

An alternative hypothesis on the informational origin of feathers and their original function

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Abstract

Understanding the origin of the feather is perhaps one of the most important aspects in the evolution of the class Aves; it is also the most problematic. Although good fossils of very early birds have been recovered, clear proto-avian fossils are almost non-existent. The feather is a structurally complex biological phenomenon that could have only evolved once; therefore, unless taphonomic events happened at exactly the right times, the undiscovered fossil record of ancient feathers is very limited. Without the feather impressions associated with *Archaeopteryx*, it would have been classified as a late Jurassic reptile instead of the earliest known bird. As a result, researchers must rely on theoretical biology to analyze the origin of feathers for the moment. While most biologists agree that the feather evolved from the reptilian scale, there is debate on how this occurred. Both locomotion and thermoregulation have been suggested as the most probable selection forces behind feather evolution. Unsurprisingly, the feathers of extant birds have three main functions: locomotion, thermoregulation, and communication. Communication is often considered only a secondary function of specialized feathers, an idea that should be re-examined. It is very possible that the earliest proto-feathers were primarily used for various information-based behaviors such as sexual signals, warning signs, territorial cues, or threatening stances. Proto-feathers could have evolved quite rapidly because simple morphological alterations could have augmented the size or shape of the pre-avian scales; the very first feathers were nothing more than modified, elongated scales. I propose that communication factors were responsible for the initial shift from scales to feathers. Those animals that had longer, wider, or novel scales could have conveyed specific messages more effectively, thereby increasing their overall fitness. Creationists are quick to point out that "half a feather" would not be useful for true powered flight or insulating obligatory endothermic animals, but even small, differentiated scales (i.e. size, shape, shading) would have allowed these pre-avians to communicate visually with one another. This alternative hypothesis would mean that the primary features of modern feathers, locomotion and thermoregulation, are historically secondary functions. It should be noted that the long feather-like structures found on *Longisquama*, a middle Triassic thecodont and the contemporary of the elusive proto-bird, were likely used for informational displays. The various markings, color patterns, secondary structures, and communication behaviors of modern reptiles strengthens the validity of this hypothesis.

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