

# Why Brontosaurus Is Once Again Considered a Valid Genus

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*Brontosaurus life reconstruction. Photo Credit: Tom Parker*

The genus *Brontosaurus* (Marsh, 1879) was long treated as a junior synonym of *Apatosaurus* (Marsh, 1877) after early 20th-century reassessments. A comprehensive specimen-level phylogenetic and taxonomic revision published in 2015 applied an expanded morphological dataset and explicit quantitative criteria to diplodocid specimens and concluded that *Brontosaurus* is in fact morphologically distinct from *Apatosaurus* and therefore merits resurrection as a separate genus. That conclusion has been widely reported and discussed, and while many paleontologists accept the result as plausible and methodologically rigorous, some researchers have urged caution about wholesale taxonomic change until further work and broader consensus are reached. This article summarizes the evidence and methods behind the 2015 revision, places the result in historical context, and evaluates the subsequent community responses and outstanding questions.

The large Diplodocid sauropod *Apatosaurus* was initially described in 1877 by O.C. Marsh. Two years later, *Brontosaurus excelsus* was first named by O. C. Marsh in 1879. However, in 1903, Elmer Riggs re-examined the available material and concluded that *B. excelsus* fell within the morphological variation of *Apatosaurus*. As such, the name *Brontosaurus* was treated as a junior synonym of *Apatosaurus* for more than a century (the name *Apatosaurus* has seniority under the International Code of Zoological Nomenclature).

Despite this, at least one paleontologist, Robert T. Bakker, argued in the 1990s that *A. ajax* and *A. excelsus* are sufficiently distinct, and that the latter continues to merit a separate genus.

Nearly all paleontologists of the 20th century concurred with Riggs though, that every species of *Apatosaurus* and *Brontosaurus* ought to be categorized under one genus. In accordance with the regulations set forth by the ICZN, which oversees the scientific nomenclature of animals, the designation *Apatosaurus*, being the first to be published, took precedence.

Therefore, *Brontosaurus* was deemed a junior synonym and consequently eliminated from formal usage.

However, Emanuel Tschopp, Octávio Mateus, and Roger B. J. Benson (2015) published a specimen-level phylogenetic analysis and taxonomic revision of Diplodocidae that re-scored individual fossil specimens rather than treating composite species as single operational taxonomic units. Their dataset scored 477 morphological characters across 81 diplodocid specimens (a much larger specimen-level effort than most earlier studies). The key methodological elements that underlie their taxonomic conclusions were:

Specimen-level scoring: each specimen was entered separately into the matrix to capture intraspecific variation and avoid conflating non-diagnostic differences.

Large character set: nearly five hundred characters spanning cranial and postcranial anatomy increased the chance of detecting consistent character suites that separate lineages.

Objective taxonomic criteria: the authors implemented a repeatable, quantitative approach to determine whether observed differences warrant genus-level separation, rather than relying on single iconic characters or subjective assessments.

These choices were intended to reduce the subjective element of taxonomic judgment by grounding decisions in explicit phylogenetic patterns and numerical character distributions. The Tschopp et al. analysis recovered two distinct, well-supported apatosaurine clades. The specimens historically assigned to *Apatosaurus* and the type material of *Brontosaurus* clustered into separate clades that according to the authors' numerical criteria differed by a magnitude of character differences comparable to other separate genera within Diplodocidae. On that basis the authors re-recognized *Brontosaurus* as a valid genus, with *B. excelsus* as the type species, and reassigned some species formerly attributed to *Apatosaurus* (e.g., *A. parvus*, *A. yahnahpin*) to *Brontosaurus* where appropriate.

Key morphological distinctions emphasized in the paper and subsequent reporting include different proportions and morphologies of cervical vertebrae (neck shape and robustness), certain dorsal and caudal vertebral characters, and aspects of limb and girdle bones that consistently separate the two clades. The authors argued that these differences are more extensive than normally found among species within a single genus, justifying generic separation.

The 2015 paper was widely publicized (e.g., *Scientific American*, *Nature*, *Smithsonian*, *Wired*) and many paleontologists described the analysis as an important and methodologically careful contribution to diplodocid systematics.

However, some scholars and commentators urged caution. Criticisms centered on (a) whether the particular character weighting, OTU selection, or taxon sampling could bias topology; (b)

whether observed differences are truly generic-level or instead represent species-level variation, ontogenetic stage differences, or preservational distortion; and (c) the broader issue that a single, large analysis, however careful, should be corroborated by independent datasets and successive studies before the field treats a long-standing taxonomic change as settled. Commentators such as Donald Prothero and others emphasized that nomenclatural stability and careful re-examination of type material remain important before museums and textbooks universally adopt the resurrected name.

Several reasons explain why the Tschopp et al. conclusion has persuasive power:

1. Breadth of specimen sampling, scoring dozens of individual specimens reduces the chance that composite or chimeric OTUs drive the result.
2. Large, repeatable character matrix, 477 characters provide a dense morphological signal; key character suites separating the apatosaurine clades appeared repeatedly across multiple elements (cervicals, dorsals, limbs).
3. Independent verification within the study, the authors solicited an independent reanalysis (Roger Benson) and presented the statistical distinctiveness of the clades rather than relying only on narrative descriptions.
4. Consistency with new fossil discoveries, the intervening 100+ years since Riggs's reassessment produced many new diplodocid specimens that provide a richer baseline for evaluating variation than was available in 1903.

These points do not make the conclusion incontrovertible, but they explain why the Tschopp et al. result changed the balance of evidence in favor of *Brontosaurus* as a separate genus and valid species.

Taxonomic changes in deep time are hypotheses that benefit from iterative testing. Outstanding areas where further research will strengthen (or refute) the resurrection of *Brontosaurus* include: Independent reanalyses using different character coding schemes, additional specimens, and alternative phylogenetic algorithms.

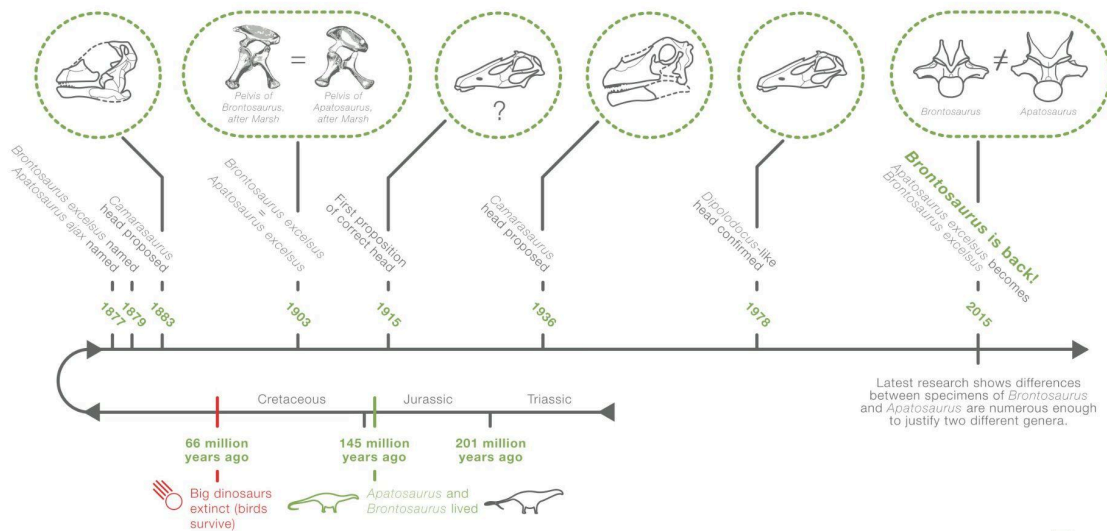
Quantitative studies of intraspecific and ontogenetic variation in apatosaurines to ensure that purported generic characters do not fall within species-level or growth-stage variation. Detailed study of type specimens and historical material to ensure that the nomenclatural acts align strictly with ICZN rules and that museum specimens are correctly identified. Integration of new finds from contemporaneous Morrison Formation localities that could fill morphological gaps and test clade diagnoses.

Some subsequent work on apatosaurine anatomy (e.g., cranial and feeding mechanics) continues to add data relevant to systematics, but consensus in paleontology often builds gradually as multiple independent studies converge.

The revival of *Brontosaurus* as a valid genus rests on a comprehensive specimen-level phylogenetic analysis that detected consistent, multi-element morphological differences between two apatosaurine clades. The 2015 study brought new data and explicit, repeatable criteria to a problem that had been decided over a century earlier on more limited evidence. Many paleontologists consider the resurrection well-supported and methodologically sound.

**The history of *Brontosaurus* – one of the greatest stories in paleontology**

<p><b><i>Brontosaurus</i></b>          Lived 150 million years ago          Western United States          Meaning: Thunder lizard          Diet: Herbivorous          Weight: 30.5 tonnes</p>	<p><b><i>Apatosaurus</i></b>          Lived 150 million years ago          Western United States          Meaning: Deceptive lizard          Diet: Herbivorous          Weight: 41.3 tonnes</p>		 <p>Sites of findings</p>
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Tschopp et al. (2015). A specimen-level phylogenetic analysis and taxonomic revision of *Diplodocidae* (Dinosauria, Sauropoda). *PeerJ* 3:e857; DOI 10.7717/peerj.857 <https://peerj.com/articles/857>

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Infographic explaining the history of *Brontosaurus* and *Apatosaurus* according to Tschopp et al. 2015

## References & Recommended Reading

Tschopp, E., Mateus, O., & Benson, R. B. J. (2015). A specimen-level phylogenetic analysis and taxonomic revision of Diplodocidae (Dinosauria, Sauropoda). *PeerJ*, 3:e857. Full open-access article.

“Brontosaurus is back” — Nature news & commentary, reportage on the 2015 revision.

O’Neill, C. (2015). “The Brontosaurus Is Back” — *Scientific American*, summary of the study and its implications.

“Is Brontosaurus making a comeback?” — *Christian Science Monitor*, overview of methods and public reaction.

“Not So Fast, Brontosaurus” — *Time* (and critical commentary by Donald Prothero / others) — discussion urging caution and further corroboration.

Smithsonian Magazine and *Wired* contemporary coverage summarizing methodology and expert reactions.