Response to reviews and editorial comments on: *What do we mean by the directions “cranial” and “caudal” on a vertebra?*

Mike Taylor

First, I would like to apologise that it has taken so long — just over two years — to handle these reviews, which were sent on 3rd January 2020. I am sure everyone involved understands that this has been a strange and difficult couple of years. Nevertheless, the delay is entirely my own fault, and I apologise.

# Comments on review 1 (Ryan D. Marek)

Marek’s multiple comments on the structure of the manuscript are noted, and taken into account (along with those of the other reviewer and editor) in the radical restructuring of the new version of the manuscript.

We also accept his point that the tone of the original submission is not to everyone’s taste. While we do not necessarily agree that more formality is always better, we recognise that there is a balance to be struck, and that the first version of this manuscript erred too far in the direction of informality. We have accordingly reworded the prose extensively.

As recommended, we have greatly reduced the role in the new manuscript of the account of how the question of orientation came to our attention, agreeing that “making it the focal point of the submission is detrimental to the paper” and that the more substantial questions of anatomical meaning are a stronger focus for the introduction. However, the disagreement with Mannion in the reviews of the *Xenoposeidon* revision remain of interest as a concrete example of how the ideas in the present manuscript are significant, so the account is retained in a reduced form in the discussion — as also advocated by Reviewer 2 (see below).

We have removed the Saegusa and Ikeda's (2014: figure 8) illustration, even though it provides a perfect single-figure example of the inconsistency we seek to illustrate, for fear of appearing critical or confrontational. We have substituted an illustration from our own previous work.

We have reworked and combined some of the illustrations along the lines that Marek suggests.

We have also followed his suggestion to expand Figure 5 to show additional long cervical vertebrae as well as the *Giraffatitan* C5 that is our principal example.

We note the comments on colour-blindness. We have have checked that where colour is used to distinguish lines with different meanings those lines are also distinguishable by other criteria, and made the relevant figure captions more explicit.

We have in general followed the specific comments attached to Marek’s review, but with some exceptions. In particular, we do not agree with the suggestion that expunging the pronoun “we” throughout and substituting passive voice would improve the manuscript, and note that the fourth of [Orwell’s Six Rules for writing English](https://en.wikipedia.org/wiki/Politics_and_the_English_Language" \l "Remedy_of_Six_Rules) is “Never use the passive where you can use the active”. We have changed some instances, but in others clarity is best served by the simpler active phrasing.

We have retained a slightly shortened section on open peer-review, contrary to Marek’s recommendation and in accordance with that of Tschopp. This section is important to us and relevant to the origin of the present paper’s core question. We have, however, removed the section on open composition, mentioning the matter only briefly in the acknowledgements.

We note that that in the Rating Scale Questions, Marek ticks the “disagree” column for the statements “This article adequately engages with the relevant scholarly literature” and “The literature review was thorough given the objectives and content of the article”. The reason this paper was written is that there *is* no relevant scholarly literature, so we are rather at a loss as to what Marek intends us to do in response to this scoring. Since Tschopp’s scoring of these questions is neutral, and since Marek does not mention any specific papers that he thinks we should have cited or discussed, we have not been able to identify any changes to make in this respect.

We take Marek’s point that “comparing multiple quantitative measures of vertebral anatomy across a range of organisms/vertebral regions” would be of interest, but we consider this work beyond the scope of the present paper, in which we aim simply to establish definitions.

# Comments on review 2 (Emanuel Tschopp)

We thank Tschopp for supplying the annotated manuscript with many small errors (typos, etc.) highlighted. We have fixed all of these.

Tschopp asks why, in Definition 4, we use two copies of the same vertebra, and not two articulated vertebrae. We have expanded the discussion in this section to explain more explicitly why the method is defined as it is. (In short, because its whole purpose is to provide a definition that works for a single vertebra.)

The point that sequences of vertebrae oriented by Definition 2 need not be illustrated in a way that results in a jagged neural canal is important: we now address it in the manuscript.

Measurement of the neural canal cross-section cannot be “corrected using sectioned vertebrae” in general — the point of the present paper is how we can get consistent results using the vertebrae we have, in the condition they are in. “Just section the vertebra” is not always a practical option. We have reworded the relevant section to make it clearer.

As noted in response to the comments of Reviewer 1, we have revised the structure of the new manuscript along the lines that Tschopp recommends.

We have added a note that Tschopp et al. (2015)’s definition of Character 194 mentions (though without discussion) that a horizontal orientation of the neural canal is used when scoring.

We note that Tschopp would prefer a shorter abstract, but we do not feel it can be significantly trimmed from the present version without losing too much information for it to remain an adequate proxy for the paper. We will therefore not remove the four candidate definition unless coerced to do so by the handling editor.

As suggested, we have modified Figure 5, to include reconstruction lines for the missing ventral portion of the cotyle, drawn from Janensch’s (1950: figure 23) illustrations.

# Comments on handling editor’s summary (Peter Falkingham)

We thank Falkingham for his constructive comments, and agree with most of his criticisms — which we will not address individually here as they largely duplicate and amplify those of the reviewers.

We have removed some of the references to blog-posts as requested. Other are retained, as they properly acknowledge the source of previously published ideas and images. As we note in our in-press chapter in the forthcoming 3rd edition of *The Complete Dinosaur* (Taylor and Wedel in press):

The better blogs have become the online equivalent of conferences: venues for the rapid and relatively informal communication of science, encompassing both review material and novel research. Many science blogs are now recognised as carrying scientifically significant material, often long before it sees formal publication, and this recognition is increasingly conveyed through citation in more formal publications. For example, our own blog, *Sauropod Vertebra Picture of the Week* or *SV-POW!* for short (<https://svpow.com/>) has been widely cited in the formal literature on subjects as diverse as open access, publication costs, study design, the moral dilemma presented by Sci-Hub, media distortions of dinosaur science, zoological nomenclature and the evolution of palaeo-art (e.g., Notton et al. 2011, Anderson 2014, Cross 2014, Heller et al. 2014, Rinaldi 2014, Witton et al. 2014, Bhatia 2015, Pennington 2016, Hoy 2017, Köklü 2017, Curry 2018, Pagnac 2018).

The point about using a consistent left-right orientation for the vertebrae in the illustrations is well taken. We have reworked all the lateral-view figures accordingly, using mirror-imaging where necessary and modifying the captions accordingly.

We agree that adding another vertebra to Figure 6, as a second example of how different definitions yield different orientations, would be helpful. We have added a posterior cervical vertebra of a giraffe, so that the illustrated example encompass two high-level clades (Sauropsida and Synapsida) as well as two regions of the vertebral column (caudal and cervical).

We have removed the background from the toothpick-method photos, as suggested.