

FOSSIL SUCCESSION: FURTHER DEBATE



*Darwin himself was well aware of the problems that the fossil record posed for his theory. He spent two chapters in the **Origin** discussing the fossil record, the first of which was devoted almost entirely to analyzing why the fossil evidence did not fit better with the theory of Common Descent. Where were the multitudes of transitional forms connecting different groups, as predicted (and expected) by his theory?*



According to Darwin, the answer was clear: the fossil record is “extremely imperfect.” It simply failed to document transitional forms. “Nature,” wrote Darwin, “may almost be said to have guarded against the frequent discovery of her transitional or linking forms.”²⁴

Artifact Hypothesis: Are the “Gaps” Real?

Modern neo-Darwinists have proposed an explanation for the imperfection of the fossil record, an explanation that supports Darwin’s view. They call this explanation the “artifact hypothesis.” According to this view, events like the Cambrian Explosion do not show that new forms of life arose suddenly. Instead, they simply show that the fossil record has been poorly sampled, and that the fossils themselves were not consistently preserved. The unfortunate and misleading result is an apparent absence of ancestors. In other words, advocates of the artifact hypothesis say that the Cambrian explosion is not real; it is only

the result—or an “artifact”—of having too small a sample of fossils to work with.

Critics of the artifact hypothesis have pointed out a number of problems with this explanation. They agree that a poor (small) data sample could create an artifact, or false impression. But *is* the sample too small? Many paleontologists would argue that we have plenty of fossils. Paleontologist Mike Foote points out that, although we continue to find new fossils, those we find belong to phyla and other major groups that we already knew about.²⁵ This strongly suggests that the pattern of the fossil record (sudden appearance, stasis, and distinct gaps between major groups) is truly representative of the history of life, not just an artifact of poor data sampling.

As Foote concludes, “We have a representative sample... and therefore we can rely on patterns documented in the fossil record.”²⁶

Soft and Small?

Is it possible that the missing Precambrian transitional forms were too small to be fossilized?

Could it be that the intermediates weren't fossilized because they didn't have hard body parts like teeth or exoskeletons? Some defenders of Common Descent say yes, and point out that small structures and soft tissues are more susceptible to decay and destruction, and are, therefore, harder to preserve. This would explain why they are absent from the fossil record.

Critics agree that soft, small structures are more difficult to preserve. However, they point out that Cambrian strata around the world have yielded fossils of entirely soft-bodied animals representing several phyla.²⁷

This point has been further emphasized by a recent Precambrian fossil find near Chengjiang, China. Scientists there recently discovered incredibly preserved microscopic fossils of sponge embryos. (Sponges are obviously soft-bodied. Their embryos are small and soft-bodied, too—other than their tiny spicules.) Paul Chien, a marine paleobiologist at the University of San Francisco argues that this discovery poses a grave difficulty for the artifact hypothesis. If the Precambrian

rocks can preserve microscopic soft-bodied organisms, why don't they contain the ancestors to the Cambrian animals?²⁸ If a soft-bodied embryo can be preserved, why not an adult animal?

New “Soft” Evidence

Trace fossils provide additional evidence that the Cambrian Explosion was real. When an animal burrows through sediment, it leaves tracks or burrows behind. These tracks can be fossilized. We call these fossilized animal tracks *trace fossils*. Both soft- and hard-bodied animals could leave trace fossils. Here's the point. If lots of soft-bodied animals existed before the Cambrian, then we should find lots of trace fossils. But we don't. Precambrian sedimentary rock records very little activity. However, at the beginning of the Cambrian explosion, we see a dramatic increase in trace fossils all over the world.²⁹

Punctuated Equilibrium

Many paleontologists are well aware of the conflict between the fossil record and neo-Darwinian

Statistical Sampling 101

Suppose you find a big box of marbles. You reach in and grab six marbles at random. When you remove the marbles, you discover that each marble is either red, green, or blue. Can you assume that the box contains only these colors? Not yet.

This sample is so small that it may not be representative of all the colors in the box. There could be a rainbow of intermediate colors in there. The “three colors only” hypothesis might be an artifact of a small sample.

However, you keep going until you've pulled about 1,000 marbles out of the box. You look at them all, and still find only red, green, and blue ones. There are still some marbles left in the box. What colors would you guess they are? ■

