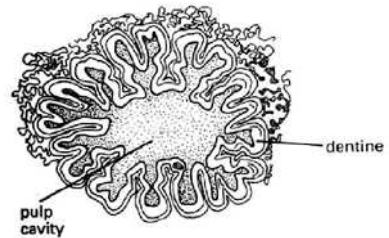


Tough (Dr. S.) Questions:

General Comment. It would appear that some of you ran out of study time and were unable to adequately review my Lecture 8.

45. The accompanying figure is a diagram of a fossil tooth in transverse (top cut off) section. In which of the following extinct groups would you expect to find such teeth?

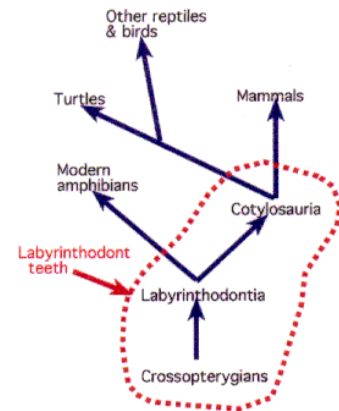
- a. Crossopterygian fish.
- b. Labyrinthodont amphibians.
- c. Cotylosaurs (stem reptiles)
- d. a and b.
- e. a., b. and c.**



Comment. The accompanying diagram – included in the Overview (III.4) and linked to the Lecture (C.10.c) was emphasized in class. From the Lecture, “c. Ancestral to the labyrinthodont amphibians, so named because of the elaborate labyrinthine folding of the enamel in the teeth, a character which *they share with their Crossopterygian ancestors and reptilian descendants.*” [Emphasis added]

47. Key(s) to a fully terrestrial existence in vertebrates was (were) the evolution of

- a. alveolar lungs.
- b. amniote egg.
- c. water impermeable integument.
- d. a and b.
- e. b. and c.**



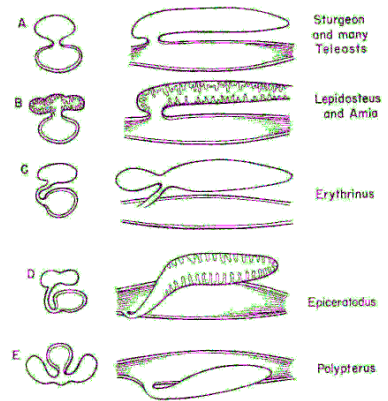
Comment. Emphasized in both Overview (III.6) and Lecture (D). Both the amniotic egg and a water impermeable integument (outer covering = “skin”) are adaptations to prevent desiccation – in the first case of the embryo; in the second, of the animal after hatching. From the Lecture: “Key to the transition to a fully terrestrial existence were the evolution of a water impermeable integument and the amniote egg.”

48. The denticles (sharp spikes) in sharks' skin are thought to be evolutionary remnants of the external bony armor of their _____ ancestors.

- a. Crossopterygian
- b. Holostean
- c. Labyrinthodont
- d. Placoderm**
- e. Teleost.

Comment. This question was designed to test your understanding of the fact that sharks and rays branched off early – before post-placoderm diversification of the various bony fish and their descendants (Lecture Figure 2). We talked about it quite a bit in class. See Overview (III), Lecture Figure 1 and the extended caption if you follow the link: “The latter character is believed to be derived - *i.e.* cartilaginous fishes are thought to be descended from placoderms, whose bony armor survives in contemporary sharks as spikes called denticles in the skin.” Also, there was a thought question (C4).

51. The air bladders / lungs of five living fish species are shown in the accompanying diagram. Both the bladder's morphology and its connection to the throat (pharynx) vary. which condition most likely resembled that of primitive actinopterygians? **E.**



Comment. This was a major take-home point: Primitive vertebrates had a lung (ventrally connected to the throat) that subsequently evolved into the swim bladder (not connected) of most modern bony fish. See Overview (III.3); Lecture (C9 and Figure 3). From the extended caption to Figure 3: “**E.** *Polypterus*, the so-called "bichir" of central Africa, and *probably representative of the primitive state which was antecedent to all other lung and bladder types.*” [Emphasis added]