

## Reply to Examiner's Reports on the PhD thesis "The use of convergence as a tool in the reconstruction of human past, with special focus on water use in hominin evolution" by Pedro Renato Bender

### Reply to Examiner's Report 1

1. Abstract: the name of „Saci LCA“ hypothesis should not be abbreviated; there should be a brief statement not only on what the hypothesis is about, but also how the hypothesis explains the loss of instinctive swimming (the same way the Unprofitability hypothesis is explained in the final paragraph of the abstract).

*Answer: I changed accordingly and added following sentence: "This model suggests that the loss of swimming ability in hominoids is best explained as a consequence of phylogenetic constraints linked to the adaptation to an arboreal life in the last common ancestor of this taxon."*

2. Some of the phrases are in my opinion extravagant and perhaps misleading, for example "idealistic zonation" (p. 76)

*Answer: I changed accordingly and deleted or replaced the term "idealistic zonation" with the term "oversimplification", "oversimplified environment" or "hypothetical landscape". I kept the term "idealistic zonation" in the Appendix D, as there the term is extensively explained by an analysis of the historical roots of the savannah hypothesis.*

Most of the definitions are Ok. Some, like the definition of the "adaptive focus" (p. 53), I find too vague.

*Answer: Please note that "adaptive focus" is not an attempt to substitute the term "adaptation". To undermine this view I added a summary of the most important points which justify the introduction of the term "adaptive focus". I also changed the term "adaptive focus" to "functional focus". I think that the term is precisely defined: "The total pattern of adaptive and non-adaptive features of an organism which is effectively used or can be used under certain circumstances in its interaction with the environment". We cannot know all the intricate functional changes which occurred during the evolution of a certain trait, but we are able to observe the way how an organism interacts with its environment. For example, we do not know if the ability to learn to swim and dive which is often observed in modern humans was shaped by natural selection. For this reason, it is advisable to use an expression like "the ability to learn to swim and to dive is part of the functional focus of modern humans" instead to label this ability as "exaptation" or "adaptation", since these terms presuppose a knowledge that is yet not available.*

In addition, insertions like "see below" should not be part of the definition.

*Answer: I changed accordingly.*

In definition of "biological constellations" p. 76: "selection" instead of "picking"?

*Answer: I changed the definition accordingly.*

Appendix p. 5: definition of “discrepant organisms” and “epistemological discrepancy” (a synonym?) is not very good. Is discrepant organism a term of the taxa (not only species) that were / are difficult to classify because of their ambivalent morphology (ambivalence being due to convergence)?

*Answer: I changed the definition accordingly (the underlined words were added) and explained that “epistemological discrepant organisms” and “discrepant organisms” are synonymous:*

*“I proposed the term “epistemological discrepant organisms” (or simply “discrepant organisms”) to designate taxa or species difficult to place in a single logical category in pre-Darwinian zoological treatises due to their ambivalent anatomy or behaviour.”*

3. Unprofitability hypothesis: on p. 323, the candidate states that more elaborate argumentation will be presented elsewhere. Why not here in the thesis? Data presented in pp. 334-335 are anecdotal (they should be substituted by more reliable ethological data, if such exist).

*Answer: I added references reviewing the literature on human anti-predatory strategies against large carnivores, focusing on lions. Additionally, I contacted further specialists and quoted them as personal communication. I therefore deleted the sentence “a more elaborate argumentation will be presented elsewhere”.*

If the reference cannot be found (is lost, p. 334, end of the first paragraph) it should be not quoted.

*Answer: I deleted the sentence.*

If I understand the arguments correctly, predators perceive their prey as unprofitable only if they ARE unprofitable, not if they APPEAR unprofitable – thus, a relatively quick change of behaviour of Kruger Park lions, once it “became obvious” that humans with sticks do not represent unprofitable targets any more. So, one assumes that early hominins represented a real danger to large predators. However, to do that they needed considerable level of skill in manipulating sticks/clubs, similar to that of modern humans. It seems difficult to argue that they had such skills.

*Answer: The unprofitability hypothesis does not imply that large predators were hunted or that sticks were thrown like modern spears. The hypothesis implies that hominins were using sticks for a rather passive defence, pointing the sticks towards the predators, which does not imply a higher level of skill in manipulating tools as observed in wild common chimpanzees I added following text to clarify this point:*

*“The unprofitability hypothesis does not imply a higher level of skill in manipulating tools than observed in wild common chimpanzees. For observations on the use of tools in wild common chimpanzees see Pruetz and Bertolani (2007), Nishida and Hiraiwa (1982); Boesch and Boesch (1981); McBeath and McGrew (1982); see also several references on tool-use in aquatic activities in chapter 4.3.3.”*

4. Historical analysis in appendix is carried out very well. At several points candidate rightly criticizes some authors for lack of historical distance and anachronism/presentism. Still some to contain elements of presentism; for example, when he states that “Aristotle’s concept of analogy to explain ... could not be satisfactory...” Well, maybe from today’s perspective but it was more than satisfactory in his time. I would word this differently.

*Answer: I rewrote the passage as following:*

*“Problems in Aristotelian zoology caused by the apparent anomaly raised by dolphins and whales (see Balmer in Aristotle 1993, 66-69) are related to the notion that his biological views were developed without any concept of species mutability (Cole 1944, 36; Mayr 1982, 305-307).”*

Also, the concept of “being ahead of his time” (. 54) is equally problematic as that of a “precursor” (p. 75 footnote).

*Answer: I deleted the passage.*

5 p. 159, last statement in the footnote – I agree, but this started to change, see, for example, Nesse et al. 2010 [.]

*Answer: I added this information and reference to this passage (underlined):*

*“Evolutionary medicine is usually considered as irrelevant in most medical education programs (Nesse et al. 2006; Nesse and Williams 1995), but there are indications that this started to change (Nesse et al. 2010).”*

6. p. 164 Conclusion, part (a) I find this difficult to read I would re-write sentences starting with “First,...” and “Second, ...”.

*Answer: I found a typo in following sentence (verb was missing) and corrected it: “This fact has immediate relevance for modern palaeoanthropological discussion.” I assume this typo caused the confusion. I also changed the paragraph diving it into “First,...” and “Second...” etc..*

#### FORMATING and STYLE

Formatting is very good but at some places Harvard style of referencing is unusual and should be changes. Thus, the candidate uses (at many places) the following style:

“see (Author year)” instead of common “(see Author year)”; similarly: “from (Author year)” instead of “from Author (year)” for example on p. 68 in Figure 3.1 legend states: “from Baumann (1837, 519)”, should be “from Baumann (1837, 519)”.

*Answer: I changed accordingly in the thesis and Appendices.*

Other:

Main text

p. 43, 2<sup>nd</sup> paragraph, line 3 change “knows as” to “known as”

*Answer: I changed accordingly.*

p. 74 footnote: is reference to Vrolik 1795 (second sentence of the footnote) or 1799 [the reviewer means certainly 1795] (third sentence)?

*Answer: The reviewer observed well, I corrected “1797” into “1795”.*

p. 312 is blank.

*Answer: This is a Microsoft Word-version problem; this will be corrected in the final thesis.*

References:

The beginning is not in an alphabetic order.

*Answer: I changed accordingly.*

Some journal names are abbreviated, some given in full

*Answer: I changed accordingly.*

Plavcan JM (p. 356), change “Luwer” to “Kluwer”.

*Answer: I changed accordingly.*

Alexander et al. (357, book name in italics

*Answer: I changed accordingly.*

Begun DR (364), volume is missing.

*Answer: I changed accordingly.*

Hall BK 1994 (391), delete “” from the title.

*Answer: I changed accordingly.*

MacKenzie and Begun (408), this is an abstract but should be cited as a journal publication not a web page.

*Answer: I changed accordingly.*

Wiley-Blackwell Encyclopedia of Human Evolution, delete “team of authors” insert “Wood, B. (ed.)” (also, make the changes in the text, where quoted).

*Answer: I changed accordingly*

Appendix

p. 13, 2<sup>nd</sup> paragraph, beginning of line 3: “was reviewed” instead of “was revised”?

*Answer: I changed accordingly*

p. 14 Figure A.1 does not seem to be complete (empty square to the right?).

*Answer: The empty square in the examiner’s copy must be a mistake resulting from Microsoft Word version problems, as in my original copy there is the text “Discrepant organisms” in the square. I will make sure that this mistake will not be repeated in the final version of the thesis.*

p. 29, 3<sup>rd</sup> paragraph, line 4 “references books” instead of “books used for consultation”?

*Answer: I changed accordingly*

p. 78 is blank,

*Answer: The blank page in the examiner's copy must be a mistake resulting from Microsoft Word version problems. I will make sure that this mistake will not be repeated in the final version of the thesis.*

p. 157 change, 2<sup>nd</sup> paragraph, line 3, change "Grower" to "Grover"

*Answer: I changed accordingly.*

p. 157 and 158 why are D. Morris' and E. Morgan's birth dates given?

*Answer: I deleted Morris' birth date. In the meantime Elaine Morgan passed away, so I gave her birth and death year (1920-2013).*

References:

The beginning is not in alphabetic order.

*Answer: I changed accordingly.*

Some journal names are abbreviated, some given in full (reference style should be uniform).

*Answer: I changed accordingly.*

Johnson CN (p. 202), change "Jurnal" to "Journal"

*Answer: I changed accordingly*

Lovejoy AO (pp 206 and 207) in all relevant references change "John Hopkins Press" to Johns Hopkins Press"

*Answer: I changed accordingly*

Temkin O ((221) – same as for Lovejoy

*Answer: I changed accordingly*

## **Reply to Examiner's Report 2**

This thesis is written in the first person and reference to "I" is perhaps overused. For example, instead of saying "I define the here proposed...", perhaps say "A definition is proposed here..." and (I follow the general meaning expressed...", one could say "The general meaning expressed is followed..."

*Answer: I changed accordingly, with some exceptions, e.g., in the "Declaration", dedication and "Acknowledgements", and in parts where the passive voice would be misleading or complicated.*

The Chapter 7 Conclusion is quite a short paper (only one and a half pages). Consider this to be integrated in the Discussion which could be headed "Discussion and Conclusion".

*Answer: I changed accordingly.*

Use of parentheses throughout e.g. (1958 (1874), 624) does not look right. Perhaps something like (1958 [1874], 624) or similar.

*Answer: I changed accordingly.*

The questionnaire survey does not seem entirely structured. Has it been validated or used before? It does however seem to support the objectives, so this not meant as a criticism.

*Answer: The questionnaire survey was not used before – I developed the questions targeting the specific aims of this review. I therefore listed the questions in the method section. In addition I better explained the methods of the questionnaire survey:*

*“(d) further data on primates’ interaction with water was gathered through a questionnaire survey carried out among chosen zoos, sanctuaries and primatologists, for species or genera where information on water use was missing in the literature. To improve the response rate, the questionnaire asked a few, simple and open-ended questions on observations of primates’ interaction with water, including playing in or at water, wading, feeding in water, sitting in water, swimming, submerging and drowning.”*

In Chapter 4.3., the questionnaire survey is carried out on chosen zoos, sanctuaries, primatologists and private owners of apes. Exactly who were these zoos, sanctuaries, primatologists and private owners of apes? How many were there, and what was the response rate from these entities? Unless I have missed something, I don’t see any example of the actual questionnaire, consent form or similar documentation. I would also have welcomed more detail in the methodology of exactly how these entities were approached to obtain the questionnaire information. I have no doubt that the data was rigorously obtained, but the methodology described in the thesis does not reflect the exact procedure in detail. Was ethical approval to use the apes for the swimming observation obtained?

*Answer: For the reason given below no response rate is available for both questionnaires. More precise information on both questionnaire surveys is given in a footnote to the expression “response rate”:*

*“A list of all zoos, sanctuaries and primatologists contacted is not available, as this research began in the early 1990s as a side project aiming to add information to the extensive literature review. As a result, no record was kept of the persons contacted; only their answers were collected. Therefore, the exact response rate can not be given. Additional answers about non-hominoid primates were also received from primatologists and other specialists working with apes, so that there is no clear delineation between this survey and the one carried out for the apes.”*

*Yes ethical approval to use the apes for the swimming observation was obtained, as explained on page 103: “We would also like to clarify that we have ethical clearance from the Animal Ethics Screening Committee of the Witwatersrand University for our study (Bender and Bender 2014, 165)”. This information was also added in the method section of chapter 4.4.*

Specific comments and corrections:

Check numbering of the initial pages; these should be in Roman numerals starting with the declaration at Pg. ii through to the list of tables on Pg. xiv.

*Answer: I changed it accordingly.*

Pg. 13 is black.

*Answer: The blank page in the examiner's copy must be a mistake resulting from Microsoft Word version problems. I will make sure that this mistake will not be repeated in the final version of the thesis.*

P. 17 Line 4 – Remove extra space for period. Please check this throughout, including the references at the end.

*Answer: I changed it accordingly.*

Pg. 9 Line 9 – space for comma. Please check this throughout.

*Answer: I changed it accordingly.*

P. 24 8<sup>th</sup> line from the bottom; Morris 2008, not Conway Morris. The references at the end make it clear which Morris this is.

*Answer: Please note that Simon Conway Morris is usually quoted as Conway Morris, Simon (e.g. by S.J.Gould or by George R. McGhee); library catalogues also use this form. I therefore keep this usual form.*

Pg. 24 Fourth line from the bottom; cite McGee here. “..... phenomenon of convergent evolution (McGee 2011). Next line ending on Pg. 25, also cite Morris 2008.

*Answer: I changed accordingly (but as “Conway Morris 2008”, see above).*

Pg. 45 line 3 “countless” instead of “uncountable”.

*Answer: I changed accordingly, also in another place.*

Pg. 59 second paragraph; “In certain regions of Morocco...” citation?

*Answer: It is not a quotation, but a fictitious example. I added the word “fictitious” to the sentence to clarify this point: “These examples serve to illustrate the differences between the terms “adaptation” and “functional focus”, which can be seen in following fictitious sentence”.*

Pg. 97 Point (8) “... in order to detect biologically...”

*Answer: I changed accordingly.*

P. 98, “Although it is impossible to be critical towards all aspects pertinent to your own research,...” would read better as “although it is impossible to be critical towards all aspects pertinent to one’ own research,...” or perhaps “Although it is impossible to be entirely objective towards all aspects pertinent to one’s own research...”

*Answer: I changed accordingly using the second option.*

Pg. 110 4.2.2., last sentence of paragraph, “...I should contact in this regard?”

*Answer: I changed accordingly.*

Pg. 112 blank

*Answer: The blank page in the examiner's copy must be a mistake resulting from Microsoft Word version problems. I will make sure that this mistake will not be repeated in the final version of the thesis.*

Pg. 124 Simply say "Fooden (2000) summarized ..." Instead of citing at the end of the sentence.

*Answer: I changed accordingly.*

P. 151 to 152 perhaps put the Genus and species next to the common ape name, e.g. Gorilla (Gorilla gorilla gorilla) and Common chimpanzee (Pan troglodytes). I suggest that you do this throughout. Also move the heading "Gorillas" from the bottom of page 151 to the top of Pg. 152.

*Answer: I changed accordingly in all section titles.*

Pg. 251 Table 5.2 Cultures for which swimming, diving or bathing was reported. Would it be possible to include out of how many cultures this random selection for each region was obtained? This would show that Bender indeed covered a substantial number of cultures. It seems that these aquatic behaviours recorded represent the "at least" number, potentially being more.

*Answer: I wrote following sentences to explain this issue:*

*"I asked Carol Ember, president of Human Relations Area Files at Yale University, how representative are the data here used for humanity as a whole. She answered:*

*The question asked is not that easy to answer. First, there is no definitive list of the world's cultures as yet that can be used as a sampling frame. Therefore, without a sampling frame, it is not possible to have a random sample of the world's cultures. Second, the HRAF Collection of Ethnography (with eHRAF World Cultures as a subset) does not claim to be a random sample. Therefore it does not claim to be a representative sample. However, in the absence of an adequate sampling frame, most researchers have chosen a cross-cultural sample, not of their own choosing, to sample from. (Carol Ember, pers. comm.)*

*In the context of this thesis, it is relevant to note and stress the evidence that the eHRAF database was not designed with a specific aim of excluding or including data on aquatic activities; consequently no bias in this respect may be expected."*

*Furthermore, I added additional information in following footnote to the description of the number of cultures chosen:*

*"The eHRAF was built up historically, using data available in the literature, and is growing constantly. When the present research was carried out from 26 June to 3 October 2012, 257 cultures were included. Now (25 July 2014), the number has increased to 289. According to the eHRAF website, "Every year 20-30 cultures with approximately 40,000 pages are added to eHRAF" (<http://hraf.yale.edu/online-databases/ehraf-world-cultures/cultures-covered/by-regions-and-subsistence/>)."*

Pg. 312 blank page

*Answer: This is a Microsoft Word-version problem; this will be corrected in the final thesis.*



Pg. 334 Half-way down the page “...(I lost this reference)...”; reference should be found and cited, otherwise the story should be omitted.

*Answer: I deleted the sentence.*

## Reply to Examiner’s Report 3

A reference should be in brackets only when it refers inferentially to a statement made in the same sentence: thus, on p. 18, in the second paragraph, the references in brackets that go from line 3 onto line 5 are entirely appropriate. But when the reference is preceded by a verb such as “see”, it becomes part of the sentence, and only the date (and any pagination that is included) should be in brackets. Thus, in the same paragraph, on line 4 from the end, the reference should not be in brackets; it should read “...that biological structures should be matched to functional requirements; see Weibel (1998) and other chapters in the same book”. Note the referencing that starts at the end of the page and goes over the next page: the partial sentence that includes the referencing is correctly done, as for example on p. 29, on line 9, “...proposed by Haas and Simpson (1946).

*Answer: I changed accordingly.*

A very minor point, which could even be said to be pleasantly idiosyncratic, is the use of occasional un-Englishisms, such as “an own hypothesis”.

*Answer: I tried to identify such un-Englishisms and change them.*

I fear that the term “paralogy” has been misunderstood on p. 26, line 12. It would perhaps have been useful to have a glossary, giving in one place the definitions of new or re-defined terms (“interlocking point”, “adaptive focus”, etc.).

*Answer: “Paralogy” is now defined as “(b) homologous sequences created by a gene duplication, that is related to another gene in the same genome (paralogy).”*

P. 28 Para. 2, Line 8 “modern cladists seems” ...

*Answer: I changed to “modern cladists seem”...*

p. 32, fn.11, first Line, delete the comma after “Chauncey D. Leake (1964)”

*Answer: I changed accordingly.*

p. 36, line 14, insert the word “of” in “the use convergent patterns”.

*Answer: I changed accordingly.*

p. 38, para.3, line 5, insert the word “in” in “can be found D’Arcy...” – The first word of the last line on that page should surely be “squatters”.

*Answer: I changed accordingly.*

p. 43, para. 2, line 3, “knows” for “known”. – On line 8, the syntax has gone awry.

*Answer: I changed both sentences accordingly. The second sentence reads as follows:*

*“In Rudwick’s hypothesis, richthofeniaceans were not feeding by ciliary action, as common in most brachiopods, but by this rhythmic flow mechanism. Rudwick demonstrated that many of the anomalous morphological traits of the richthofeniaceans could be explained as intrinsic parts of this feeding mechanism.”*

p. 56, para. 4, line 3, “a” is superfluous. – On the second line from the bottom, “Penguin’s” should be “Penguins”.

*Answer: I changed accordingly.*

p. 58, para.2, ends very awkwardly and ungrammatically.

*Answer: I changed accordingly. The sentence reads now as follows:*

*“For these goats, the ability to climb on trees is probably an important aspect of their functional focus, as food in this region is scarce. However, it is reasonable to assume that the ability to climb trees was primarily shaped in connection with the mountain habitats of wild goats (Capra aegagrus) ancestor – climbing on rocks and not on trees.”*

p. 67, third line from the end – there is no Fig. 3.1. (f).

*Answer: The empty figure in the examiner’s copy must be a mistake resulting from Microsoft Word version problems, as in my original copy there is figure 3.1. (f). I will make sure that this mistake will not be repeated in the final version of the thesis.*

p. 70, fn.26 – where does the quotation end?

*Answer: I corrected the footnote accordingly.*

p. 73, para.2, line 4: “apes” should be “apes”.

*Answer: I changed accordingly.*

p. 77: the second paragraph should end with “)”.

*Answer: I changed accordingly.*

p. 82, line 4, delete the comma after the bracket.

*Answer: I changed accordingly.*

p. 101, line 7 from end, “these data is”. Given that the word “data” is a plural, and is correctly preceded by “these”, the next word should be “are”.

*Answer: I changed accordingly, throughout the thesis.*

p. 103, last line: “personal” should be “personnel”.

*Answer: I changed accordingly.*

p. 104, fn.36, “chimpanzee’s” and “gorilla’s” should be “chimpanzees” and “gorillas”.

*Answer: I changed accordingly.*

p. 114, first item in table: what on earth is “Cebus capuchin”? Given that the title of the paper referred to includes “Cebus apella”, it should be in any case listed under Sapajus. Incidentally, it is good to see that the candidate is bang up to data with taxonomic advances.

*Answer: I changed accordingly.*

p. 148, on first line, the full name of the sanctuary is Lola ya Bonobo.

*Answer: I changed accordingly, throughout the thesis.*

p. 223, line 3: I see that Lucy was born in 1996, yet was already undergoing ASLD training in October 1970!

*Answer: I changed the birth year to “1964”.*

p. 252, at the beginning of the second paragraph, “frequent as in their regions of origin or less” is incorrect syntax.

*Answer: I changed to “For immigrant populations in North America, aquatic activities are described as frequently as in their regions of origin, or less frequently.”*

p. 282, para. 3, line 5, “Yanoama” should presumably be Yanomama.

*Answer: There are several variants for the name of the Yanoama, like Yanomama, Yanomamö or Yanomami. As indicated in footnote 70, I follow the eHRAF terminology for all cultures, including Yanoama.*

p. 306, para. 2, open with “...three very early potential taxa were described” – then four are named!

*Answer: Four species of three genera are described. I changed “taxa” to “species”, writing “four very early potential hominin species”.*

p. 309, third to second lines from bottom, “of” is missing.

*Answer: I changed accordingly*

p. 324, second line from end, “few scientists could not resist the temptation” is ungrammatical.

*Answer: I replaced “few” with “some”.*

p. 343, para.3, lines 2-3: “very few data... is available” should be “are available”.

*Answer: I changed accordingly.*