

Cope's Law of the Unspecialized, Cope's Rule, and weak directionality in evolution

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ABSTRACT

Background: Edward Drinker Cope nurtured the idea that evolution moves by an inner motor towards the perfection of structures. This concept animated his major contributions to evolutionary theory, including the Law of the Unspecialized and the familiar Cope's Rule. The former states that clades start with unspecialized forms and evolve towards specialized descendants eventually bound to become extinct because of their 'overperfection'. Through time, the Law of the Unspecialized has been abandoned, probably because it is dominated by a concept of strong directionality (and the many distortions this concept entails).

Questions: Is directionality in evolution real? If so, does the evidence contradict the Law of the Unspecialized, as is now commonly assumed?

Procedure: We review the Law of the Unspecialized. Then we recast it in modern terms. We highlight the connection between Cope's Rule and the Law of the Unspecialized.

Conclusions: A form of weak directionality is real. We conclude that the concept of directionality has been unjustly deprecated. It is, in fact, a pervasive, important, and easily testable feature of evolution.

Keywords: Cope's Rule, Cope's Law of the Unspecialized, weak directionality, body size, ecological specialization.

INTRODUCTION

What we understand today as Cope's Rule is the tendency towards increasing body size in a lineage over geological time (Cope, 1887). It has been said that Cope's Rule might not really be Cope's (Polly, 1998), instead that it was attributed to Edward Drinker Cope by twentieth-century scholars such as Simpson (1953) and Rensch (1954) based on faint evidence. These authors might have been persuaded that the rule is really Cope's by passages in the great American palaeontologist's later writings, especially *The Origin of the Fittest* (1887) and *The Primary Factors of Organic Evolution* (1896), which provide ample evidence that Cope

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