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Peer review history for:

Weij R, Baker SE, Edwards TR, Kibii J, Luti G, Pickering R. Taung and beyond: The mining history, geology and taphonomy of *Australopithecus* in South Africa. *S Afr J Sci.* 2025;121(1/2), Art. #18509. <https://doi.org/10.17159/sajs.2025/18509>

HOW TO CITE:

Taung and beyond: The mining history, geology and taphonomy of *Australopithecus* in South Africa [peer review history]. *S Afr J Sci.* 2025;121(1/2), Art. #18509. <https://doi.org/10.17159/sajs.2025/18509/peerreview>

Reviewer 1: Round 1

Date completed: 03 August 2024

Recommendation: Accept / **Revisions required** / Resubmit for review / Resubmit elsewhere / Decline / See comments

Conflicts of interest: None

Does the review fall within the scope of SAJS?

Yes/No

Is the review written in a style suitable for a non-specialist and is it of wider than only specialist interest?

Yes/No

Do the Title and Abstract clearly and accurately reflect the content of the review?

Yes/No

Does the review provide a significantly novel perspective or significant recent advances in the field?

Yes/No

Is the objective of the review concisely stated?

Yes/No

Is appropriate and adequate reference made to other work in the field?

Yes/No

Do current debates and points of contention receive appropriate coverage?

Yes/No/Not applicable

Are gaps in the literature adequately identified?

Yes/No/Not applicable

Does the review provide direction for future research?*

Yes/No/Not applicable

Are the methodology and statistical treatment appropriate?

Not applicable/Yes/No/Partly/Not qualified to judge

Are the interpretations and recommendations aligned with the objective?

Yes/Partly/No

Please rate the manuscript on overall contribution to the field

Excellent/Good/Average/Below average/Poor

Please rate the manuscript on language, grammar and tone

Excellent/Good/Average/Below average/Poor

Is the manuscript concise and free of repetition and redundancies?

Yes/No

Is the supplementary material relevant and separated appropriately from the main document?

Yes/No/Not applicable

Please rate the manuscript on overall quality

Excellent/Good/Average/Below average/Poor

If accepted, would you recommend that the article receives priority publication?

Yes/**No**

Are you willing to review a revision of this manuscript?

Yes/**No**

Select a recommendation:

Accept / **Revisions required** / Resubmit for review / Decline

With regard to our policy on 'Publishing peer review reports', do you give us permission to publish your anonymised peer review report alongside the authors' response, as a supplementary file to the published article? Publication is voluntary and only with permission from both yourself and the author.

Yes/**No**

Comments to the Author:

Thank you for asking me to review this paper. It does not report the results of a traditional scientific study, but it clearly belongs in the special issue and provides important context to our understanding of South African palaeoanthropological sites, Taung in particular. I have some suggestions to make the paper more impactful, but I have no issues to report with the content (bearing in mind that I do not work in SA and am less familiar with the history of our discipline there).

I very much appreciate this contribution. It reviews the geological history of australopith cave sites and the recent cultural history of human exploration of them, highlighting how the two intersect. Anyone wanting to learn the basics of SA cave geology need only turn to this paper to learn or remind themselves about the geological processes at play. These sections are incredibly useful and cogent. The cultural history of exploration and excavation is weaker, but this may be the way the review sets itself up to give visibility to people who have been ignored in narratives of scientific endeavours. From the significance statement and abstract I was expecting much more of this with greater detail on some of these forgotten individuals – and I was definitely expecting to hear about the forgotten females, but there was not a single mention of how women were involved in any of the activities covered by the paper. From the title, I was also expecting a greater focus on taphonomy.

Having thought about how the current framing and the bulk of the text are presented, I feel something of a disjoint between them, and thus my most substantive suggestion is to reframe this paper to be clear that it covers geological history and the subsequent study of the caves with a focus on Taung. The obvious bridge between these two things (geological history and history of exploration) is that the specific geological processes created caves of interest to the mining industry who came in and began blasting the sites which, in turn, exposed how significant the fossil material was, leading to scientific work there. Through both the mining and scientific exploration, Black and Chinese people have been exploited to achieve aims that were met but then attributed to the white people who had colonised the region – this should be acknowledged and described as it already is, but some explicit discussion of women should be added. However, I might not emphasise this aspect of the paper in the significance statement or abstract. It should be incorporated as part of the history of the site, but I often feel as authors that we should do this in many of our papers and without explicitly noting that this is 'special'. Of course it is different to some extent because there has been so little attention here before, but I do believe that we should not state this as a unique or special goal of our work. It is simply the right thing to do. I will leave this as a decision for the authors or editor to consider. So – to summarise my main suggestion: reframe this paper with the two major goals in mind – reviewing the geological history and the history of scientific study, emphasising how they intersect – in doing so, the discrimination and exploitation of human populations will naturally be part of the story, whilst taphonomic conditions of the fossil material and palaeoclimatic information arising from the specific geological history of the site will emerge as a natural part of that side of the story. This reframing will necessitate a new title which at present does not indicate the totality of what is in the text, and some revisions to the abstract and significance statement. It will likely benefit from some restructuring as well, so that there are fewer separate sections which at present don't always have obvious linkages.

In the reframing as suggested above, there are a few areas where I think that more specific information

about or emphasis on Taung would be useful. This issue is about Taung, so it makes sense to use it as the primary example, wherever possible, of how natural and cultural processes and mechanisms impact our interpretation of the data that we extract from cave sites. Taung is clearly mentioned in addition to Sterkfontein and Makapans Valley in the current abstract, but Taung and Sterkfontein show up in the text far more often than Makapansgat; there are also other South African sites noted at times. It would make sense to give Taung 'pride of place' and use the other sites only when necessary (i.e. because Taung can't be used to illustrate a relevant point). Below I note a few of these areas with corresponding line numbers.

The one other change to this paper that feels necessary is more of an enhancement - a map! A map with each site - and a key that indicates things such as the years of mining work, the focus of mining (lime, etc), and any other relevant info - would be extremely helpful. The map would, in essence, serve as a visual summary of the paper.

Below I provide some additional questions and suggestions by line number:

Line 10 – change research to summary or review

Line 20-22 – sentence beginning "This taxon" should be deleted from the revised abstract

Line 44 – sentence beginning "These caves..." should be deleted as it feels out of place and too detailed.

Line 48 – hominid or hominin? This term is used inconsistently.

Line 100 – remove 'became stuck' as 'unable to exit' covers this possibility amongst others.

Line 181 – I would suggest adding something about the significance of specimen StW573 – not a lot of info, just an additional clause to the sentence as many readers won't know exactly what this specimen represents.

Line 180-194 – here is an example of some text that illustrates my point above about making Taung the main site referenced in the paper (and generally the need to be clearer from the outset that the other sites are going to be used secondarily). The first site mentioned in this section is Sterkfontein in line 180. Only the final paragraph is about Taung. There is no mention of Makapansgat specifically, which is strange because it is currently in the abstract suggesting it will get the same coverage as the other two sites.

Line 224 – Bolt's Farm is referenced but hasn't been introduced or given any contextual info. Not all readers will know how this site fits into the overall story of early hominin evolution in South Africa.

Line 225 – the point about ex situ blocks is really interesting and here I wondered if more detail would be useful (some references to studies that have tried to associate them, info on where they are stored, what work has been done on them, have any hominins been recovered from them)

Line 276 – honour might be a better term than 'immortalise'

Line 277 – It might help to be explicit about the nickname. I am not familiar with it and don't know if it is the discoverer's first name, surname, or both.

Line 286 – hominid or hominin?

Line 310-312 – I would suggest expanding on this with a relevant Australopithecus example(s)

Line 321 – who pushed for this – the scientists, the government, some of the typically unseen people who might be mentioned here?

Line 352 – add the original reference(s)

Line 358 – species or skeletal composition (or both)? Archaeologists and anthropologists/ecologists may think of this term as meaning different things so it might be worth specifying.

Line 362 – replace 'multipronged' with something like 'has taken a multiproxy approach'

Line 365 – delete 'there have been'

Line 367 – an avian reference is missing

Line 367 – when you say 'faunas' do you mean assemblages that have been accumulated and/or damaged by these groups of animals?

At the end of section 6 it might be interesting to discuss how the impacts of mining damage to fossils have impacted studies of the hominins, other fauna, or the geology of the caves. The mining industry is part of the taphonomic history of the material after all, and mining history is an important part of this paper.

Line 376 – a single individual can't accumulate, as such.

Section 7 – This is a very brief section – I don't think it merits being its own section because of how short it is. Can more be said? If not, incorporate it elsewhere and don't emphasise this aspect of the paper in the

rewritten abstract.

Line 401 – include some example references after ‘some authors’

Line 430 – not all readers will know what the Global Meteoric Water Line is

Line 430-432 – the idea in this sentence isn’t fleshed out quite enough – which hypotheses from earlier studies can be tested?

Line 439 – allow, not ‘allows’

Line 441 – it would be nice if South African researchers could be centred here with some examples of relevant studies and important findings from these labs

Line 443-444 – why is there a lack of standardisation? Is it due to some impact of the mining industry, geology in different caves, methods brought by different teams from different educational backgrounds?

Line 468 – imported is not the right word.

Line 475 – This is an odd thing to say in my opinion because SA already is positioned to offer – and does do - world-class research in these areas.

Line 478 – it might be nice to end on some examples of issues related to Taung specifically or *Australopithecus africanus* generally that can be explored with the new speleothem or 3D imaging labs referred to here.

Author response to Reviewer 1: Round 1

Thank you for asking me to review this paper. It does not report the results of a traditional scientific study, but it clearly belongs in the special issue and provides important context to our understanding of South African palaeoanthropological sites, Taung in particular. I have some suggestions to make the paper more impactful, but I have no issues to report with the content (bearing in mind that I do not work in SA and am less familiar with the history of our discipline there).

AUTHOR: Thank you for asking me to review this paper. It does not report the results of a traditional scientific study, but it clearly belongs in the special issue and provides important context to our understanding of South African palaeoanthropological sites, Taung in particular. I have some suggestions to make the paper more impactful, but I have no issues to report with the content (bearing in mind that I do not work in SA and am less familiar with the history of our discipline there).

I very much appreciate this contribution. It reviews the geological history of australopith cave sites and the recent cultural history of human exploration of them, highlighting how the two intersect. Anyone wanting to learn the basics of SA cave geology need only turn to this paper to learn or remind themselves about the geological processes at play. These sections are incredibly useful and cogent. The cultural history of exploration and excavation is weaker, but this may be the way the review sets itself up to give visibility to people who have been ignored in narratives of scientific endeavours. From the significance statement and abstract I was expecting much more of this with greater detail on some of these forgotten individuals – and I was definitely expecting to hear about the forgotten females, but there was not a single mention of how women were involved in any of the activities covered by the paper. From the title, I was also expecting a greater focus on taphonomy.

AUTHOR: We thank the reviewer for their positive feedback. We appreciate pointing out that we have not mentioned the role of females. Please see our response below for more detail.

We have edited and expanded the significance statement to more accurately reflect the themes discussed in our review. We have, however, left our statements about forgotten individuals as we believe that we do quite extensively discuss them, dedicating two sections and two pages of our manuscript to this topic.

We agree that our current title suggests a stronger focus on taphonomy. We have modified our title, significance statement, abstract and introduction to address this comment.

Having thought about how the current framing and the bulk of the text are presented, I feel something of a disjoint between them, and thus my most substantive suggestion is to reframe this paper to be clear that it covers geological history and the subsequent study of the caves with a focus on Taung. The obvious bridge between these two things (geological history and history of exploration) is that the specific geological processes created caves of interest to the mining industry who came in and began blasting the sites which, in turn, exposed how significant the fossil material was, leading to scientific work there.

AUTHOR: We agree and have reframed our introduction to better introduce the scope of our review. Because the reviewer summarized the link between the geological and exploration history so nicely, we took the liberty to rewrite and incorporate the sentence from their comment above in our introduction.

Through both the mining and scientific exploration, Black and Chinese people have been exploited to achieve aims that were met but then attributed to the white people who had colonised the region – this should be acknowledged and described as it already is, but some explicit discussion of women should be added. However, I might not emphasise this aspect of the paper in the significance statement or abstract. It should be incorporated as part of the history of the site, but I often feel as authors that we should do this in many of our papers and without explicitly noting that this is ‘special’. Of course it is different to some extent because there has been so little attention here before, but I do believe that we should not state this as a unique or special goal of our work. It is simply the right thing to do. I will leave this as a decision for the authors or editor to consider.

AUTHOR: This is a critically important but often difficult question to answer as there are few references to the role of women in early historical documents. In the instance of the Chinese immigrant in particular at least, we know that only six women were ‘imported’, and there is no information I have found regarding their roles. Chinese immigrants were brought in on four-year contracts and housed in isolated compounds with limited space and movement restrictions. Even the Chinese cooks and ‘compound police’ (fellow Chinese men brought in to control those living in the camps) were Chinese men. It is safe to assume though, that even in the Black mining communities, women were not mining as gendered roles were strictly observed during this period. Of course, women were involved in subsidiary activities outside of the mining operations (such as cooking) but little is discussed in this regard. The reviewer makes an excellent suggestion about how to shape discussions on women's roles in future publications, but in this instance it is difficult. In order to mitigate this, we have changed ‘men’ to people, to better represent that we are discussing all genders’ activities in these mining operations:

Lines 503-505:

*“These **people** ~~men~~ worked in cramped and hazardous situations, leading to over 69,000 mineworker deaths between 1900 and 1993, and more than a million were maimed or seriously injured (see Leon et al. 1995).”*

Additionally, we have added the following sentence to the end of the first paragraph of this section (lines 508-509):

“...Although obviously around, there are no mentions of women in the literature, meaning they are also erased from these histories, and that only White men received the credit for the mining and fossils and everyone else (including women of all colours) was historically excluded.”

So – to summarise my main suggestion: reframe this paper with the two major goals in mind – reviewing the geological history and the history of scientific study, emphasising how they intersect – in doing so, the discrimination and exploitation of human populations will naturally be part of the story, whilst taphonomic conditions of the fossil material and palaeoclimatic information arising from the specific geological history of the site will emerge as a natural part of that side of the story. This reframing will necessitate a new title which at present does not indicate the totality of what is in the text, and some revisions to the abstract and significance statement. It will likely benefit from some restructuring as well, so that there are fewer separate sections which at present don’t always have obvious linkages.

AUTHOR: The paper has been reframed such that the sections follow each other more logically. To this end, we have removed redundant section headings and tried to link subsequent sections better. Also we have tried to highlight Taung as much as possible. We agree with the reviewer that our former title did not fully capture the scope of this review and have rephrased it to address this comment.

We also had to remove the numbering of our sections to follow the journal’s editorial guidelines. We therefore have no more “main” sections with subsections. We looked critically into merging some sections, but we believe our current sections are still appropriate and that it helps the reader to have multiple confined sections rather than long ones. However, to address this comment, we have tried to improve the transitions between sections to make their linkages more obvious.

In the reframing as suggested above, there are a few areas where I think that more specific information about or emphasis on Taung would be useful. This issue is about Taung, so it makes sense to use it as the primary example, wherever possible, of how natural and cultural processes and mechanisms impact our interpretation of the data that we extract from cave sites. Taung is clearly mentioned in addition to Sterkfontein and Makapans Valley in the current abstract, but Taung and Sterkfontein show up in the text far more often than Makapansgat; there are also other South African sites noted at times. It would make sense to give Taung 'pride of place' and use the other sites only when necessary (i.e. because Taung can't be used to illustrate a relevant point). Below I note a few of these areas with corresponding line numbers.

AUTHOR: We agree with the reviewer in this regard and have rewritten or reorganised sections of the manuscript to better reflect Taung as the focus of the paper. As Taung is one site in the UNESCO Fossil Hominid Sites of South Africa, we do still reference the Cradle of Humankind and Makapansgat frequently. Additionally, due to the high number of fossil sites in the Cradle there is simply much more literature to draw upon and since this is a review it was often necessary to lean on these sites when information directly pertaining to Taung was not available. We hope our changes better reflect the reviewer's comment and give Taung 'pride of place'.

The one other change to this paper that feels necessary is more of an enhancement - a map! A map with each site - and a key that indicates things such as the years of mining work, the focus of mining (lime, etc), and any other relevant info - would be extremely helpful. The map would, in essence, serve as a visual summary of the paper.

AUTHOR: We thank the reviewer for this suggestion and have now included a map that shows the sites including the underlying geology. In this figure, we also summarize the years of mining work and focus of mining per site as suggested.

Below I provide some additional questions and suggestions by line number:

Line 20-22 – sentence beginning "This taxon" should be deleted from the revised abstract

AUTHOR: We have replaced "taxon" with "species". We are unsure though why this sentence should be removed. In our opinion, it is relevant for setting up the story: South Africa hosts a rich record of hominin fossils, including *Australopithecus africanus*, the species that was first described by Dart and really sparked research in human evolution in South Africa.

Line 44 – sentence beginning "These caves..." should be deleted as it feels out of place and too detailed.

AUTHOR: We believe this is important geological background, particularly as we set off to review the geological history. We therefore kept this sentence but tried to be more specific and now also refer to our new Figure 1, showing a geological map and the dolomite host rocks overlain by the three hominin fossil sites.

Lines 46-47:

"These caves and palaeocave remnants formed within the Palaeoproterozoic Malmani (the Cradle and Makapan Valley) and Reivilo (Taung) Dolomites within the Transvaal Supergroup (Walraven & Martini 1995) (Figure 1)."

Line 48 – hominid or hominin? This term is used inconsistently.

AUTHOR: We thank both reviewers for pointing out this inconsistency – we have changed this throughout the manuscript to "hominin".

Line 100 – remove 'became stuck' as 'unable to exit' covers this possibility amongst others.

AUTHOR: We have removed this.

Line 181 – I would suggest adding something about the significance of specimen StW573 – not a lot of info, just an additional clause to the sentence as many readers won't know exactly what this specimen represents.

AUTHOR: We have added this (lines 444-446):

*"...An attempt to date the near complete *Australopithecus* specimen 'little foot' (StW573) from Sterkfontein via cosmogenic nuclide burial dating resulted in an age of 3.67 ± 0.16 Ma (Granger et al. 2015)."*

Line 180-194 – here is an example of some text that illustrates my point above about making Taung the main site referenced in the paper (and generally the need to be clearer from the outset that the other sites

are going to be used secondarily). The first site mentioned in this section is Sterkfontein in line 180. Only the final paragraph is about Taung. There is no mention of Makapansgat specifically, which is strange because it is currently in the abstract suggesting it will get the same coverage as the other two sites.

AUTHOR: Thank you for this feedback. We have now added an introduction to this section, and moved Taung to the beginning (lines 318-324), so that it is more clearly showcased in the context of dating the caves and their fossils (lines 152-165). Makapansgat is now mentioned in line 368.

New introductory paragraph (lines 312-316):

“There are several analytical techniques well suited to dating fossil cave sites and remains. The method used depends on the type of material (clastic sediment, speleothem, bone, tooth enamel) and the suspected age. Due to the limited range of methods applied to dating the Taung site, we refer to the wider UNESCO Fossil Hominin sites of South Africa (including Taung, the Cradle of Humankind and Makapan Valley).”

From line 368:

“...As well as Taung, palaeomagnetic analysis has been applied at Makapansgat (Herries et al. 2013) and a number of Cradle sites including Bolt’s Farm (Edwards et al. 2020;2023), Sterkfontein (Pickering & Herries 2020), Drimolen (Herries et al. 2020), Gondolin (Herries et al. 2006b), Gladysvale (La Cruz et al. 2002) and Kromdraai (Thackeray et al. 2002).”

Line 224 – Bolt’s Farm is referenced but hasn’t been introduced or given any contextual info. Not all readers will know how this site fits into the overall story of early hominin evolution in South Africa.

AUTHOR: We have altered this section a little. It is important to note in this response that, in light of the fossil evidence, Bolt’s Farm does *not* have a large role to play in the overall story of early hominin evolution in South Africa as there are no hominin fossils known from this site. Bolt’s Farm is only referenced here in passing due to the mixing of *ex situ* dumps blocks during mining. We have tried throughout to better center Taung in this paper and we feel it does not help for the purpose of the manuscript to give a broad introduction to Bolt’s Farm here. However, we do agree that not all readers will know about Bolt’s Farm, so by rephrasing the corresponding sentence we have tried to make clear that this site is simply an example for *ex situ* blocks.

Lines 284-287:

“...Though blocks of fossil-bearing sediments were certainly not transported between caves, they were, in some instances, inadvertently mixed where the cave contained multiple depositional sequences (e.g., ~~such as~~ Bolt’s Farm (Edwards et al. 2019)). To date, it has been almost impossible to associate ex situ breccia blocks with the exact stratigraphic loci they originated from.”

Line 225 – the point about *ex situ* blocks is really interesting and here I wondered if more detail would be useful (some references to studies that have tried to associate them, info on where they are stored, what work has been done on them, have any hominins been recovered from them)

AUTHOR: We agree with the reviewer that it is an interesting idea. However, there is not much in the literature regarding studies that attempt to re-associate blocks with *in situ* deposit, though we are sure it is something researchers have worked on themselves. We have included a study from the Cradle which attempted to associate fossil rich block dumps from Waypoint 160 with the remaining deposit at lines 486-492:

*“...Though blocks of fossil-bearing sediments were certainly not transported between caves, they were, in some instances, inadvertently mixed where the cave contained multiple depositional sequences (e.g., ~~such as~~ Bolt’s Farm (Edwards et al. 2019)). To date, it has been almost impossible to associate ex situ breccia blocks with the exact stratigraphic loci they originated from. *There has, however, been one study which recovered a fragment of primate tooth from an ex-situ block and successfully located a remaining piece of the same tooth from in-situ sediment at Waypoint 160, Bolt’s Farm (Gommery et al. 2019).*”*

Line 276 – honour might be a better term than ‘immortalise’

AUTHOR: We have followed this suggestion.

Line 277 – It might help to be explicit about the nickname. I am not familiar with it and don't know if it is the discoverer's first name, surname, or both.

AUTHOR: We now explicitly mention that the specimen has been nicknamed 'Simon'.

Line 286 – hominid or hominin?

AUTHOR: As detailed above: hominin.

Line 310-312 – I would suggest expanding on this with a relevant Australopithecus example(s)

AUTHOR: We have adjusted the sentence to incorporate this suggestion (lines 632-634): *Some important hominin fossils have been recovered from mine dumps, such as the enigmatic Gondolin molar GDA-2, however only inferences can be made on their possible origin (Menter et al. 1999).*

Line 321 – who pushed for this – the scientists, the government, some of the typically unseen people who might be mentioned here?

AUTHOR: It is actually not clear who. The original text for this information (<chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.saimm.co.za/Journal/v070n01p013.pdf>) simply states that the intention was there and that it prompted the owner of White Limes to explore alternative mining options in the Northern Cape.

Line 352 – add the original reference(s)

AUTHOR: We have added Brain (1981).

Line 358 – species or skeletal composition (or both)? Archaeologists and anthropologists/ecologists may think of this term as meaning different things so it might be worth specifying.

AUTHOR: We have clarified this statement to prevent confusion as follows:

"...Though earlier researchers were primarily concerned with the taxonomic composition of vertebrate remains in the caves in South Africa."

Line 362 – replace 'multipronged' with something like 'has taken a multiproxy approach'

AUTHOR: We have replaced this.

Line 365 – delete 'there have been'

AUTHOR: Done.

Line 367 – an avian reference is missing

AUTHOR: Thanks for catching this. We have included the reference (Pokines et al. 2021a).

Line 367 – when you say 'faunas' do you mean assemblages that have been accumulated and/or damaged by these groups of animals?

AUTHOR: We have changed 'faunas' to accumulators to better reflect that we are discussing the role that these groups of animals play in accumulating materials.

At the end of section 6 it might be interesting to discuss how the impacts of mining damage to fossils have impacted studies of the hominins, other fauna, or the geology of the caves. The mining industry is part of the taphonomic history of the material after all, and mining history is an important part of this paper.

AUTHOR: The following paragraph was added (lines 711-724):

"Taphonomic studies on the impact of mining on fossils directly have not been done. That said, the broader impact of dynamite blasting for speleothem in caves has certainly impacted cave geology and interpretation, with nearly every site in the Cradle of Humankind preserving a fossiliferous 'miners dump'. Several of these dumps (such as that of Gondolin mentioned above, Menter et al. 1999; and those of Bolts Farm, e.g., Gommery et al. 2008) have been explored and retain critical information of taxonomic information, albeit anchoring these specimens into the broader context of the site geology and stratigraphy is near impossible. In some instances, such as Australopithecus prometheus "Little Foot" and Australopithecus sediba, fossil finds in the dumps have been placed in actual in situ stratigraphic locations in the caves and resulted in discovery of partial skeletons (Clarke 1998; Berger et al. 2010). Early writers, such as Eitzman (1958), recount instances of how mining operations destroyed large portions of the record and these accounts are well summarised by Dusseldorp (2022). Unfortunately, despite mining operations in the

Cradle having ended many decades ago, gold mining operations further afield still impact on the integrity of the Cradle with mine effluent threatening the local environment and waterways (Durand et al. 2010)."

Line 376 – a single individual can't accumulate, as such.

AUTHOR: Well pointed out! We have adjusted this section heading as follows:

"The curious case of the Taung Child's taphonomy"

AUTHOR: Section 7 – This is a very brief section – I don't think it merits being its own section because of how short it is. Can more be said? If not, incorporate it elsewhere and don't emphasise this aspect of the paper in the rewritten abstract.

AUTHOR: We agree that the section is too short to emphasise it as we did in the original abstract. We have removed the following sentence from the abstract at line 28: *"We look into the taphonomy of the Taung child fossil itself, which is unusual in the context of other similar aged fossils."*

As mentioned earlier, we also had to remove the numbering of our sections to follow the journal's editorial guidelines. We therefore have no more "main" sections with subsections.

Line 401 – include some example references after 'some authors'

AUTHOR: We have rewritten this section to improve the flow and reduce our word count and we have adjusted this sentence to direct readers to the summarised texts in Baker 2013 to avoid adding additional references to our text:

"...Additional taphonomic features have now been recognised (see Baker, 2013 for a full list)."

Line 430 – not all readers will know what the Global Meteoric Water Line is

AUTHOR: We thank the reviewer for pointing this out and have clarified this at lines 789-873 as follows:

"...Fluid inclusion stable isotopes also quantify rainfall amounts and source, and allow for direct comparison with the Global Meteoric Water Line (i.e., the global annual average, linear relationship between oxygen and hydrogen isotope ratios in meteor water)."

Line 430-432 – the idea in this sentence isn't fleshed out quite enough – which hypotheses from earlier studies can be tested?

AUTHOR: We have expanded this sentence and now explain which hypotheses can be tested based on three publications cited here (lines 873-878):

"...ProducingFurthermore, such a multi-proxy record from the already dated cave sites will allows us to test the hypotheses in earlier studies, that is, that in the wider Cradle region, 1) rainfall variability is modulated by orbital precession (Hopley et al. 2018), 2) the two alternating sedimentation modes, speleothem vs. clastic, represent wet and dry conditions respectively (Pickering et al. 2019), and 3) orbital eccentricity cycles (100, 400 and 2400 ka) influenced long-term aridity trends in southern Africa (Chase, 2021)."

Line 439 – allow, not 'allows'

We have corrected this.

AUTHOR: Line 441 – it would be nice if South African researchers could be centred here with some examples of relevant studies and important findings from these labs

Thank you for this suggestion. We have added a line of text to refer to the U-Th/He dating lab at the University of Johannesburg and the work of Tebogo Makhubela. We mention the new laboratory facilities at the University of Cape Town, where we are all based, but this is a new facility that is yet to produce any published data. We do not feel that we can do more to centre South African researchers, as the bulk of speleothem/cave researchers in South Africa are already authors on this paper. We do appreciate the sentiment of the reviewer though, and agree this is a good thing to do.

AUTHOR: Line 443-444 – why is there a lack of standardisation? Is it due to some impact of the mining industry, geology in different caves, methods brought by different teams from different educational backgrounds?

In this section, we tried to explain that there is a lack of standardisation as different research teams bring their own experience, perspective and knowledge and thus their own way of conducting research. This leads to differences in excavation practices, sampling methods etc. We already addressed this in lines 890-893 and thus have not altered the text any further.

AUTHOR: Line 468 – imported is not the right word.

We argue that “imported” is the right word in this instance and it is the terminology consistently used in all academic texts when discussing this situation. Furthermore, in general usage, “importing” is used to describe anything that has been introduced from elsewhere, such as cultural practices, ideas, or even people. Chinese migrant workers were literally imported to South Africa to work on mining operations across the country, and by 1910, they were all deported back to China (with the exception of 30 individuals who were unaccounted for and ~3000 individuals who had passed during their tenure on the mines in South Africa).

AUTHOR: Line 475 – This is an odd thing to say in my opinion because SA already is positioned to offer – and does do - world-class research in these areas.

Unfortunately the reality is that, while South Africa does boast some world class research- the facilities available for processing and dating speleothem material have been very limited. Historically South African speleothem material has been removed from the country and dated overseas, either in Europe, the US or Australia. We chose to highlight this here as it is something which we are passionately and actively working to change. For example, the U-Th and U-Pb carbonate dating laboratory that is currently being set up in the Department of Geological Sciences at the University of Cape Town is the first of its kind in South Africa and indeed on the African continent.

AUTHOR: Line 478 – it might be nice to end on some examples of issues related to Taung specifically or Australopithecus africanus generally that can be explored with the new speleothem or 3D imaging labs referred to here.

To address this comment, we have included a short paragraph highlighting potential research avenues for Taung (lines 909-919):

“To our best knowledge, none of these techniques described above have been applied to understanding depositional processes and environmental change at Taung. While more challenging for tufa deposits, the Taung carbonates could be dated with U-Th and U-Pb to refine the existing palaeomagnetic ages. Additionally, trace element analyses could provide valuable palaeohydrological proxy data further improving our understanding of the environmental context of Australopithecus africanus at Taung. Similarly, additional work on the faunal assemblages, very little of which has been revisited in the past two decades (last assessed in McKee 1993), would be valuable to situate the palaeoenvironment and taxonomic diversity of the western interior of southern Africa from a critically underrepresented period of the early Pleistocene. The faunal materials associated with the Taung Child have not been analysed to the same extent as those in the coeval Cradle deposits.”

Reviewer 2: Round 1

Date completed: 16 August 2024

Recommendation: Accept / **Revisions required** / Resubmit for review / Resubmit elsewhere / Decline / See comments

Conflicts of interest: None

Does the review fall within the scope of SAJS?

Yes/No

Is the review written in a style suitable for a non-specialist and is it of wider than only specialist interest?

Yes/No

Do the Title and Abstract clearly and accurately reflect the content of the review?

Yes/No

Does the review provide a significantly novel perspective or significant recent advances in the field?

Yes/No

Is the objective of the review concisely stated?

Yes/No

Is appropriate and adequate reference made to other work in the field?

Yes/No

Do current debates and points of contention receive appropriate coverage?
Yes/**No**/Not applicable

Are gaps in the literature adequately identified?
Yes/No/**Not applicable**

Does the review provide direction for future research?*

Yes/No/Not applicable

Are the methodology and statistical treatment appropriate?
Not applicable/Yes/No/Partly/Not qualified to judge

Are the interpretations and recommendations aligned with the objective?
Yes/Partly/No

Please rate the manuscript on overall contribution to the field
Excellent/Good/**Average**/Below average/Poor

Please rate the manuscript on language, grammar and tone
Excellent/Good/Average/Below average/Poor

Is the manuscript concise and free of repetition and redundancies?
Yes/No

Is the supplementary material relevant and separated appropriately from the main document?
Yes/No/**Not applicable**

Please rate the manuscript on overall quality
Excellent/**Good**/Average/Below average/Poor

If accepted, would you recommend that the article receives priority publication?
Yes/**No**

Are you willing to review a revision of this manuscript?
Yes/No

Select a recommendation:
Accept / **Revisions required** / Resubmit for review / Decline

With regard to our policy on [‘Publishing peer review reports’](#), do you give us permission to publish your anonymised peer review report alongside the authors’ response, as a supplementary file to the published article? Publication is voluntary and only with permission from both yourself and the author.

Yes/No

Comments to the Author:

This paper sets out to provide a broad overview of early hominin cave sites in South Africa, outlining cave formation processes, efforts to date the fossils within the caves, the historical context and links to mining, and taphonomic research. This is appropriate for the issue provided that the authors address the following.

Terminology: the text variably uses “hominin” and “hominid.” I recommend sticking with one, specifically “hominin.” If we accept that Homo is sister to the genus Pan, which is the consensus from genetic work, then the appropriate term to describe humans and the extinct species (e.g., Australopithecus africanus) more closely related to modern humans than to chimpanzees and bonobos is “hominin,” which is shorthand for the tribe Hominini. Under contemporary taxonomies, the term “hominid” refers to the family Hominidae, which includes hominins but also species on the gorilla, orangutan, and chimpanzee lineages.

Similarly, the text also uses the term “Australopithecine”, vernacular for the subfamily Australopithecinae, which was used in pre-genetic taxonomies when chimpanzees were thought to be closer to other apes than to humans. Again, if we accept that chimps are our closest living relatives, then the appropriate term is “australopiths” which refers to the subtribe Australopithecina. I recommend you use “australopiths” since “Australopithecine” refers to outdated pre-molecular taxonomies that did not recognize the close evolutionary relationships between Homo and Pan.

The introduction: The brief introduction implies that this paper is about “the stages of formation of the caves themselves, the processes through which material is accumulated in the caves, from fossils to speleothems and how we use the caves and their contents to place Australopithecus africanus in context.” There is no mention here about the lengthy discussion of the historical context provided in Section 5.

Consequently, when I got to Section 5, I found the discussion to be out of place with the stated goals of the paper. I'm not asking you to remove Section 5, but rather to expand the introduction to give a more accurate description of what is covered in this paper.

Organization: Section 5 provides a discussion of the historical, social, and ethical context of the discovery of the caves, particular in relation to mining activities. Its current placement in the text seems out of place, as it is sandwiched between other discussions that are more paleo-focused (e.g., cave formation and taphonomy). I think the paper might flow better if you keep the geo/paleo discussions together, rather than in the current form, which is geo/paleo, followed by history/social, followed by more geo/paleo.

Paleoclimate: the discussion about paleoclimate is limited mostly to what can be gleaned from speleothem formation versus deposition of clastic sediments, with the former interpreted as evidence for wet phases and the latter for evidence of drier conditions. Two comments on this. First, given the broad overview provided here, covering history, cave formation, taphonomy, and so on, it would be great to extend beyond paleoclimate to include a section discussing other paleoenvironmental research. There has been a lot of work about the paleoenvironmental context of the hominin fossils, and it would be very useful to provide an overview here.

Second, with respect to the contrast between clastic sediments versus speleothems, the text indicates that clastic sediments are deposited during dry phases and speleothems are formed during relatively wet phases— “meaning that the presence of flowstones directly indicates wetter conditions in the past.” This seems to be an oversimplification. As also noted in the text, clastic sediments can only enter the cave when it is open to the surface and that speleothems are only forming when the cave is closed. So, how do we know that speleothem formation is providing a climate signal rather than a signal of whether the cave is open or closed? For instance, you could have uniformly wet conditions over geological time, with clastic sediments being deposited when the cave is open and speleothems forming when the cave is closed. Aren't things more complex than suggested by the text?

Minor edits:

Lines 42-43 “Hominin fossils, including *Australopithecus africanus*, have been recovered from three localities in South Africa: at Taung, Makapan Valley, and the cave systems of the Cradle of Humankind (hereafter referred to as “the Cradle”).” The way this is written implies that there are only 3 hominin localities in South Africa. Rephrase perhaps to “Fossils of *Australopithecus africanus* have been recovered from...”

Line 56: “...the cave sediments” of which caves?

Line 88-89: It would be great to have a figure of this here. As a reader, I'd rather not have to refer to another paper to understand the sedimentological processes discussed in this paper.

Line 144: replace climate with environmental. Climate can be very important for some species, but it's generally thought that the availability of suitable forage or cover is more important. There is a climate component to this, but other variables are important too (e.g., soils).

Section 4 Dating the caves: What about more recent attempts to provide age control based on a species' morphology? It would be worth discussing Frost et al. (2022: <https://doi.org/10.1073/pnas.2210627119>) and the accompanying debate

Line 167-168: It would be great to include a figure here providing a photograph of what these FBUs look like.

Line 366: Leopard should not be capitalized

Section on taphonomy; paragraph beginning on line 356: The text notes that contemporary taphonomic research has offered important new insights about paleoenvironments, paleoecology, and relationships between living organisms and the cave systems. This is followed by a very general discussion about taphonomy (e.g., different bone accumulating agents), but I think you could provide some more specific summaries. In the context of South African caves, what are those main takeaways? What have we learned about the taphonomy of the Cradle caves?

Conclusion, line 443-445: the paragraph opens with “One of the major challenges in South African cave research is the lack of standardised methodology and excavation protocols. Research teams use different

methods for collecting and analysing data, making it difficult to compare results across studies” Can you provide specific examples? Furthermore, it’s not clear to me how new technologies, which are discussed immediately after this statement, relates to this problem or is going to somehow solve it.

Author response to Reviewer 2: Round 1

This paper sets out to provide a broad overview of early hominin cave sites in South Africa, outlining cave formation processes, efforts to date the fossils within the caves, the historical context and links to mining, and taphonomic research. This is appropriate for the issue provided that the authors address the following.

AUTHOR: Thank you. We agree with this summary of our manuscript.

Terminology: the text variably uses “hominin” and “hominid.” I recommend sticking with one, specifically “hominin.” If we accept that Homo is sister to the genus Pan, which is the consensus from genetic work, then the appropriate term to describe humans and the extinct species (e.g., *Australopithecus africanus*) more closely related to modern humans than to chimpanzees and bonobos is “hominin,” which is shorthand for the tribe Hominini. Under contemporary taxonomies, the term “hominid” refers to the family Hominidae, which includes hominins but also species on the gorilla, orangutan, and chimpanzee lineages.

AUTHOR: We thank both reviewers for pointing out this inconsistency; we have replaced all instances of hominid with hominin.

Similarly, the text also uses the term “Australopithecine”, vernacular for the subfamily Australopithecinae, which was used in pre-genetic taxonomies when chimpanzees were thought to be closer to other apes than to humans. Again, if we accept that chimps are our closest living relatives, then the appropriate term is “australopiths” which refers to the subtribe Australopithecina. I recommend you use “australopiths” since “Australopithecine” refers to outdated pre-molecular taxonomies that did not recognize the close evolutionary relationships between Homo and Pan.

AUTHOR: Thanks for this feedback, we have replaced “Australopithecine” with “australopiths”.

The introduction: The brief introduction implies that this paper is about “the stages of formation of the caves themselves, the processes through which material is accumulated in the caves, from fossils to speleothems and how we use the caves and their contents to place *Australopithecus africanus* in context.” There is no mention here about the lengthy discussion of the historical context provided in Section 5. Consequently, when I got to Section 5, I found the discussion to be out of place with the stated goals of the paper. I’m not asking you to remove Section 5, but rather to expand the introduction to give a more accurate description of what is covered in this paper.

AUTHOR: We agree and have expanded the introduction to address this comment and such that it better reflects the scope of our review.

Organization: Section 5 provides a discussion of the historical, social, and ethical context of the discovery of the caves, particular in relation to mining activities. Its current placement in the text seems out of place, as it is sandwiched between other discussions that are more paleo-focused (e.g., cave formation and taphonomy). I think the paper might flow better if you keep the geo/paleo discussions together, rather than in the current form, which is geo/paleo, followed by history/social, followed by more geo/paleo.

AUTHOR: We acknowledge this feedback and understand where the reviewer is coming from. First, as mentioned in response to one of Reviewer #1’s comments, we had to remove the numbering of our sections to follow the journal’s editorial guidelines. We therefore have no more “main” sections with subsections.

We have looked into moving the discussion of the Taung Child taphonomy (section “The curious case of the Taung Child’s taphonomy”) up, however, we believe we need the discussion of mining history and the development of the Osteodontokeratic Culture Hypothesis to place the taphonomy of the Taung Child into context. We do acknowledge that this section ends somewhat abruptly and have therefore added a few summarizing sentences to wrap it up more appropriately.

Paleoclimate: the discussion about paleoclimate is limited mostly to what can be gleaned from speleothem formation versus deposition of clastic sediments, with the former interpreted as evidence for wet phases

and the latter for evidence of drier conditions. Two comments on this. First, given the broad overview provided here, covering history, cave formation, taphonomy, and so on, it would be great to extend beyond paleoclimate to include a section discussing other paleoenvironmental research. There has been a lot of work about the paleoenvironmental context of the hominin fossils, and it would be very useful to provide an overview here.

AUTHOR: Good point. To address this comment, we have added the following paragraph (lines 215-226):

"...The evident cycles of deposition, erosion, and redeposition in Southern African caves deposits (e.g. Brain, 1995, de Ruiter 2003; Reynolds et al. 2007; Herries et al. 2009) imply that the cave deposits sample multiple depositional episodes containing a 'climate-averaged' mix of species (Hopley & Maslin 2010; Reynolds & Kibii 2011). The available fossil evidence from Taung, Makapans Valley, and the Cradle of Humankind suggests that these regions experienced significant climatic fluctuations with profound impacts on the local environment, influencing the availability of resources and the suitability of the areas for various faunal and floral species survival (Knight & Fitchett 2018). Palaeoclimatic reconstruction using fossil fauna and flora, from different sites, points to the existence of mosaic habitats (a combination of open grassland, savannah woodland, and few patches of closed forest) (see Reynolds & Kibii, 2011: Table 11) but overall agrees with the dry phase hypothesis. This combination of habitats is reflected in the speleothem carbon isotope signal from the Limeworks Member 1 Collapsed Cone and Buffalo Cave speleothem in the Makapansgat Valley (Hopley et al. 2007)."

Second, with respect to the contrast between clastic sediments versus speleothems, the text indicates that clastic sediments are deposited during dry phases and speleothems are formed during relatively wet phases— "meaning that the presence of flowstones directly indicates wetter conditions in the past."

AUTHOR: We have altered the text to 'wet conditions in the past' rather than the comparative phrasing of *wetter* conditions.

This seems to be an oversimplification. As also noted in the text, clastic sediments can only enter the cave when it is open to the surface and that speleothems are only forming when the cave is closed. So, how do we know that speleothem formation is providing a climate signal rather than a signal of whether the cave is open or closed? For instance, you could have uniformly wet conditions over geological time, with clastic sediments being deposited when the cave is open and speleothems forming when the cave is closed. Aren't things more complex than suggested by the text?

AUTHOR: The references cited here (Weij et al. 2024, Ayliffe et al. 1998, Pickering et al. 2007, Pickering and Edwards, *in press*) discuss how intrinsically the climate/environmental setting is linked with the opening and closing of the cave. We acknowledge your comment and in order to make this clearer to the audience, we have placed a figure (Figure 2) which shows the process of opening/closing of the cave and speleothem formation.

We also know that the Plio-Pleistocene experienced regular and significant shifts in climate conditions (from the marine oxygen isotope record, see Lisiecki and Raymo, 2005 for the best example and summary), so we do not expect the terrestrial record to have uniformly wet conditions over the last few million years. On the contrary, we expect regular and significant variation in the hydroclimate, reflected as recurring wet and dry phases.

Minor edits:

Lines 42-43 "Hominin fossils, including *Australopithecus africanus*, have been recovered from three localities in South Africa: at Taung, Makapan Valley, and the cave systems of the Cradle of Humankind (hereafter referred to as "the Cradle")." The way this is written implies that there are only 3 hominin localities in South Africa. Rephrase perhaps to "Fossils of *Australopithecus africanus* have been recovered from..."

AUTHOR: We have rephrased this sentence following the reviewer's suggestion.

Line 56: "...the cave sediments" of which caves?

AUTHOR: The caves in the Cradle. To clarify this, we have altered this sentence (lines 184-186) as follows:

"Previously, researchers divided up the cave sediments of the Cradle (palaeo-) caves into members based on their lithologies, leading to overly complicated stratigraphies emphasising complexity of the Cradle (palaeo-) caves (e.g., Brain 1958; Partridge 1978, 2000; Bruxelles et al. 2014, 2016; Stratford et al. 2014)."

Line 88-89: It would be great to have a figure of this here. As a reader, I'd rather not have to refer to another paper to understand the sedimentological processes discussed in this paper.

AUTHOR: Thank you for this suggestion, we agree that this would illustrate our point better. We have added a figure showing the different stages of cave formation and modes of deposition (adapted from Edwards et al. 2020), please see Figure 2.

Line 144: replace climate with environmental. Climate can be very important for some species, but it's generally thought that the availability of suitable forage or cover is more important. There is a climate component to this, but other variables are important too (e.g., soils).

AUTHOR: We have changed "climate" to "environmental".

Section 4 Dating the caves: What about more recent attempts to provide age control based on a species' morphology? It would be worth discussing Frost et al. (2022: <https://doi.org/10.1073/pnas.2210627119>) and the accompanying debate

AUTHOR: We do acknowledge that biochronology is important and useful to provide chronological context, particularly when complimenting absolute age data. To address this comment, we have cited this more recent paper (lines 356-358), however, it does not alter the current understanding of the chronology.

"...Although absolute dating is preferred, biochronology remains useful to provide chronological context when multiple absolute dating methods provide inconsistent results as shown recently by Frost et al. (2022)."

Line 167-168: It would be great to include a figure here providing a photograph of what these FBUs look like.

AUTHOR: Thank you for the suggestion. We have included a figure of FBUs from several different caves (see Figure 3) to demonstrate that these are ubiquitous features across the Cradle of Humankind.

Line 366: Leopard should not be capitalized

AUTHOR: We have changed this.

Section on taphonomy; paragraph beginning on line 356: The text notes that contemporary taphonomic research has offered important new insights about paleoenvironments, paleoecology, and relationships between living organisms and the cave systems. This is followed by a very general discussion about taphonomy (e.g., different bone accumulating agents), but I think you could provide some more specific summaries. In the context of South African caves, what are those main takeaways? What have we learned about the taphonomy of the Cradle caves?

AUTHOR: The reviewer is certainly correct in that there are several specific summaries we could incorporate, however, this section aims to introduce broader concepts in the Osteodontokeratic culture and later cave taphonomy research, rather than specifics. Due to restrictions in word count having added significant sections throughout the manuscript, we have only incorporated a small adjustment to this section to try incorporate the reviewer suggestions. This is in line with Reviewer #1's suggestion of adding additional commentary on the mining operations and their impact on Taphonomy, which is more relevant in the overall flow of our paper.

Conclusion, line 443-445: the paragraph opens with "One of the major challenges in South African cave research is the lack of standardised methodology and excavation protocols. Research teams use different methods for collecting and analysing data, making it difficult to compare results across studies" Can you provide specific examples? Furthermore, it's not clear to me how new technologies, which are discussed immediately after this statement, relates to this problem or is going to somehow solve it.

AUTHOR: The reviewer makes a valid point in that specific instances would be useful, however, in this instance our observation regards different excavation protocols is a personal observation through continued work and interaction with several research projects across the Cradle, the excavation methods not being a readily available, published resource. This is a commonly discussed issue, that SAHRA has attempted to institute minimum standards of excavation protocol in an effort to systemize excavation efforts and data collection across Plio-Pleistocene sites. Our discussion of new technologies is a direct response to these issues. We have added an additional section, as a result of Reviewer #1's suggestion, that addresses aspects of some innovations or explorations that would be valuable in terms of assessing the Taungs materials to the same level of investigation as has been applied to those of the Cradle Cave deposits.

Author response: Other additions

General response:

We would like to thank both reviewers for taking the time to review our manuscript and we really appreciate their constructive and insightful feedback. We have tried to accommodate their suggestions as much as possible, and believe that the revisions have improved the flow, structure and content of our manuscript. We expanded our introduction to more accurately reflect the scope of our review. We have also added three new figures that support the paper's content and help clarify concepts discussed in the text. We hope to have improved the flow of our paper by more clearly linking subsequent sections.

We acknowledge the journal's word count limit, meaning that we needed to be conservative with adding more text and references.

In this manuscript, we refer several times to other contributions to the special issue. There has been some discussion with the SAJS editorial team on how best to handle this. One option was to remove all the cross references, which we have elected not to do, as we do wish to direct our readers to the other relevant papers in the special issue. Our speleothem community may not appreciate immediately that this paper sits in a special issue and we want to highlight the links to the other papers, especially to mark the Taung centenary. Another option was to per comm the first authors of the other papers as a way to cite them. We have elected not to do this either, but to cite the first author and this issue, e.g. Black et al., this issue and in the reference list leave this as an incomplete citation. Our hope is that by the copy editing stage of the special issue production, the citation list can be finalised.

Please find our responses to reviewer comments below. Reviewer comments are given in bold black text and our responses in plain black text. Where appropriate, sections of the revised manuscript are copied here, and new text is shown in [plain blue text](#). Line numbers correspond to the revised manuscript with track changes document.

Associate Editor comments to Author: Round 1

Thank you for submitting your revisions on " Taung and Beyond: the mining history, geology and taphonomy of Australopithecus in South Africa". The revised manuscript is very much improved. May I please request further minor revisions on the updated manuscript.

Ln 96 'by far the most' as compared with? Please reword for clarity

Fig 1. Historical summary – include publication details for all, not just Nature or link to reference list

Ln 121 'complicated stratigraphies emphasising complexity' remove redundancy

Ln 122 'by other studies' seems a little vague. Include author names?

Ln 140 'so' is rather casual – please reword

Figure 2. If the letters indicated on the figure are not needed (A, B, C etc) then please remove. I can't see these referred to anywhere.

Figure 2 caption. Please describe all stages e.g. stage 5 is missing.

Figure 3. In the interests of space, I recommend moving Figure 3 to supplementary information.

Ln 199 and elsewhere – is it possible to cross reference Figure 2 stages elsewhere in the text to make more use of the figure

Ln 286 please reword sentence beginning 'Dating speleothem' to improve grammar

Ln 345 opening sentence of Witwatersrand section is overly long. Please split / cut down for clarity.

Ln 385 (and 684) here you refer to Chinese 'men' but in the next sentence 'people'. Is this intentional, and if so can you provide some context as having the current sentences back to back reads as slightly confusing.

Ln 445 'no historical work done' please elaborate or clarify what is meant here

Ln 490 replace 'This explained the modern human violence' with 'This was used to explain modern human violence'

Ln 748 reword for grammar and clarity: 'with even several genera hominin not being unusual'

Italicise all latin names throughout

Ln 622 australopithecine please check in line with R2 comments

Please can you accept the current track changes and include the new changes as a fresh round of tracked changes. Please include a brief response letter with these change requests. You can upload the new files in this discussion thread.

Author response to Associate Editor: Round 1

Ln 96 'by far the most' as compared with? Please reword for clarity

AUTHOR: We mean compared to other South African hominin fossil sites. We feel that this sentence already makes that clear as we start the sentence with "the bulk of early hominin research in southern Africa", however, we have added the following to clarify further:

"Historically, the bulk of early hominin research in southern Africa has been conducted in the Cradle as it is by far the most densely packed fossil site in this region with localised cave systems, many of which have yielded hominin fossils."

Fig 1. Historical summary – include publication details for all, not just Nature or link to reference list

AUTHOR: Due to the lack of space, we have removed the journal names and added links to our reference list for all publications mentioned in this figure. We also added a few other things for clarity:

"19th - early 20th century: Lime mining at most Cradle caves

1924 Discovery of the Taung skull

1925 Dart, 1925 (ref.¹), description of Taung skull

1936: Broom, 1936 (ref.⁸⁶), Discovery of an adult australopith at Sterkfontein

1953 Dart, 1953 (ref.⁹⁵), basis for the Osteodontokeratic Culture Hypothesis

1981 Brain, 1983 (ref.²⁸), The Hunters or the Hunted.

1999 UNESCO World Heritage status for the wider Cradle of Humankind area, including Taung and Makapan valley

2019 Pickering et al. 2019 (ref.¹⁶), first Cradle-wide U-Pb chronology

2025 Taung Centenary and SAJS special issue"

Ln 121 'complicated stratigraphies emphasising complexity' remove redundancy

AUTHOR: We have removed 'complicated'.

Ln 122 'by other studies' seems a little vague. Include author names?

AUTHOR: We have included the author names:

"Previously, researchers divided up the cave sediments of the Cradle (palaeo-) caves into members based on

their lithologies, leading to ~~complicated~~ stratigraphies emphasising complexity³⁻⁸. An alternative is presented by ~~other studies~~⁹⁻¹¹ Pickering et al.⁹, Edwards et al.¹⁰ and Pickering & Edwards¹¹”

Ln 140 ‘so’ is rather casual – please reword

AUTHOR: We have replaced ‘so’ with ‘thus’.

Figure 2. If the letters indicated on the figure are not needed (A, B, C etc) then please remove. I can’t see these referred to anywhere.

AUTHOR: We do not use letters in Figure 2. Perhaps you mean figure 3? If so, then the letter labels are referred to when listing the cave names in the last sentence of the figure caption:

“... a-c) Bolt’s Farm. d) Cooper’s. e) Makapansgat Limeworks. f) Swartkrans. g) Gondolin. h) Bolt’s Farm.”

Figure 2 caption. Please describe all stages e.g. stage 5 is missing.

AUTHOR: Thanks for pointing this out, we forgot to include stage 5 at the end of the sentence below. We have added it now:

“The caves gradually close when increased vegetation blocks the cave entrance, after which increased effective precipitation reinitiates speleothem deposition (Stage 5).”

Figure 3. In the interests of space, I recommend moving Figure 3 to supplementary information.

AUTHOR: Okay, we have done so and now refer to this figure as ‘Supplementary Figure 1’. We have placed this figure at the end of our manuscript, after the references.

Ln 199 and elsewhere – is it possible to cross reference Figure 2 stages elsewhere in the text to make more use of the figure

AUTHOR: Thank you for the suggestion, we have added more cross references to Figure 2 in the following sentences:

Lines 101-103:

“The caves we see today (Figure 2; Stage 9) are the result of speleothem and clastic deposition, erosion and sediment infill, mining and excavation.”

Lines 108-109:

“Speleothems can only form when they are uninterrupted by clastic sediment input, thus when the caves are closed or when little to no surface flooding occurs (Figure 2; Stage 2 and 5).”

Lines 121-123:

“The presence of such material thus suggests that during that sedimentation mode, the caves were open, and that climatic conditions were relatively dry¹⁶ (Figure 2; Stage 3, 4, 6 and 7).”

Lines 128-130:

“The evident cycles of deposition, erosion, and redeposition (Figure 2) in South African cave deposits²⁰⁻²² imply that such deposits sample multiple depositional episodes containing a ‘climate-averaged’ mix of species^{22,23}.”

Ln 286 please reword sentence beginning ‘Dating speleothem’ to improve grammar

AUTHOR: *“Dating speleothems, ~~a ubiquitous feature of all cave systems~~, directly is possible with the radiometric U-Th and U-Pb technique.”*

Ln 345 opening sentence of Witwatersrand section is overly long. Please split / cut down for clarity.

AUTHOR: We have split this sentence into two as follows:

“Palaeontological and archaeological discoveries in South Africa are heavily intertwined with gold rushes and cave exploration/mining⁶³, ~~and~~ Both have played important roles in shaping the history and culture of South Africa, and they continue to be areas of interest for historians, palaeoscientists, geologists, and adventurers alike (see Athreya et al. this issue⁶⁴).”

Ln 385 (and 684) here you refer to Chinese ‘men’ but in the next sentence ‘people’. Is this intentional, and if so can you provide some context as having the current sentences back to back reads as slightly confusing.

AUTHOR: This happened during the previous round of revisions to address Reviewer #1’s comment about including a discussion of women, but then we added a few sentences about the role women (lines 359-362)

and should have changed it back. Since it was in fact just Chinese men, we have changed “people” back to “men”.

Ln 445 ‘no historical work done’ please elaborate or clarify what is meant here

AUTHOR: Here we mean that we have not been able to find any scientific articles on this. To clarify, we have modified the sentence as follows:

*“Most Cradle sites were exploited for lime during the 19th and early 20th Century, although there are few records of these activities during this time and almost no **scientific**, historical ~~work~~**studies** done (to the best of our knowledge).”*

Ln 490 replace ‘This explained the modern human violence’ with ‘This was used to explain modern human violence’

AUTHOR: Done.

Ln 748 reword for grammar and clarity: ‘with even several genera hominin not being unusual’

AUTHOR: *“This is unusual in that most sites with early hominin remains have more than one specimen, many preserve near complete skeletons (Sterkfontein, Malapa, Rising Star), with **occasionally** even several ~~genera-hominin~~ **genera** not being unusual.”*

Italicise all latin names throughout

AUTHOR: We have checked and all genera and species are now italicised. ‘Australopiths’ is not supposed to be italicised. We had one instance (line 37) where it was and have now corrected that it.

Ln 622 australopithecine please check in line with R2 comments

AUTHOR: We forgot to correct this during the previous round of revisions. We have now changed this to ‘australopith’.
