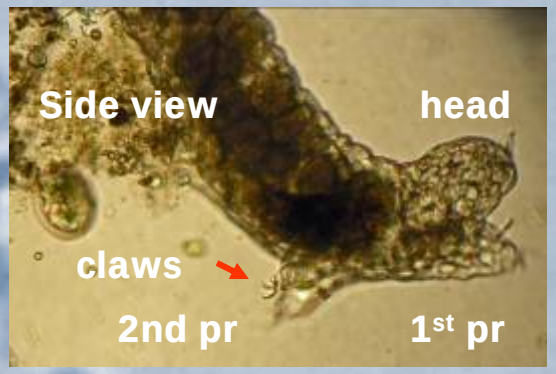


Fasciola busci



Blood Fluke (Schistosomes)– female♀ lies in male's ♂ gynecophoric canal



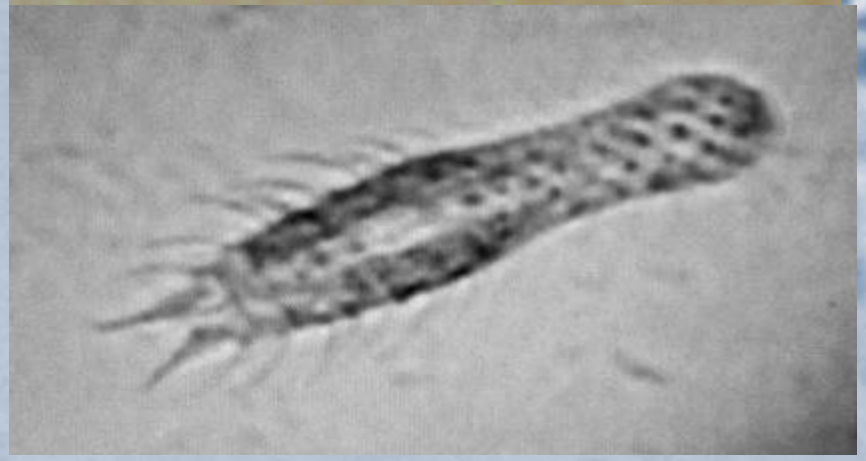


http://www.youtube.com/watch?v=9-nwKEGgDiE

PH: TARDIGRADA-the 'water bears'
(~500 um) 4 pairs of clawed,
unsegmented legs

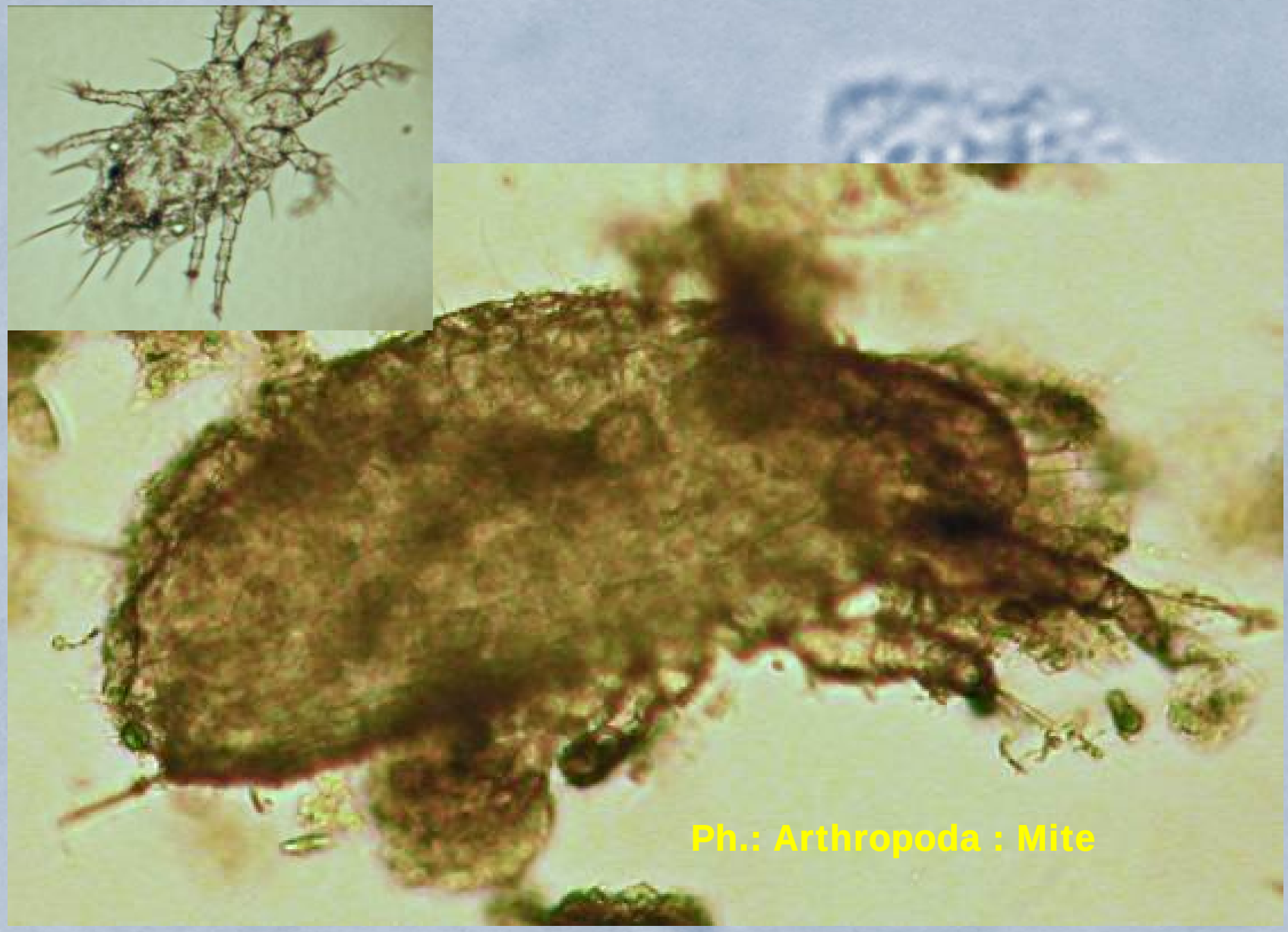
Last pair

Ph. Gastrotricha: cf *Chaetonotus*



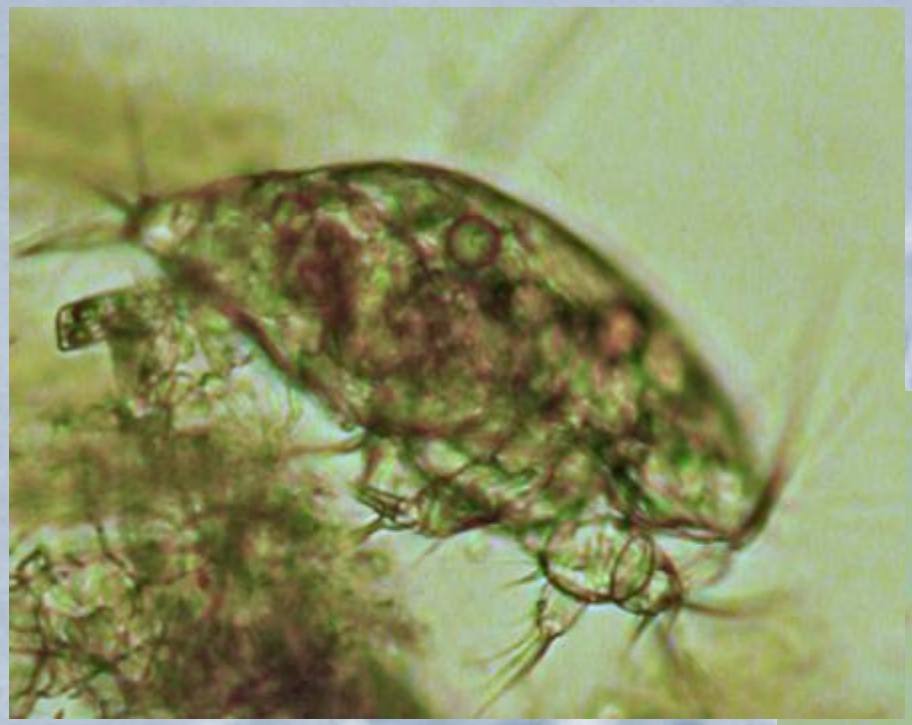
http://www.youtube.com/watch?v=nJOCLAFkQAg

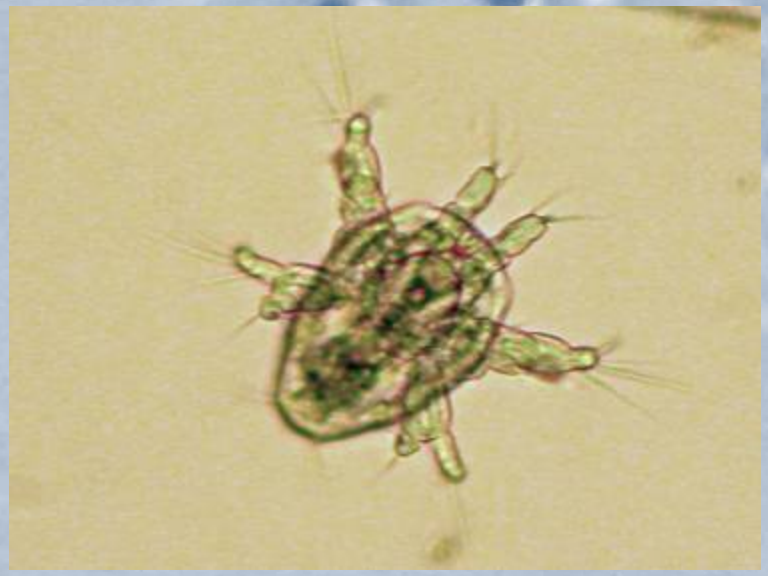

Ph. Gastrotricha: cf
Chaetonotus

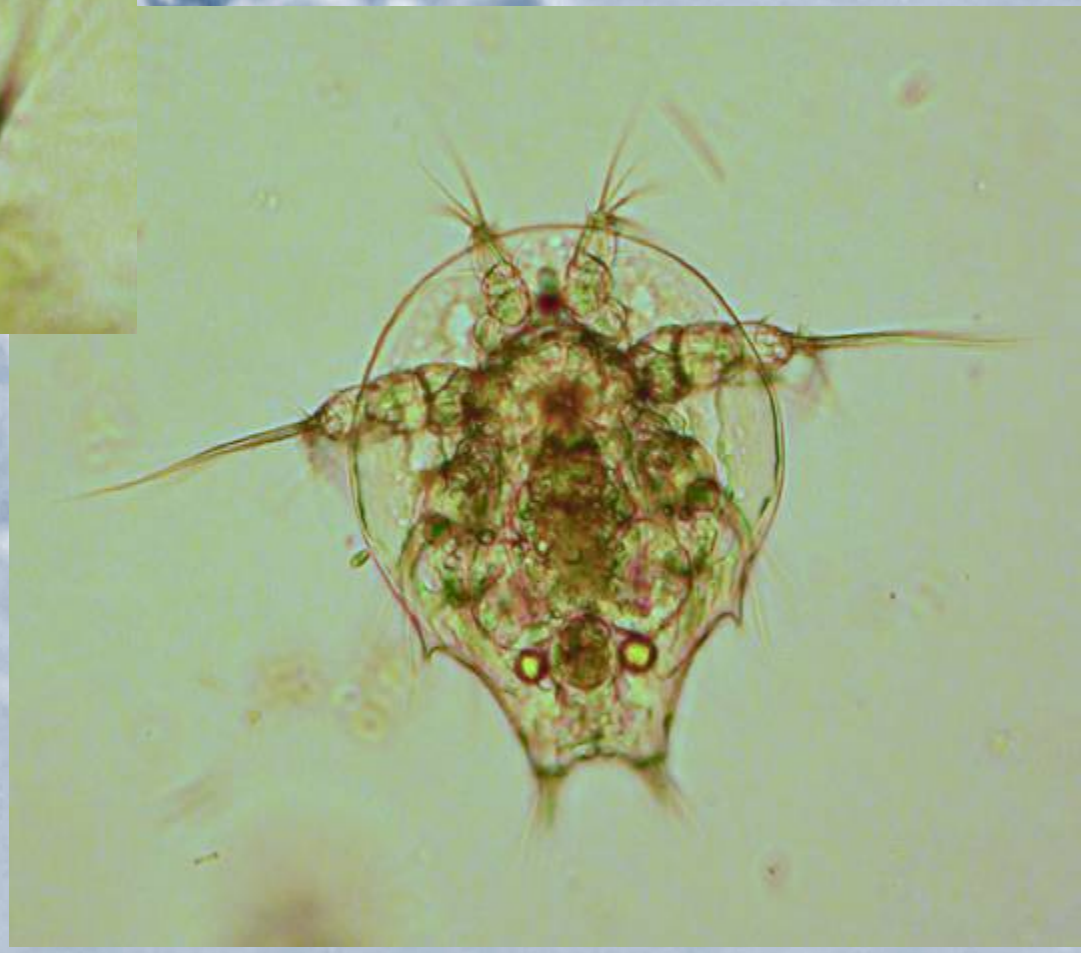

Ph.: Arthropoda : Mite


Ph.: Arthropoda : Mite

Arthropoda:
Crustacea - larva







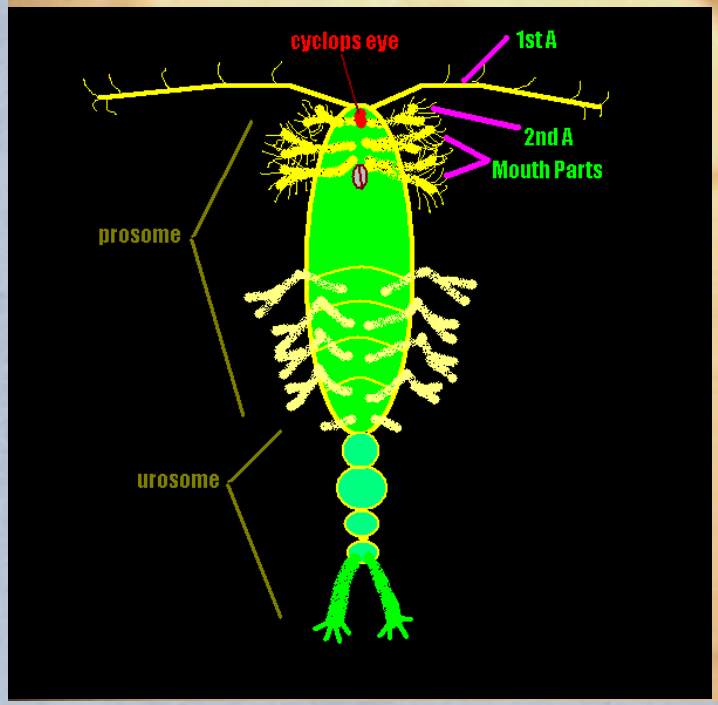

Arthropoda:
Crustacea-
Amphipoda

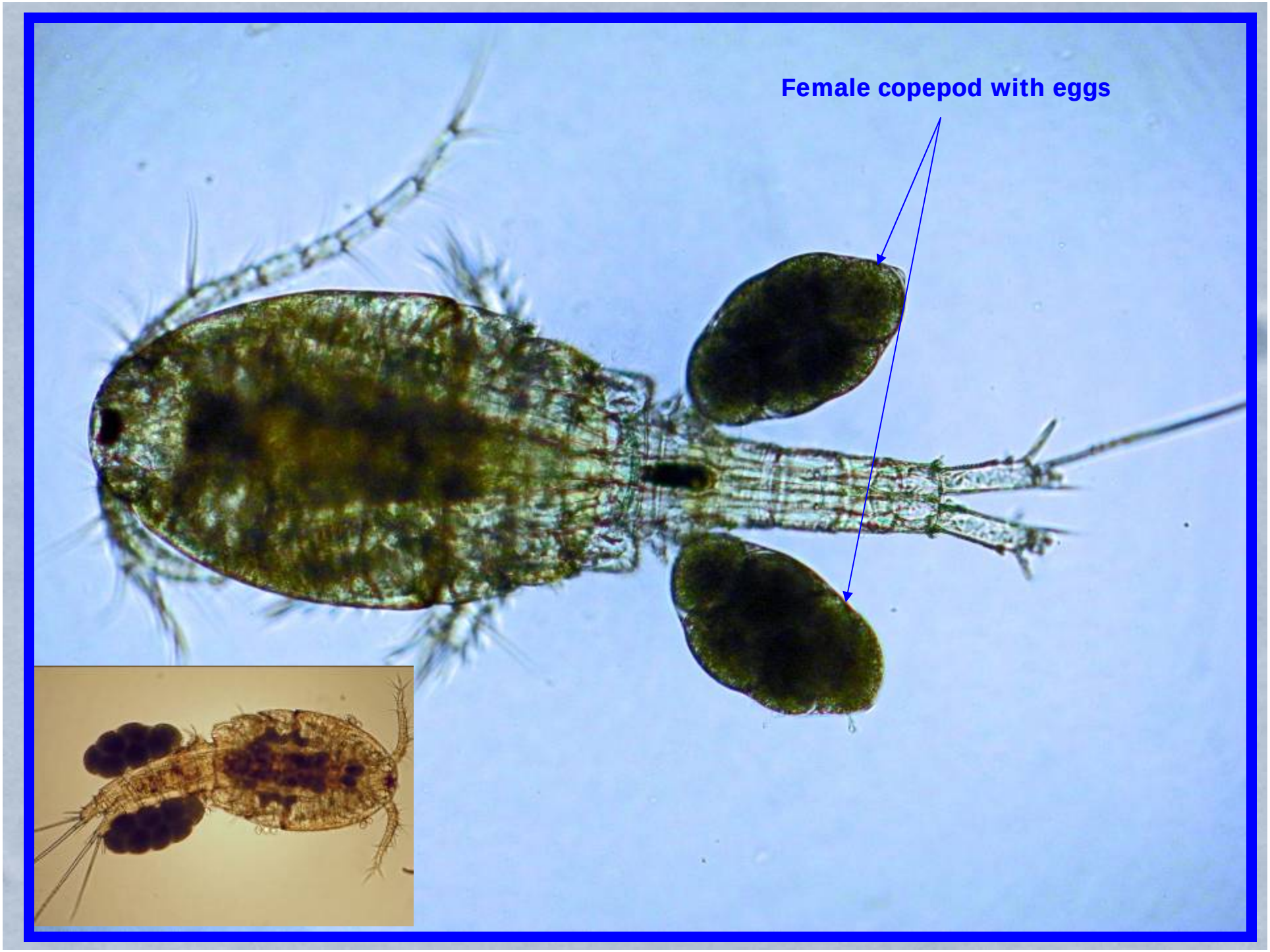

Arthropoda:
Crustacea-
Copepoda


Arthropoda:
Crustacea-
Copepoda

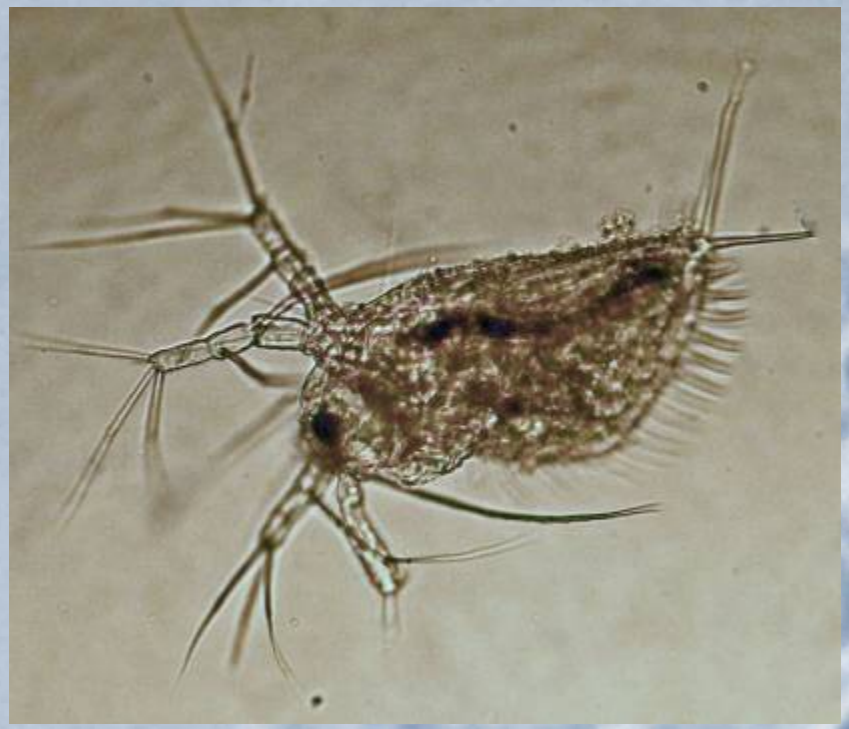
Arthropoda: Crustacea- Amphipoda

Arthropoda: Crustacea- Copepoda

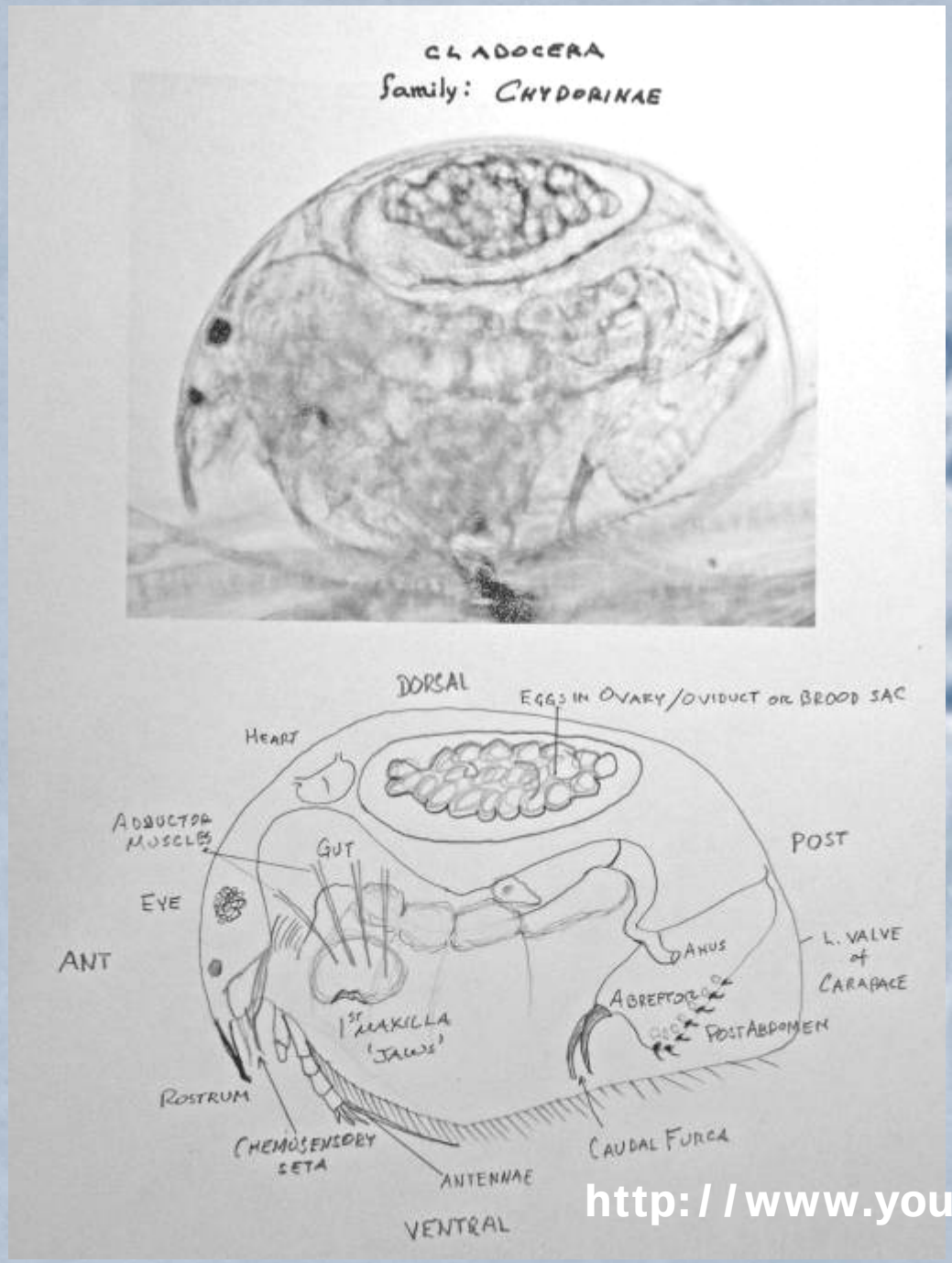



Female copepod with eggs

Cladocera: *Daphnia* & relatives – ‘water fleas’

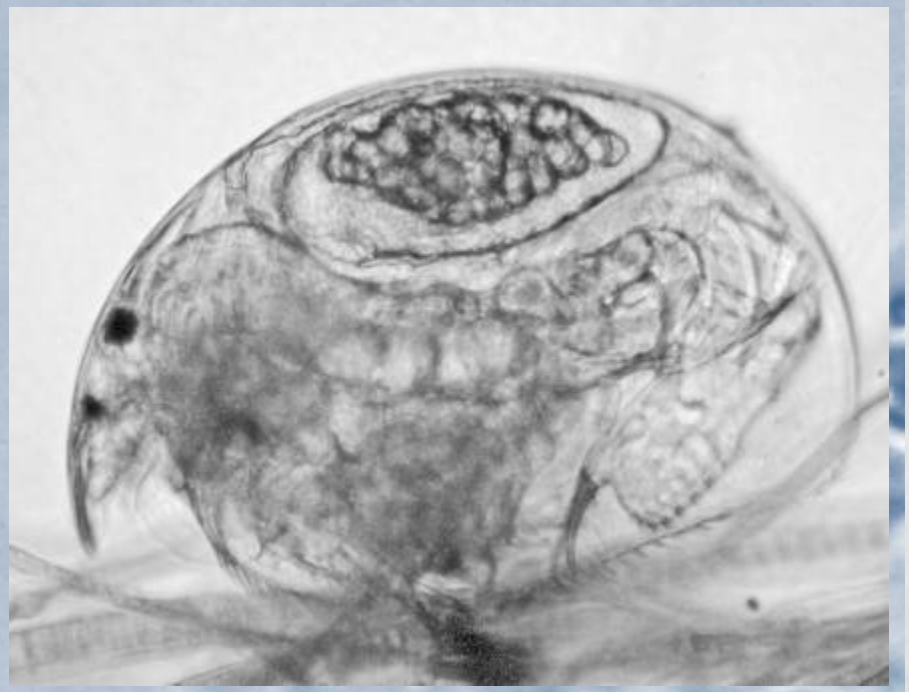


Macrothicidae



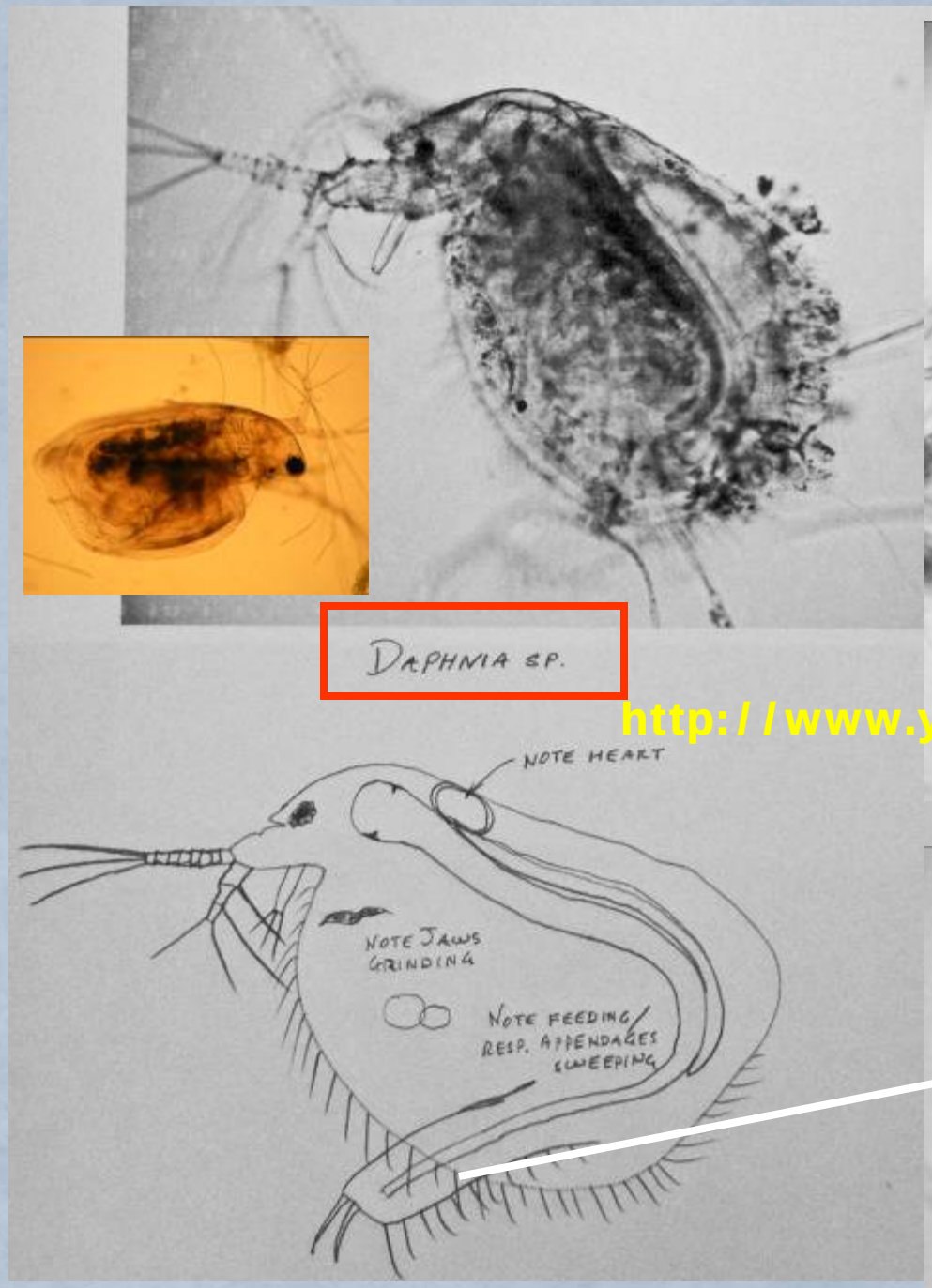
Cladocera: Chydorinae

http://www.youtube.com/watch?v=WXjXle1Enok

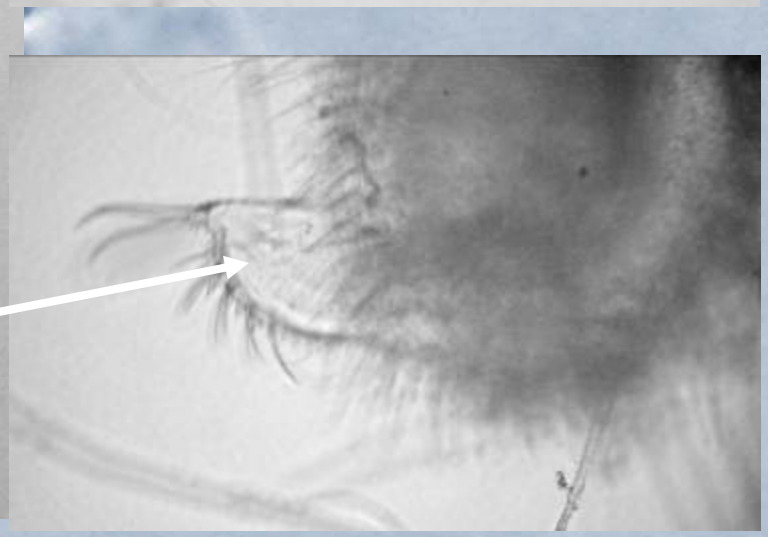


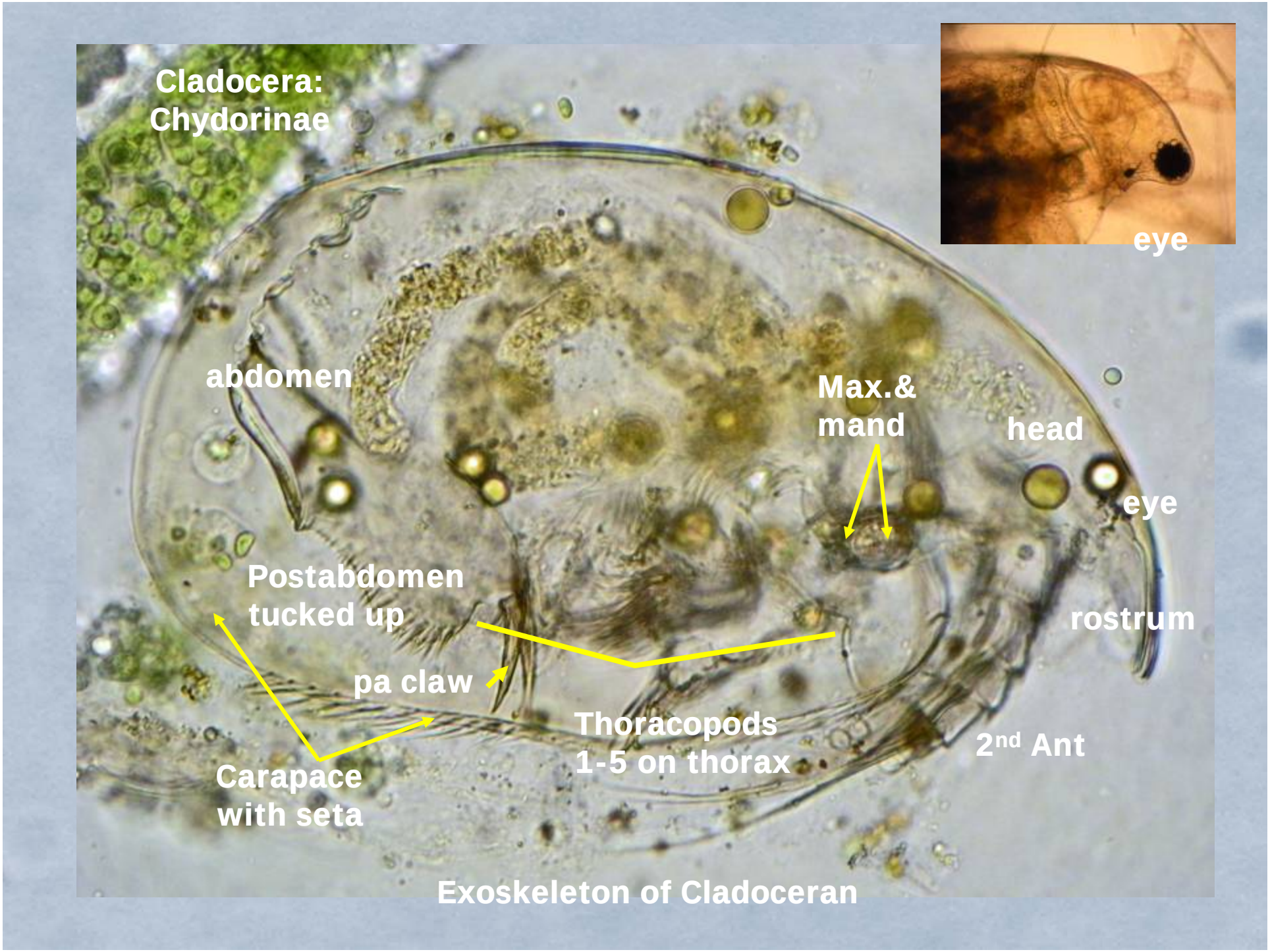
Cladocera: *Daphnia* & relatives

http://www.youtube.com/watch?v=WXjXle1Enok

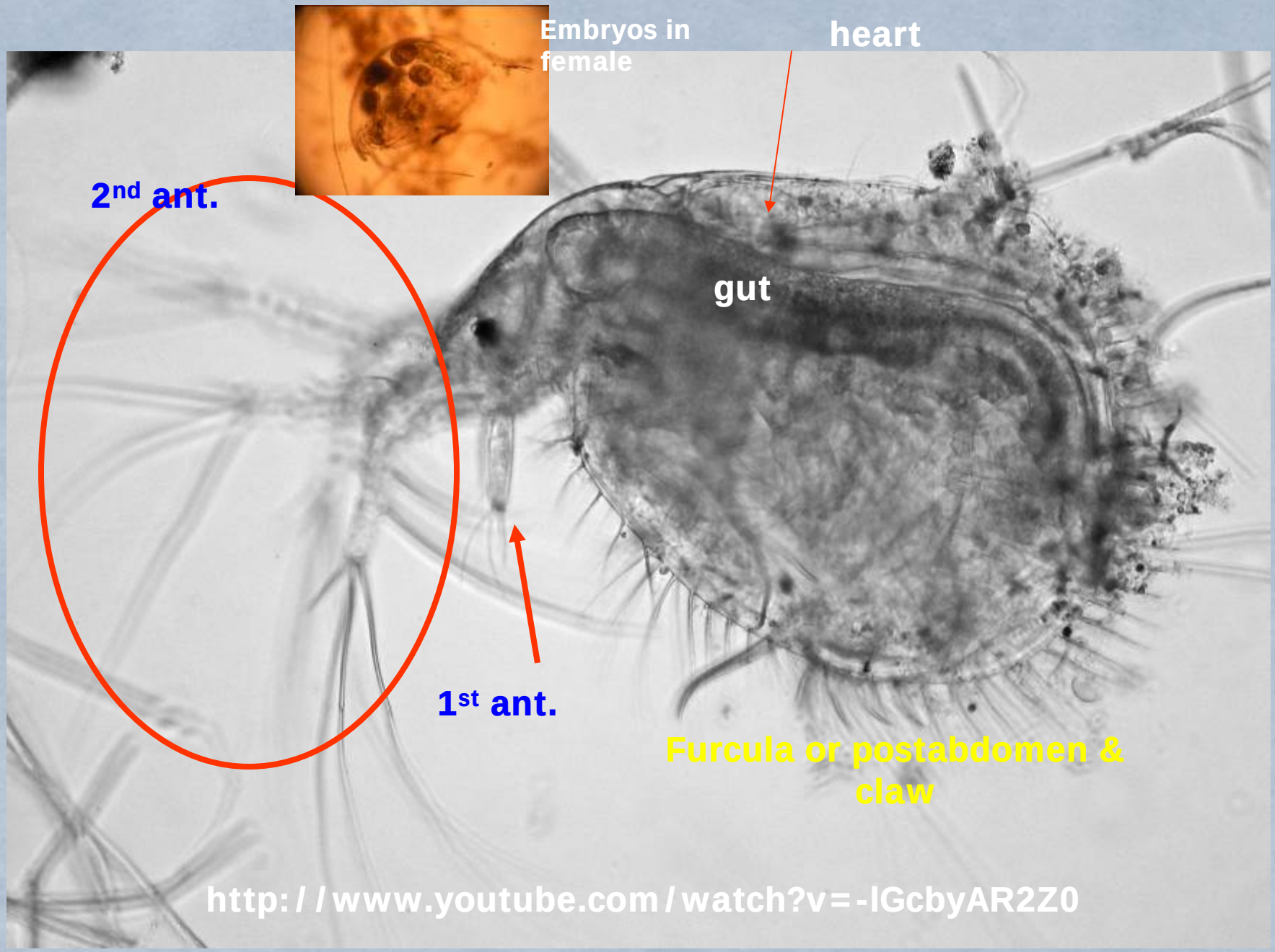


http://www.youtube.com/watch?v=E5i55Hsxr7s

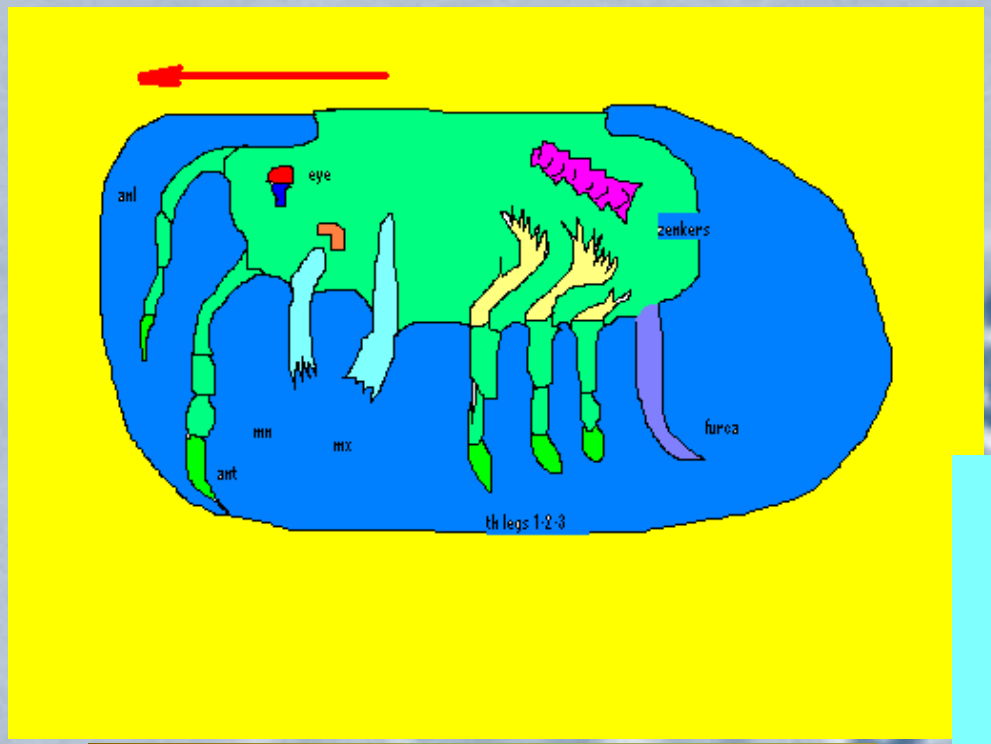


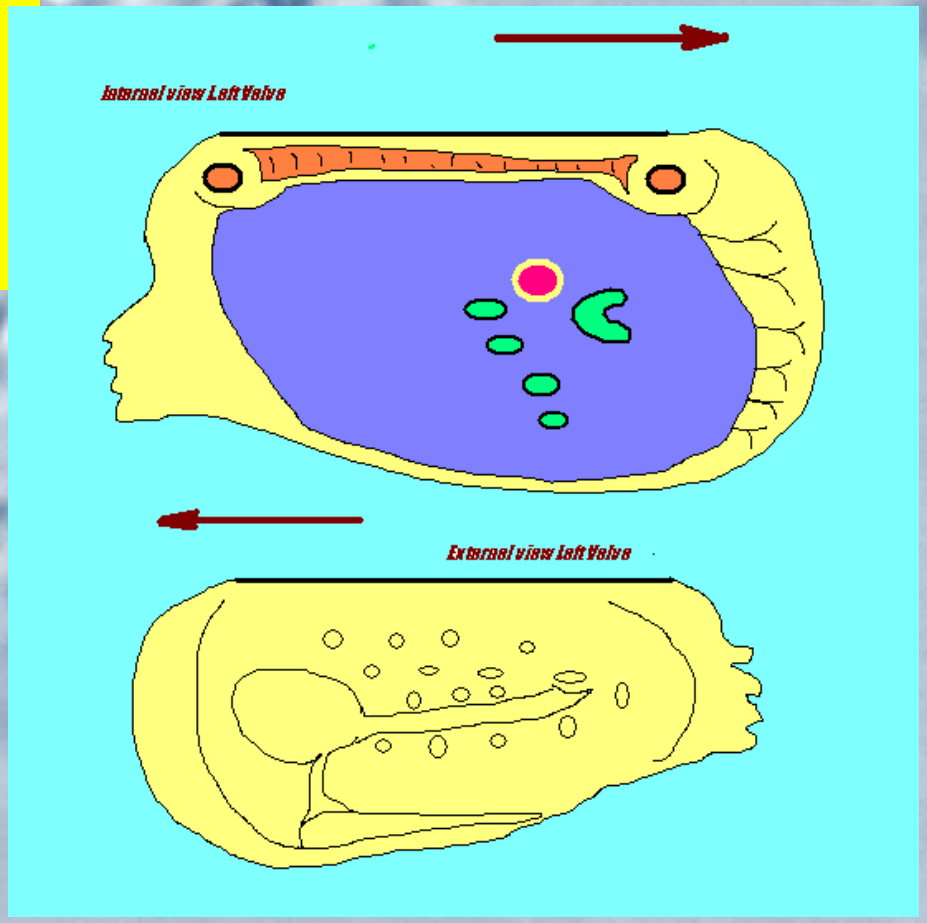


Exoskeleton of Cladoceran

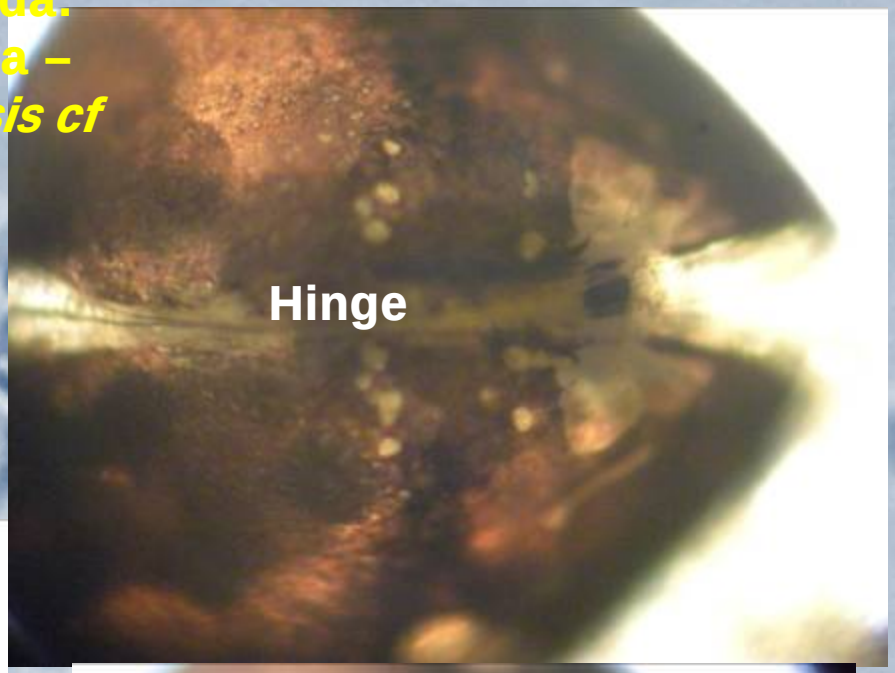

Embryos in female
heart
2nd ant.
gut
1st ant.
Furcula or postabdomen & claw
http://www.youtube.com/watch?v=-lGcbyAR2Z0

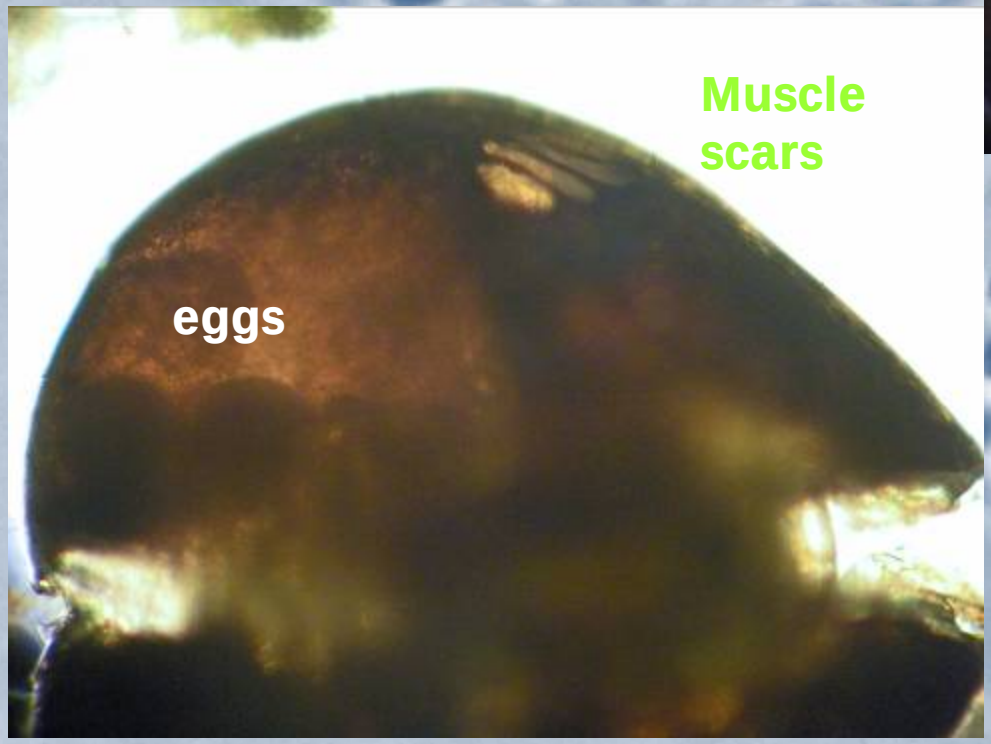
Arthropoda: Ostracoda

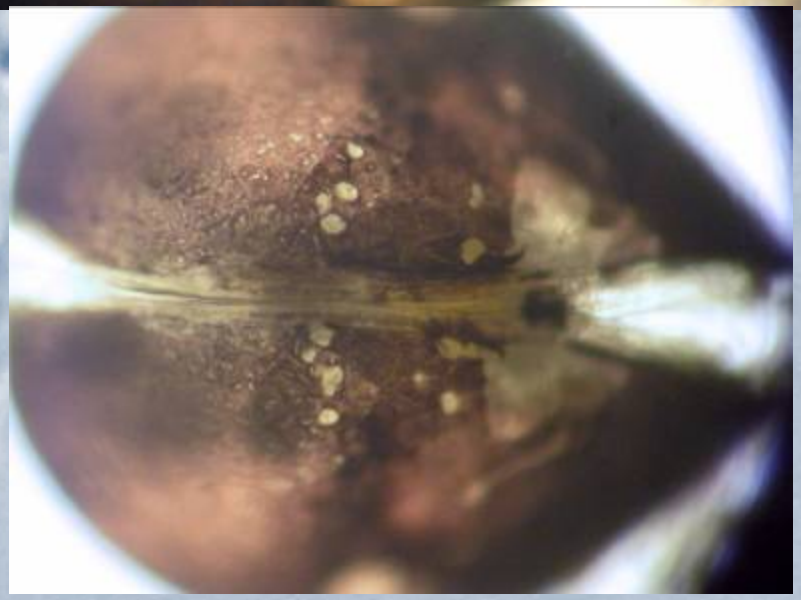


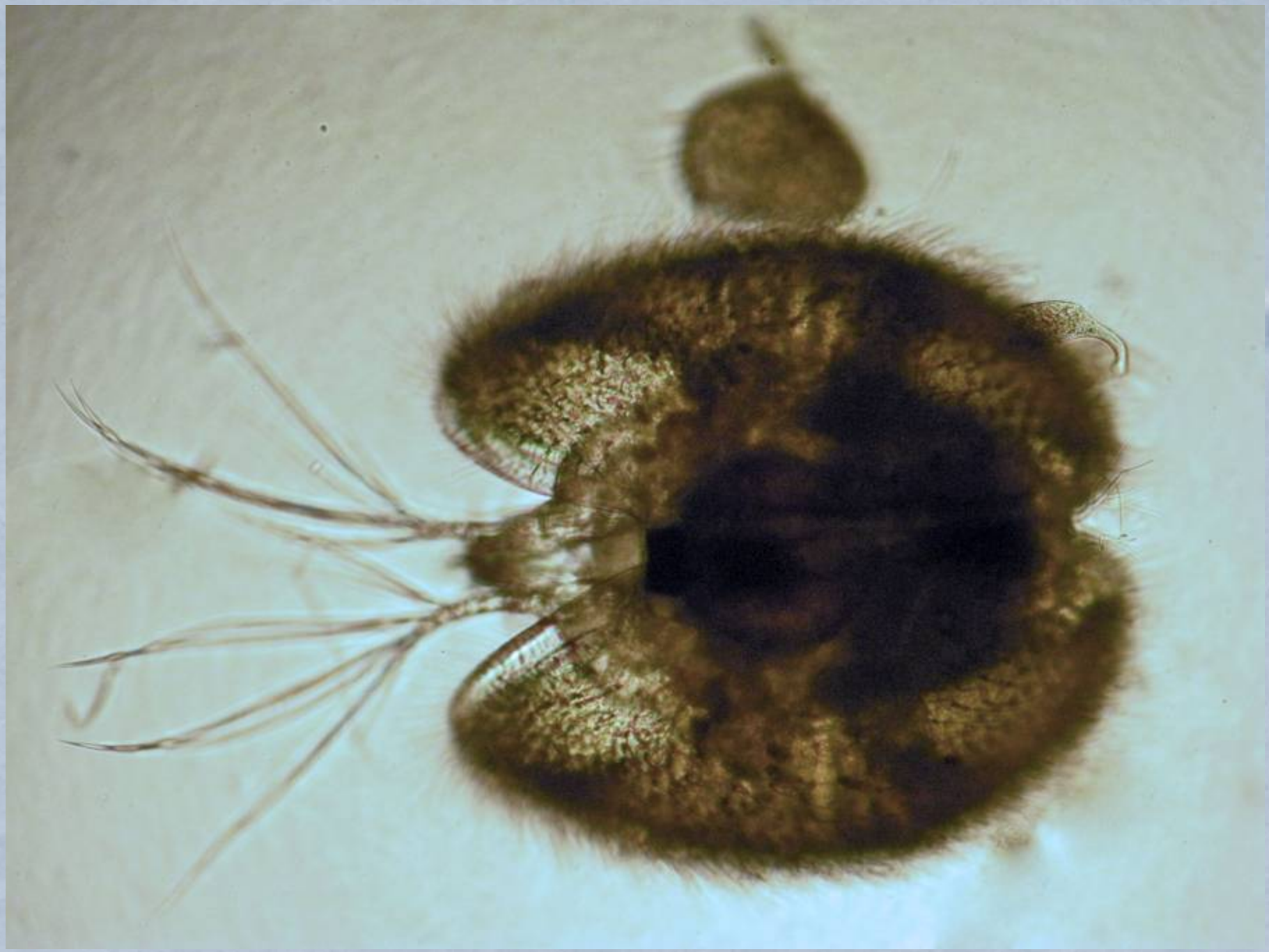


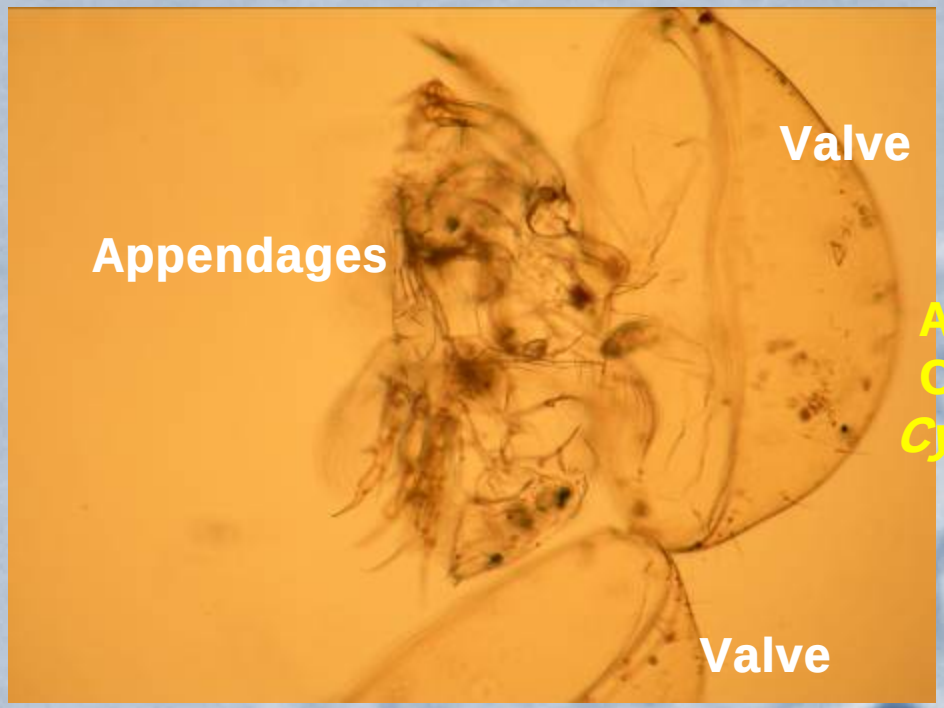
Arthropoda: Ostracoda – *Cypridopsis cf vidua*



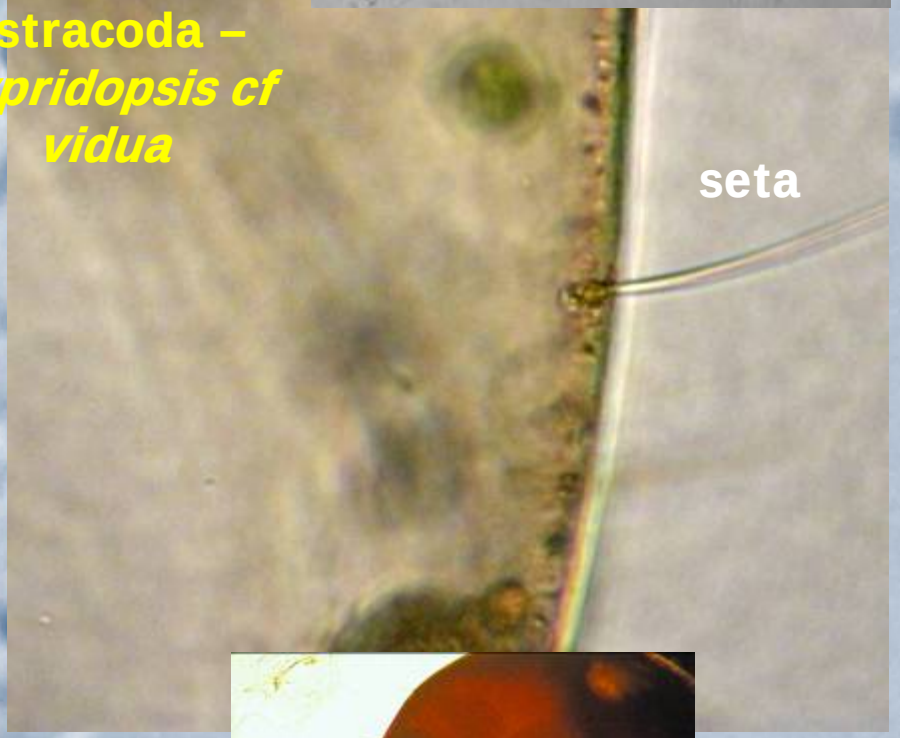


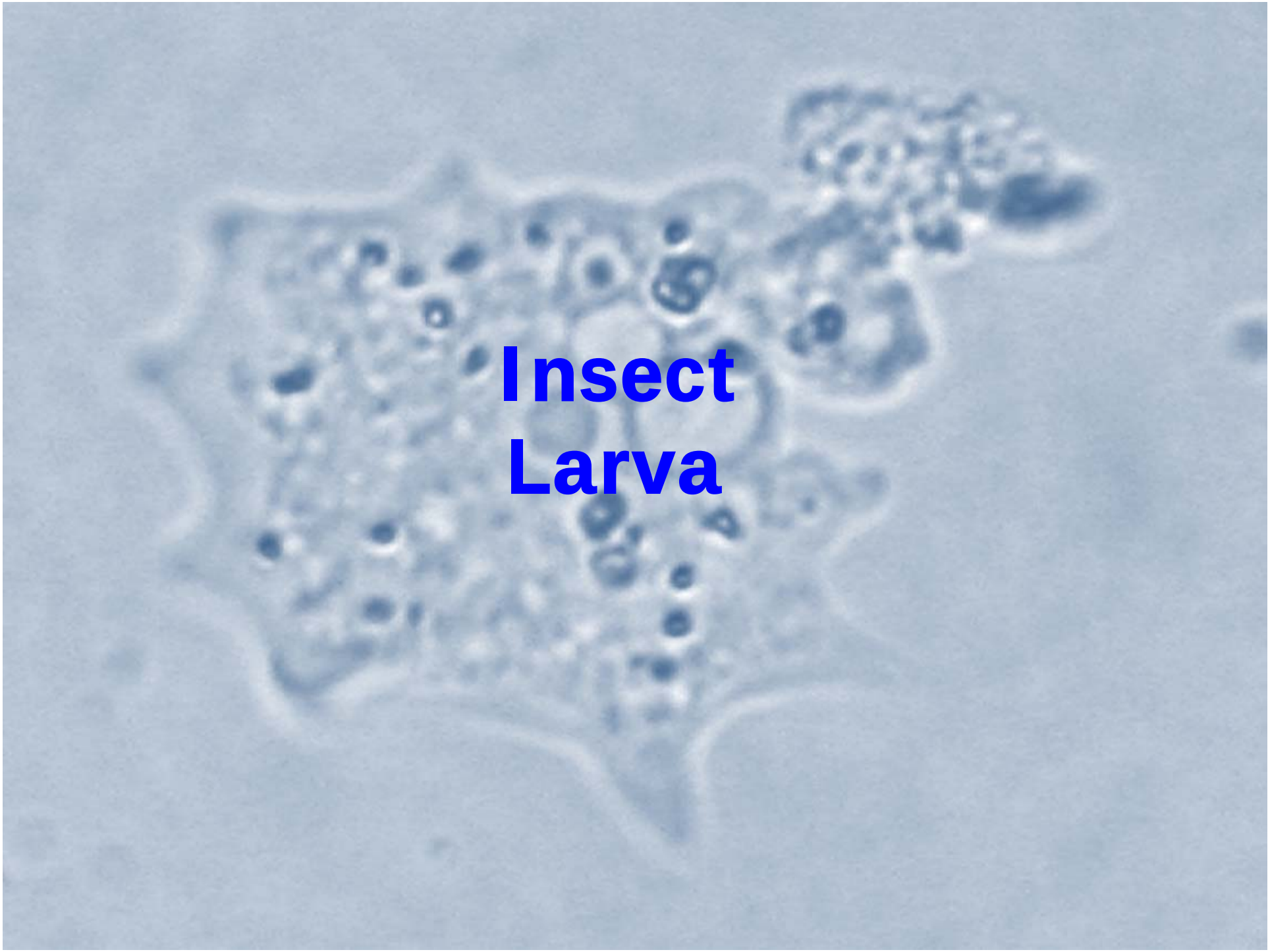


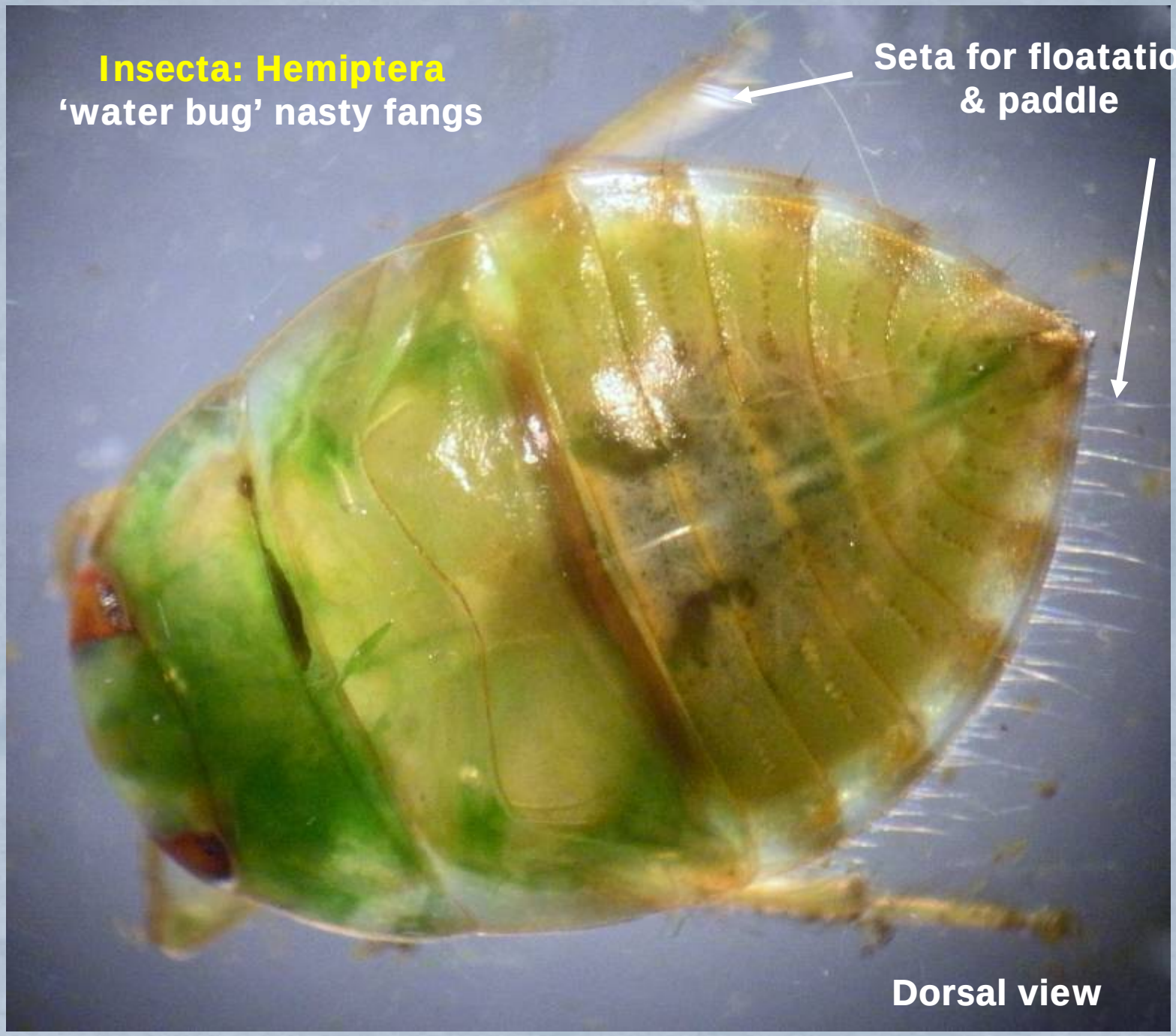


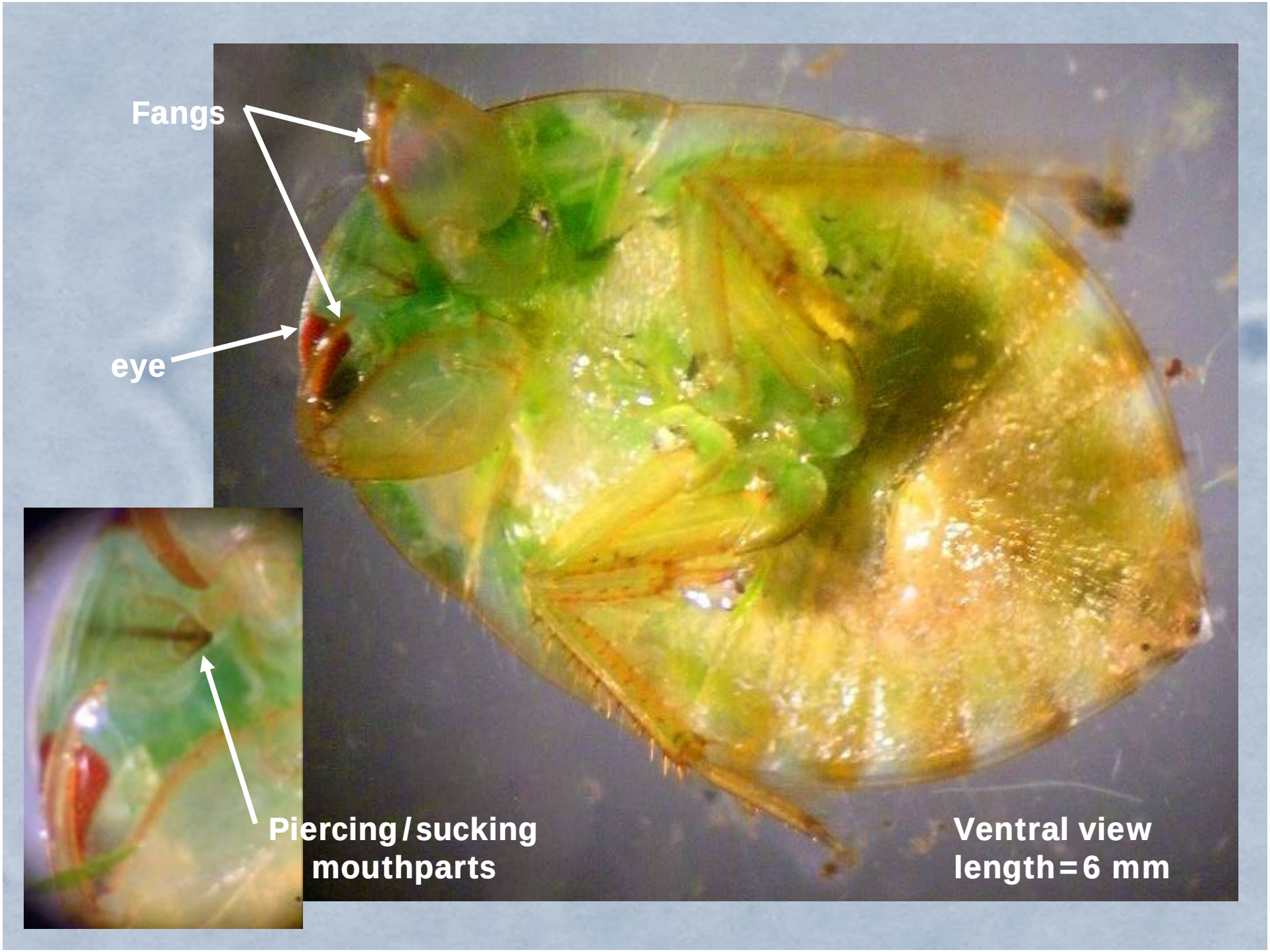


Arthropoda: Ostracoda – *Cypridopsis cf vidua*




Insect
Larva


Insecta: Hemiptera
'water bug' nasty fangs
Seta for floatation
& paddle
Dorsal view

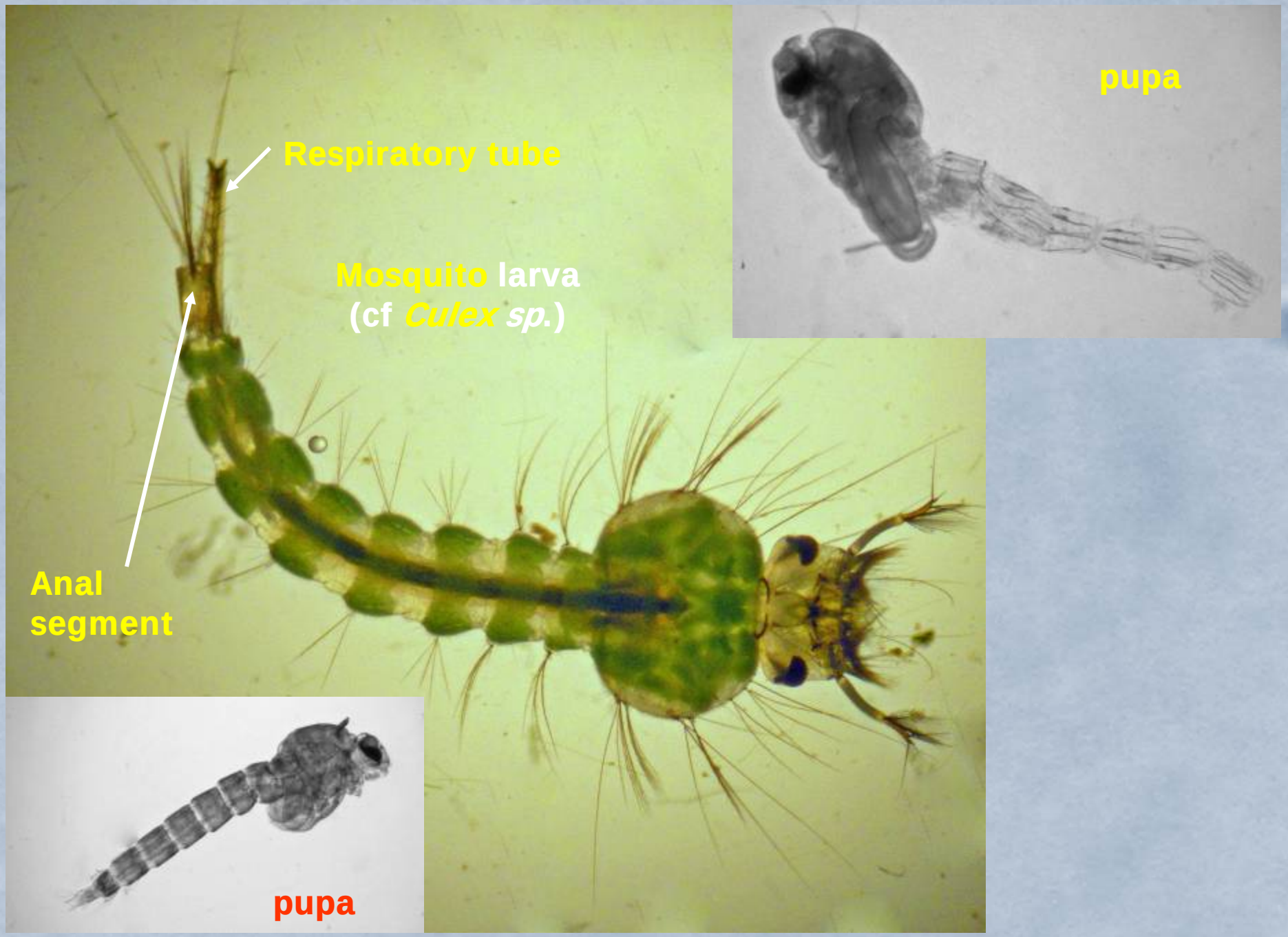

Fangs
eye
Piercing / sucking
mouthparts
Ventral view
length = 6 mm

Heads – note ‘jaws’

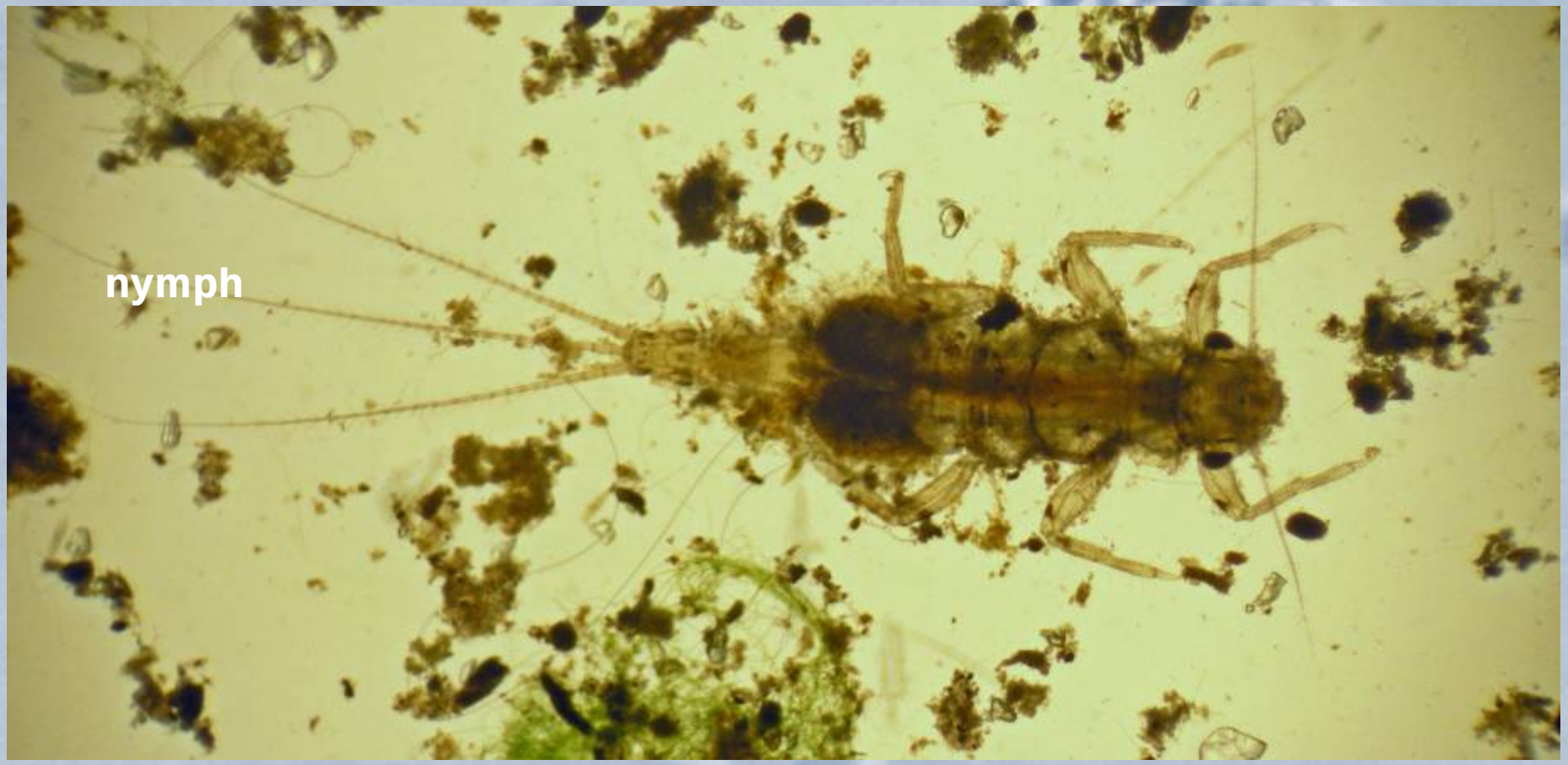
body

tails

Biting flies –Diptera – mosquito, ‘no-see-um’, etc.: LARVA


Respiratory tube
Mosquito larva
(cf *Culex sp.*)
Anal segment
pupa
pupa

Insecta: Order Odonata: damselfies and dragonflies

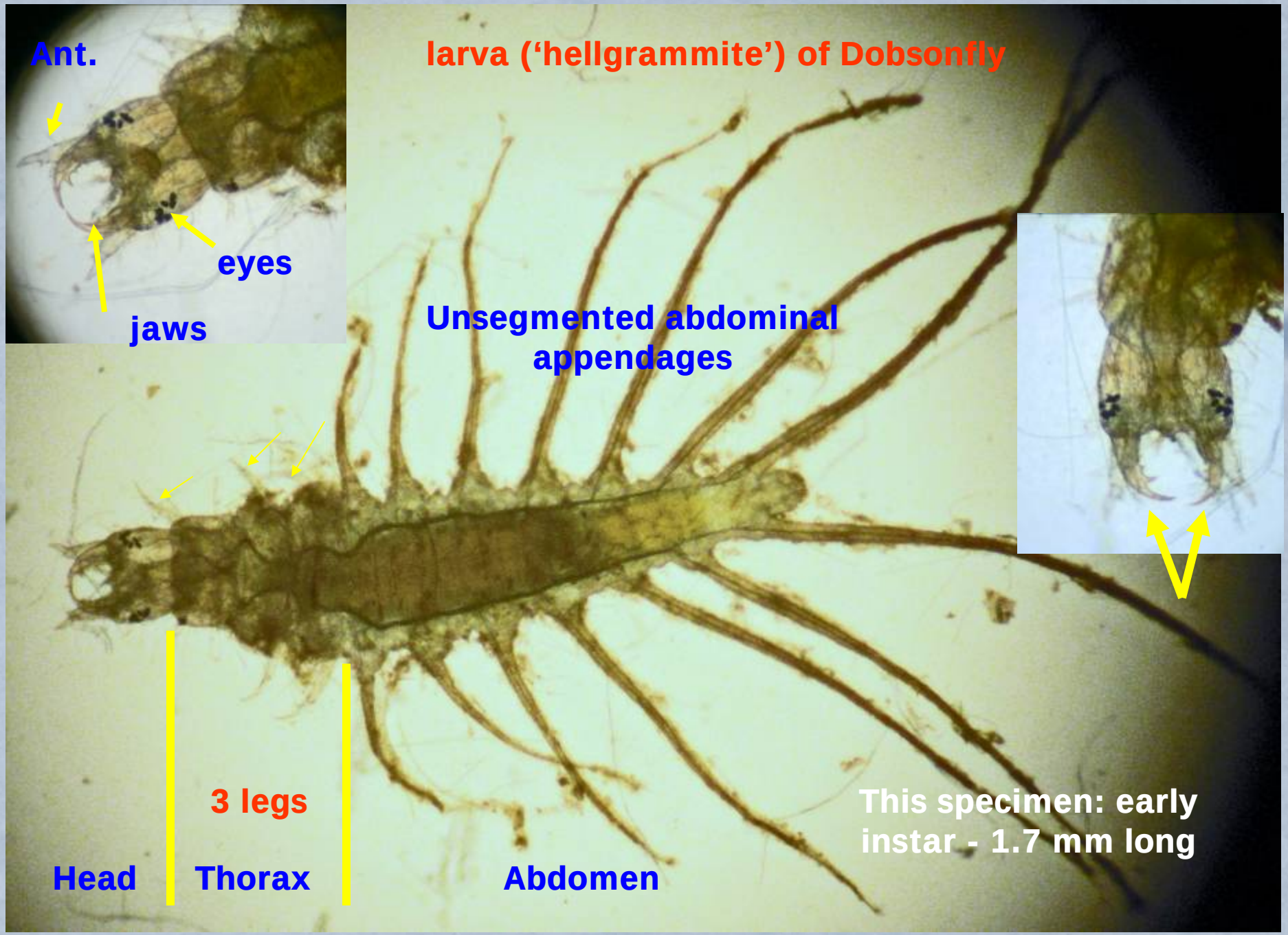


http://www.youtube.com/watch?v=i3AR5ZDRyWE

Order Odonata: damselfies and dragonflies; another nymph

http://www.youtube.com/watch?v=i3AR5ZDRyWE

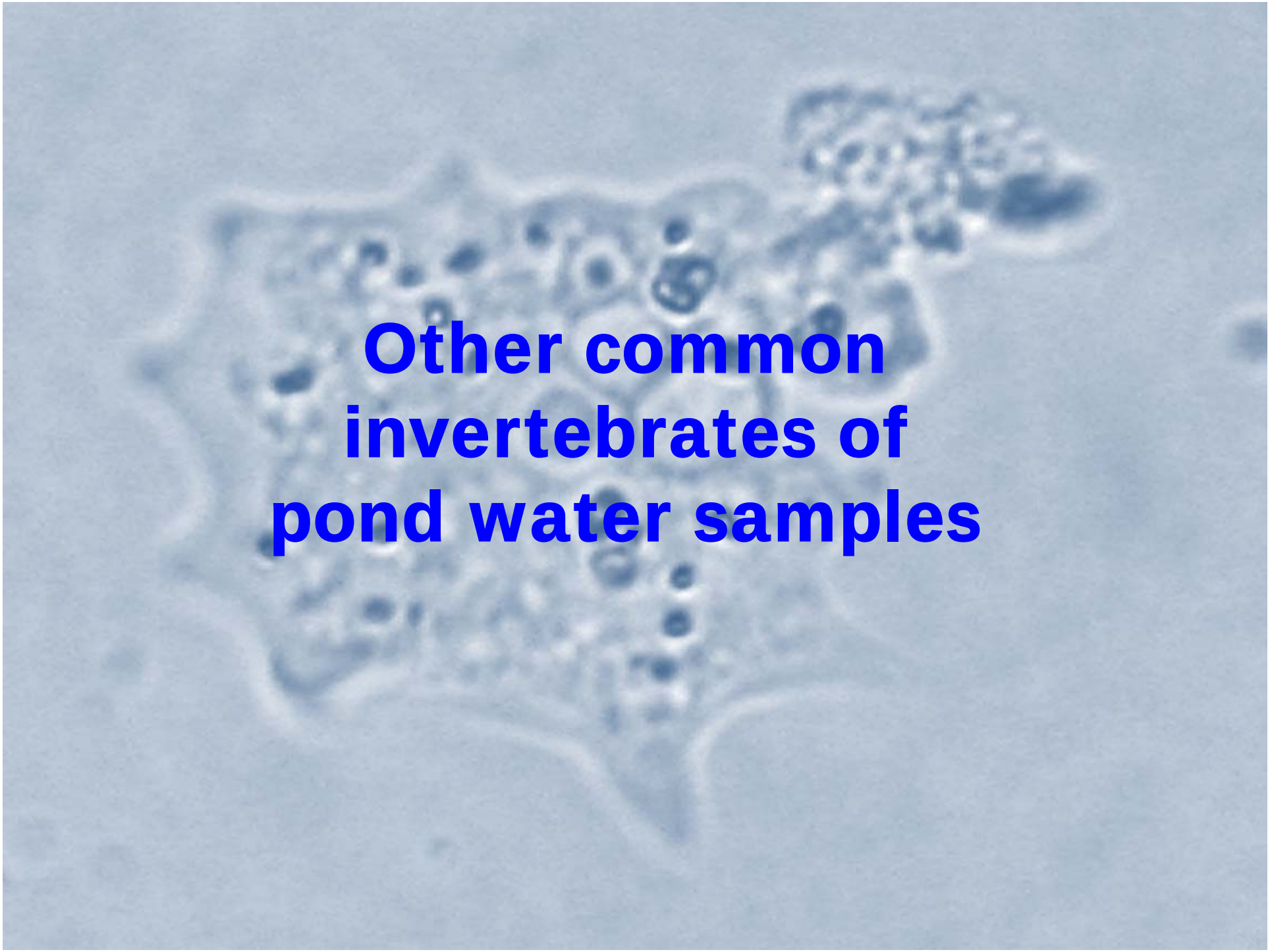
Insecta: Order Odonata: damselfies and dragonflies


Ant.
larva ('hellgrammite') of Dobsonfly
eyes
jaws
Unsegmented abdominal appendages
3 legs
Head
Thorax
Abdomen
This specimen: early instar - 1.7 mm long

B&W, Relected and
Transmitted light; 8 mm high

Insecta :
Trichoptera

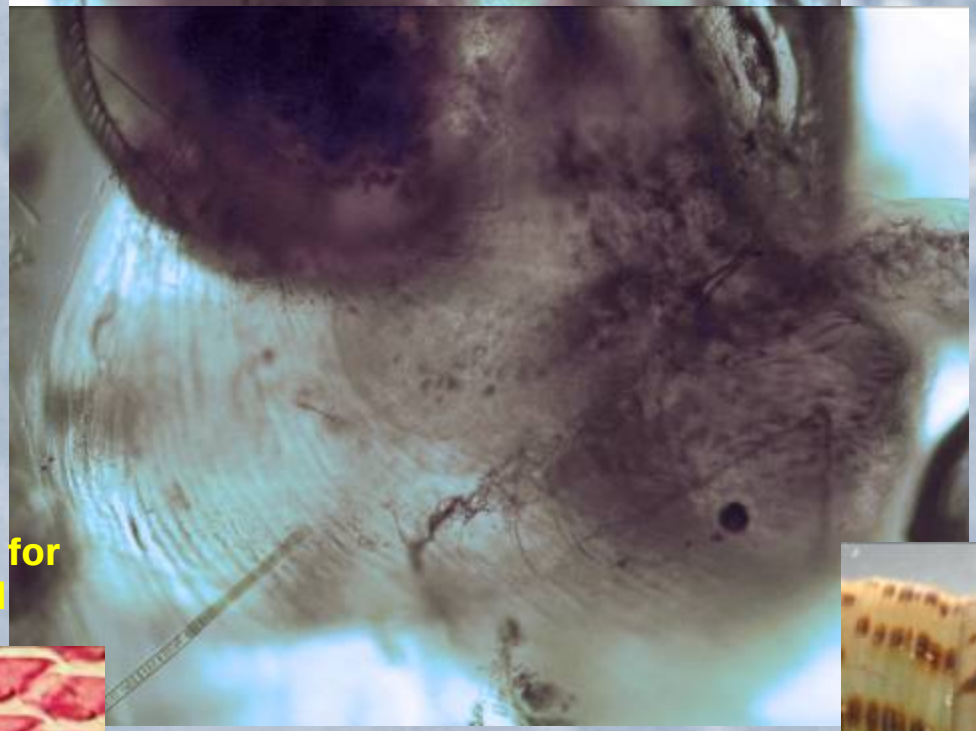
Caddis fly
larva case
of carefully
cemented
sand grains

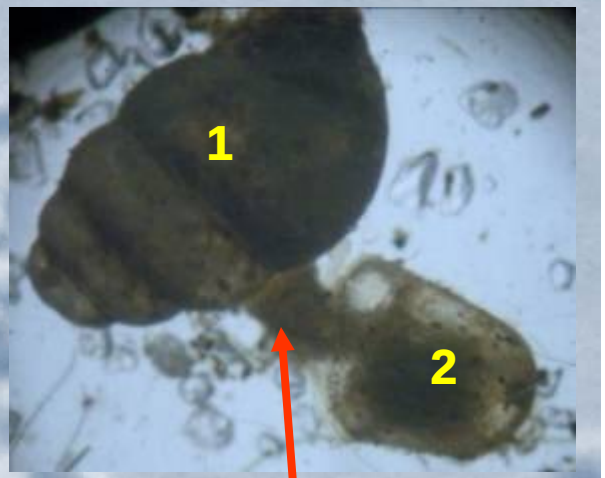

Other common
invertebrates of
pond water samples

Ph.Nematoda: a worm; ubiquitous

egg

Typical knotting



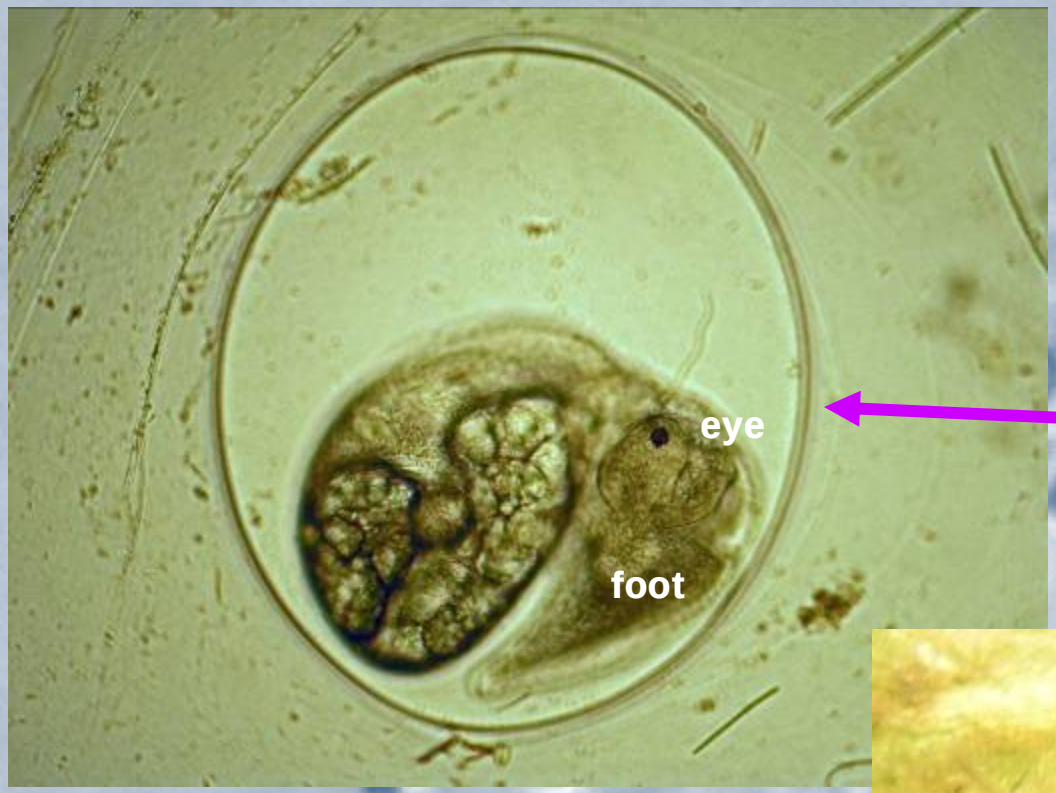


Foot of 2

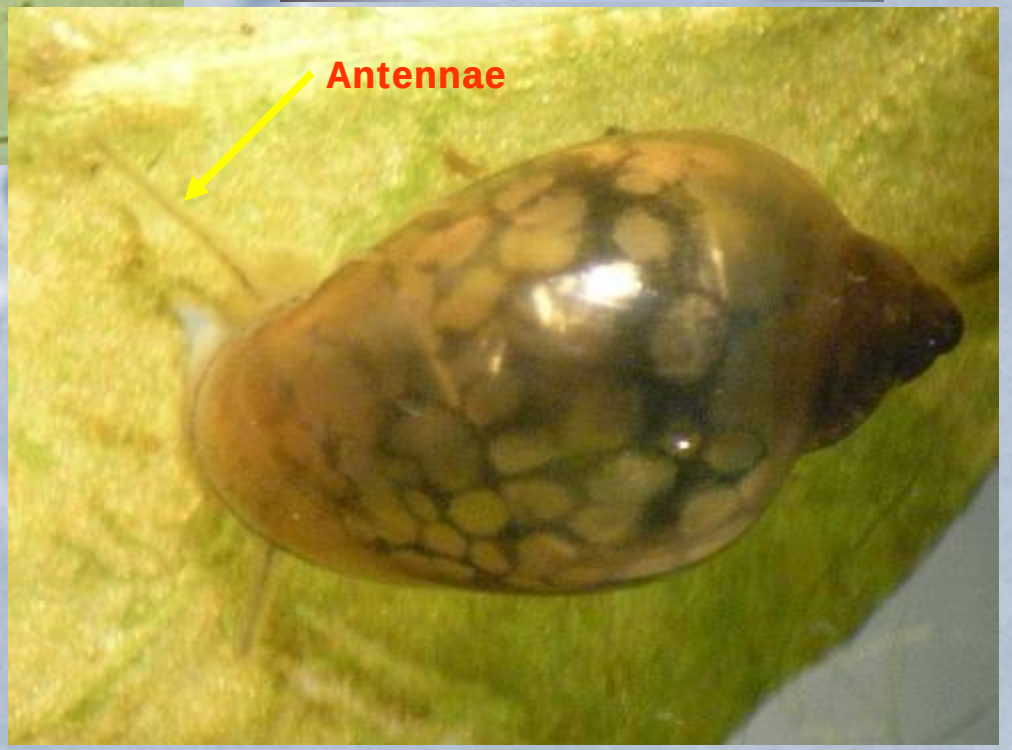
Ph.Mollusca: Gastropoda – pond snail

Radular 'teeth' for rasping food

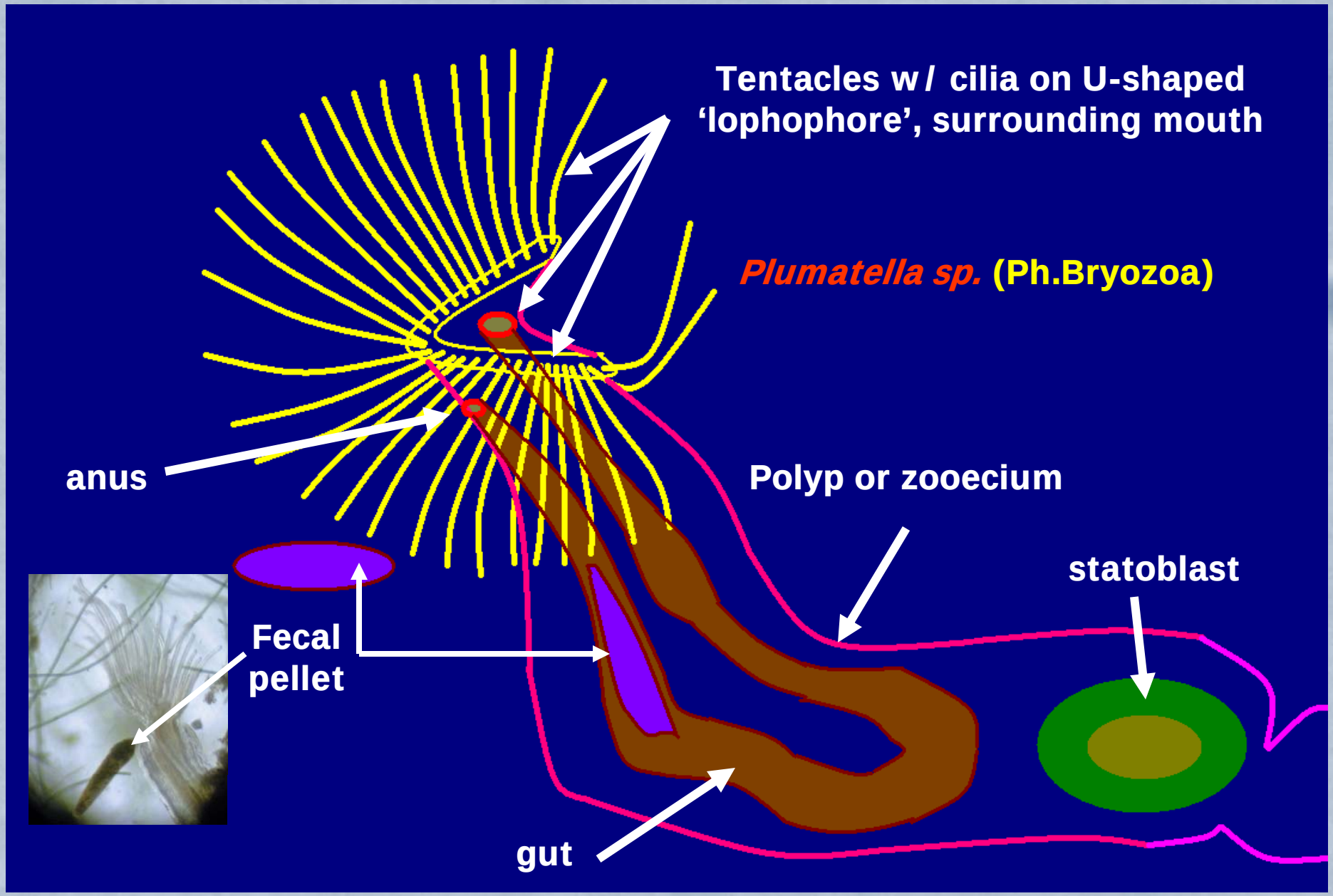
Euglandina sp.

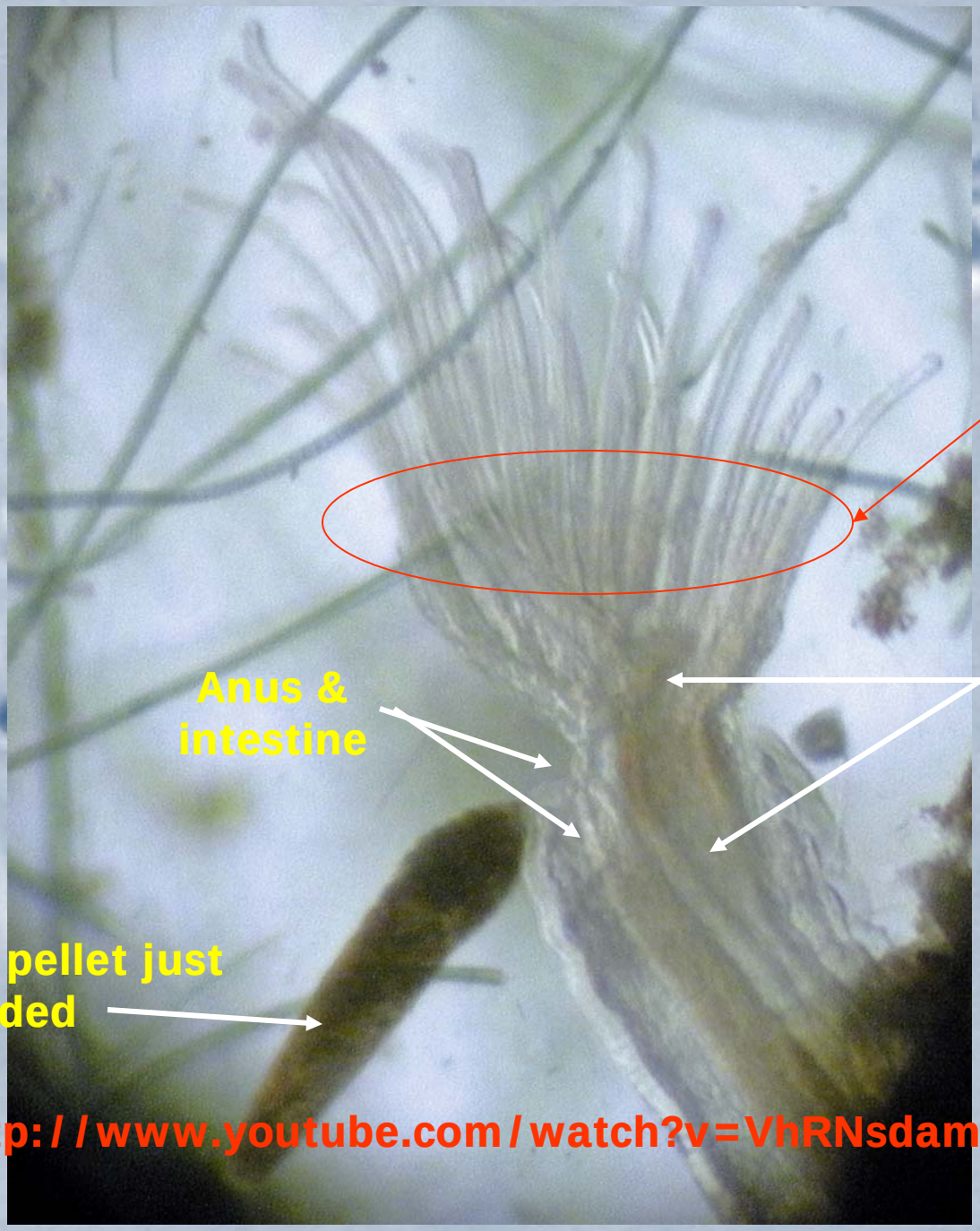


Egg with young snail larva in a gelatinous mass with 5-12 other eggs that were sitting on a *Naiad* leaf



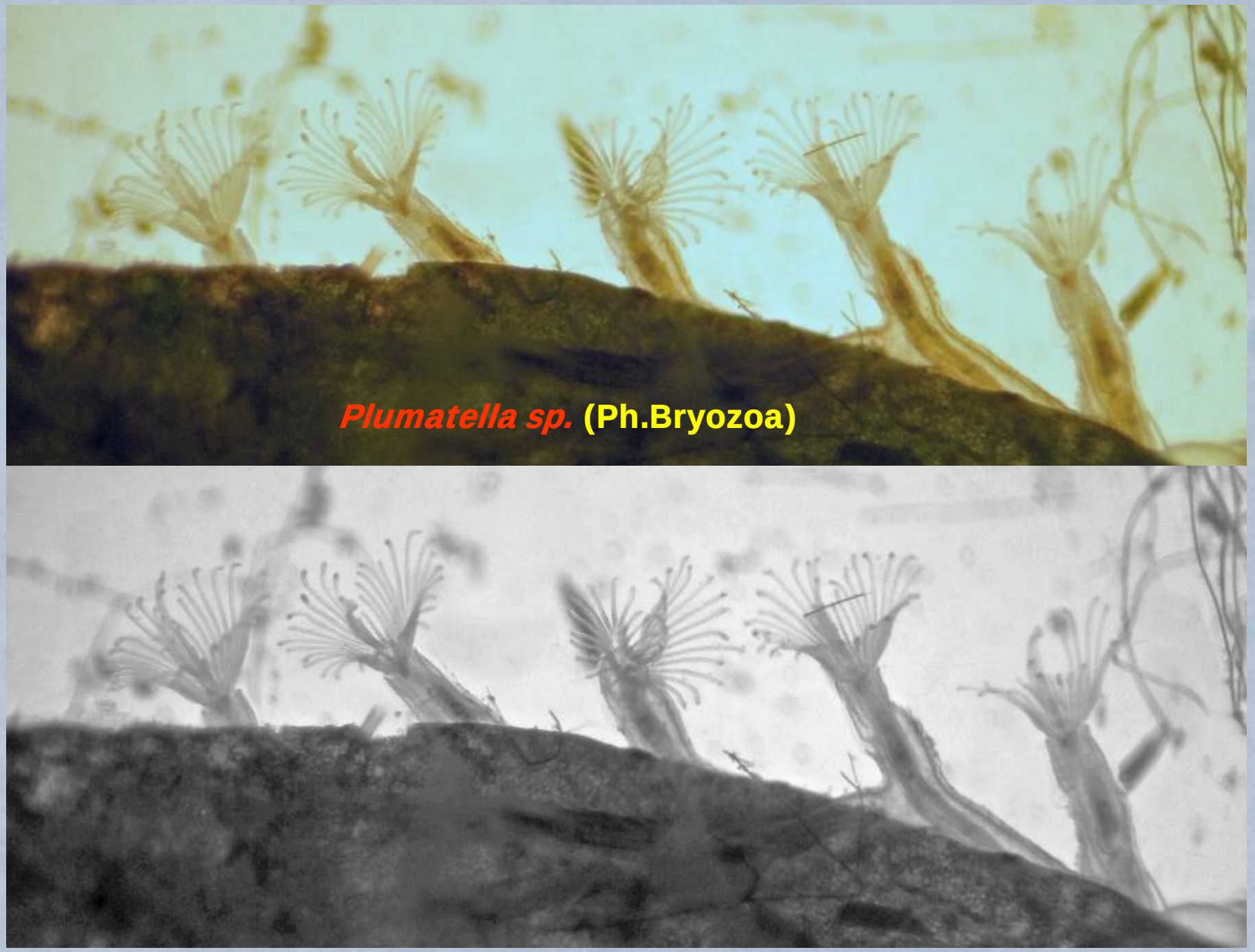
Ph.Annelida: Class Oligochaeta-
Stylaria sp


Tentacles w/ cilia on U-shaped 'lophophore', surrounding mouth
Plumatella sp. (Ph.Bryozoa)
anus
Polyp or zooecium
statoblast
Fecal pellet
gut

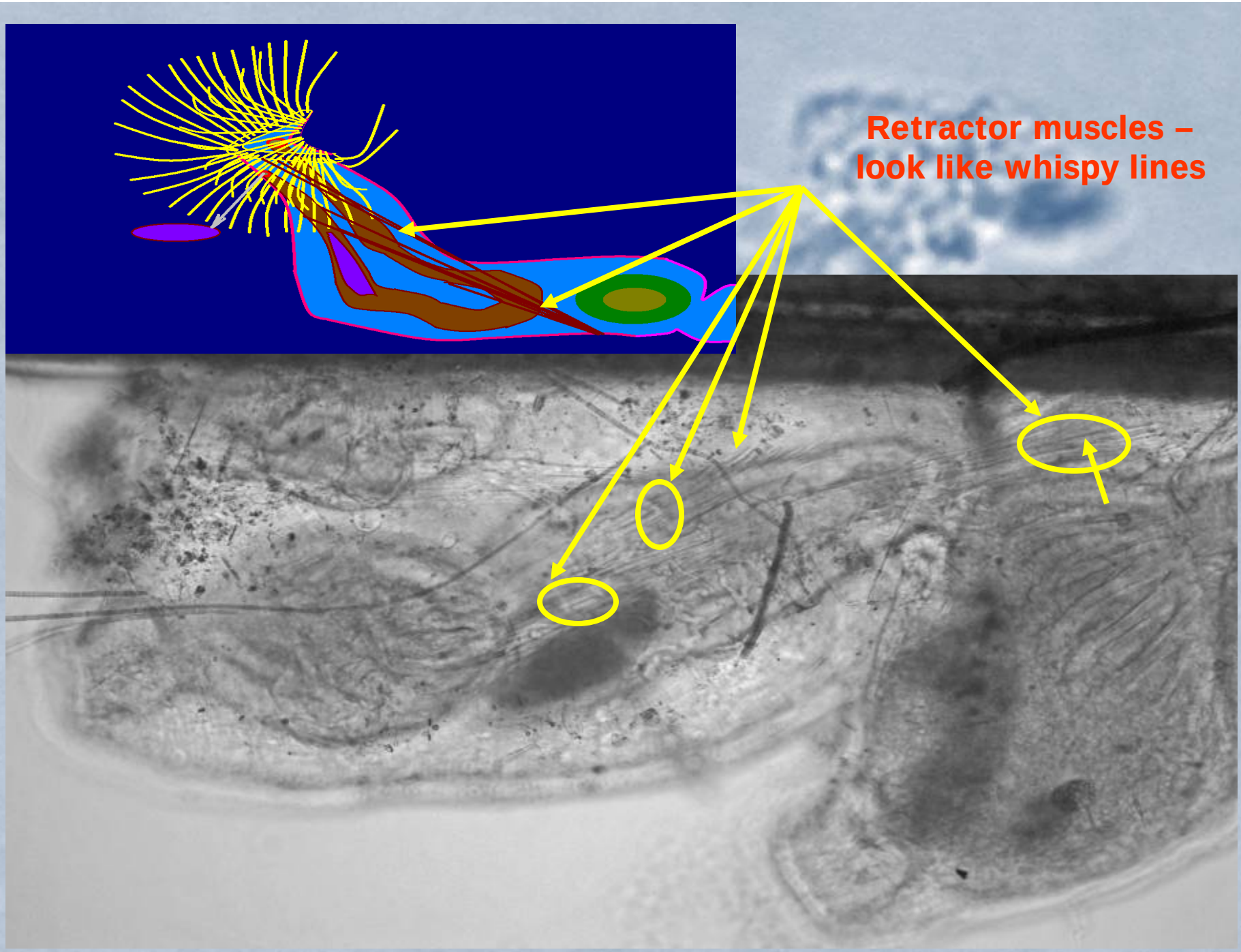


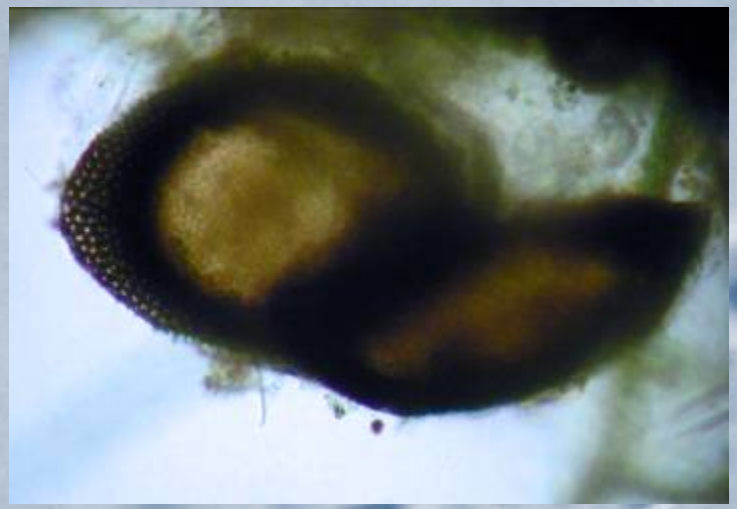
http://www.youtube.com/watch?v=VhRNsdamH84


Statoblast ('bud')

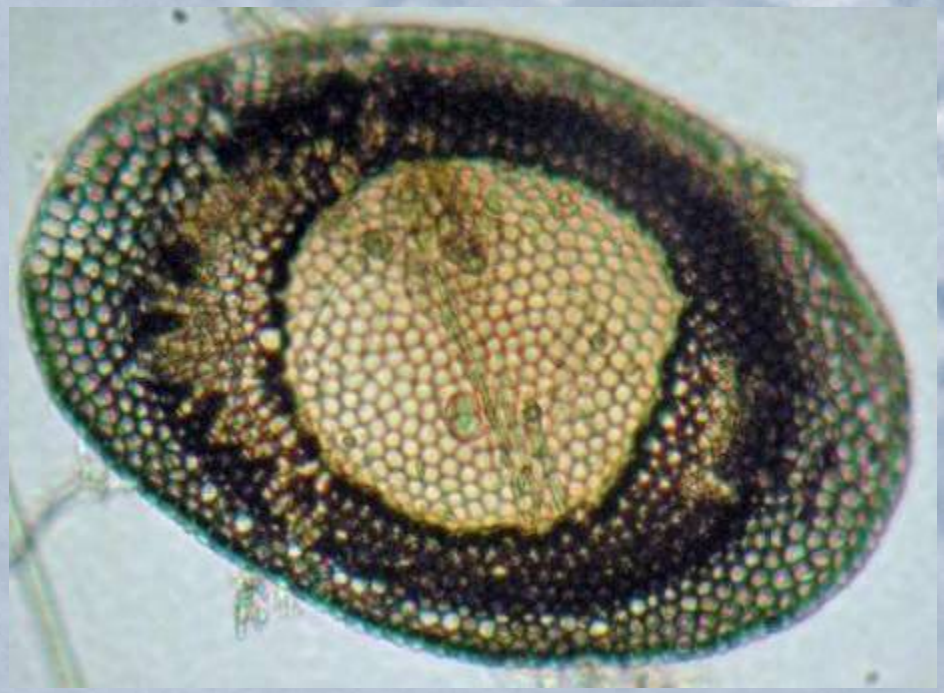

Plumatella sp. (Ph.Bryozoa)

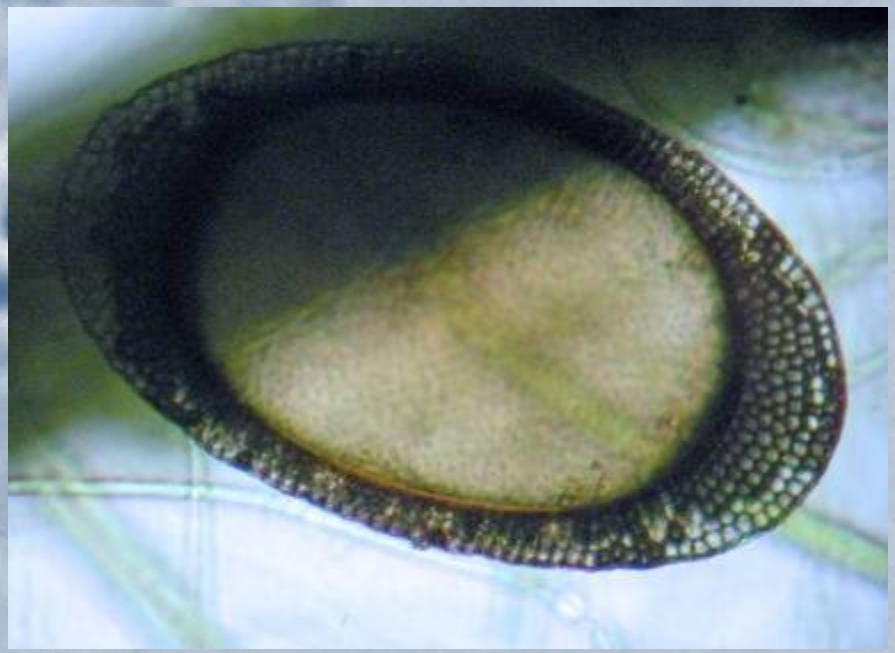

Three polyps (zooecia)
of *Plumatella*
Statoblast ('bud')
Colony or 'zooarium'

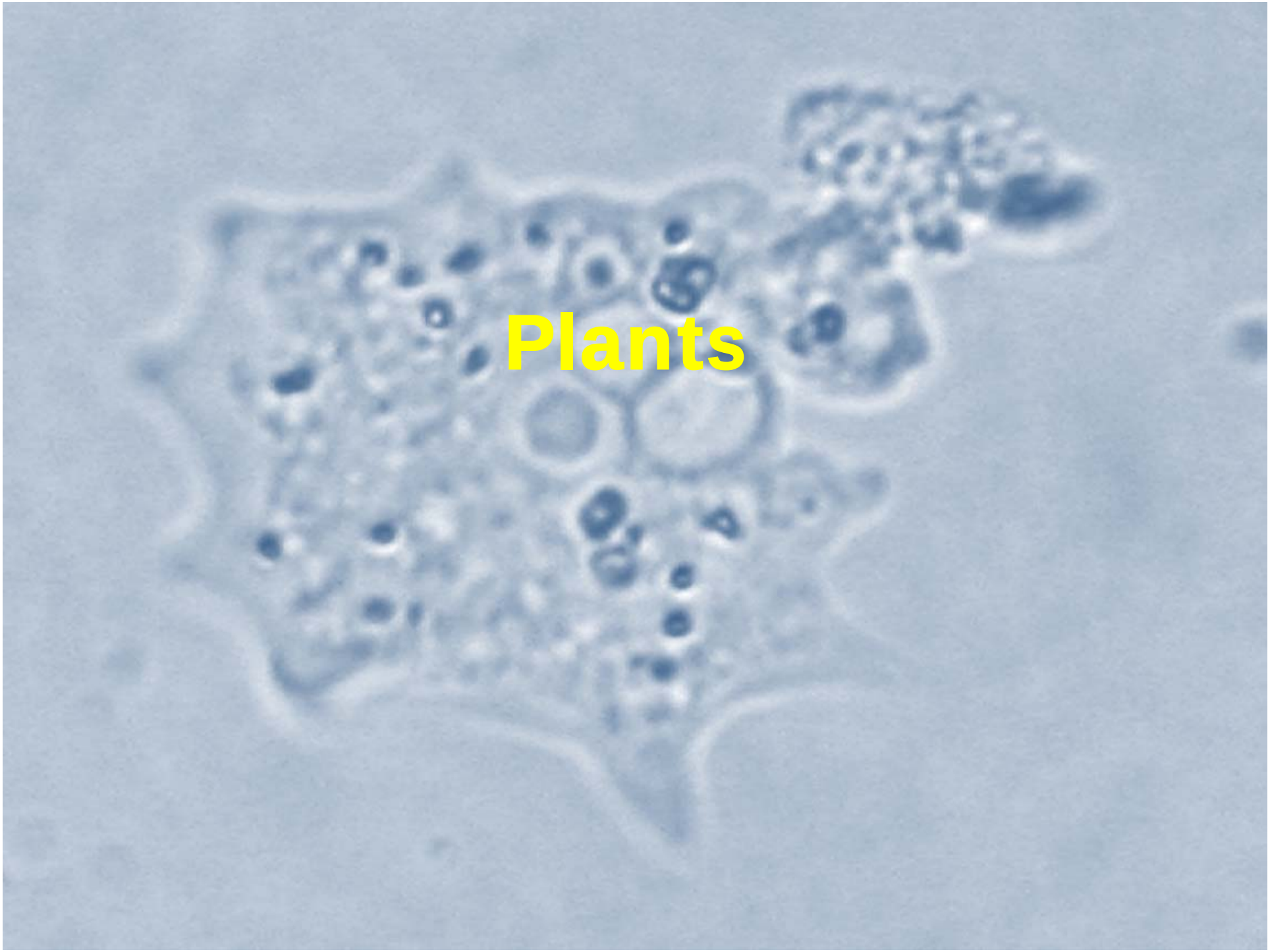

Retractor muscles –
look like whispy lines

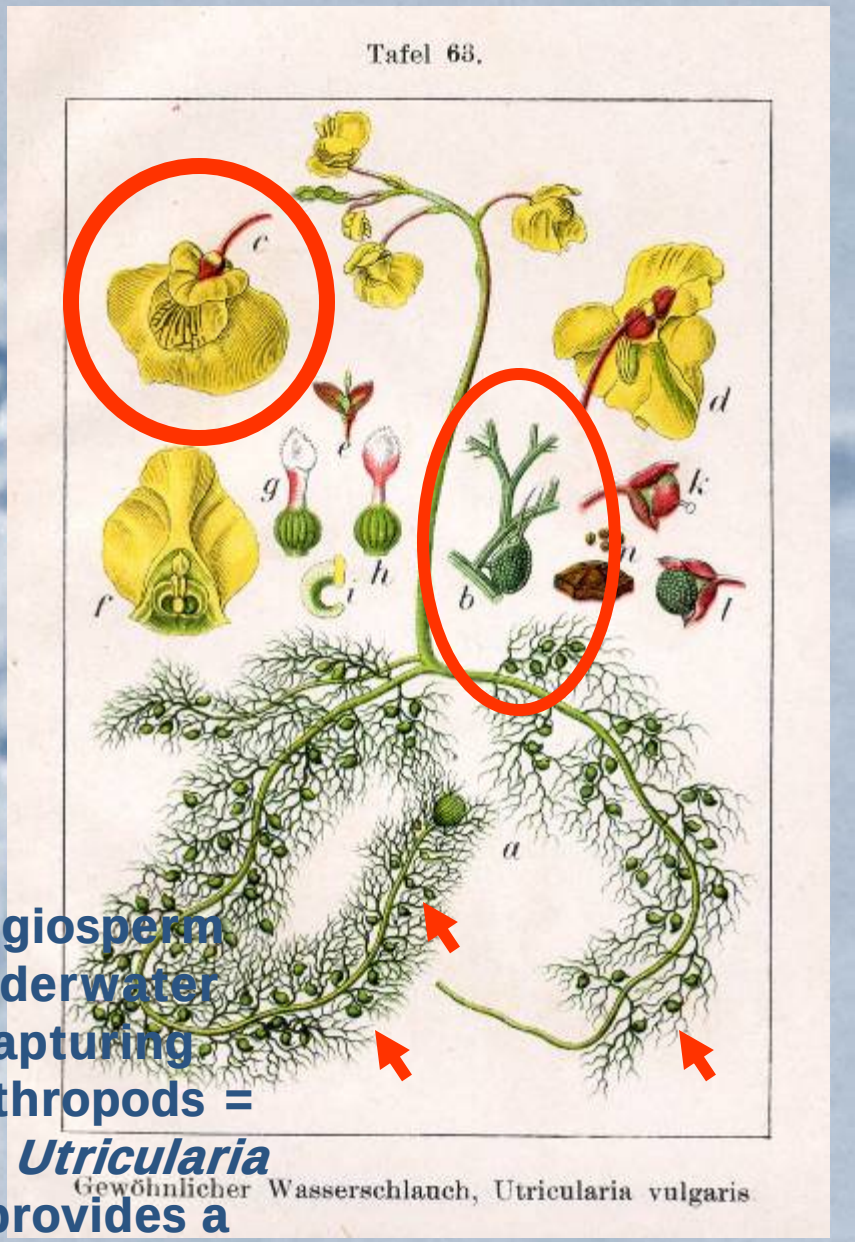


Plumatella sp. **(Ph.Bryozoa)**
'statoblasts' or reproductive-asexual- encased buds to survive unfavorable conditions & grow to a new colony at the right time



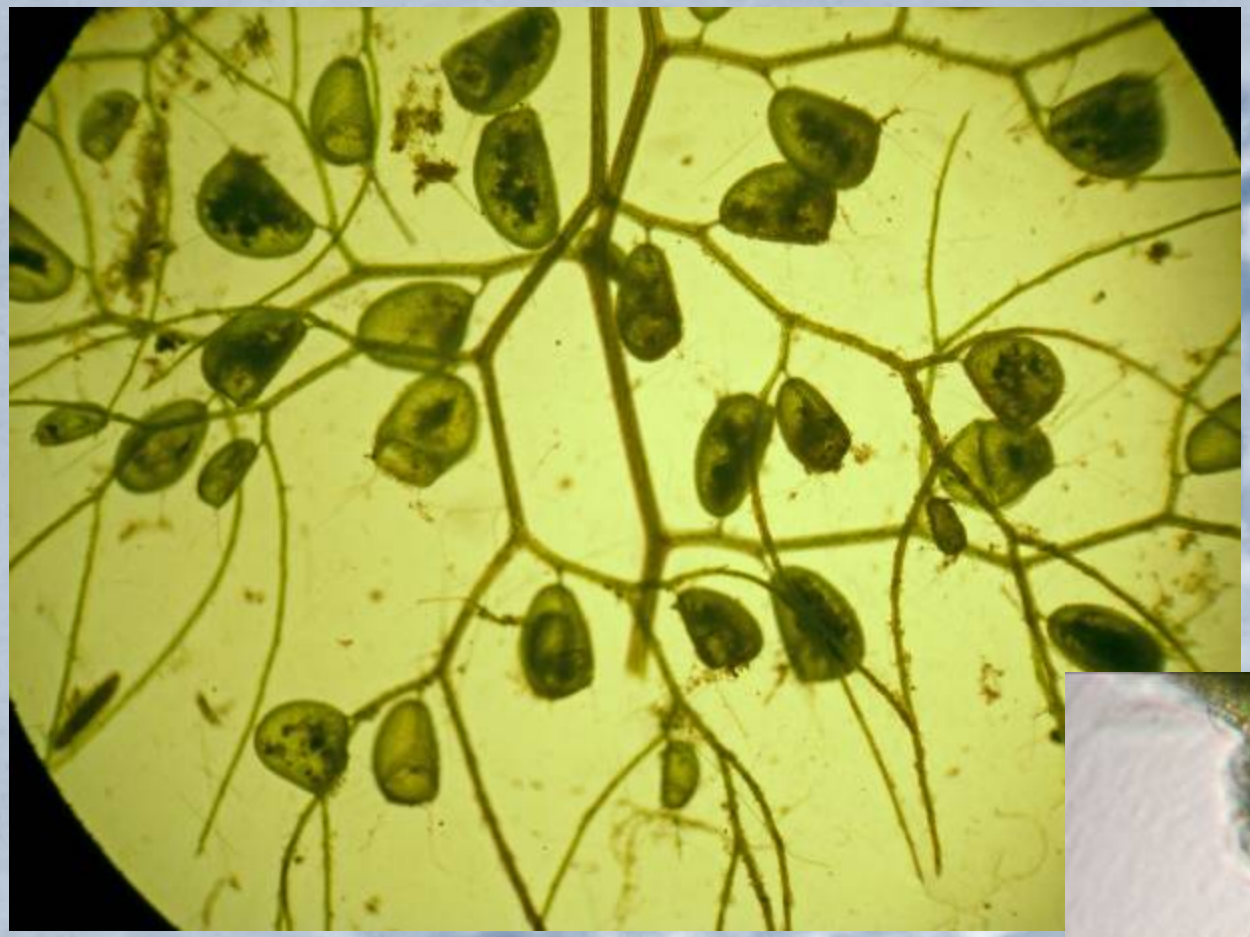



Plants



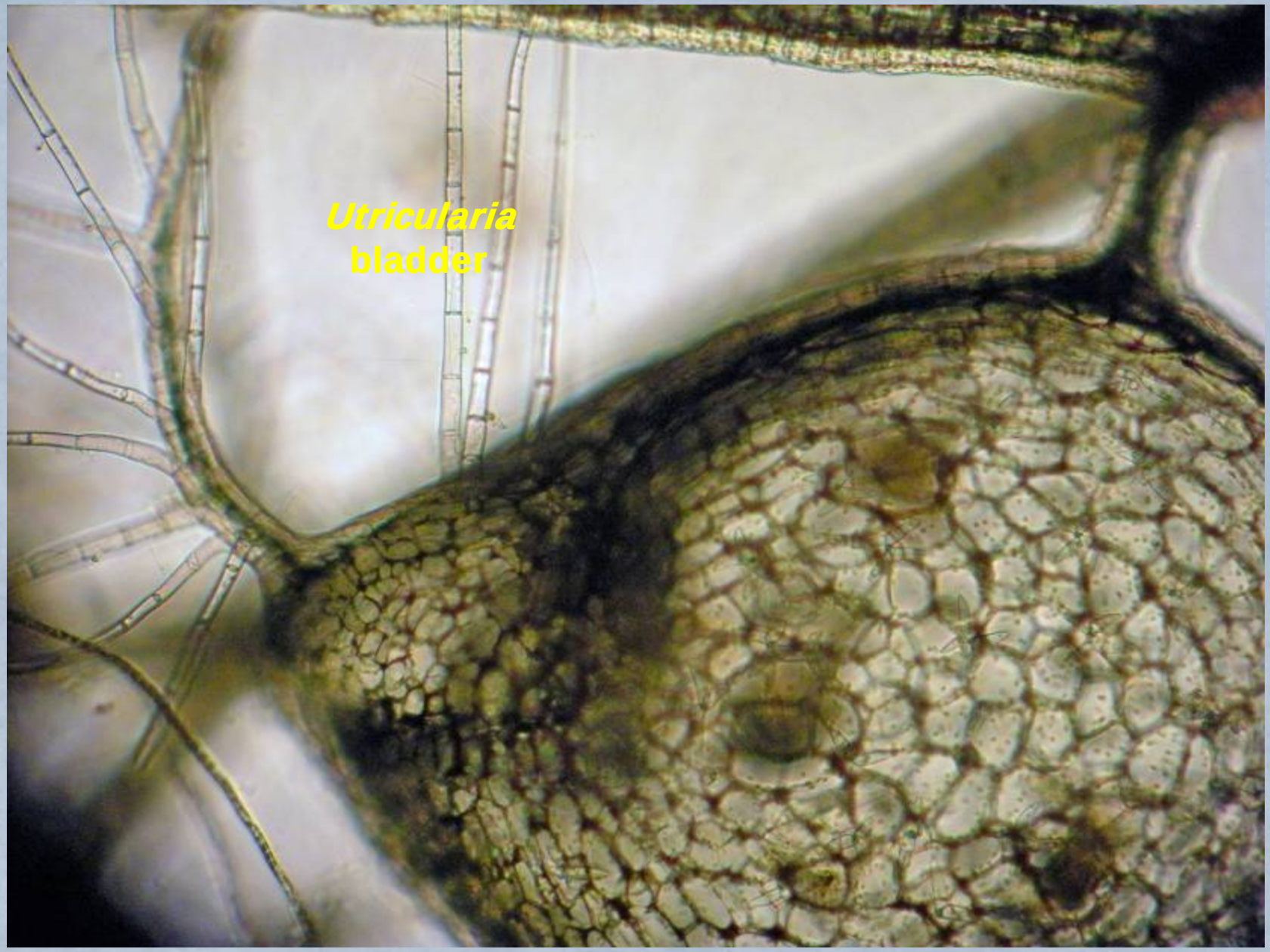
'Bladderwort'- angiosperm plant that has underwater "bladders" for capturing protists & small arthropods = Carnivorous plant : *Utricularia vulgaris* . It also provides a major pond habitat


Utricularia vulgaris flowers



bladders

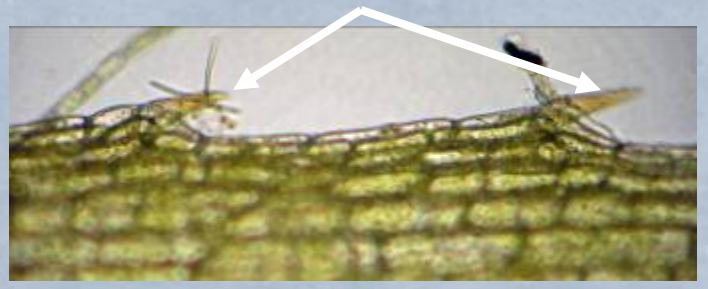
Young bladders


Utricularia
bladder

Utricularia
bladder

Najas guadalupensis

Note spines on leaf

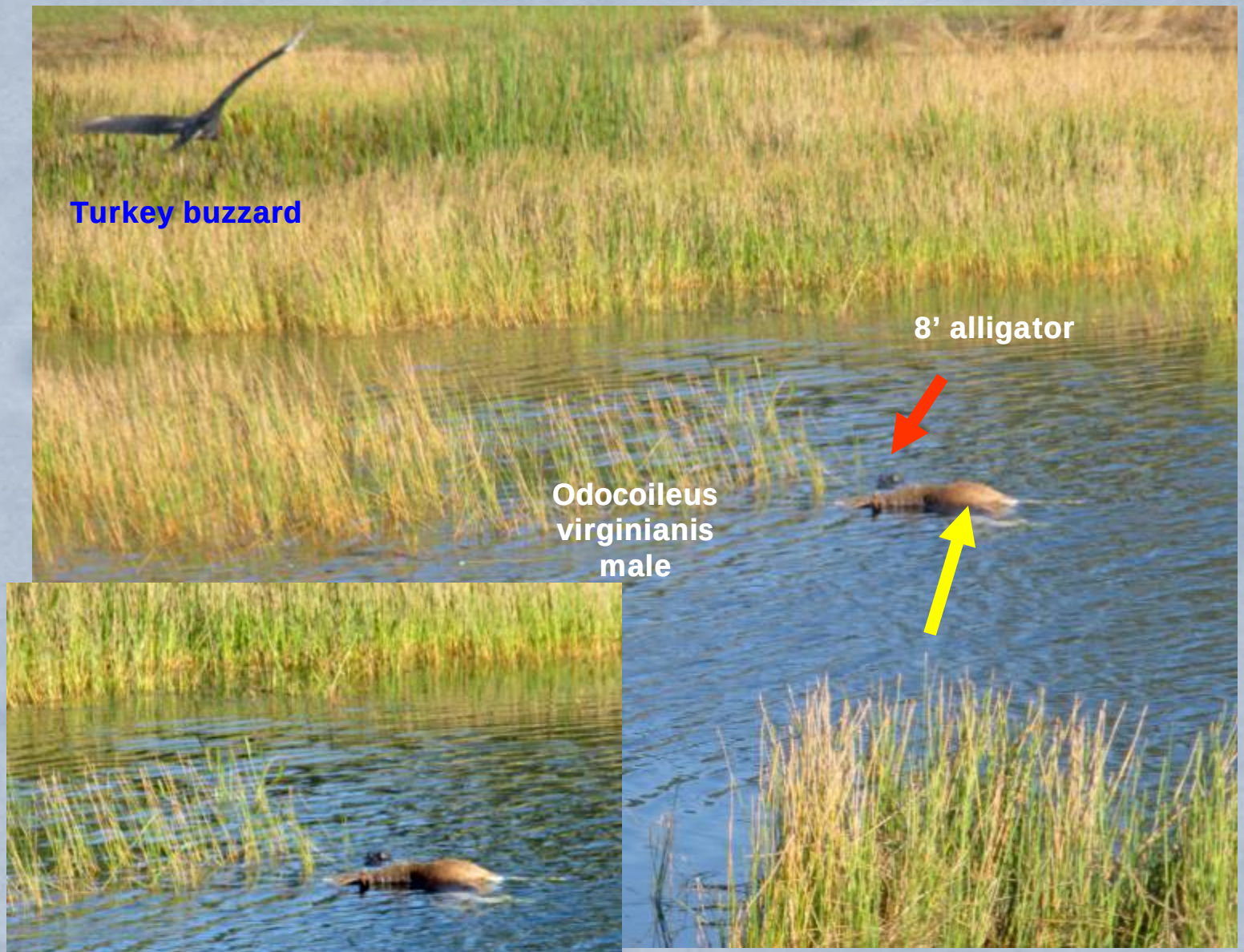


pollen

Pickerelweed
(*Pontederia cordata*)

water lilies / lily pads

cattails


Turkey buzzard
8’ alligator
Odocoileus
virginianis
male

Lower thoracic, lumbar & sacral Vert.+ pelvis after the turkey buzzards finished the alligators scraps(5 days)

8 ft Alligator

Drowned whitetail deer

22 hrs later only neck, thorax & forearms are left (6 AM)

Sometimes pond life is more megascopic and slightly more dramatic…especially in Florida