

# Supplementary information

## Data collection

Relevant documents were initially identified by searching by the academic databases Google Scholar and Web of Science. The search terms used for the initial search were “stone art\*fact”, “lithic”, “3D model\*ing”, “scanning” and “photogrammetry”. Additional texts were found by reviewing the publishing history of the lead author(s) of the initially identified documents and by searching for documents that cited those texts, or that were cited within them.

The full bibliographic data was then sourced from the academic database Web of Science. Articles were added to a Web of Science query using their DOIs (Digital Object Identifier), or when necessary, their title. All articles had their complete bibliographic metadata exported from Web of Science as \*.txt file. This file was then initially imported into Bibliometrix Shiny app, then exported again as an \*.xlsx file for data cleaning.

An issue common to all academic databases is that none are perfectly comprehensive (Harzing and Alakangas 2016). Twenty-eight identified articles were not listed on Web of Science. Journals with multiple identified articles that were not listed by Web of Science included the Journal of Computer Applications in Archaeology, PaleoAnthropology, and Quartär. The missing articles were added manually to the \*.xlsx file. While it was not practical to completely reproduce the bibliometric data for the missing articles, data manually added included: Authors, Authors’ Keywords, Document Title, DOI, Language, Publication Year, Publication Source, and Times Cited (this number which was sourced from Google Scholar (and was correct as of the 26th May 2022)).

Data cleaning was carried out on the \*.xlsx file. The primary aim of this was to identify and combine synonyms in Authors’ Keywords (e.g. “Acheulean” and “Acheulian”), and to consolidate multiple names that represent a single author (e.g. “Porter S” and “Porter ST”). Even after data cleaning, preliminary co-word analysis of the Authors’ Keywords and Web of Science Indexing Keywords did not meaningfully discriminate between papers (see Table 1.).

Authors’ Keywords	No. of Articles	WoS Keyword	No. of Articles
<i>lithic technology</i>	19	<i>technology</i>	28
<i>handaxe</i>	18	<i>reduction</i>	17
<i>acheulean</i>	17	<i>archaeology</i>	16
<i>3D scanning</i>	14	<i>site</i>	15

<i>geometric morphometrics</i>	14	<i>evolution</i>	12
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*Table 1. List of 5 most common Authors' Keywords, Web of Science Indexing Keywords.*

While these keywords might be appropriate for understanding the thematic and conceptual dynamics of archaeology as an academic field, they are not particularly meaningful for conceptual mapping of a specialised subfield like 3D lithic analysis. Rather, they reflect the fact that academic databases are multidisciplinary, and that bibliometric studies generally analyse much larger datasets; a recently published paper looked at a sample of 90 million peer-reviewed papers (Chu and Evans 2021). Instead, each paper was manually given an alternate set of keywords based on the following categories:

#### *Thematic*

This category included the following keywords: “archival”; “cognitive archaeology”; “cultural transmission”; “curation”; “diagnostic”; “fracture mechanics”; “functional”; “illustrative (function)”; “illustrative (methodology)”; “illustrative (morphology)”; “illustrative (reduction strategy)”; “illustrative (typology)”; “knapping skill”; “methodological (analytical)”; “methodological (illustrative)”; “methodological (modelling)”; “methodological (software)”; “open science”; “pedagogical”; “primate archaeology”; “raw material use”; “reduction strategy”; “review”; “social archaeology”; “standardisation”; “taphonomic”; “techno-morphological”; “typological”; “underwater archaeology”. By necessity these keywords were broad, and were designed to capture the general conceptual focus of individual papers. “Methodological” and “illustrative” were divided into multiple keywords to better reflect the aims of individual papers.

#### *Analysis*

This category included keywords relating to the specific types of analysis that a paper utilised. The analysis categories were: “2D gmm”; “3D gmm”; “ballistic”; “core axes angle”; “core shape”; “cortex ratio”; “cross section”; “digital elevation model”; “edge analysis”; “edge angle”; “elliptical Fourier analysis”; “estimated reduction percentage”; “flaked area index”; “flake size”; “flake size”; “landmark morphometrics”; “platform angle”; “platform shape”; “radial point distribution”; “reduction intensity index”; “residue analysis”; “scar density index”; “scar pattern index”; “spatial distribution”; “surface area”; “symmetry”; “TCSA”; “terrain ruggedness index”; “TOCSA”; “usewear”; “volume”; “volumetric reconstruction method” etc.

#### *Industry*

Examples include: “Acheulean”; “Levallois”; “Upper Palaeolithic”; “First Nations American” etc. These terms were sourced directly from the paper.

#### *Artefact*

This category always included the generic keywords: “core”; “flake”; “retouched flake”; “point”; “biface”. From a materialist perspective (*sensu* Hiscock 2007) points are primarily retouched flakes, and almost all bifaces - used here as a generic terms for artefacts that are variously classified as bifaces, handaxes, large cutting tools, cleavers - are cores (or less commonly retouched flakes). However it was clear from an initial survey of the literature that both points and biface studies formed a significant and distinct component, and so were distinguished from other studies of retouched flakes and cores.

The category “other artefact/tool type” included flaked artefacts that did not fall clearly into those broad keywords (such as Polynesian adzes), ground stone artefacts and other non-flaked artefacts, and non-artefactual tools, e.g. “anvil”; “hammerstone”; “pounding tool” etc. The keyword “nodule” was also included for studies that made 3D models of unmodified raw material (e.g. Lin et al. 2019; Lin, McPherron and Dibble 2015; Peresani et al. 2021). Author designated terms, e.g. “handaxe”, “keilmesser”, “blade core”, “Clovis point” etc., were also included in this category.

Papers could have multiple keywords in each category. Additional information about whether the study included an experimental component, study region, modelling methodology, and analytical software used was also recorded for each paper.

Additionally, study region, study country and study site, 3D modelling method, analytical software used, and number of models produced was recorded for each paper.

### *Region of Study*

The following regions were used: Australia, Central Asia; East Africa; East Asia, Europe; North Africa; North America; Pacific; South America; South Asia; South-east Asia; Southern Africa; West Africa; West Asia. Experimental studies were also recorded as a separate keyword in this category.

### *Site*

Sites with multiple sub-designations, e.g. Ein Gev I, Ein Gev 2; were kept, but were also grouped under a single name, e.g. Ein Gev.

Papers could have multiple keywords in a single category. As an example, a paper could have both “experimental” and “West Asia” in the region category, if it included both experimental assemblage and archaeological material from Israel. Thematically a paper might be categorised as both “cognitive archaeology” and “reduction strategy”.

Additional information about modelling methodology, analytical software used and the total number of models was also recorded for each paper.

The earliest paper dated to 2002, and the most recent paper was published in 2022. No more papers were added to the datasets after May 2022. The final, clean dataset was then saved as a non-proprietary \*.csv format for archival purposes, and for combining in R to the Web of Science \*.txt file.

## Supplementary References

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# Dataset

Below is the bibliography of the dataset. It is divided into a bibliography on papers that use 3D models for analytical, archival, methodological, or pedagogical purposes and a bibliography where 3D models are solely used illustratively. The raw data used for the bibliometric analysis can be found here: <https://doi.org/10.5281/zenodo.7037023>.

## Analytical, archival, methodological, or pedagogical bibliography

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