

## A Vast Quantity of Evidence Confirms That Non-Bird Dinosaurs Were Not Aquatic

By Darren Naish -- SUPPLEMENTARY INFORMATION

This document corrects various additional claims made by Brian J. Ford and is intended as a supplement to my talk given at Conway Hall on Tuesday 15<sup>th</sup> May 2018. Needless to say, there was insufficient time in the talk to fit in all of these additional corrections and comments.

Brian J. Ford (BJF) has made numerous incorrect or questionable claims in his popular talks on his ‘aquatic dinosaur model’ (all of which are given to popular audiences – people on cruise ships and so on – never to scientists at academic conferences or meetings). In this document, I want to correct various of the claims made in his lecture on his aquatic dinosaur model (and available here on youtube: <https://www.youtube.com/watch?v=kwnfV1WrBF4>). There are simply too many incorrect, erroneous or arguable statements for me to respond to *all* of them, but I have singled out those that most require my response.

Format: I refer below to the point of time at which the statement is made by BJF, explain or report his statement, and then follow it up with a **correction**.

---

At c 10:30, BJF shows a reconstruction of the sauropod *Brontomerus* and credits it to “Parsells Avenue Community Church, Rochester, New York”.

**Correction:** A few minutes of research would show that this image is by artist and scientist Francisco Gascó and was produced to accompany the official announcement of *Brontomerus*’s publication in 2011. Maybe it was used by the “Parsells Avenue Community Church, Rochester, New York”, but it should certainly not be credited to that institution.

---

At c 24:35, BJF figures a life reconstruction of a running *Edmontosaurus*, crediting it to ‘Bristol University’. He links it with sauropod dinosaur expert Mike Taylor, referring to “Mike Taylor’s Department of Bristol University”

**Correction:** Mike is an affiliate of Bristol University; he is not based there nor work there. The *Edmontosaurus* life reconstruction is by artist Todd Marshall and is nothing whatsoever to do with Bristol University or Mike Taylor.

---

Moving on, BJF spends part of his talk quoting (or, at least, showing on slides) sections from my 2012 *Laboratory News* article. At c 32:30, BJF draws attention to my use of “the old imperial tonnes, which I rather thought we’d forgotten about”.

**Correction:** The ‘tons’ referred to in my article are very clearly intended to be metric tons, and are written as such.

---

At c 33:50, BJF criticised my characterising of *Spinosaurus* as waterside wading predators before going on to refer to evidence for a more aquatic lifestyle (noting that I “didn’t seem to know” this).

**Correction:** In 2012 (when my *Laboratory News* article was published), our understanding of spinosaur anatomy was based predominantly on data from *Baryonyx* and *Suchomimus*, both of which are proportioned much like other theropods and lack obvious aquatic adaptations. Thus I did not credit or refer to the data published by Ibrahim et al. (a study positing very different proportions – and numerous specialisation for aquatic life – in *Spinosaurus*). This is because the Ibrahim et al. paper was published in 2014 and my clairvoyant abilities were non-functional in 2012, as they still are today. Contra BJJ, the Ibrahim et al. research is nothing to do with China.

---

At c 35:20, BJJ shows a screengrab of a piece of text that includes the typos “volumetric analysls” [sic], which BJJ then goes on to mock.

**Correction:** Because BJJ’s quotation of this piece of text is surrounded by quotations from my 2012 *Laboratory News* article, it is very much implied (perhaps not deliberately, or perhaps deliberately) that this text is mine, whereas it is not. An easy solution to avoid what looks like an under-handed tactic would be to provide citations for the relevant pieces of text.

---

At c 36:00, BJJ refers to my comments on post-cranial pneumaticity in sauropods, and describes his own consultation of the relevant publication (Henderson D. M. 2003. Topsy punters: sauropod dinosaur pneumaticity, buoyancy and aquatic habits. *Proceedings of the Royal Society of London B* (suppl.) 271, 180-183). He goes on to refer to the figures in Henderson’s paper as “drawings” and says (c 36:45) that the mis-match between centre of gravity and centre of buoyancy in the sauropod models concerned is merely “just because whoever drew the pictures *decided* that is the case”.

**Correction:** BJJ cannot have read Henderson’s paper, since it describes how he constructs his digital models, and how the centre of gravity and centre of buoyancy are determined. It does not involve drawing pictures but is substantially more sophisticated and involves the incorporation of numerous parameters. The technique has, furthermore, been ground-truthed on a variety of living animal models.

---

At c 37:00, BJJ describes how pneumaticity means that the bones “in the upper part of the body” of some dinosaurs were “hollow”.

**Correction:** This fails to credit the fact that post-cranial skeletal pneumatisation in some non-bird dinosaurs involves chest bones on the lower surface of the thorax and side of the chest (Cerda, I. A., Salgado, L. & Powell, J. E. 2012. Extreme postcranial pneumaticity in sauropod dinosaurs from South America. *Paläontologische Zeitschrift* 86, 441-449) and air sacs distributed throughout the lower part of the body cavity (e.g., Wedel, M. J. 2005. Postcranial skeletal pneumaticity in sauropods and its implications for mass estimates. In: K. Curry Rogers, K. & Wilson, J. A. (eds), *The Sauropods: Evolution and Paleobiology*, pp. 201–228. University of California Press, Berkeley). Furthermore, the bones were not merely “hollow”, but continuous with the respiratory system. BJJ also expresses surprise at the idea that dinosaurs might develop “hollow bones” in a terrestrial environment before going on to say that “hollow bones” would make more sense in water. However: (1) the modern animals most notable for their development of pneumatic bones are birds, quite a few of which are denizens of terrestrial environments; (2) birds associated with aquatic habits have a reduced

or absent skeletal pneumatization relative to their terrestrial relatives because – contra BJJ – pneumaticity is disadvantageous for aquatic animals.

---

At c 37:25, BJJ states that the “hollow bones” of the relevant dinosaurs would not make much weight difference for terrestrial animals; the pneumaticity concerned accounting for “a very small proportion in a hundred-ton dinosaur”.

**Correction:** On the contrary, quantitative studies indicate a non-trivial weight saving of c 10% in a c 11 ton sauropod (Wedel, M. J. 2005. Postcranial skeletal pneumaticity in sauropods and its implications for mass estimates. In: K. Curry Rogers, K. & Wilson, J. A. (eds), *The Sauropods: Evolution and Paleobiology*, pp. 201–228. University of California Press, Berkeley).

---

At c 37:30, BJJ states that weight saving adaptations “would matter like anything” for an aquatic dinosaur.

**Correction:** This is remarkably naïve given the well-established fact that amphibious and aquatic tetrapods have an *increased specific gravity* relative to terrestrial ones, and that their bones and bodies feature numerous features associated with increasing weight, not decreasing it.

---

At c 37:40, BJJ refers to sauropod footprints where “only the forelimbs have left an impression”.

**Correction:** If BJJ has checked the literature on dinosaur tracks he would know that ichnologists have had substantial reason to doubt the idea that the tracks concerned were really made by swimming sauropods. They may not be. Even if they were, evidence for swimming is not evidence of aquatic specialisation.

---

At c 38:25, BJJ quotes the section of my 2012 *Laboratory News* article in which – when referring to the enormous tail muscles of dinosaurs – I note that “the metabolic costs required to power these muscles provide evidence of endothermy”. He then proclaims that this “shows how he doesn’t understand science; he knows nothing of biology! He believes that the warmth in our bodies comes from exercising our muscles”. BJJ goes on to explain how this view would be erroneous and that the heat produced within the endotherm body is generated by internal organs.

**Correction:** In a fairly remarkable and apparently deliberate twisting of a quote, BJJ seems to have ignored or missed the fact that the relevant text does not state what he claims. Rather, it says that “*the metabolic costs required to power the muscles provide evidence of endothermy*”; it does not link heat production to muscular function *at all*. A quantitative study linking the presence of giant muscles to a high metabolic base rate was even cited in my text (Pontzer, H., Allen, V. & Hutchinson, J. R. 2009. Biomechanics of running indicates endothermy in bipedal dinosaurs. *PLoS ONE* 4(11): e7783).