

EVOLUTIONARY PALEONTOLOGISTS

e16 Missing links and gradualism < *Archaeopteryx*, ammonoids, horse >

Wit consists in seeing the resemblance between things which differ, and the difference between things which are alike. —Madame de Staël, *De l'Allemagne*, 1813.¹

To make correlations from one local geological column to another, paleontologists pay attention to *differences* in the fossils of successive strata. After 1859, evolutionary paleontologists actively sought to find proof of Darwinian evolution. They did so by observing fossils for their *similarities* at successive levels.

The similarities approach had already been used by Owen, originally in an effort to find against evolution. But by 1846, in *British Fossil Mammals*,² he has found that *Archegosaurus* links reptiles and fish because it possessed traits of both *and* its stratigraphic position between the first appearance of undoubted reptiles and the earlier appearance of fish is indicative of evolution of reptiles from fish. Retrodictions (predictions about the past) of missing links were persuasive when these were found. The retrodiction of a missing link between dinosaurs and birds was persuasive for the correctness of evolution when the stunning example, *Archaeopteryx* (“*ancient wing*”) was found (first a single feather described by H. von Meyer, in 1861, then a jumbled skeleton (sans head) with feather impressions acquired by Owen in 1862).³ Lyell acceded to progressivism in 1866 (**Footnote e16.1**).

Landmark investigations of the fossil record that found phyletic gradualism indeed has occurred (can be construed), were by:

Wilhelm Heinrich Waagen and Andrzej P. Karpinski: *Die Formenreihe des Ammonites subradiatus* (evolutionary trends in fossil ammonoids), Munich, 1869.⁴

Thomas Henry Huxley (**Figure e16.1**): *Man's Place in Nature*, 1863,⁵ on the continuity of birds via *Archaeopteryx* from dinosaurs in 1868,⁶ and *The Pedigree of the Horse*, 1870.⁷

Melchior Neumayr: evidence of evolution in invertebrate fossils, 1875⁸ (**Figure e16.2**).

Studies such as these had made the catastrophist concept of successive creations untenable. Nor could there be an intellectual retreat to the postulate of an original creation which had produced life in all its variety, when:

Othneil Marsh: *Introduction and Succession of Vertebrate Life in America*, 1877, showed that animal diversity increased in spite of extinctions which temporarily reverse that trend.⁹

Karl Alfred von Zittel (1839-1904): *Handbook of Paleontology*, 1880-93, a four volume comprehensive survey, unintentionally documented that all life prior to the Devonian had been in the oceans. All land plants and land animals have evolved since then (for none had any occurrence in Murchison's Silurian System or in any known older rocks).¹⁰

A valid criticism of these early studies is that they were qualitative descriptions of features that could be more easily seen than they could be measured. For objectivity, beginning with the pioneer studies of Roland Brinkmann in 1929 (**Figure e16.3**), paleontologists have increasingly used statistics and computational paleontology methods.¹¹

As viewed in statistical studies, the acquisition of a new character or the disappearance of a character in samples of populations at a time (stratigraphic horizon) or place (geographic location) is a gradual evolutionary change in the blur of each (**Figure e16.4**). Phyletic sequences with many and varied degrees of such gradualistic change are, the already classic examples of, *Paludina* in Slavonia, *Potamides* in the Tertiary of the Vienna Basin, *Micraster* in the Cretaceous, and *Zaphrentis* in the Carboniferous. □

Figure e16.1 Thomas Henry **Huxley** (1825-1895)

“As the new industrial scientific world took over, as people rose to speak, as doubt became more honorable than certainty, Huxley was there at the head of the charge, armed with the best weapons and quips.” —James R. Kincaid.¹²

“He shaped our vision, closing one window onto future immortality he opened another on our prehistoric past.” —Adrian Desmond.¹³



Huxley earned the title of “Darwin’s bulldog” for his tenacious support in his writings and speaking engagements of his friend Darwin’s theory of evolution. “How incredibly stupid not to have thought of that myself”¹⁴ he wrote of *Origin*. Darwin himself avoided public utterances as he was hampered by a stutter. In 1860, a meeting at Oxford University of the British Association for the Advancement of Science billed a lecture by Dr. Henry Draper (1837-1882), an American, on *Intellectual Development, Considered with Reference to the Views of Mr. Darwin*. In the audience, and ready to debate were Huxley (for Darwinian theory) and Bishop Samuel Wilberforce (prepped by the rebarbative Richard Owen and against). The event would come to symbolize the emancipation of natural science from theology. The bishop (“Soapy Sam” to his detractors)¹⁵ spoke first, as Huxley would later recall “with inimitable spirit, emptiness and unfairness.” A precis of various accounts of what then transpired is: At one point Wilberforce enquired, “Does Mr Huxley claim apes on his grandmother’s or his grandfather’s side?” Huxley was heard to murmur, “The Lord hath delivered him into mine hands” and when his turn was called he replied, “If ... the question is put to me, would I rather have a miserable ape for a grandfather or a man highly endowed by nature and possessed of great means of influence, and yet who employs these faculties and that influence for

the mere purpose introducing ridicule into a grave scientific discussion—I unhesitatingly affirm my preference for the ape.” A roar of laughter erupted from the students who packed the hall. Amid the motley, holding up an enormous Bible and shouting “Here is the truth—in here!” Admiral Fitz Roy to little effect “implored the audience to believe God rather than Man.”¹⁶

Ostensibly congenial in each others company when they shared an office at the Zoological Society in 1861, Huxley could not rein in his impulse to humor when told of Wilberforce’s (1805-1873) thrown-from-his-horse death: “For once, reality & his brains came into contact & the result was fatal.”¹³



Figure e16.2 The fossil snail *Paludina* traced back in time (1 to 10) decreases in ornamentation (the shells have been scaled to be the same height). This apparent gradualistic evolution (10 to 1) was described by **Melchior Neumayr** (1845-1890) in 1875.⁸

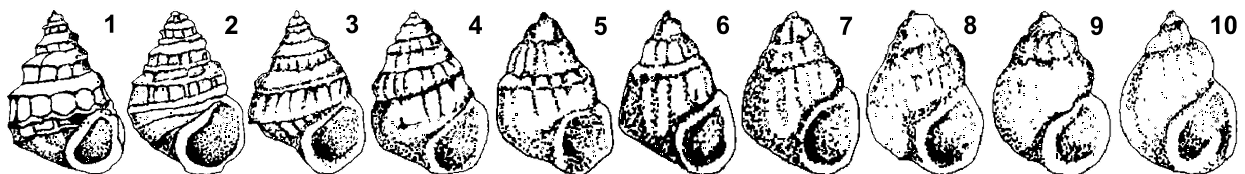


Figure e16.3¹⁷ Evidence for phylogenetic gradualism in the evolution of ammonites (collected from plasters in the brickpits around Peterborough, England, during the 1920s). Calculated best-fit lines (gray) show the rate of change in the ratio between the number of outer-ribs and the peripheral spines of *Spinikosmokeras aculeatum anterior* (a) and *Spinikosmokeras aculeatum aculeatum* (b). Individual counts (dots) are plotted at the fossils' height in the sampled section.

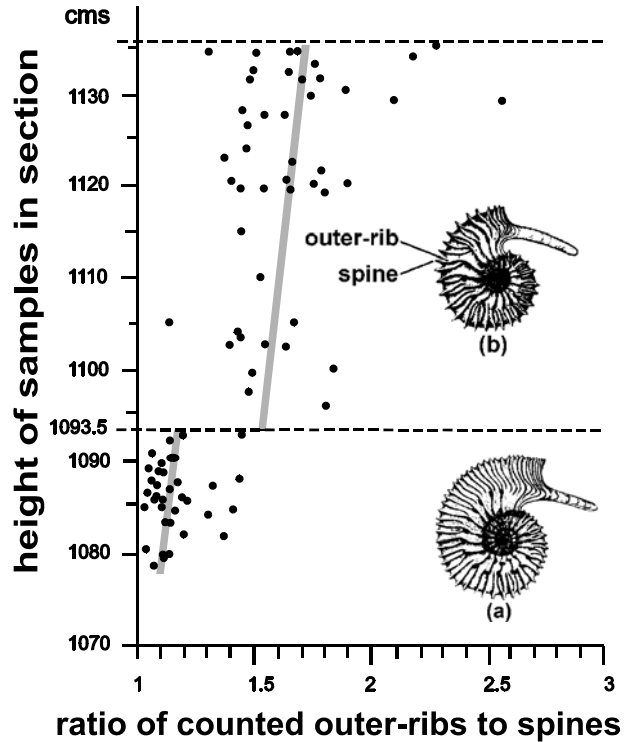
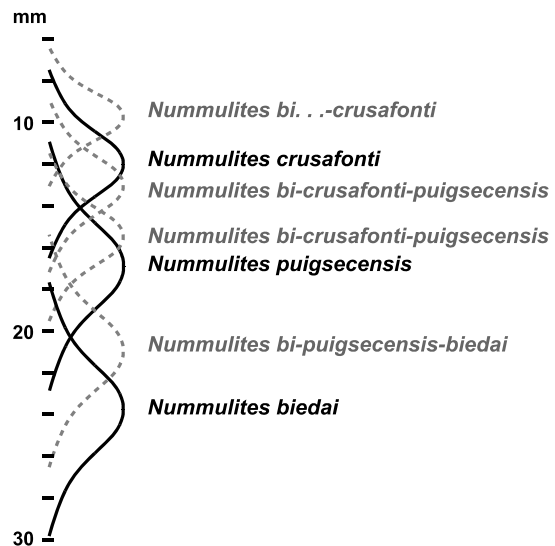


Figure e16.4¹⁸ Schematic representation of variation in diameter of 7 forms in the evolutionary line *Nummulites* during the middle Eocene.

Intermediate forms in the animal and vegetable kingdoms when found support the gradualists expectation of continuous clines, both geographic gradation in phenotypic characters (chorocline) and evolutionary temporal gradation (chronocline). Species names can honor original finds but in a single study of a cline, naming all found subspecies of geographic races of successional subspecies would not be reasonable.

M. Crusafont-Pairó in 1967 proposed a nomenclature for intermediate forms in which the prefix bi- is written before the two specific names between which it lies. In a chronocline the two specific names are written in temporal order as exemplified here.

(Two forms have the same name (*Nummulites bi-crusafonti-puigsecensis*) without being identical but for ongoing biostratigraphic analysis the numerical data for each would be available.)



Footnote e16.1 Lyell's volte-face

“... there is no foundation in geological facts, for the popular theory of the successive development of the animal and vegetable world, from the simplest to the most perfect forms; (Lyell *Principles*, 1st edition 1830, Vol. I, to 9th edition, 1857). | “... we have been firmly led by paleontological researches to the conclusion that the ... animals ... made their appearance in chronological order analogous to that in which they would be arranged zoologically according to an advancing scale of perfection in their organization.” (Lyell *Principles*, 10th edition 1867/68: Vol. I, Chap. 9).

Footnote e17.1 The voyeuristic aspects of Darwin’s *Living Cirripedia* (parasitic potent males on polyandrous females) were seized on by satirists, cartoonists, and even Charles Dickens (his Barnacle family in *Little Dorrit*) to titivate vulgar naturalists of both sexes who swarmed the seashore (made accessible by cheap railfares beginning in the 1850s) caught up in the salt-water aquarium craze pushed by Philip Henry Gosse (1810-1888) who extolled a nobler view until in 1865 *Origin* outed the horrors of raw nature whereafter to sell he must belligerently echo the psalmist: “I will praise Thee; for all is fearfully and wonderfully made.”¹