

Work

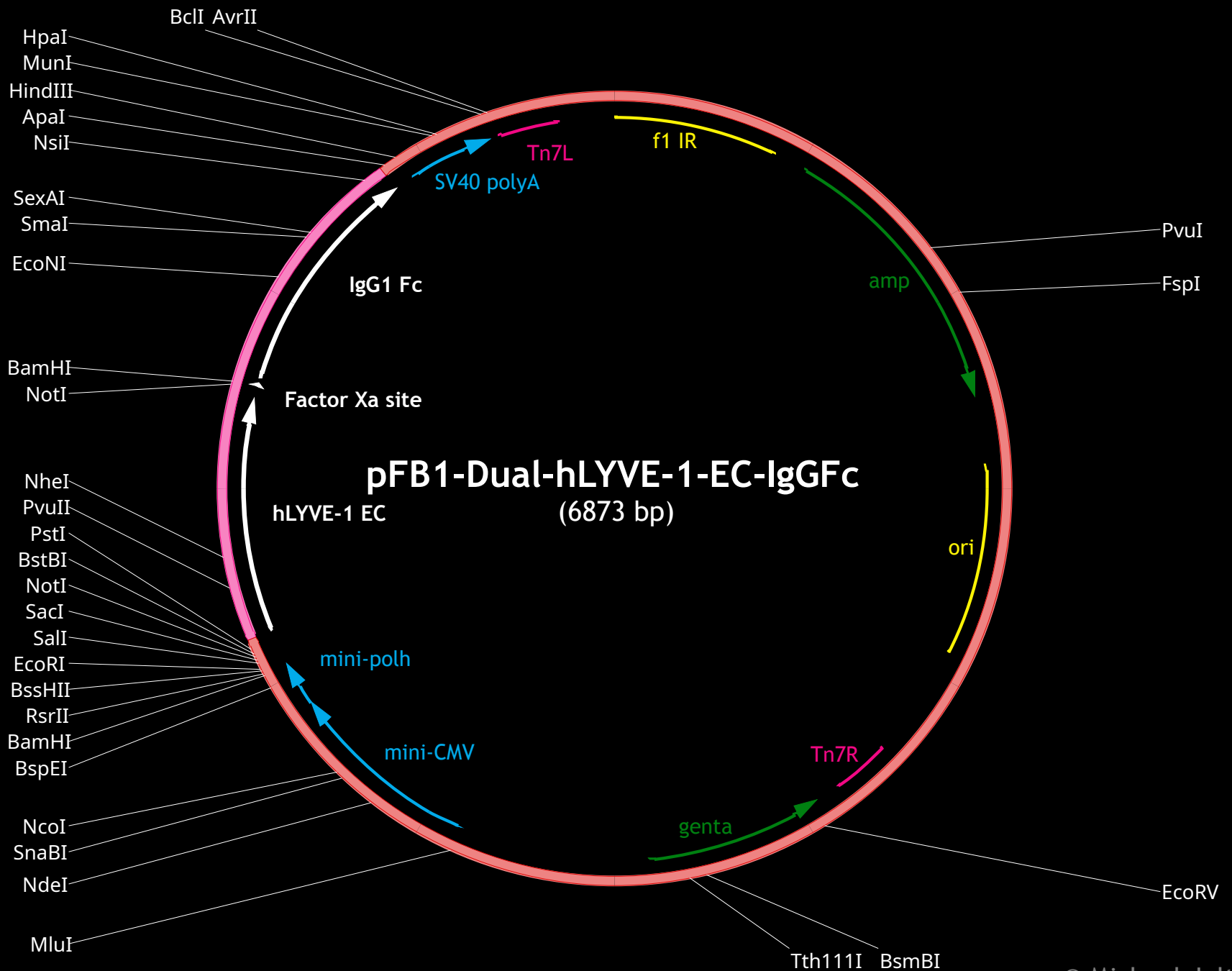
LYVE-1 & Podoplanin expression

Dual promoter lacZ baculovirus

Video imaging of CAM angiogenesis

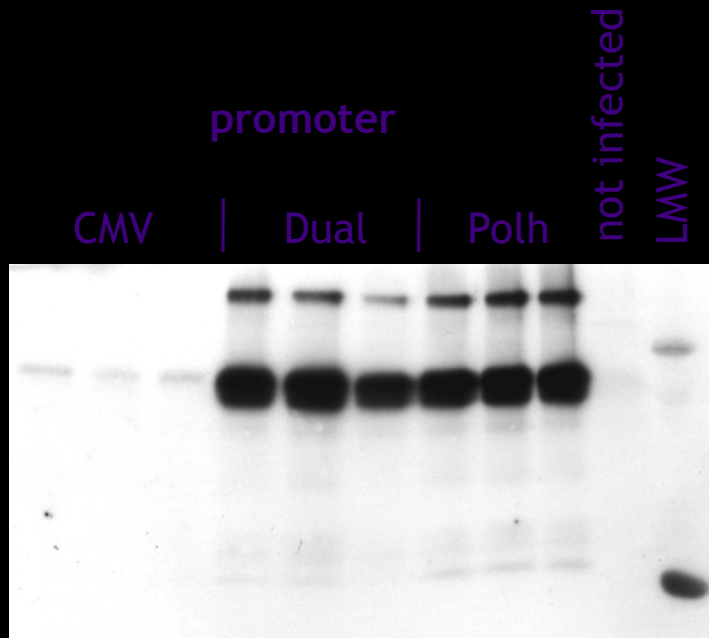
Fun

Evolution of the lymphatic system: Part I

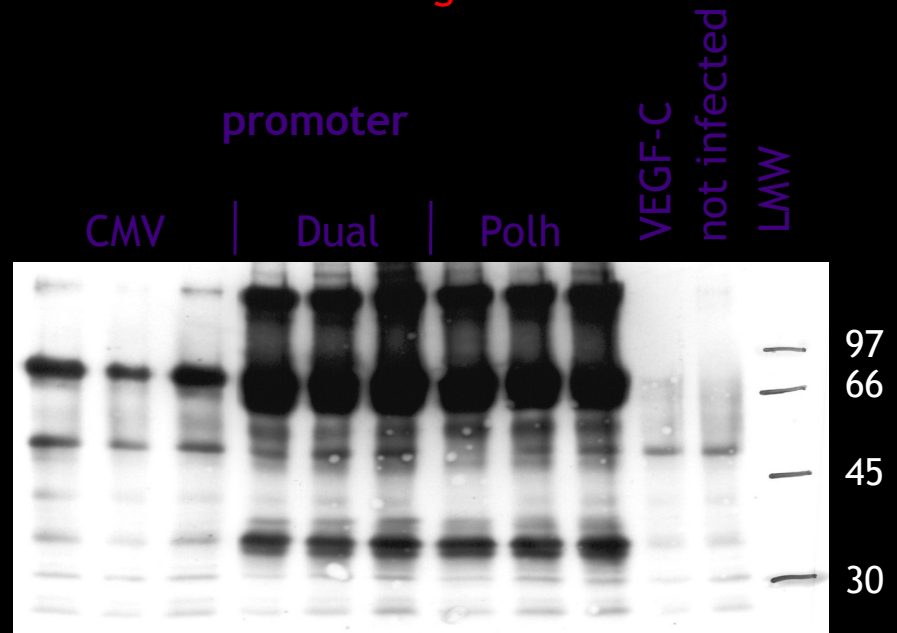


Expression of hLYVE-1-EC-hlgGfc in insect cells (HF)

straight Western: anti-hlgG



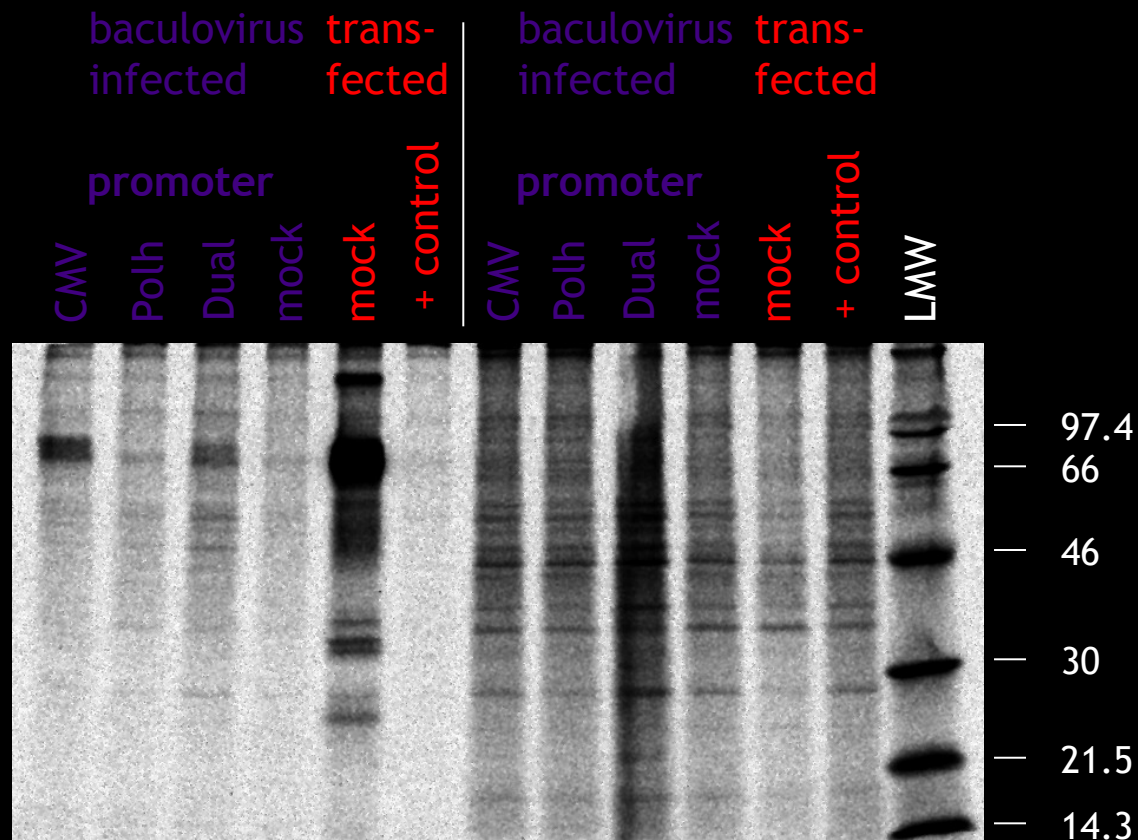
IP: PAS (from 1 ml sup)
Western: anti-hlgG



Expression of hLYVE-1-EC-hIgGFc in mammalian cells

293T

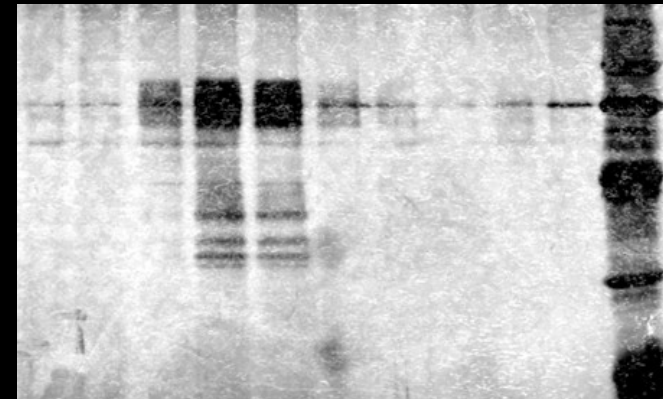
Cos-1



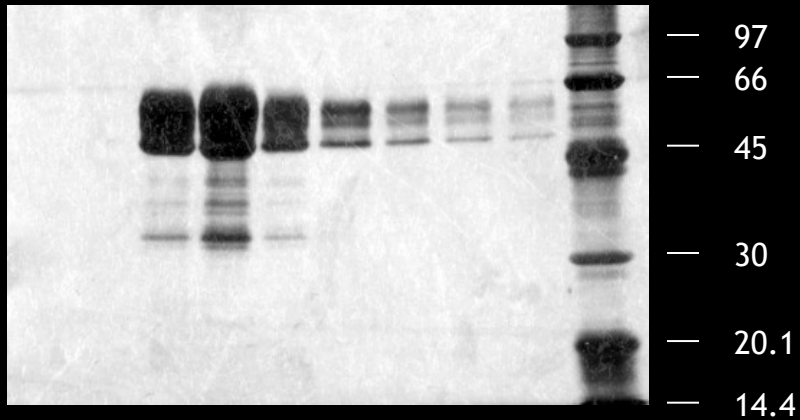
LYVE-1 & Podoplanin antigen production



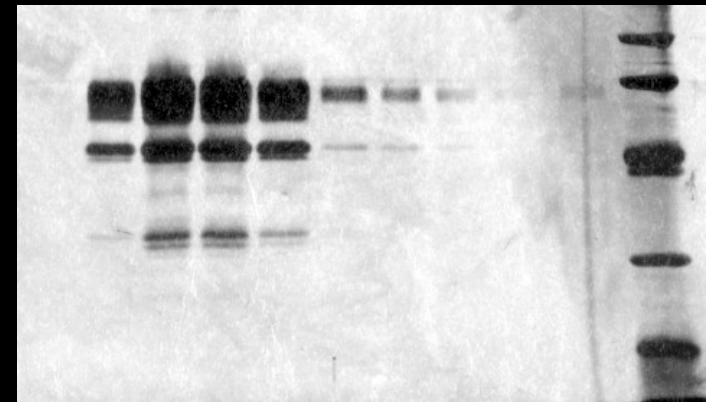
hLYVE-1-EC-hIgGFc



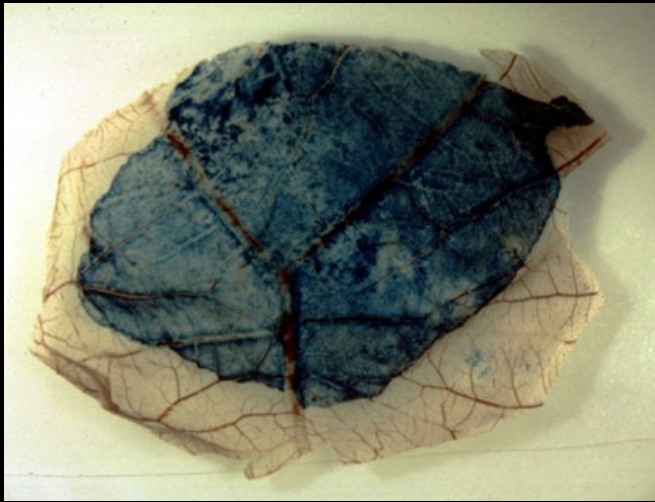
mLYVE-1-EC-hIgGFc



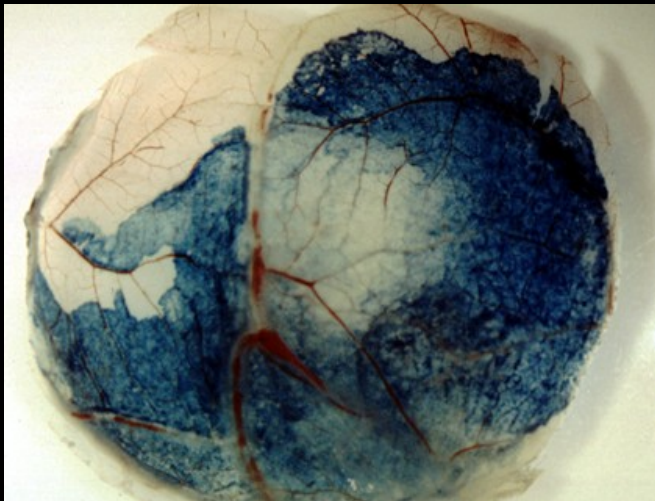
hPodoplanin-EC-hIgGFc



mPodoplanin-EC-hIgGFc



Dual promoter lacZ



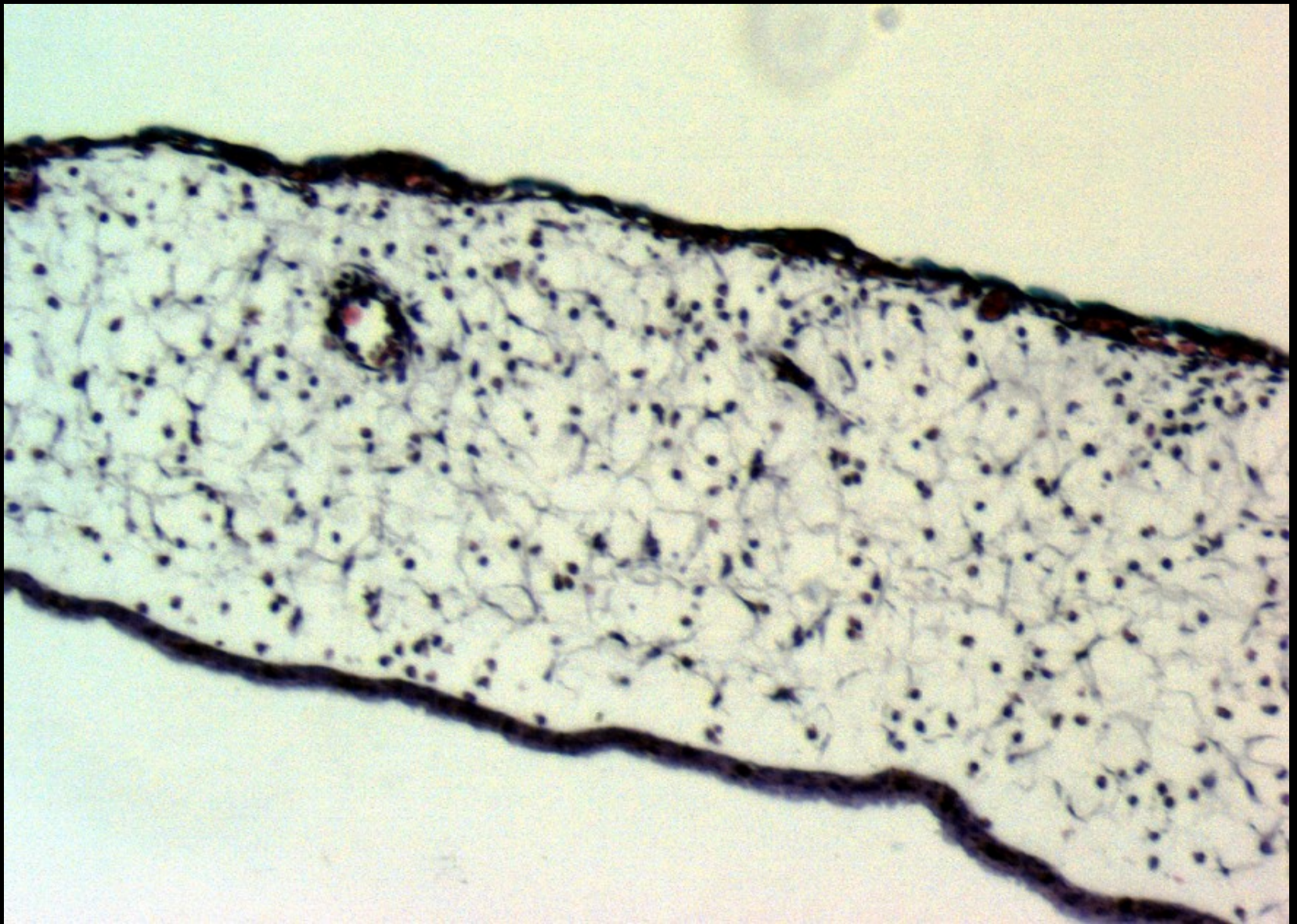
Dual promoter lacZ

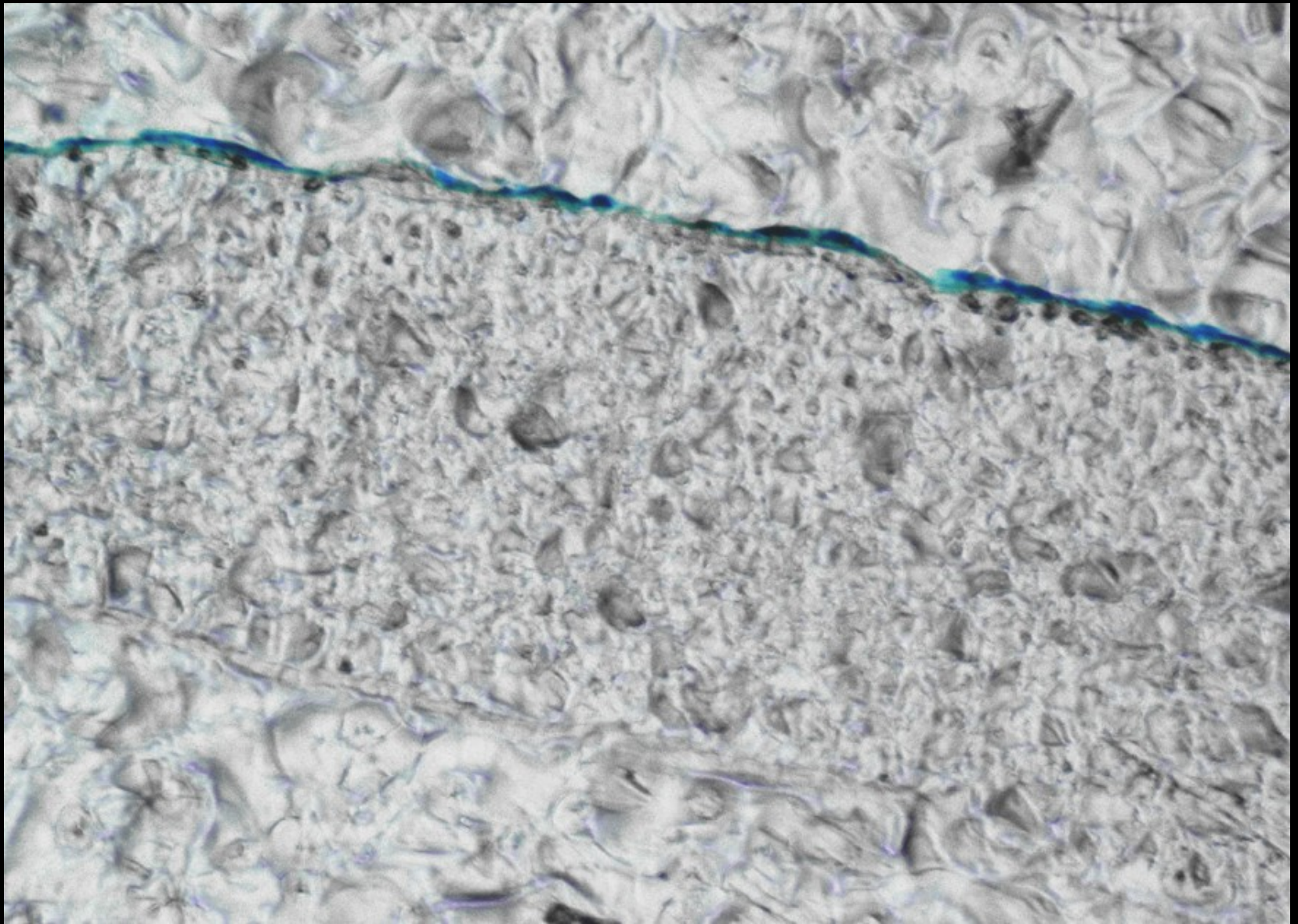
lacZ baculo-infected d 13 CAM

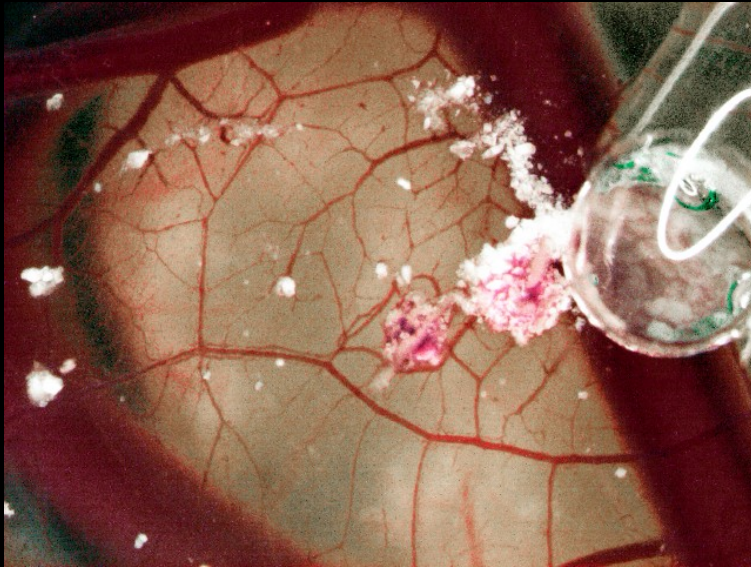
infection with concentrated virus
harvest 48 h p.i.



Polh promoter VEGF-C







0 min

10 min

Video imaging of CAM angiogenesis

d13-d16

1.5 $\mu\text{g}/\text{d}$ VEGF-A₁₀₉



2d

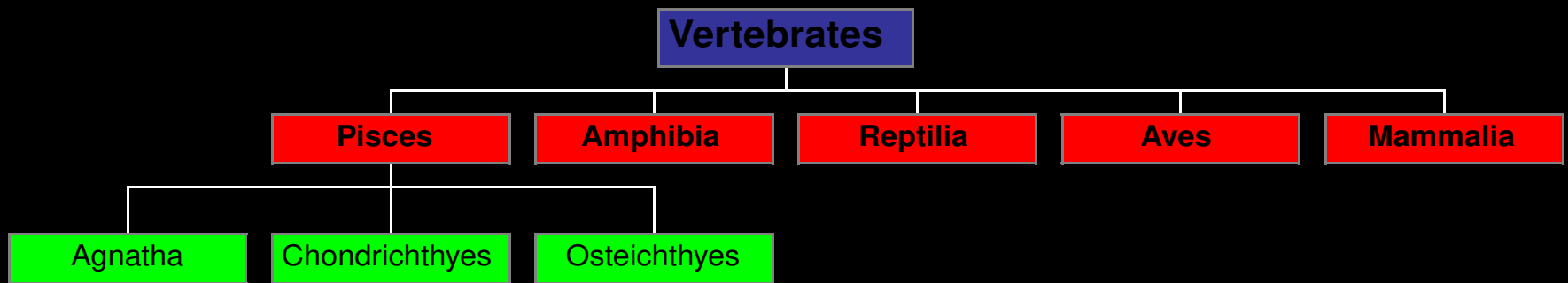
To do list

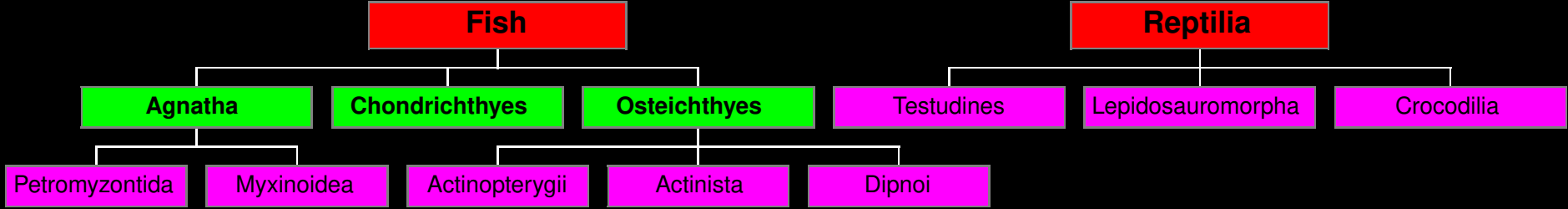
- (Hybrid VEGF story)
- mLYVE-1-EC-hlgGFc
- Baculoviruses with Dual-promoter VEGF-A & VEGF-C
- mVEGFR-3-promoter-lacZ baculovirus
- Improvement of resolution of video imaging

Why did the
lymphatic
system evolve?

What animals have
a lymphatic system?

Classification of vertebrates





Subphylum Vertebrata

- Class Myxinoidea (hagfish)
- Class Petromyzontida (lamprey)
- Class Chondrichthyes (sharks, rays, skates, chimeras)
- Class Actinopterygii (rayfinned fishes)
- Class Actinista (coelacanth)
- Class Dipnoi (lungfishes)
- Class Amphibia (frogs, toads, salamanders)
- Class Testudines (turtles, tortoises)
- Class Lepidosauromorpha (snakes, lizards)
- Class Crocodilia (alligators, crocodiles)
- Class Aves (birds)
- Class Mammalia (mammals)

Mammals



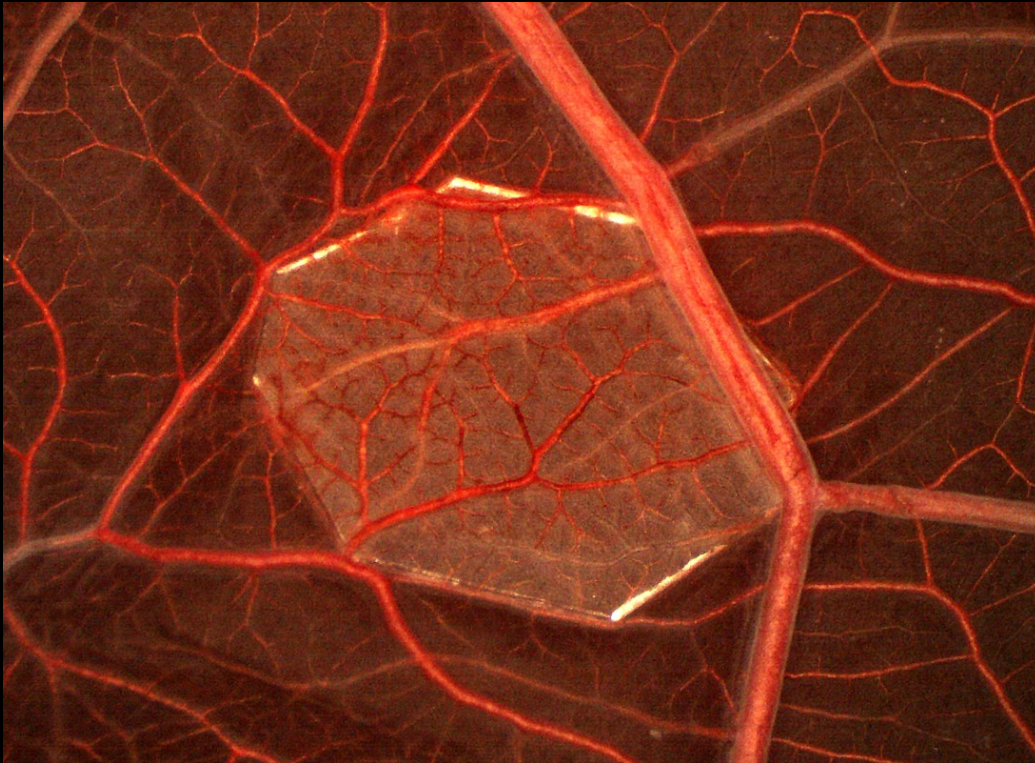
Birds

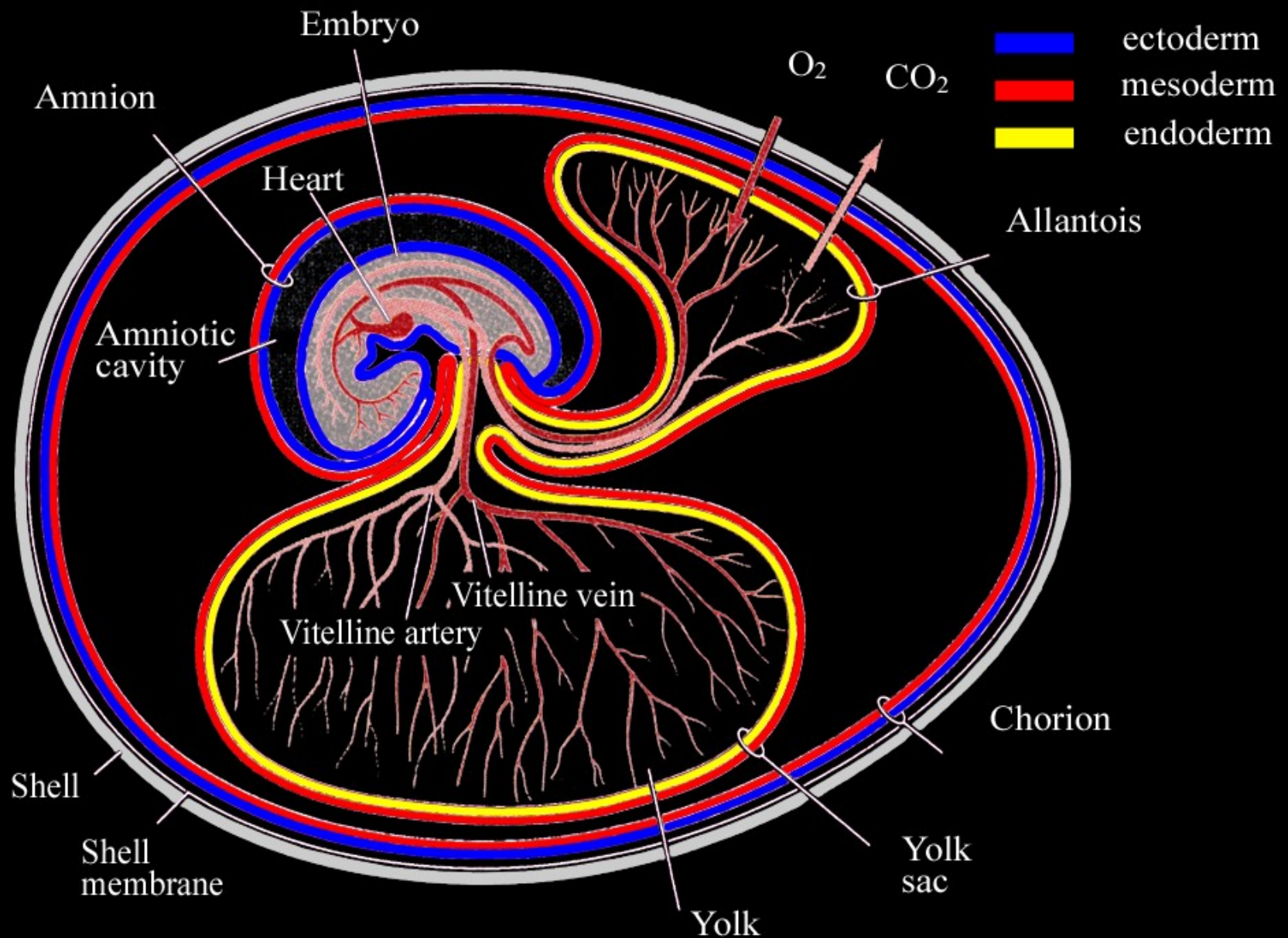


Birds

- do have a lymphatic system similar to mammals (blind-ended initial lymphatics; pipe-like, valved collecting lymphatics)
- do not have lymph nodes (with the exception of aquatic birds: two cervico-thoracic & two lumbar nodes)
- do not have lymph hearts (with few exceptions)

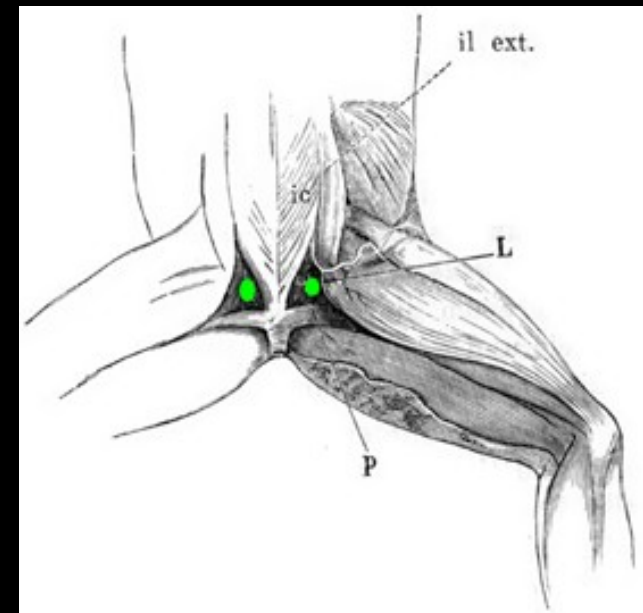
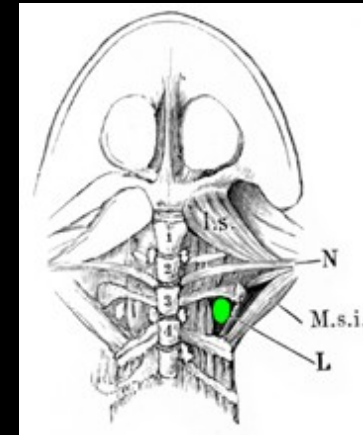
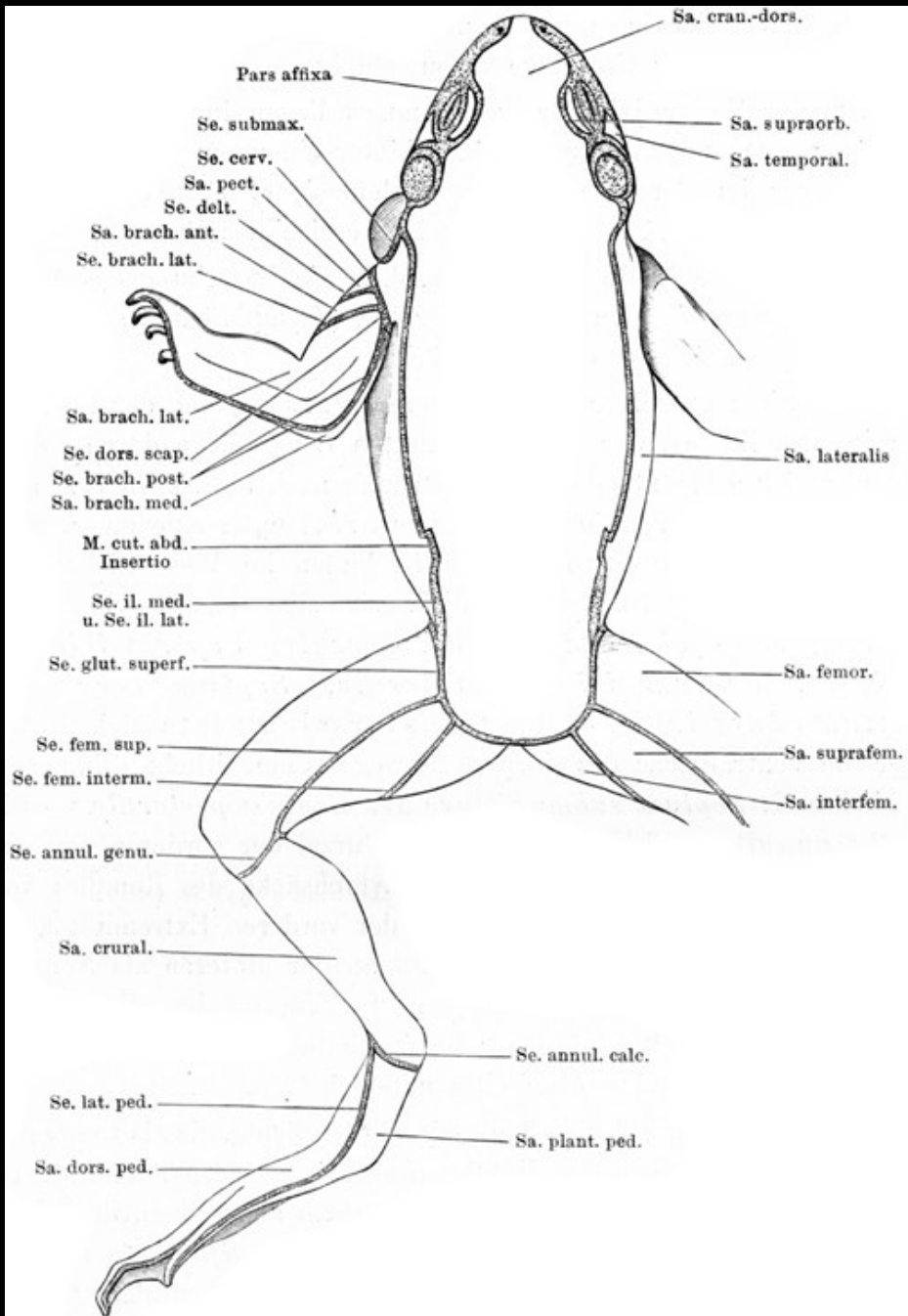
Lymphatics of the CAM: Partially different function from "normal" lymphatics





Amphibians





Amphibia

- do have a lymphatic system
- specific to frogs: the superficial lymphatics of the frog consist of lymph sacs separated by septa; the sacs originate by fusion of lymphatic networks
- the collecting lymphatics frogs have the shape of clefts/crevices, no valves, the only pipe-shaped lymphatics are draining the inner organs
- deeper lymph sacs replace in amphibia connecting tissue
- feature lymph hearts (at least 4, up ~100) that are positioned at the entry points of the lymphatic structures into the venous system; function of lymph hearts is presumably a regulated entry of the lymph into the circulatory system and not a pumping function

Reptils



Reptils

- do have a lymphatic system similar to amphibia
- feature only two lymph hearts

Fish



Bloodpressure in Fish (mm Hg)

- *Myxine glutinosa* 8/6
(slime eel)
- *Anguilla anguilla* 38/25
(seawater eel)
- *Ophiodon elongatus* 38/28
(lingcod)
- *Thunnus albacares* 90/33
(tuna)



- Agnatha (jawless fish)
 - Myxinoidea (hagfish)
 - Petromyzontida (lampreys)
- Chondroichtyes (cartilaginous fish)
- Osteichtyes (bony fish)
 - Actinista (coelacanth)
 - Sarcopterygii (lungfish, etc.)
 - Actinopterygii (rayfinned fish)

Actinista

Only living species: coelacanth

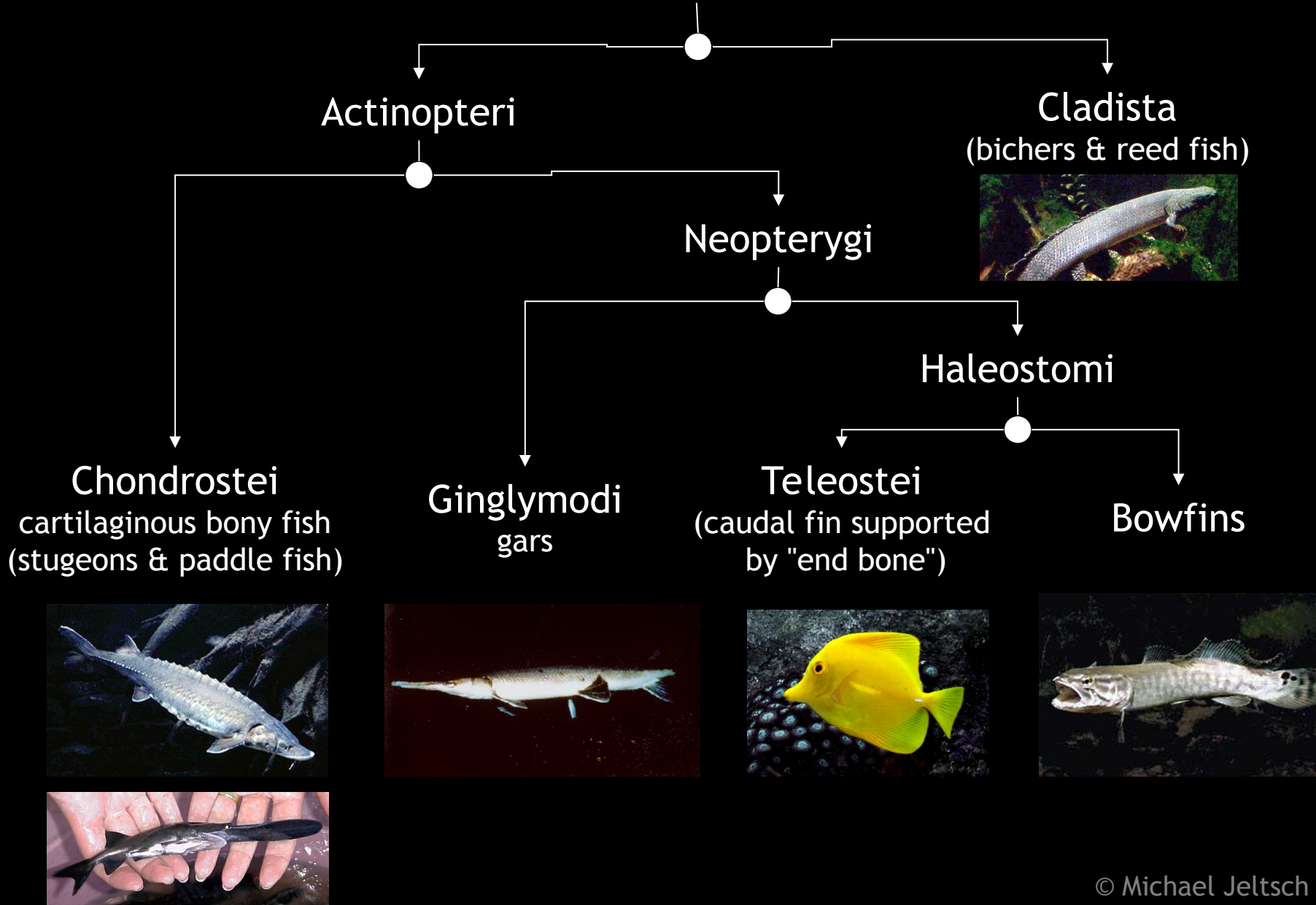


Actinopterygii

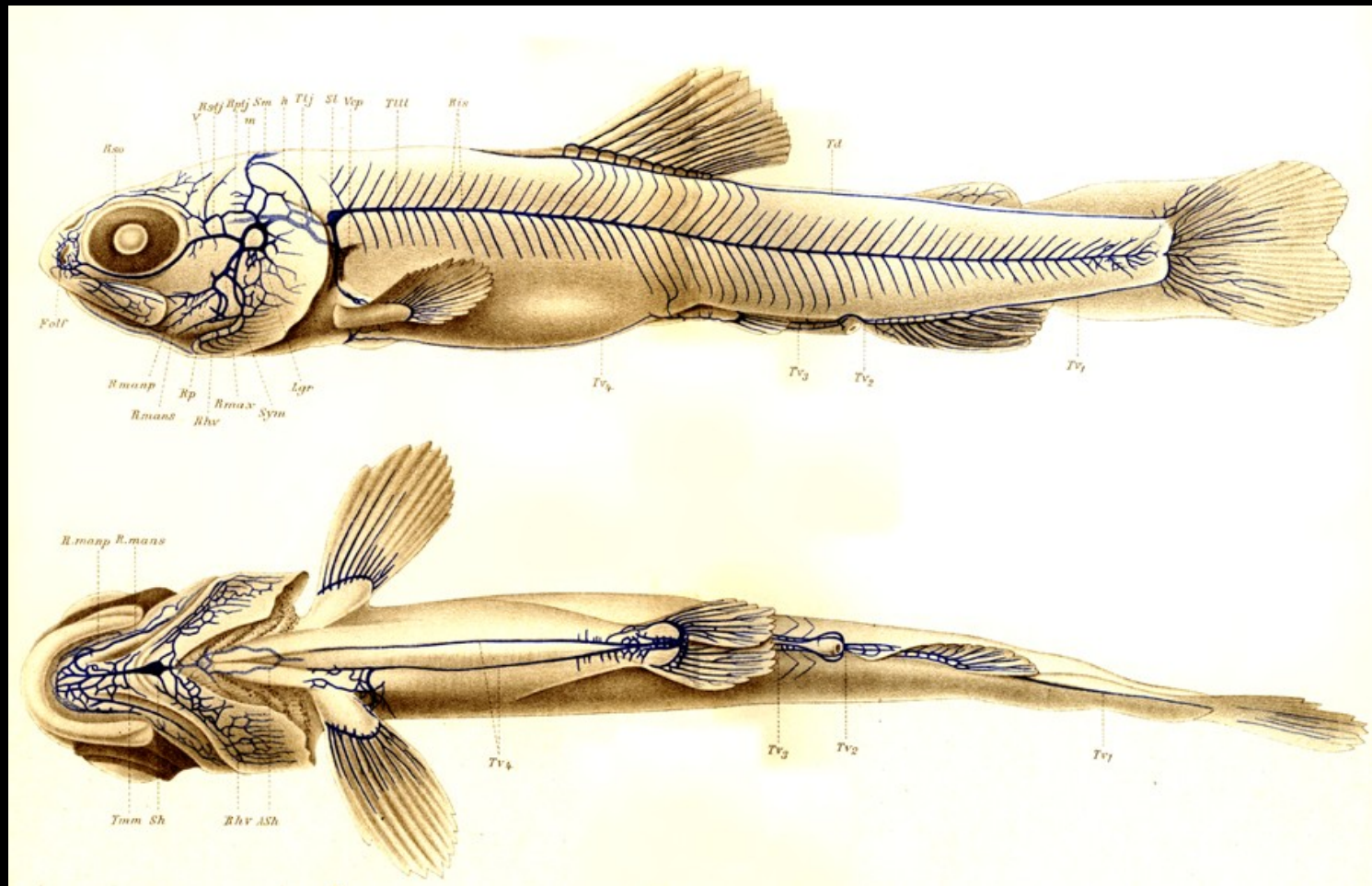
rayfinned fishes



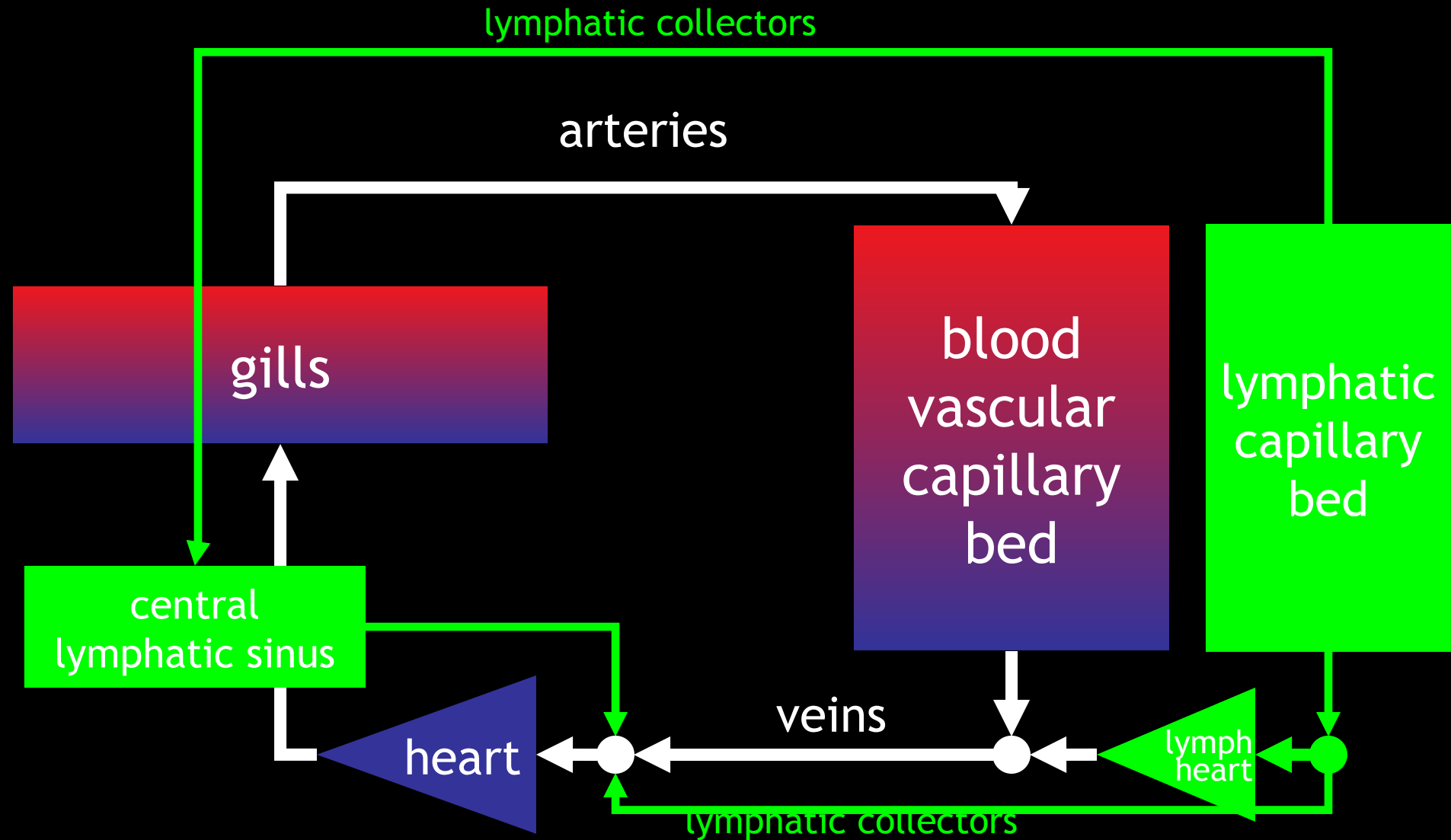
Actinopterygii (rayfinned fishes)

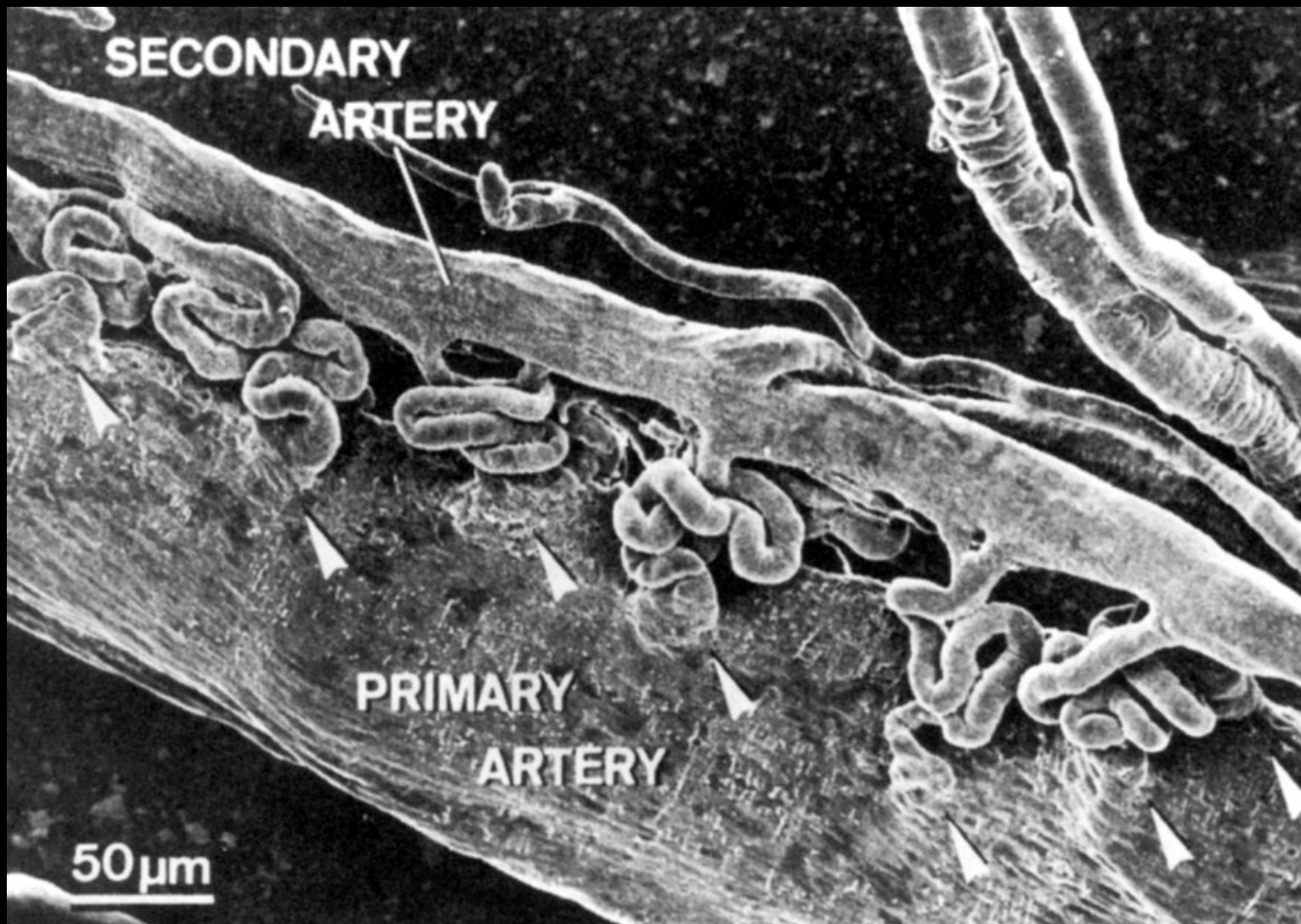


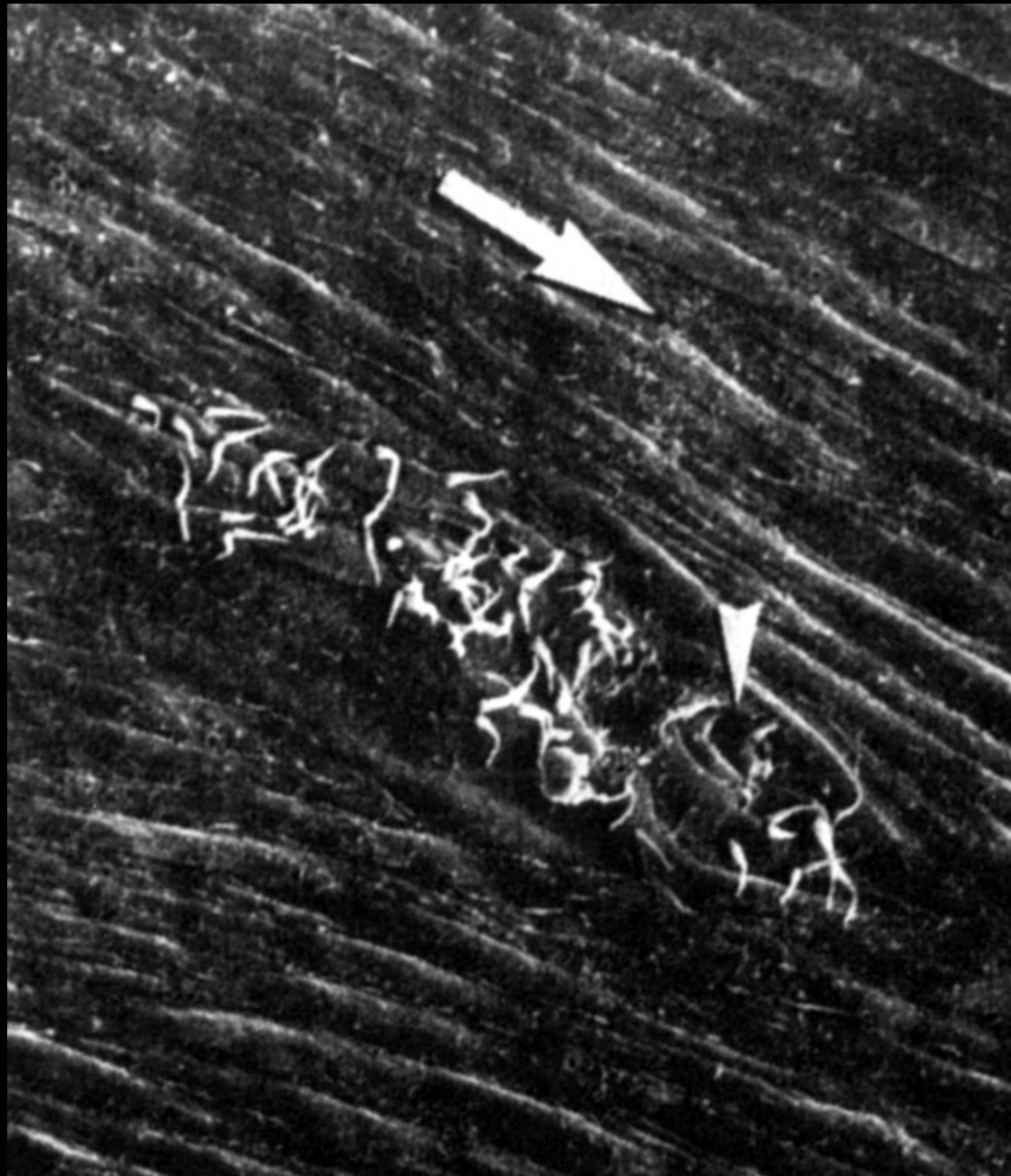
Salmo trutta



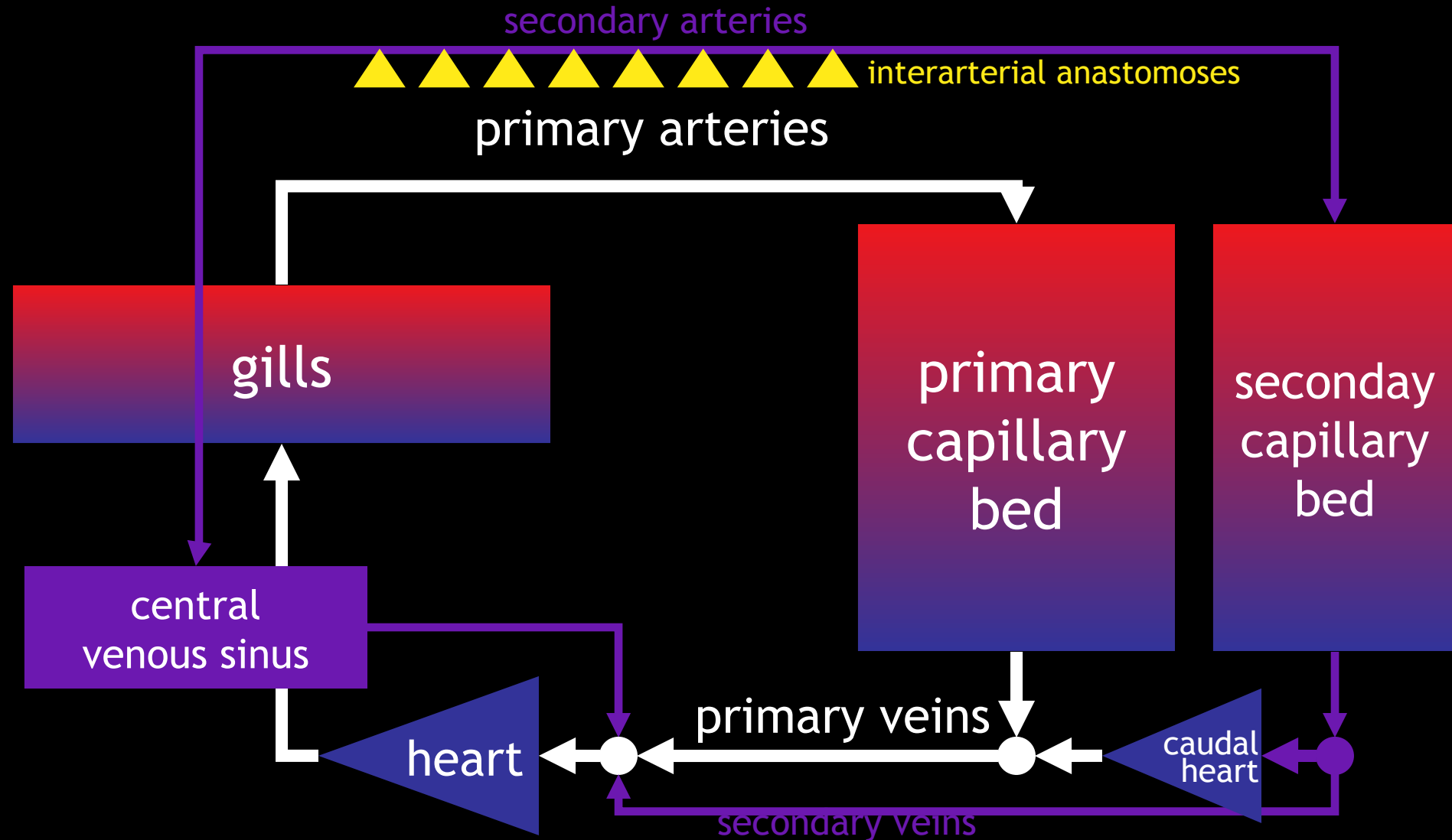
The vascular system of teleost fish (until 1981)







The vascular system of teleost fish (since 1981)



Glass catfish



Lungfis



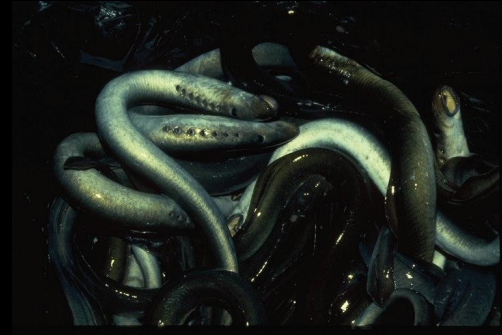
Chondrichthyes

sharks, rays, skates, chimeras



Jawless fish

hagfish & lamprey



Jawless fish

- do not have a classical "vascular system"
- all vessels are leaky
- heart muscle has no own blood supply
- a blood-filled subcutaneous sac wraps the entire trunk
- hagfish: two "true" hearts
- variable amount of blood cells in different vessels
- secondary circulation?

Ideas

- Lymphatic system of aquatic mammals
- Lungfish
- Zebrafish: secondary circulation and chylous vessels?