The history of the mounted cast skeletons of the Carnegie *Diplodocus*

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**Abstract**

Diplodocus is a sauropod dinosaur from the Upper Jurassic Morrison Formation of North America. It is known around the world primarily because of a single skeleton, that of the Carnegie Diplodocus, because the millionaire industrialist Andrew Carnegie had casts of this specimen mounted in nine prominent cities around the world between 1905 and 1930. Since their creation, many of these mounts have been subject to various changes. XXX summarise.

**Keywords:** Diplodocus, sauropod, skeletal mount, cast, history, Carnegie Museum

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# Introduction

*Diplodocus* is a sauropod dinosaur from the Late Jurassic of North America, found in the extensive Morrison Formation of the western United States. Although larger and more complete sauropods are now known, *Diplodocus* was the first giant dinosaur known from a substantially complete skeleton: the Carnegie Museum’s iconic specimen CM 84, the holotype of the species *Diplodocus carnegii* (Hatcher 1901). Casts of this important specimen were sent to cities throughout Europe and in Latin America and Russia, and the original fossil material was mounted in the Carnegie Museum. Later, a single concrete cast was made. As a result of these replicas, this individual became — and remains — the single best-known dinosaur in the world.

Although the mounted skeleton is often referred to as CM 84, it is actually a composite containing substantial portions of the *D*. *carnegii* paratype CM 94 and smaller parts of other specimens, as well as some cast and sculpted elements. The composition of both the original fossil mount and the casts is described in detail in Taylor et al. (in prep).

The present paper summarizes the history of the mounted cast skeletons subsequent to their original unveiling.

## Nomenclature

When referring to the various cast mounts, we refer to them by the name of the city that they were originally mounted in (e.g., the London cast, the Berlin cast, the Vernal cast); the sole exception is that we refer to the Russian cast by the name of the nation in which it resides, as because it was initially installed in St. Petersburg but currently stands in Moscow.

## Institutional abbreviations

* BMNH — British Museum of Natural History, London, England. (Now the Natural History Museum, using the abbreviation NHMUK.)
* BSP — Bayerische Staatssammlung für Paläontologie und Geologie, Munich, Germany.
* CM — Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA.
* MfN — Humboldt Museum für Naturkunde, Berlin, Germany (formerly HMN). Fossil reptile specimens are designated MB.R.*nnnn*.
* MNHN — Muséum National d’Histoire Naturelle, Paris, France.

# Updates to the casts

Since the mounting of the nine original casts, some updates have taken place. As noted above, the Munich cast was never mounted, and at the time of writing, it remains in that museum’s basement.

## The London cast

The London cast, having been initially mounted in the Reptile Gallery (now the Human Biology Gallery), was moved to the Fossil Reptile Gallery (now the Waterhouse Gallery) in 1931, stored in the basement for safety in April 1940 (four months before the beginning of the Blitz), returned to the Fossil Reptile Gallery after World War II, and moved to the museum’s main hall (now the Hintze Hall) in 1979 (Hendry 2018), before finally being taken down in January 2017 to make more space for corporate events (Steerpike 2015; Nieuwland 2019:260). At some point, the London cast was assigned its own specimen number, NHMUK PV R8642 (Natural History Museum 2022).

Changes to the mount have been minimal during this time. Small caudal vertebrae have often been stolen, and the museum kept a box of spares to replace them (Hendry 2018). Two significant changes were also made (or at least, in one case, purportedly made).

First, the neck was supposedly raised in the 1960s (Barrett et al. 2010:40), although the then-current posture depicted by Barrett et al. (2010:4–5) does not appear more elevated than in the original pose of 1905 (Barrett et al. 2010:27).

Second, the tail was replaced and elevated in 1993 (Lindsay et al. 1996:269; Barrett et al. 2010:43). The dragging plaster casts of the original were replaced by lightweight glass-reinforced plastic casts in a more dynamic pose that better reflects current understanding of sauropod behavior, as well as discouraging petty theft. The scaffolding around the hips had to be strengthened to take account of the shift in balance with the tail no longer serving as an anchor (Lindsay et al. 1996:269). The molding and casting was performed between February and May 1993 by John Coppinger, otherwise known as the sculptor who created the Jabba the Hutt puppet for *Star Wars Episode VI: Return of the Jedi* (1983). Coppinger accepted the job on the understanding that he couldn't guarantee preserving the original, extremely fragile plaster vertebrae. As he expected, they were critically damaged in the process, so their broken remains lie somewhere under new houses in Amersham, where his workshop had been (John Coppinger, pers. comm, 2023). The new second-generation tail molds were given to the NHM.

Since the original plaster cast femora had to be removed from this hips in order to make the necessary changes to the armature, the femora were also replaced by lightweight casts (Nigel Larkin, pers. comm., 2023). These femora were sourced from Dinolab, Inc. (Lorraine Cornish, pers. comm., 2024), and would therefore have been cast from the molds created from the concrete cast in Vernal. The whereabouts of the original plaster femora is unknown: they do not appear to be in the museum collection (Paul Barrett, pers. comm., 2024).

When the *London* cast was taken down in 2017, the opportunity was taken to replace in the incorrect camarasaurid forefeet with new casts (Lorraine Cornish, pers. comm., 2024). These were sourced from Research Casting International (RCI). The old forefeet remain in the museum’s collection (Susannah Maidment, pers. comm., 2024). Unfortunately, the replacement forefeet were cast from the molds that had been created by Dinolab, Inc. (Peter May, pers. comm., 2024), and so were casts made from molds of the concrete cast that had been made from the same mold that also produced the original London cast. The new forefeet are therefore all but identical to the old ones, although some small changes have been made. As of November 2022 (the “Dippy Returns” exhibition in the NHM’s Waterhouse Gallery), the London mount still had three-clawed camarasaurid forefeet in their original splayed posture, but the carpal elements are much thinner than in the original cast and the metacarpals have rather flatter proximal ends (Taylor, pers. obs, 2022). Also, its atlas was mounted upside down (Taylor 2022b).

At the time of writing (May 2024), the London cast is on a long-term loan to the Herbert Art Gallery and Museum in Coventry, UK. In early May 2024, a new bronze *Diplodocus* skeleton was installed in the Evolution Garden in front of the Natural History Museum, and will be open for public viewing from 18 July (Natural History Museum, 2024). The new skeleton was created by Factum Arte using 3D scans provided by the museum (Factum Arte, 2024). Its forefeet resemble those of the current version of the plaster cast, with caramasaurid metacarpals and three unguals, but thin carpals (photographs in press pack for Natural History Museum, 2024).

## The Berlin mount

Sometime before 2005, the excess non-ungual phalanges and unguals were discarded from the forefeet of the Berlin mount, though the plantigrade pose of the forefeet remained unchanged (Taylor, pers. obs., 2005). The cast was completely remounted in 2006 by RCI, under the supervision of a team led by Kristian Remes, as part of a renovation of the Museum für Naturkunde’s central hall. Among other postural changes, the tail was raised and the forefeet were reconfigured in a digitigrade pose (Figure 14B). Remes no longer remembers whether new and more appropriate forefoot material was used in the remounting (Kristian Remes, pers. comm., 2022), but it is most likely that the original casts were used and merely reposed (Wolf-Dieter Heinrich and MfN preparators via Daniela Schwarz, pers. comms., 2022). Peter May of RCI (pers. comm., 2022) also believes, but does not recall with certainty, that the original manus cast material was reused. However, none of the forefoot material casts that are unused in the present mount can be located in the MfN collection (Daniela Schwarz, pers. comm., 2022).

## The Paris mount

The Paris mount remains in its original location, and is entirely unchanged since its creation in 1908, with the possible exception that a few tail vertebrae may have had to be replaced in the mid-20th century after a mishap. Coggeshall (1951b:278) claimed that the museum was converted into a hospital during World War I and the skeleton dismantled and later remounted, but this contradicts other accounts, and the museum is not included in lists of temporary hospitals at that time. The preponderance of evidence shows that the mount was not moved during either World War (Vincent Reneleau, pers. comm., 2022). This makes the Paris mount an important and perhaps unique historical artifact in its own right, and it is to be hoped that the MNHN resists the temptation to modernize it.

## The Vienna mount

The Vienna mount has been moved twice and undergone a partial remount (with changes to the tail and slight changes to the neck), probably before 1998 judging by photos in Riedl-Dorn (1998).

XXX See Taylor (2024).

## The Bologna mount

The Bologna mount is in its original location (although it was possibly relocated to another hall in the museum and then moved back at some point). In 2009, to coincide with the centennial of the original installation, the tail was raised (Sarti 2012:1). The neck has also been placed in a leftward curve, perhaps at the same time — probably to offer visitors a better view.

## The Russian mount

The Russian mount has undergone by far the most complicated history of them all. Having originally been mounted at the The Imperial Museum in St. Petersburg in early to mid July 1910, it was first moved to Moscow in 1934 along with the other collections of the Russian Academy of Sciences. In 1937 it was remounted in the Neshkuchny Palace, an 18th-century complex next to Gorky Park, as part of the 17th International Geological Congress, which was held in Moscow in that year (Bodylevskaya 2007). Here it was given a bizarre posture with parasagittal hindlimbs but strongly everted elbows (Taylor 2014), possibly following Austrian paleontologist Othenio Abel’s (1910) suggestion. It was next moved to storage in Almaty, Kazakhstan from 1942 to 1944, possibly to avoid war damage. After this, it was returned to the Neshkuchny Palace, but subsequently placed in storage following the Palace’s closure as a museum in 1954. In 1987, it was remounted in Moscow’s new Orlov Museum of Natural History, this time in more traditional fashion with erect limbs, but with a dragging tail that was already strikingly old-fashioned by that time. So far as we are aware, however, the same original set of casts have remained in use through all these changes.

## The La Plata mount

The La Plata mount was repaired and repainted a brick-red color in 1977. It has been moved within the museum on multiple occasions — from Hall III to Hall V in 1987, and to Hall II in 2003 (Otero and Gasparini 2014:300–301), at which time the posture of both the neck and tail was updated and the color reverted to its original dark gray. The history of this mount is covered in detail by Otero and Gasparini (2014).

## The Madrid mount

The Madrid mount has been moved within the museum, but in other respects seems to be largely unchanged since the original mounting. In 1935, the museum received as a further gift from the Carnegie Museum a cast of the high-quality skull CM 11161. Museum staff considered replacing the skull of the mounted skeleton with the new skull, but it was eventually decided instead to display the new skull alongside the mount instead. It remained on display until 1989, and now resides in the Madrid museum’s collection area (Pérez García and Sánchez Chillón 2009:145). Recent photographs confirm that the original skull remains in place on the cast skeleton.

## The Mexico mount

The Mexico mount was moved within its museum in 1964, and now resides in the Evolution of Life Gallery. It has recently been remounted, most likely in 2018, though definitive information is difficult to come by. XXX to be updated from new document

## The Vernal mount

XXX cite Taylor et al.

# Discussion

XXX

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# Tables

**Table 1.** The dozen Carnegie *Diplodocus* skeletons consisting of the original material mount and all casts made from the original molds, in chronological order of presentation. Reproduced from Taylor et al. (in prep).

|  |  |  |  |
| --- | --- | --- | --- |
| **Mount** | **Museum** | **Presented to** | **Unveiled** |
| London cast | British Museum (Natural History) (now the Natural History Museum) | King Edward VII | 12 May 1905 |
| Carnegie mount | Carnegie Museum of Natural History | N/A | 11 April 1907 |
| Berlin cast | Museum für Naturkunde Berlin | Kaiser Wilhelm II | 13 May 1908 |
| Paris cast | Muséum National d’Histoire Naturelle | Président Armand Fallières | 15 June 1908 |
| Vienna cast | Kaiserliches und königliches naturhistorisches Hof-Museum | Emperor Franz Joseph | 24 September 1909 |
| Bologna cast | Museo Giovanni Capellini, Università di Bologna | King Victor Emmanuel III | 27 October 1909 |
| Russian cast | The Imperial Museum, St. Petersburg | Tsar Nicholas II (nominally) | Early to mid July 1910 (see text) |
| La Plata cast | Museo de La Plata | President Roque Sáenz Peña Lahitte | 1912; no specific event |
| Madrid cast | Museo Nacional de Ciencias Naturales | King Alfonso XIII | 2 December 1913 |
| Mexico City cast | Museo de Paleontología (Universidad Nacional Autónoma de México) | N/A | 1930; no specific event |
| Munich cast | Bayerische Staatssammlung für Paläontologie und Geologie | N/A | (Arrived in 1934; never mounted) |
| Vernal cast | Utah Field House of Natural History | N/A | 6 June 1957 |