

Outline 18: Paleozoic Life

Radiation of the Animal Phyla

Cambrian Life

- The first animals evolved about 100 my before the start of the Cambrian. These are the Ediacaran fossils of the latest Proterozoic.
- None of these animals had hard parts.
- Base of the Cambrian defined by first animals with hard parts.

Cambrian Life

- Early Cambrian fossils consist mostly of trilobites, brachiopods, archaeocyathids, and small little shells.
- The Middle Cambrian Burgess Shale records the "Explosion of Life." All known phyla had appeared by then.
- A phylum is a major body plan.

Burgess Shale Fossils

- Most are soft-bodied fossils, a very rare kind of fossilization.
- Of today's 32 living phyla, 15 are found in the Burgess Shale. The other 17 are microscopic or too delicate to be preserved.
- Another 10 extinct phyla are also found in the Burgess Shale.

Burgess Shale Fossils

- Assume that all 32 living phyla were alive in the Middle Cambrian.
- Add the 10 extinct phyla for a total of 42 phyla. That's more phyla than today!
- Cambrian phyla were more diverse than today.

A Paradox

- There were more body plans (phyla) near the start of animal life than today.
- However, there were many fewer species.
- This doesn't match the expectation of slow evolutionary diversification of life.

The Pattern of Animal Evolution

- Initial radiation of phyla.
- Reduction by natural selection.
- No new phyla since the Cambrian.
- Diversification within remaining phyla.

A Hypothesis

- The genome of early animals was less rigid, not as "hardwired" as later animals. Adaptive mutations were more possible.
- A wide variety of body plans were produced by mutations.
- Natural selection eliminated some of these body plans.

A Hypothesis

- Body plans that survived became the modern phyla.
- 500 my of evolution has made genomes more rigid and more species rich.
- Mutations required to make a new body plan would be lethal. Phyla were locked in.