Peer Community In Archaeology

Archaeophenomics: an up-and-coming field in bioarchaeology

Anneke H. van Heteren *based on peer reviews by* ***Stefan Schlager*** *and 1 anonymous reviewer*

Allowen Evin, Laurent Bouby, Vincent Bonhomme, Angèle Jeanty, Marine Jeanjean, Jean-Frédéric Terral (2022) Archaeophenomics of ancient domestic plants and animals using geometric morphometrics : a review. Missing preprint_server, ver. Missing article_version, peer-reviewed and recommended by Peer Community in Archaeology. https://doi.org/10.31219/osf.io/skeu5

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Anneke H. van Heteren based on reviews by Stefan Schlager and 1 anonymous reviewer

Phenomics is the analysis of high-dimensional phenotypic data [1]. Phenomics research strategies are capable of linking genetic variation to phenotypic variation [2], but a genetic component is not absolutely necessary. The paper "Archaeophenomics of ancient domestic plants and animals using geometric morphometrics: a review" by Evin and colleagues [3] examines the use of geometric morphometrics in bioarchaeology and coins the term archaeophenomics. Archaeophenomics can be described as the large-scale phenotyping of ancient remains, and both addresses taxonomic identification, as well as infers spatio-temporal agrobiodiversity dynamics. It is a relatively new field in bioarchaeology with the first paper using this approach stemming from 2004. This study by Evin et al. [3] presents an excellent review and unquestionably demonstrates the potential of archaeophenomics.

The authors provide an exhaustive review specifically of bioarchaeological studies in international journals using geometric morphometrics to study archaeological remains of domestic species. Although geometric morphometrics lends itself well for archaeophenomics, readers should keep in mind that this is not the only method and other approaches might equally fall under archaeophenomics as long as high-dimensional phenotypic archaeological data are involved.

Distinguishing archaeophenomics from phenomics is important because of a critical difference. Archaeological remains are often altered by taphonomical processes. As such data may not be as complete as when working with modern specimens. Although this poses difficulties, morphometric analyses can usually still be

performed as long as the structures presenting the relevant geometrical features are present. Even fragmented remains can be studied with a restricted version of the original landmarking/measurement protocol.

Evin et al. [3] define archaeophenomics as "phenomics of the past". This is only partly correct. It can be deduced from their review that they really mean phenomics of our (human) past. This leaves a gap for phenomics of the non-human past, for which I suggest the term palaeophenomics.

[1] Jin, L. (2021). Welcome to the Phenomics Journal. Phenomics, 1, 1–2. https://doi.org/10.1007/s43657-020-00009-4.

[2] Bilder, R.M., Sabb, F.W., Cannon, T.D., London, E.D., Jentsch, J.D., Stott Parker, D., Poldrack, R.A., Evans, C., Freimer, N.B. (2009). Phenomics: the systematic study of phenotypes on a genome-wide scale. Neuroscience, 164(1), 30-42. https://doi.org/10.1016/j.neuroscience.2009.01.027

[3] Evin, A., Bouby, L., Bonhomme, V., Jeanty, A., Jeanjean, M., Terral., J.-F. (2022). Archaeophenomics of ancient domestic plants and animals using geometric morphometrics: a review. Peer-reviewed and recommended by PCI Archaeology. https://doi.org/10.31219/osf.io/skeu5

Reviews

Evaluation round #1

DOI or URL of the preprint: https://osf.io/skeu5/

Authors' reply, 22 April 2022

Dear Editor,
First we would like to thank you for your work and the work done in all the PCI initiative.
We have agreed to all reviewers suggestions and uploaded a version 2 of our manuscript.
Best regards
Allowen EVIN
Download tracked changes file

Decision by Anneke H. van Heteren, posted 14 April 2022

Minor revisions

Dear Allowen Evin and co-authors,

I agree with the reviewers that this paper is very well written and would generally merit a recommendation. However, both reviewers also pointed out some problems with the English language and some other small linguistic issues. Please address their suggestions for improvement accordingly.

Best wishes,

Anneke van Heteren

Reviewed by Stefan Schlager, 11 April 2022

To be fair, I have to stress that I am an expert on GMM but not on plant morphology.

The authors present an interesting review paper about studying phenotypic variation and evolution of ancient domestic plants and animals using geometric morphometrics methods (GMM). They aim to coint the term ”archaeophenomics” as a counterpart for achaeogenomics and discuss possibilites and pitfalls associated with analysing the shape of those organisms. They stress the possibilites of actual and future research regarding domestication studies based on the phenome analyzed using GMM. Their main aim is to provide a complete review on current papers based on that approach.

The paper is well argued and comprehensibly written and delivers what it promises.

Here are some minor issues:

L48: revolutionned => revolutionized

L59: ’The sentence ”Phenomics, i.e. tje analysis ...” is almost identical to line 58. Please remove redundancy.

L82: ”... partly complete” please decide: partly or complete ;)

L90: ””appears as a” did you mean ”appears to be a”?

Reviewed by anonymous reviewer 1, 14 March 2022

This manuscript provides a concise review of the recently developed field of archaeophenomics, as well as concisely describing the key areas that underpin the topic. The authors provide extensive review of past research as relevant to the topic area, and is also clear and succinct in execution. The References list and citations of past research are comprehensive.

Here I provide some small suggested grammatical edits:

L48 - suggest replacing ”revolutionned” with ”advanced”

L59 - repetition from L48; suggest combining L58 & 59 more cohesively

L316 - suggest correction: ”attempt” to ”attempts”

L318 - suggest rephrase: ”The many approaches now available....”