UNIVERSITY OF WASHINGTON

ARCHY 483
Analysis of Stone Artefacts

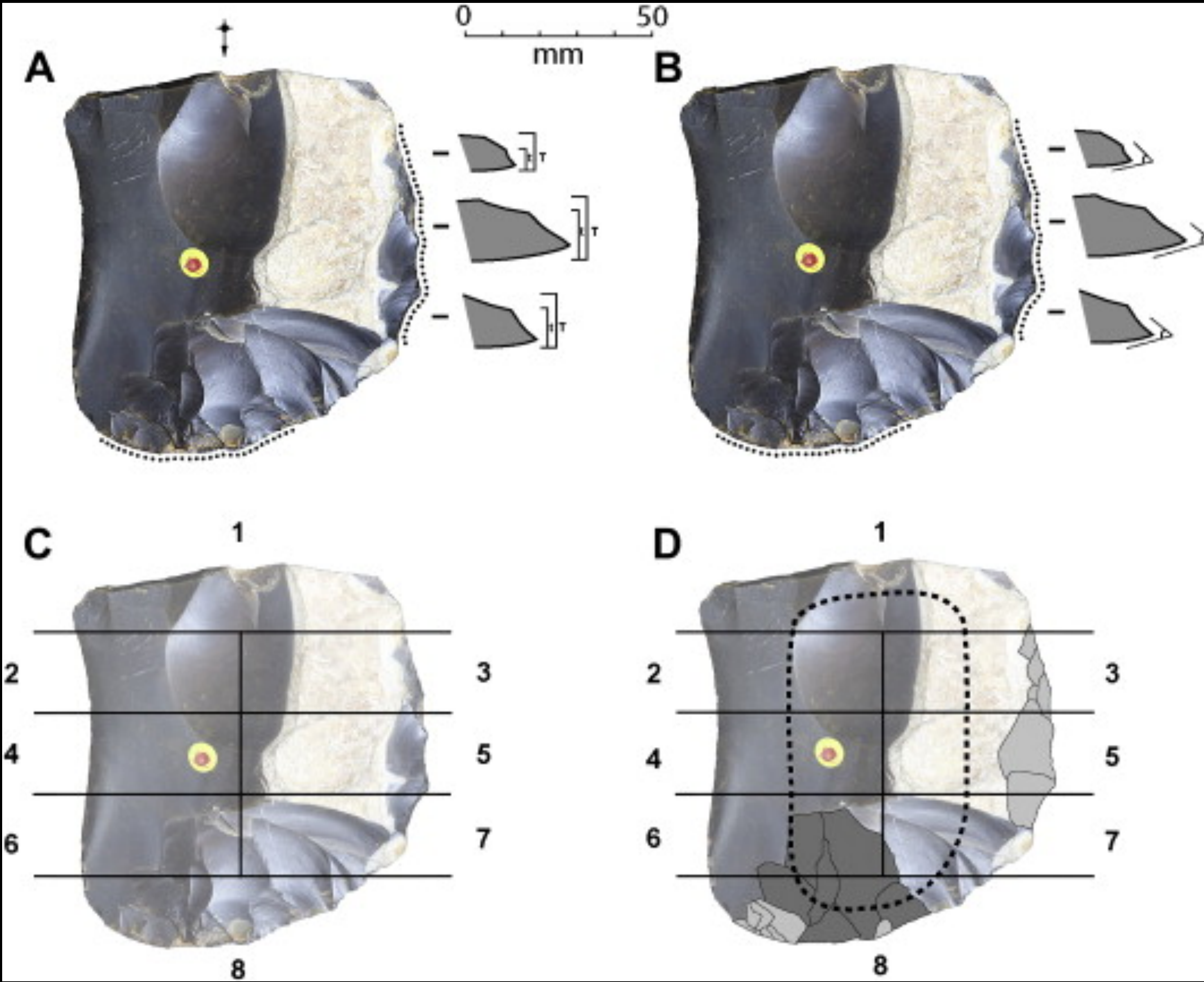
Spring 2019

Lecture 4

Chaîne opératoire, principles of classification: epistemology and systematics

Q1: What is the one single concept that is key when considering how to measure stone artefacts?

Q2: Draw a sketch that shows how Kuhn’s GIUR is calculated



0
50
mm
A
B
C
D
1
2
3
4
5
6
7
8
1
2
3
4
5
6
7
8

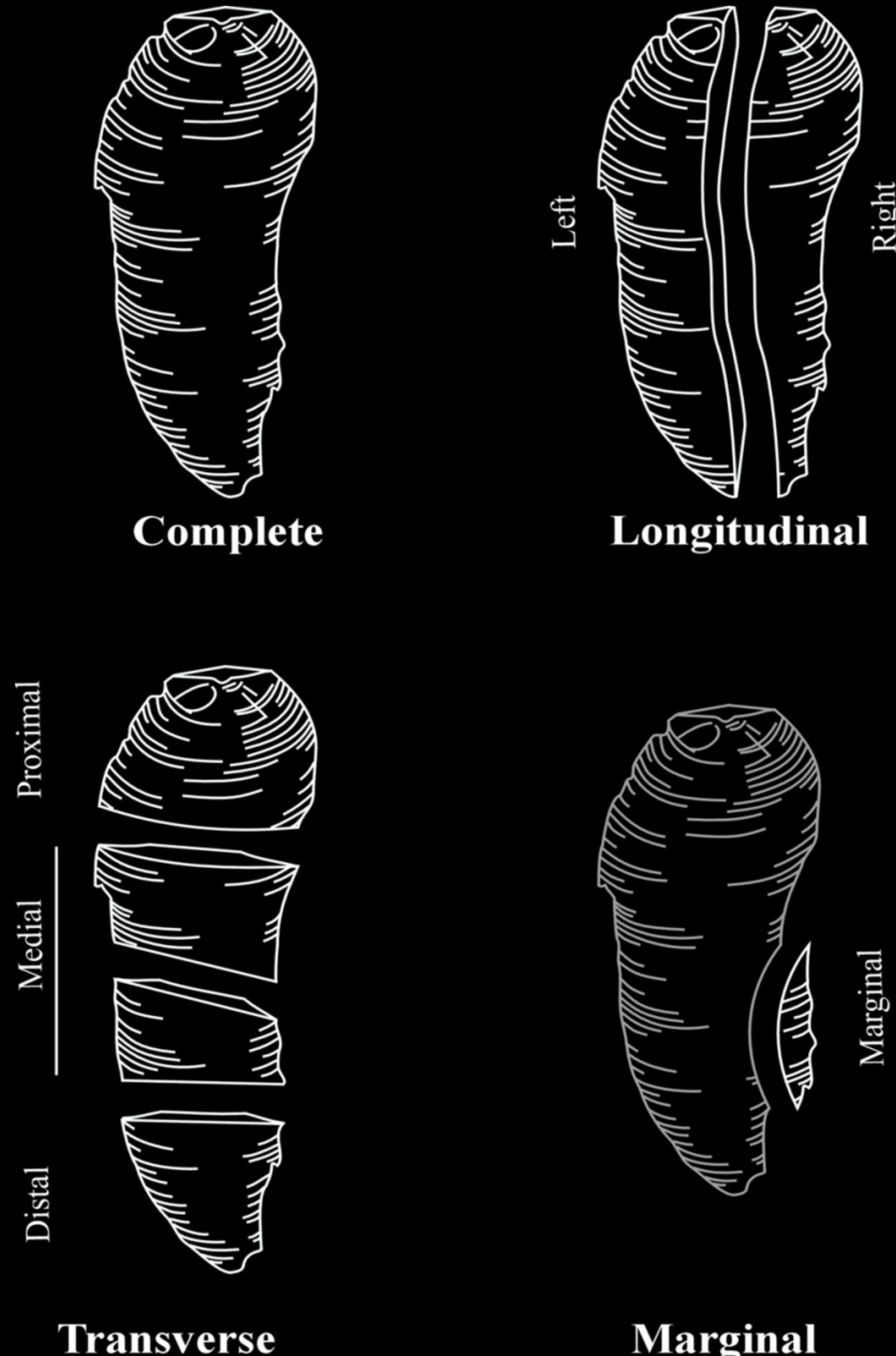
Q1: What is the one single concept that is key when considering how to measure stone artefacts?

Q2: Draw a sketch that shows how Kuhn's GIUR is calculated

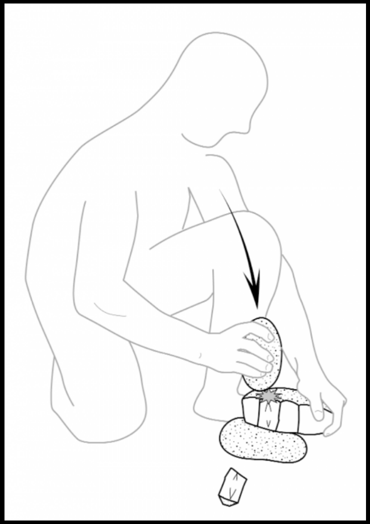
Q3: What does this equation calculate?

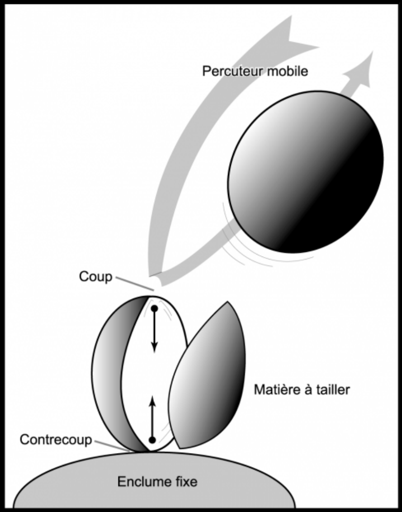
MNF=C+T+L

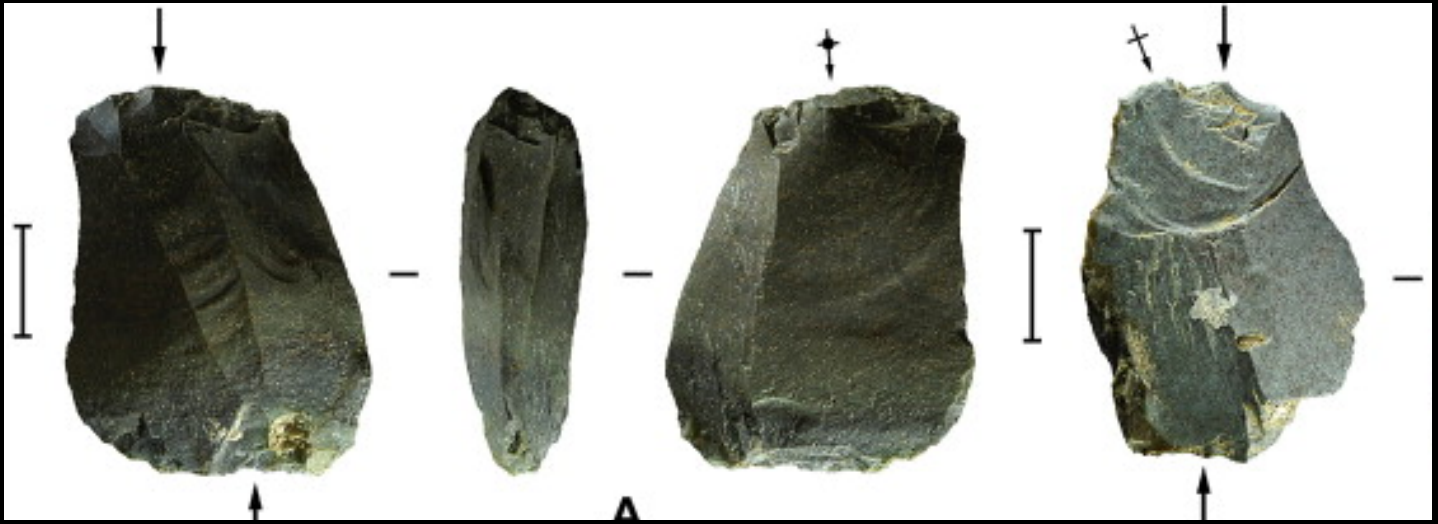
MNF= C+T+L


Complete
Left
Right
Longitudinal
Proximal
Medial
Distal
Transverse
Marginal
Marginal

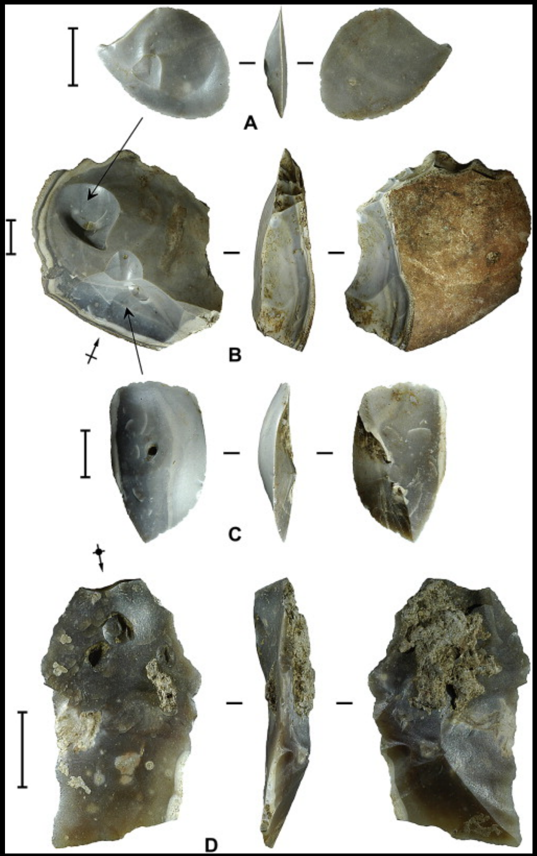
Q1: What is the name of this technique?







Q2: What is the name of the distinctive type of fracture on these pieces, and how is it caused?



Q3: What are two common types of core preparation? Sketch one of them

Lab report 3

Published

Edit

The **goal** of this lab is to extend our understanding of debitage attribute analysis, and begin to learn basic skills and ideas of reproducible research.

Here are three files including Rproj file, a template R markdown file, and an Excel spreadsheet that you will need to to work on your analysis. You will need to download these three files, and put them all in one folder:

archy-483-lab-3-flake-analysis.Rproj

archy-483-lab-3-flake-analysis.rmd

archy-483-lab-3-flake-analysis.xlsx

To complete this assignment, please follow the steps below:

1. **Open the Excel file**. Look at it carefully to make sure it has the columns you need. Type your measurements into the spreadsheet and save it.

2. After you complete your spreadsheet, **ensure** that you have R & RStudio installed on your computer, and then **open the Rproj file**. This should open RStudio and you can find the R markdown file (.rmd) by clicking on 'file' pane showing on the lower right of your RStudio window.

3. **Edit the R markdown file** to create your own plots, and make a short report about your observations and analysis for flakes.

4. **Knit the R Markdown file** to produce a docx file.

When you are finished, **upload** to canvas:

1. your **Rmd file**
2. your **Excel file**, and
3. your **docx file** that is produced after you knit your Rmd file.

You need to submit all three items to get the full grade for this lab, as well as the hard copy worksheet.

Replication report: step 1

Published   Edit

Together with the members of your group:

1. Establish a slack channel for your group to communicate. Remember that frequent, clear communication is vital to successful group work

2. Browse the list of journal articles at the bottom of the webpage: https://github.com/benmarwick/ctv-archaeology/blob/master/README.md and choose one that is about stone artefacts. If you know of other papers that you want to work on, please send me a message on Slack before completing this assignment.

3. Submit the full citation of the article you have chosen to as this assignment. Each group member must make their own submission to canvas (though you should all agree on the same article in your group).

4. Start reading the article to identify the main claims made by the authors, and starting thinking about how you can validate those claims with the data provided by the authors.

Bicho, N. and Cascalheira, J. (2018) The use of lithic assemblages for the definition of short-term occupations in hunter-gatherer prehistory. In Picin, A. and Cascalheira, J. (eds.) *Short-term occupations in Paleolithic Archaeology. Interdisciplinary Contributions to Archaeology*. Springer. https://doi.org/10.17605/OSF.IO/3WGSA

Breslawski RP, Etter BL, Jorgeson I, Boulanger MT (2018). The Atlatl to Bow Transition: What Can We Learn from Modern Recreational Competitions? *Lithic Technology* http://doi.org/10.1080/01977261.2017.1416918

Marwick, B., 2013. Multiple Optima in Hoabinhian flaked stone artefact palaeoeconomics and palaeoecology at two archaeological sites in Northwest Thailand. *Journal of Anthropological Archaeology* 32, 553-564. http://dx.doi.org/10.1016/j.jaa.2013.08.004.

UNIVERSITY *of* WASHINGTON
UNDERGRADUATE ADVISING

ABOUT US DEGREE OVERVIEW ACADEMIC PLANNING ACADEMIC HELP FACULTY &

> Home > Academic planning > Frequently asked questions

Frequently asked questions

Below are the most frequently asked questions about academic planning by UW students. If you can't find the answer you are looking for below or in our other academic planning pages, you can schedule an appointment through our appointment scheduler, by calling (206) 543-2550, or by stopping by 141 Mary Gates Hall.

Courses/Credits

How many courses should I take? (+)

What is a credit? (−)

You earn credit by completing courses. In general, one credit represents one hour in class per week. Many UW courses are 5 credits, and meet 5 hours per week. Most UW bachelor degrees require 180 credits. If you take 15 credits per quarter and attend three quarters per year, in four years you will have 180 credits.

https://www.washington.edu/uaa/advising/academic-planning/frequently-asked-questions/

How many credits/courses should I take?

How much time will I spend studying/doing homework for class?

College courses require much more study time than high school courses. In general, courses require two hours of homework for every hour of class. So, a 15-credit load should end up taking about 45 hours of time per week (15 hours of class time plus 30 hours of homework).

https://www.washington.edu/uaa/advising/academic-planning/frequently-asked-questions/

Retouch

Classes of retouch

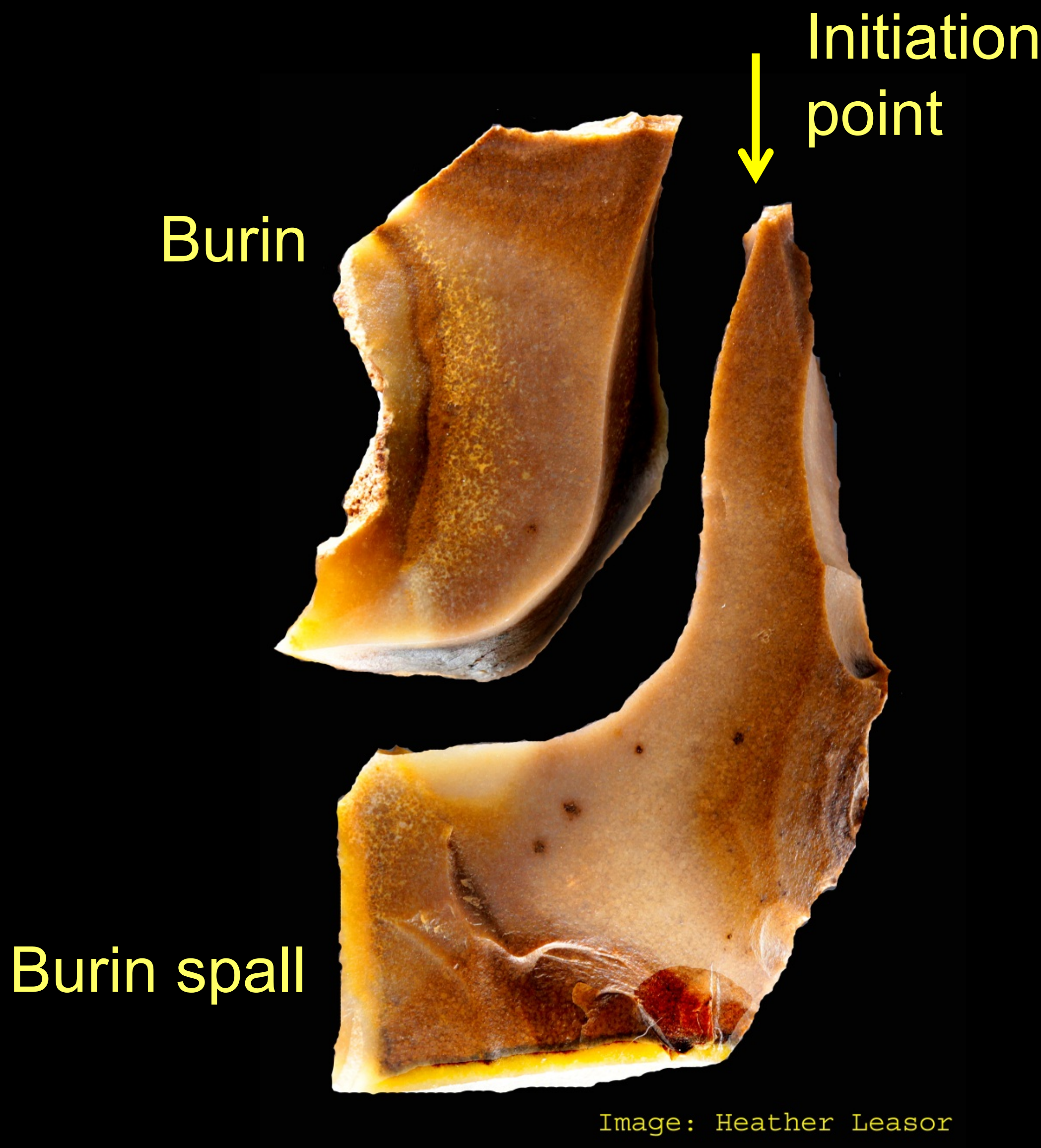
- Unifacial retouch – scars are solely on dorsal or ventral surface.

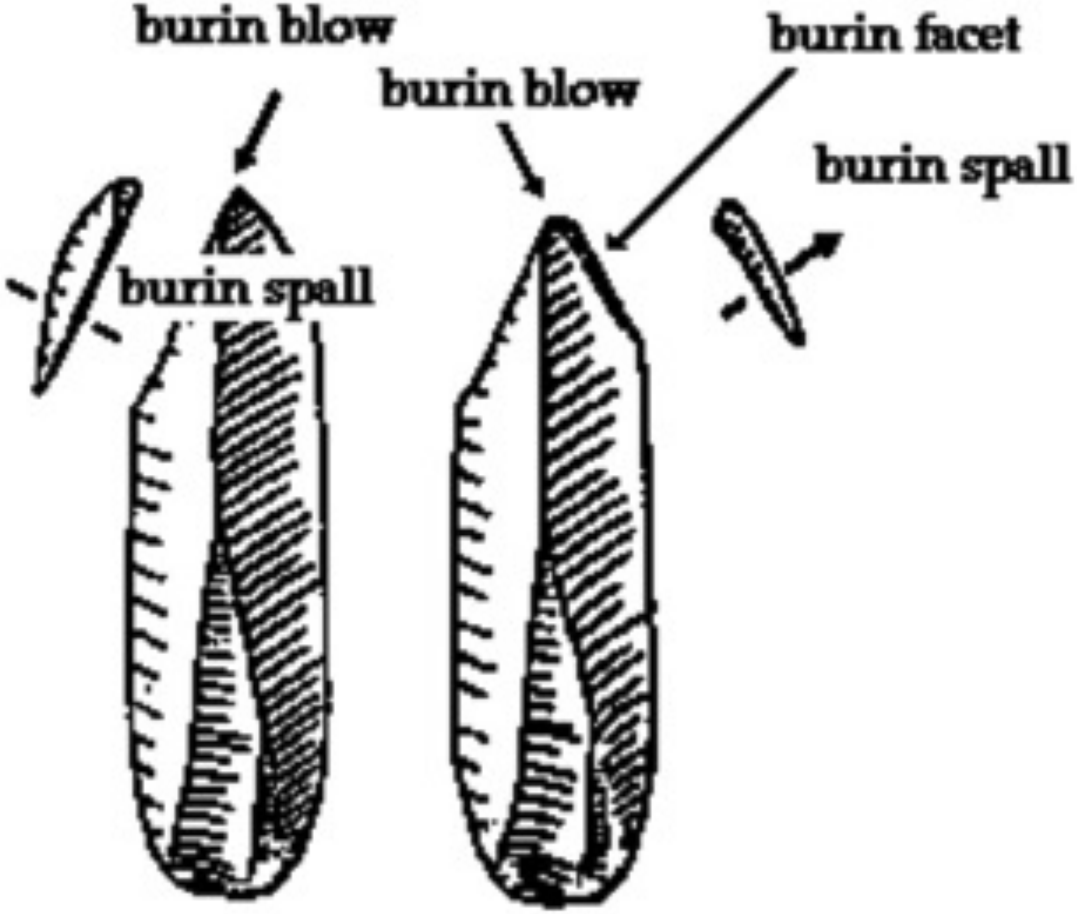
- Bifacial retouch – scars are on both surfaces (dorsal and ventral), and overlap

- Burin retouch (or longitudinal retouch) – scars run along the margin of the flake, rather than perpendicular to the margin.

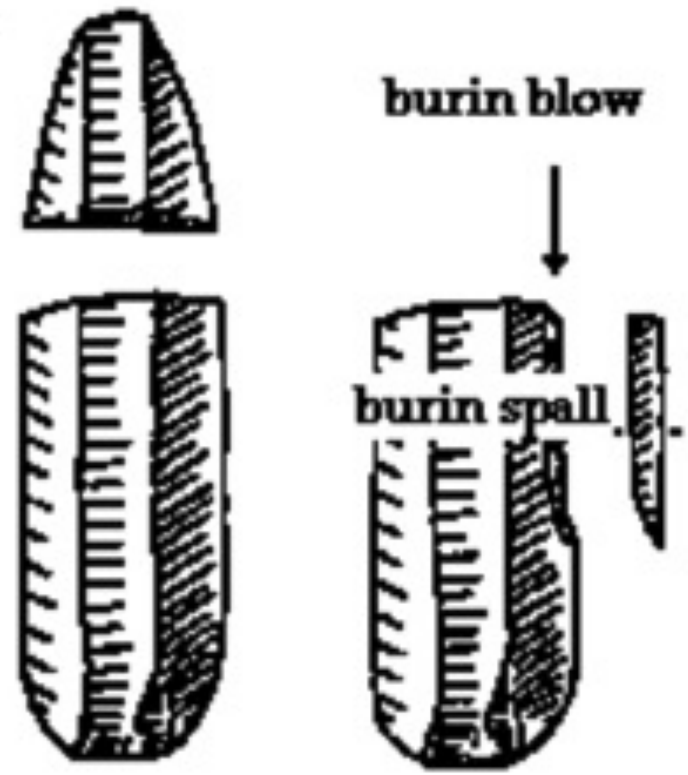
Longitudinal retouch

- Creating longitudinal retouch involves striking a flake which runs along the edge of the parent flake
- The retouched flake (i.e. the parent flake) is referred to as a ‘burin’
- The flake that’s been struck off the edge of the burin is referred to as a ‘burin flake’ or ‘burin spall’
- In this example, the burin spall has an outrepasse termination

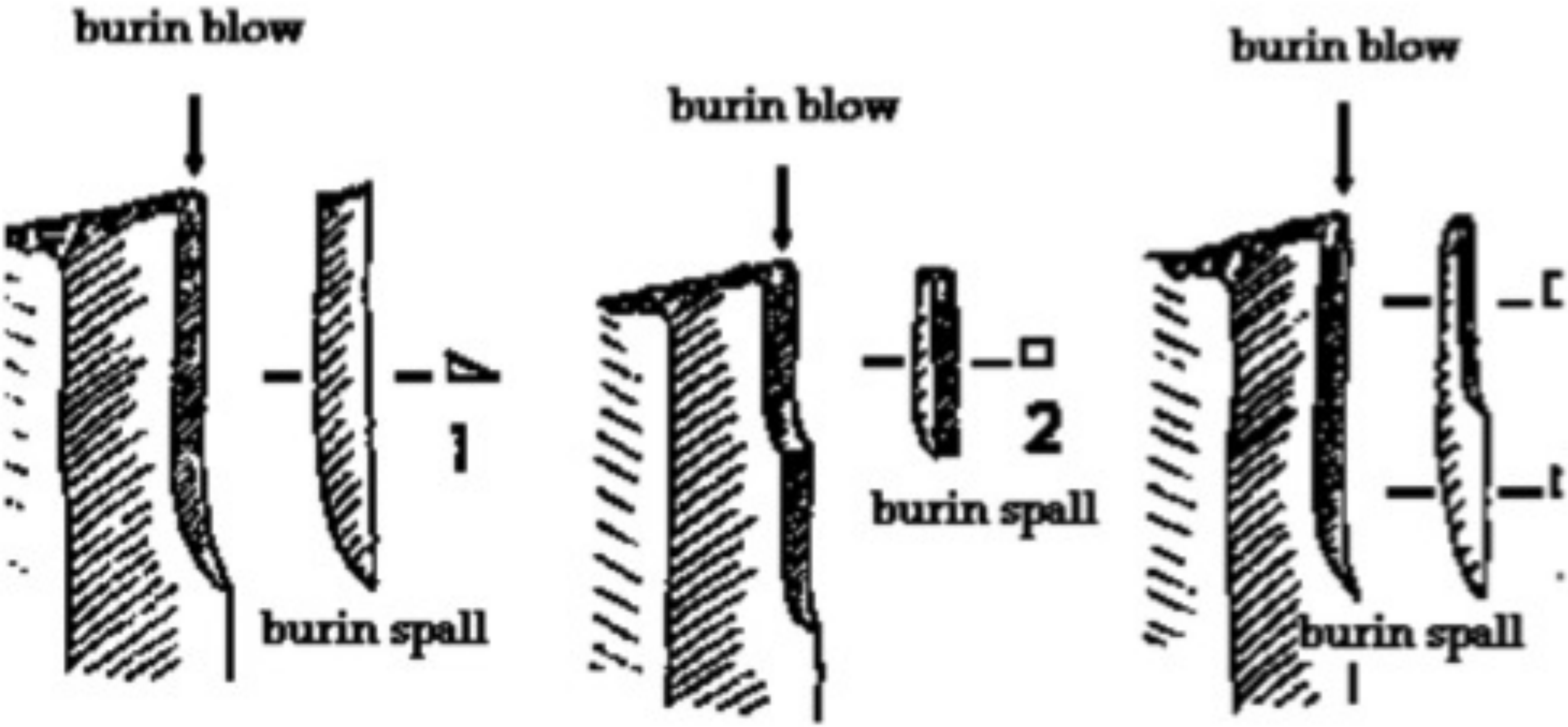




Dihedral burin



Burin on a break



Burin on an edge of a truncated blade with different kinds of burin blows

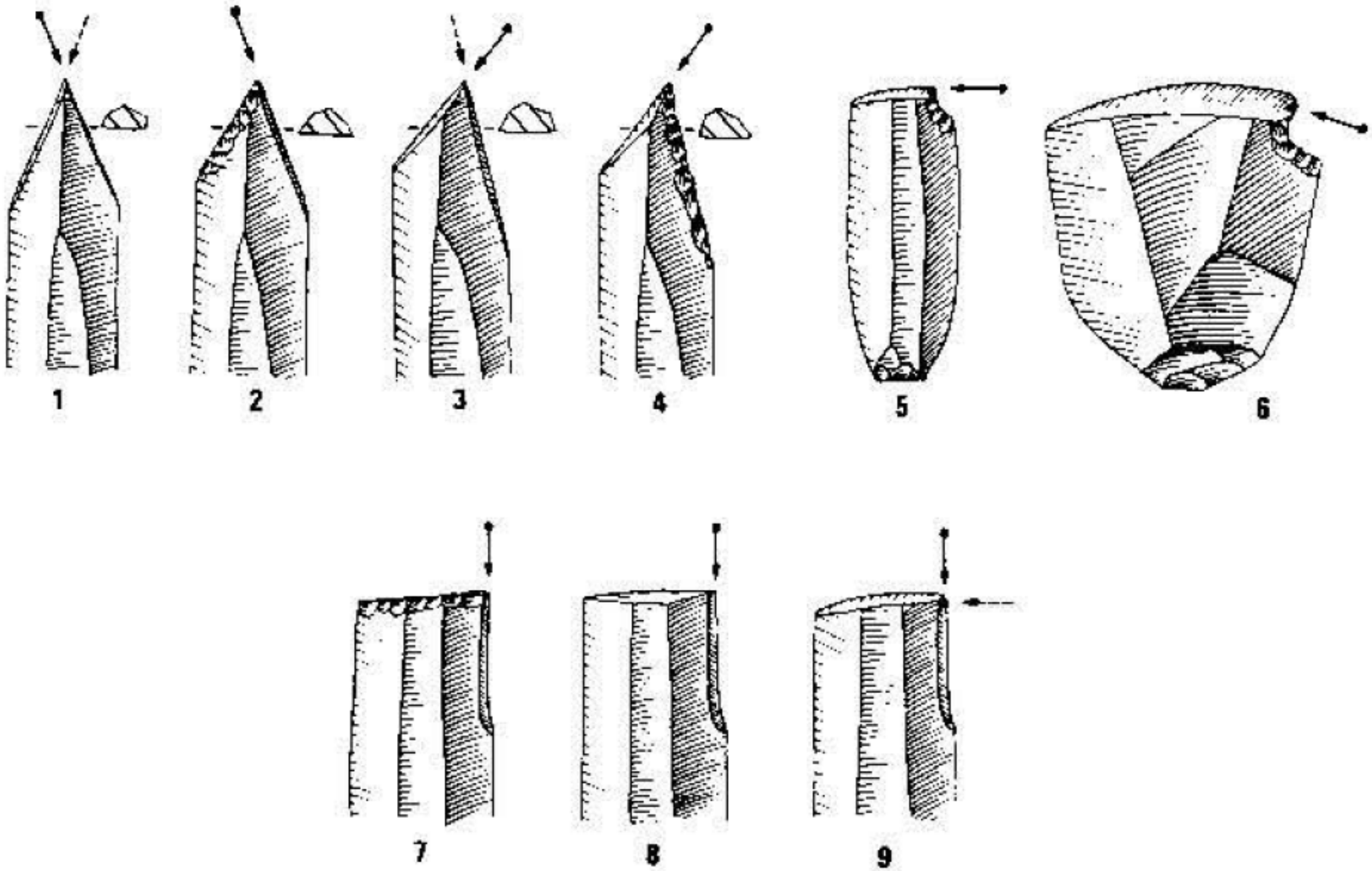
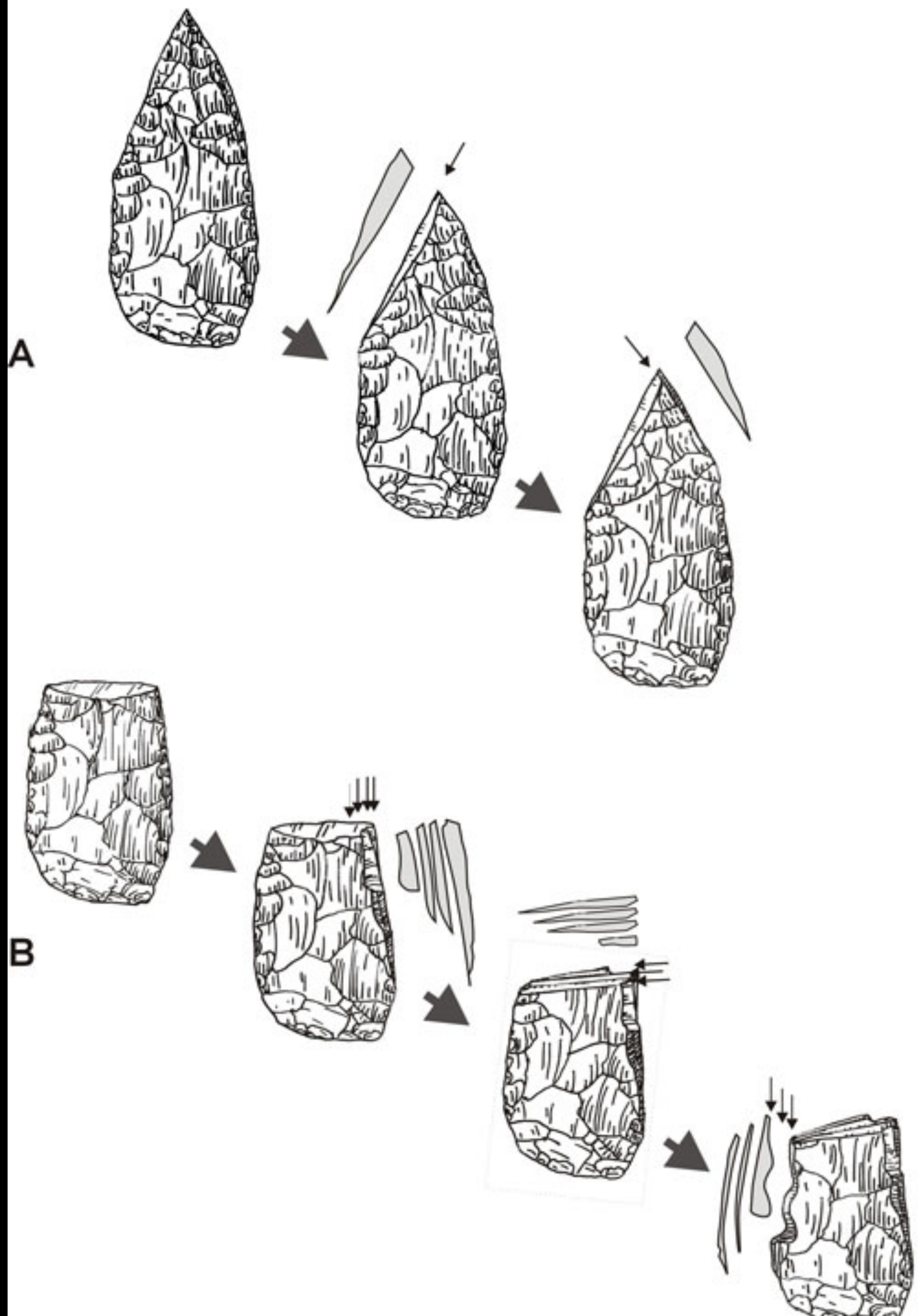
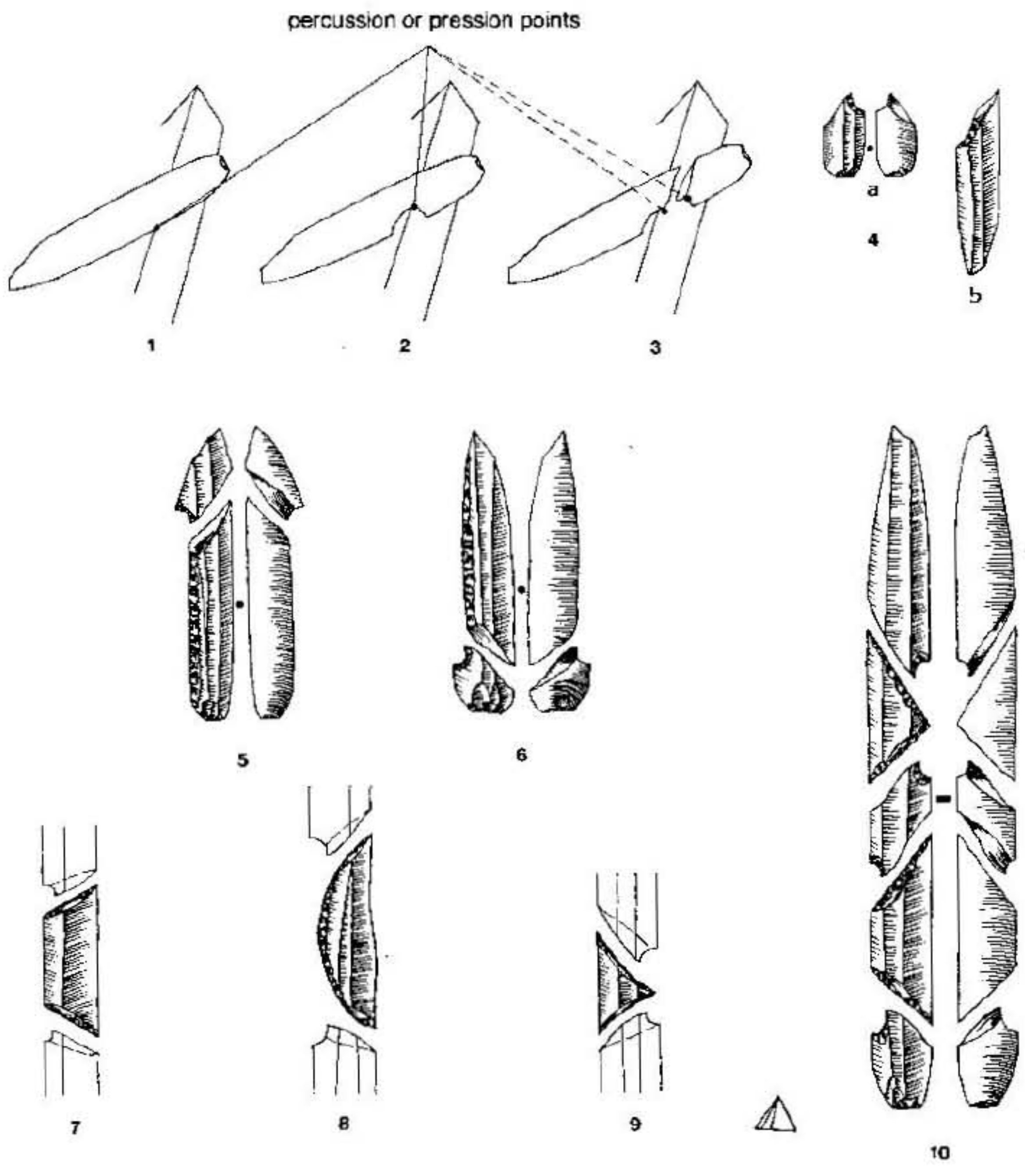


Fig. 57 — Various examples of simple burins. *Axis burins*. 1 : dihedral. 2 : on truncation. "*Déjetés*" *burins*. 3 : dihedral. 4 : on lateral retouch. *Transverse burins on notch*. 5 : on a blade. 6 : on a flake. *Angle burins*. 7 : on truncation. 8 : on transversal break. 9 : on transversal burin facet.

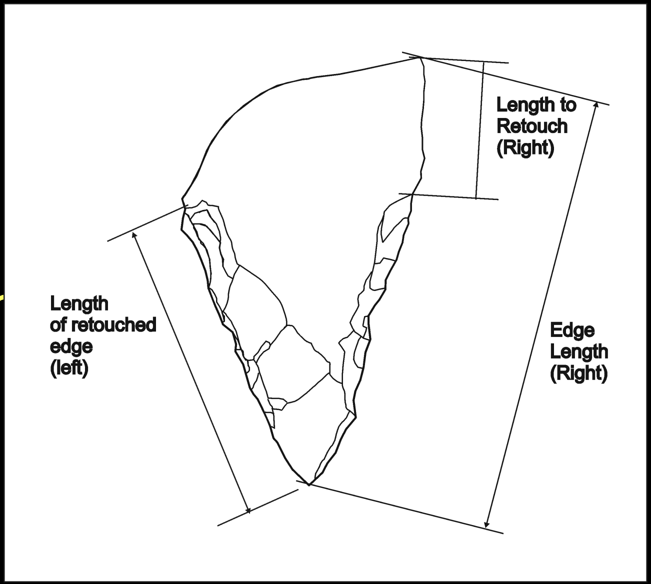

A
B



percussion or pression points
1
2
3
a
4
b
5
6
7
8
9
10

Characteristics of the retouched edge

- Location of retouch: either as simple coded variables or using metrical measurements.
- Quantifying the length of the retouched edge: usually by measuring the length of the retouched edge or edges.
- Curvature of retouched edge or edges
- Intersection of retouched edges: angled, pointed etc.
- Characteristics of the retouch scars themselves: e.g. quantifying termination types, size of scars, invasiveness of scars….



Chaîne opératoire

1.3. *Problems with the chaîne opératoire (CO) approach*

The CO approach heralded an exciting period in Paleolithic archaeology, as the application of this methodology encouraged previously underused approaches to lithic analysis such as refitting, which revealed copious amounts of new information regarding past stone tool manufacturing processes. However, problems with the approach began to emerge. One of the most serious of these is the method advocated by Boëda to be used in the absence of refittings: *lecture des schémas diacritiques* (Boëda, 1994), in which the analyst reconstructs the *chaîne opératoire* through study and experimentation. The problem with the lecture approach is that it is extremely subjective; it is based upon the analyst's experience and intuition, and it is not replicable, nor quantifiable. As pointed out by Tostevin (2012:96), the lecture approach can lead to faulty inferences. For instance, Boëda, in his analysis of the assemblage from Biache Saint-Vaast level IIA, concluded that two systems of recurrent Levallois core reduction are present: a unidirectional scheme and a bidirectional scheme, each applied to different cores (Boëda, 1988). Dibble's analysis of the same assemblage, however, showed a strong relationship between blank size and dorsal scar pattern (Dibble, 1995a), implying that the core reduction strategy changed from unidirectional to bidirectional as cores were reduced in size. Tostevin cites this as an example of "the methodological failings of the *lecture des schémas diacritiques* [which] has tarnished the more rigorous applications of the *chaîne opératoire* approach" (Tostevin, 2012:96). Bar-Yosef and Van Peer (2009) used two reduction sequences from Taramsa 1 to illustrate the fact that only one production system (Levallois) is represented when a traditional *lecture* is applied to the analysis, whereas a second production system is evident in one of the core reductions when it is refitted.

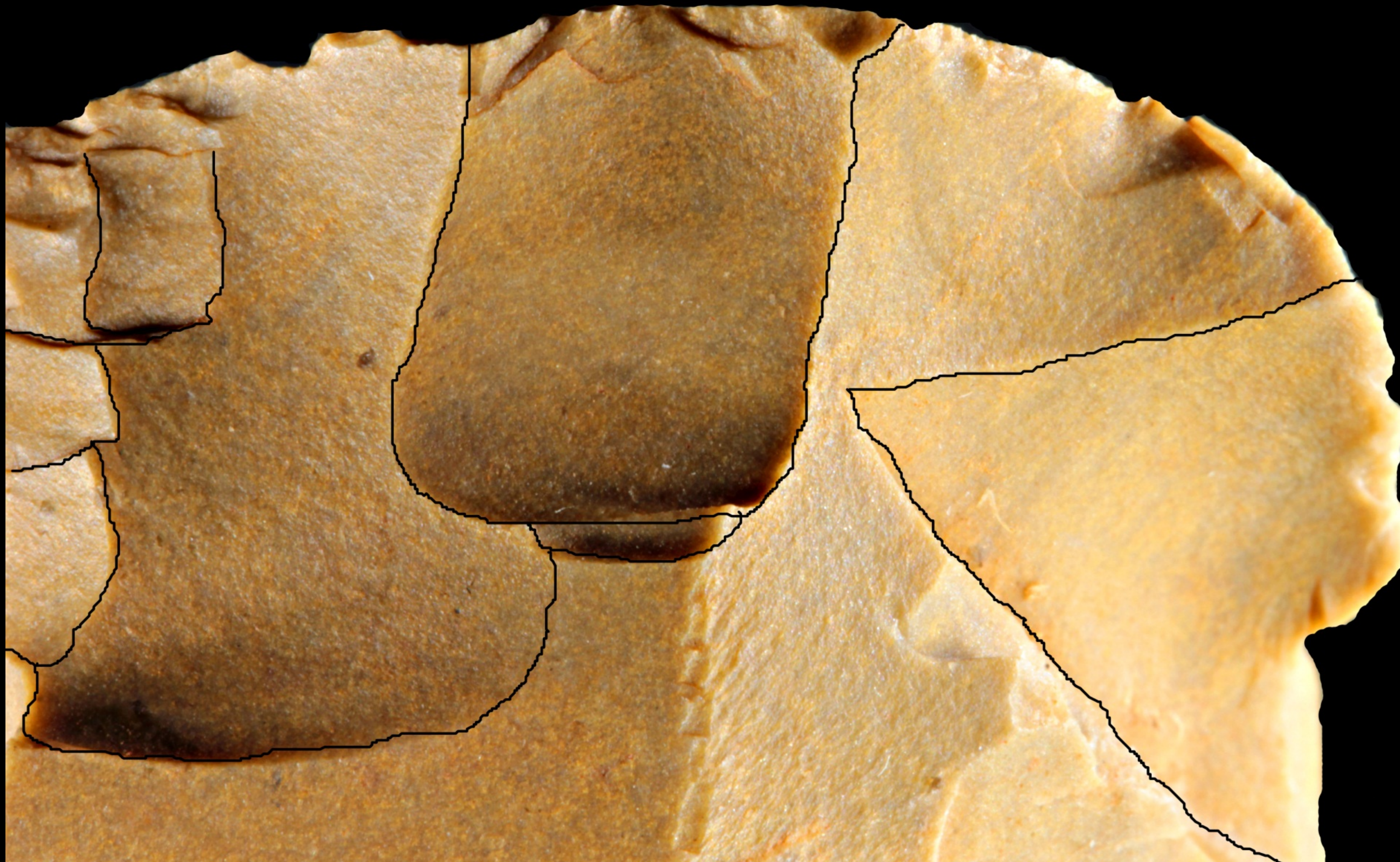
Another serious problem with the CO approach is its insistence on identifying the intentions and goals of prehistoric knappers, including the "desired endproducts" of knapping sequences. As pointed out by Bar-Yosef and Van Peer (2009:114), technological classification is seen as reflecting "emic cognitive standards". Yet, the belief that we can identify desired end products based upon a reconstruction of the CO is a fallacy; "it is only possible for us to identify artifacts that were somehow desired based on independent evidence"(Bar-Yosef and Van Peer, 2009). Turq et al. (2013) echo these concerns, stating that some scholars assume that lithic artifacts represent desired, "cognitively real" endproducts. On the basis of detailed technological analyses of stone tools from numerous sites in northwestern Europe, they demonstrate that lithic artifacts were regularly transported into, and out of, sites; importantly, these artifacts are not always what archaeologists identify as the desired end products of a reduction sequence. In other words, they provide evidence that

The third major problem with the CO approach is that there is severe inconsistency in the application of definitions by lithic analysts. For instance, Draily notes that although Boëda's definition of Levallois debitage contains six "nondisassociable" technological criteria (Boëda, 1993), many authors have argued for the presence of Levallois concept even when those six criteria were not met (Draily, 2011:147). She also points out that since the publication of Boëda's definition of six nondisassociable criteria for Discoidal debitage (Boëda, 1993), numerous variants have been proposed. Draily asks "We just need to agree, do we accept Boëda's definition, or do we each produce our own definition of Discoidal?" (Draily, 2011:151, our translation). Her concerns are echoed by DiModica, who notes that some lithic analysts view technological variants as broad, flexible categories, whereas others prefer stricter definitions and accommodate variability by introducing new variants or technological concepts (DiModica, 2010:205). Both comment on the confusion surrounding the distinction between centripetal recurrent Levallois and unifacial Discoidal technology. As DiModica

Monnier, G. F., & Missal, K. (2014). Another Mousterian Debate? Bordian facies, *chaîne op eratoire* technocomplexes, and patterns of lithic variability in the western European Middle and Upper Pleistocene. *Quaternary International*, *350*, 59–83.

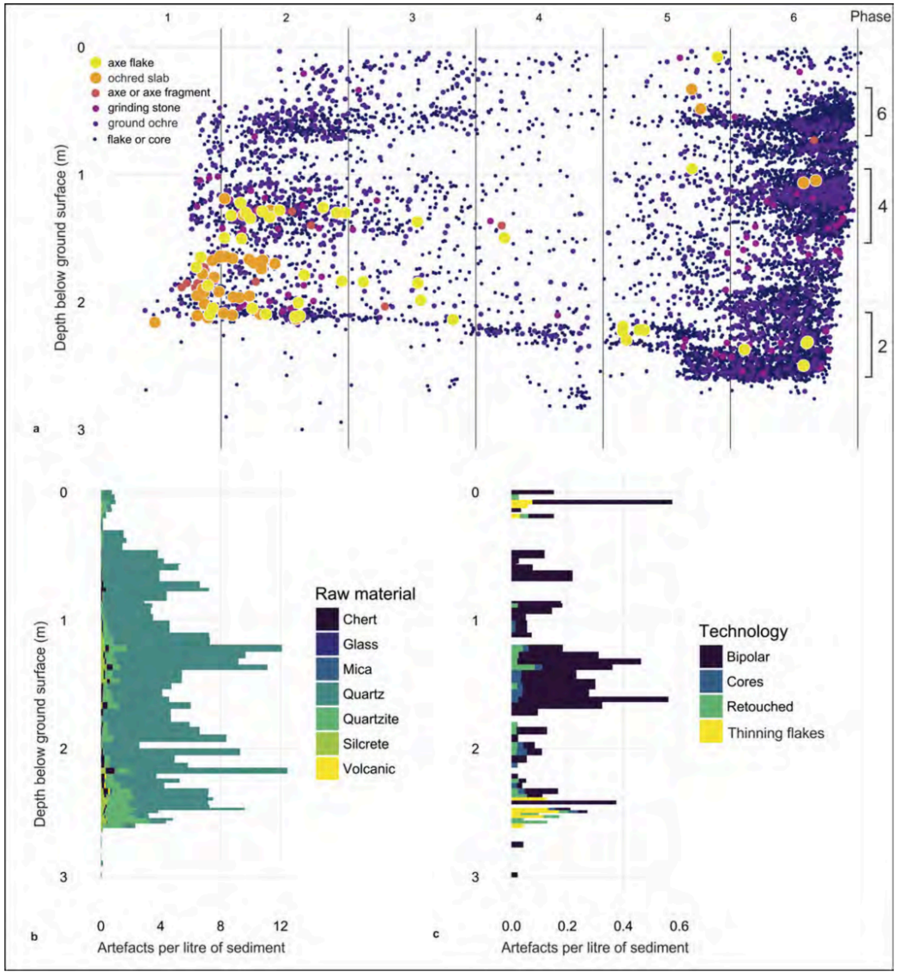
Diacritical study or flake scar sequencing

- "Sequencing" means reconstructing the order in which events occurred.
- In this case, the order in which flakes were removed, on the basis of the arrangement of flake scars.
- The trick is working out which flake scars are "intruding" onto other scars.



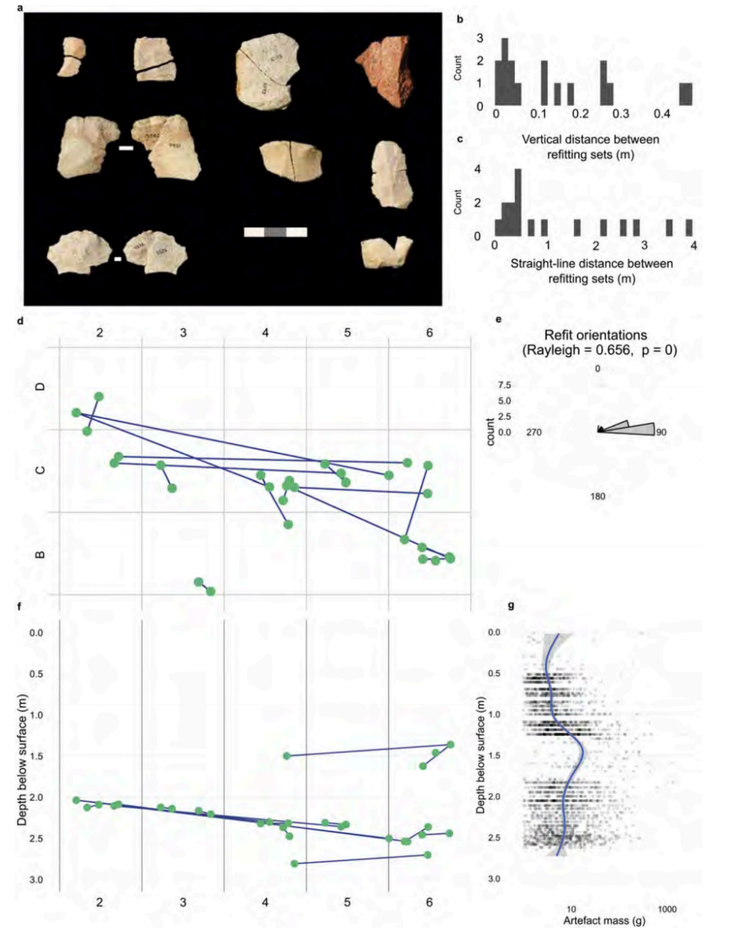
Refitting or Conjoin analysis: the ideal sequencing technique

- Conjoining, or refitting, artefacts back together clearly yields massive amounts of data on the reduction process.
- The disadvantage is that it requires us to find most (or all) of the artefacts produced during a series of flaking events.
- AND – how many conjoined artefacts do we require before we can be justified in making generalising statements about reduction processes?



Extended Data Figure 2 | Plot of artefact densities and assemblage composition as a function of depth below ground surface. a, Plot of density of artefacts found during the 2012 and 2015 excavation seasons in squares from the C and B rows. Artefacts are shown by type (axe flake, ochred slab, axe or axe fragment, grinding stone, ground ochre, and flake or core) superimposed on the southwest profile wall (Extended Data Fig. 1). Phases represent the three dense artefact bands (see text and Supplementary Information). **b,** Plot of artefact density and raw material type with depth, based on plotted artefacts and residue found in the 7-mm sieves for square B6. **c,** Plot of technological changes with depth, based on plotted artefacts and residue found in the 7-mm sieves for square B6.

ARTICLE RESEARCH



Extended Data Figure 6 | Summary of Madjedbebe silcrete artefact refitting analysis. a, Selection of refitting and conjoining artefacts; scale bar intervals, 10 mm. **b,** Histogram showing the distribution of vertical distances between refitting artefact fragments. The median vertical refit distance is 0.10 m, with a median absolute deviation of 0.13 m. **c,** Histogram showing the distribution of straight-line distances between refitting artefact fragments. The median straight-line refit distance is 0.44 m, with a median absolute deviation of 0.47 m. **d,** Plan view showing the refitted artefacts at the locations where they were found at the time of excavation. Blue lines connect refitted pieces. Annotations on the axes show the excavation grid coordinates. **e,** Polar plot of horizontal orientations of the vector between pairs of refitted pieces. The Rayleigh test result indicates a significantly non-random distribution. For most refits, both artefacts in the refit pair were recovered from the same horizontal plane. **f,** Section view showing the refitted artefacts at the locations where they were found at the time of excavation. Blue lines connect refitted pieces. **g,** Plot of artefact mass by depth in square B6: each point represents one artefact, the blue line is a robust locally weighted regression, and the grey band is the 95% confidence region for the LOWESS regression line.

Classification

Why classify?

"So what's this? I asked for a *hammer!* A hammer! *This* is a crescent wrench! ... Well, maybe it's a hammer. ... Damn these stone tools."

Why classify?

1. To make named groups to communicate about
2. To have something to compare and explain

What are the rules of classification?

What are the rules of classification?

1. Should be based on sets of variables whose importance and means of combination is somehow determined from a body of theory

What are the rules of classification?

2. There must be recognizable similarities and differences between the phenomena being observed in relation to the variables on which the classification is based

What are the rules of classification?

3. It must be exhaustive, or in other words, it must encompass all of the observed variation.

Choices you need to make when developing a classification

Monothetic or polythetic?

Manual or statistical?

Essentialist or materialist?

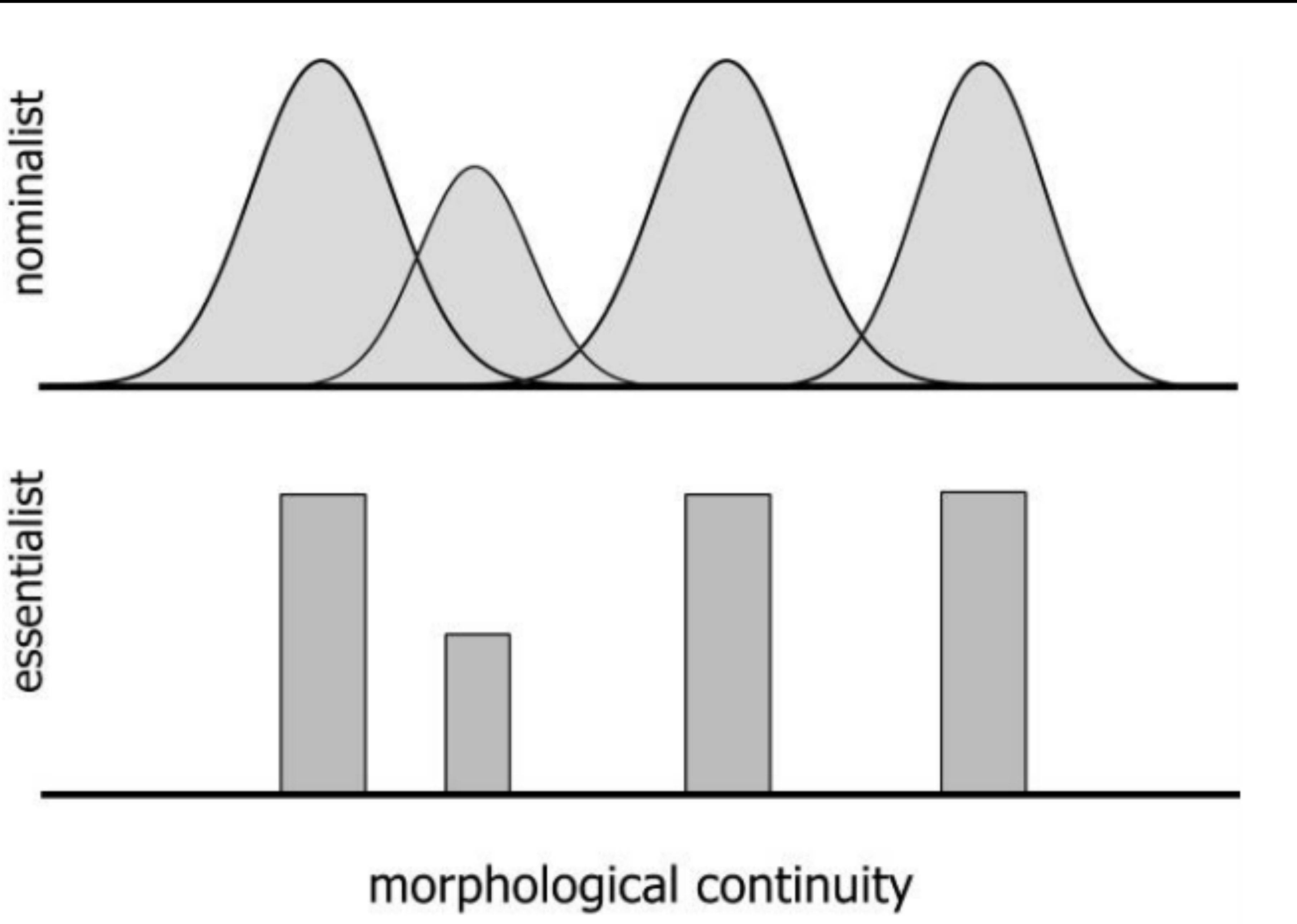
Retouch Properties

Specimen	Angle: High	Angle: Low	Edge Shape: Straight Edge	Edge Shape: Concave Edge	Edge Shape: Convex Edge	Feature: Notched	Feature: Nosed	Feature: Distal Point	Location: Distal	Location: Lateral	Location: Distal and Lateral	Location: Distal and Proximal	Surface: Dorsal Only	Surface: Ventral Only	Surface: Bifacial	Ventral: Pronounced Bulb	Ventral: Bulbar Trimming	Group
High Angled Concave and Nosed End Scraper																		
1	X			X			X		X									1
2	X			X			X		X									1
3	X			X			X		X									1
Low Angled Convex and Notched Side and End Scraper																		
4		X			X	X					X							2
5		X			X	X					X							2
6		X			X	X					X							2
Point																		
7	X		X					X			X				X			3
8		X			X			X	X					X				3
9		X			X	X		X			X		X					3
Tula																		
10	X		X						X				X			X	X	4
11	X			X					X				X			X	X	4
12		X			X			X				X			X	X	X	4

Groups 1 and 2: MONOTHETIC

Groups 3 and 4: POLYHETIC

Retouched Flakes

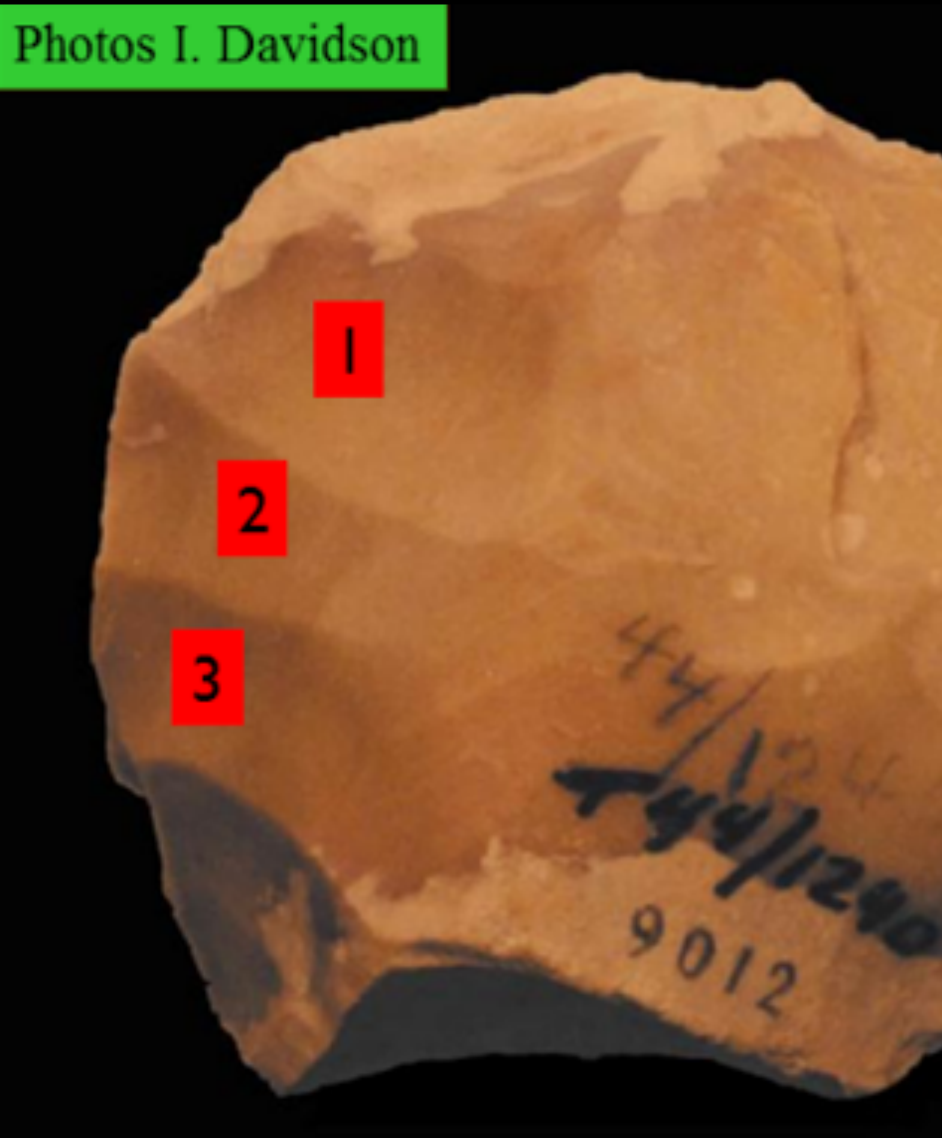

nominalist
essentialist
morphological continuity

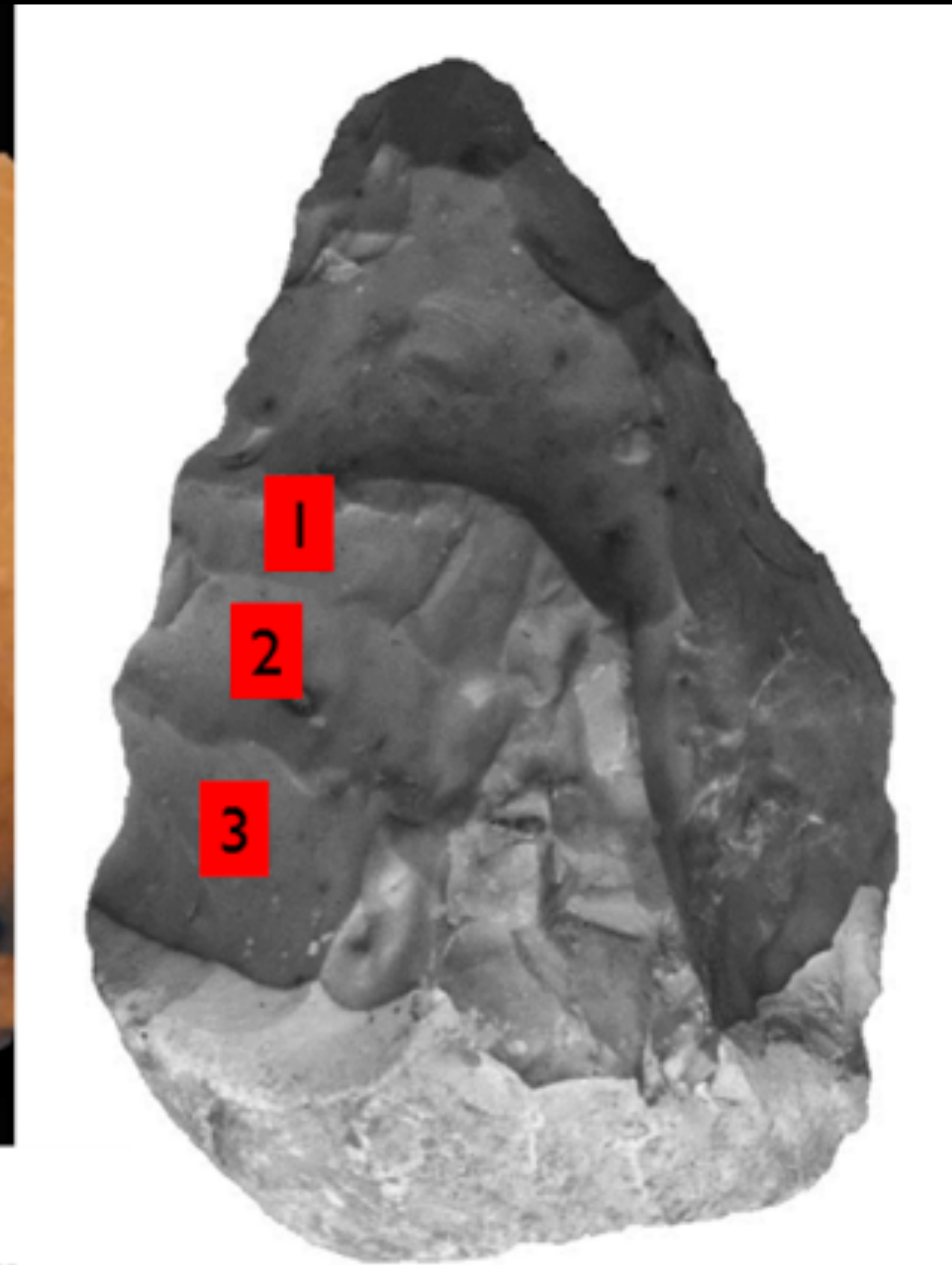
A classification system should avoid assumptions that cannot be empirically verified

- Tool as end-point
- Finished artefact fallacy
- Waste


1 2 3 4 5 6 7 8 9 10 11 12
1 2 3 4 5

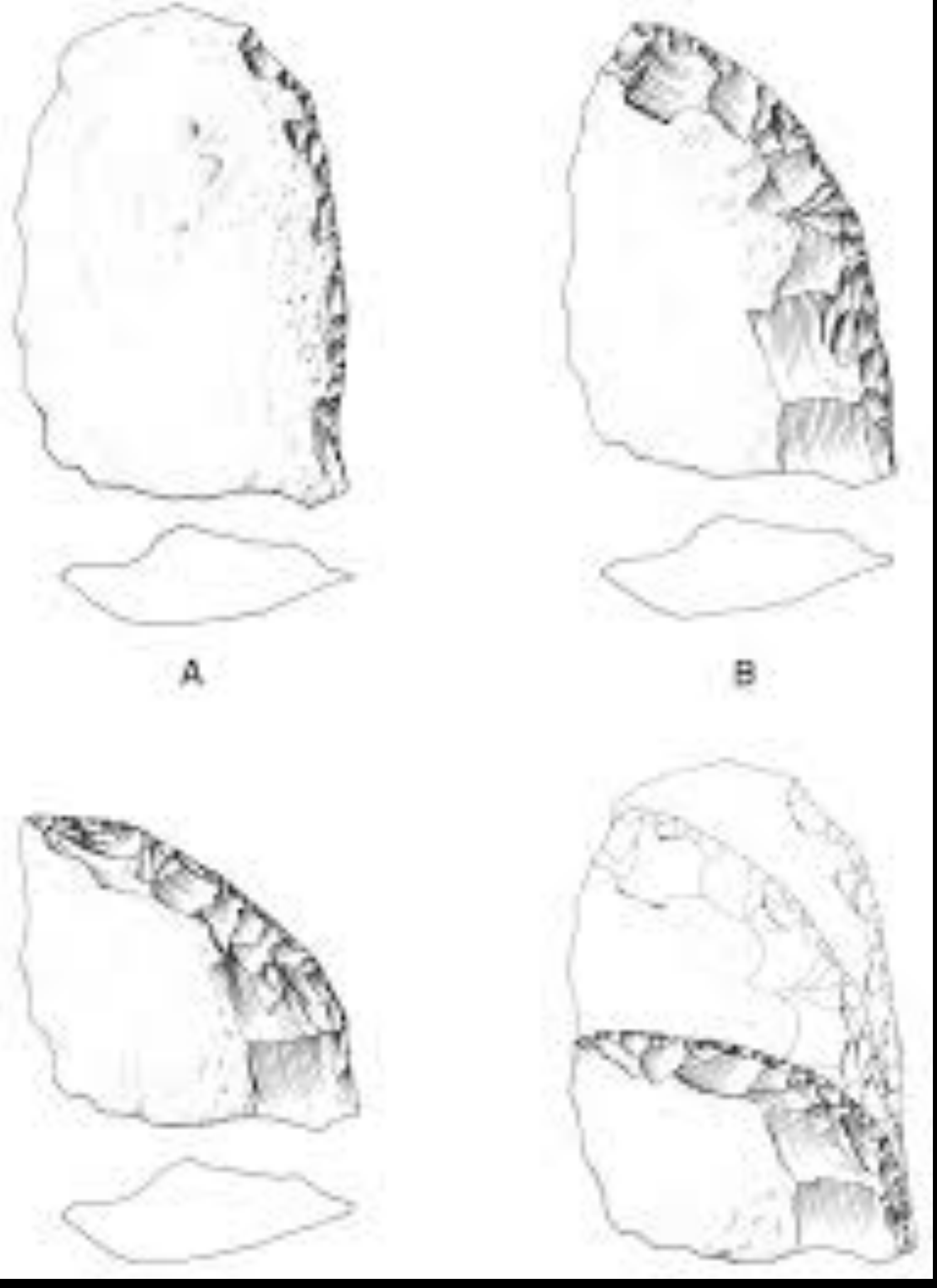

TOO COOL TO DO DRUGS
COOL TO DO DRUGS
DO DRUGS
DRUGS





Removal of flakes of identical form interpreted differently depending on final form of discarded object

Tabun 340 ka


A
B

J Archaeol Method Theory (2017) 24:813–851
DOI 10.1007/s10816-016-9297-8

CrossMark

Major Fallacies Surrounding Stone Artifacts and Assemblages

Harold L. Dibble[1,2,3] · Simon J. Holdaway[4,5] · Sam C. Lin[6] · David R. Braun[2,7,8] · Matthew J. Douglass[9] · Radu Iovita[10] · Shannon P. McPherron[2] · Deborah I. Olszewski[1] · Dennis Sandgathe[11]

Published online: 8 August 2016

Abstract While lithic objects can potentially inform us about past adaptations and behaviors, it is important to develop a comprehensive understanding of all of the various processes that influence what we recover from the archaeological record. We argue here that many assumptions used by archaeologists to derive behavioral inferences through the definition, conceptualization, and interpretation of both individual stone artifact forms and groups of artifacts identified as assemblages do not fit squarely

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7 Center for the Advanced Study of Human Paleobiology, George Washington University, Washington, DC 20052, USA

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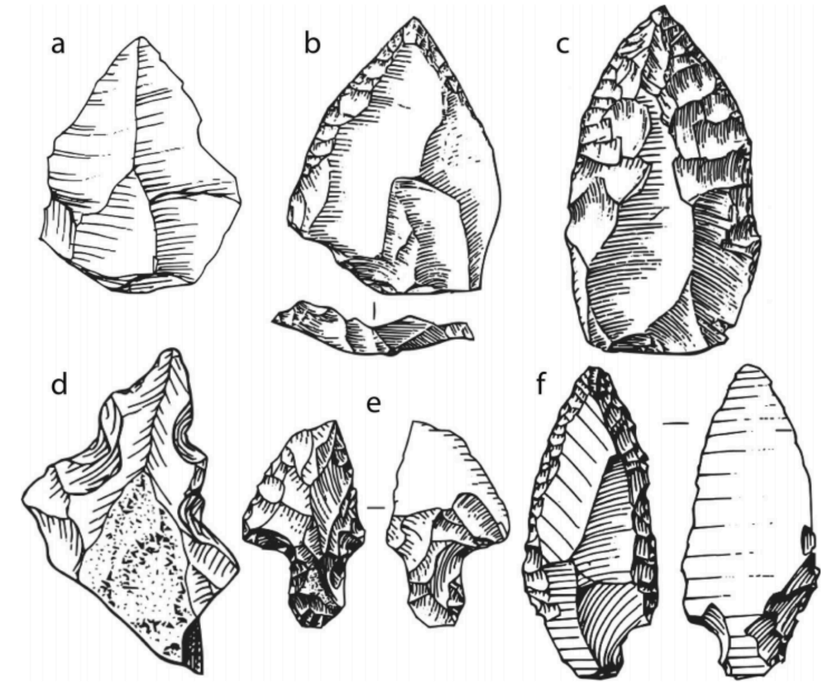

Fig. 1 Different point forms defined in Bordes' typology. **a** Levallois point; **b** retouched Levallois point; **c** Mousterian point; **d** Tayac point; and **e**, **f** stemmed points. Redrawn from Debénath and Dibble (1994) and Dibble et al. (2012)

Mousterian points closely resemble convergent scrapers, with the principal difference between them—in the words of Bordes (1961) who defined them as a type—being that someone "could kill a bear"

Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

Sink the Mousterian? Named stone tool industries (NASTIES) as obstacles to investigating hominin evolutionary relationships in the Later Middle Paleolithic Levant

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ARTICLE INFO

Article history:
Available online 13 February 2014

ABSTRACT

The Later Middle Paleolithic lithic archaeological record for the East Mediterranean Levant has been invoked to support competing and contradictory models for the evolutionary relationships between *Homo sapiens* and *Homo neanderthalensis*. The lithic evidence has not helped paleoanthropology achieve a conclusive resolution about this issue because archaeologists continue to structure inter-assemblage lithic variability in terms of stone tool industries such as the "Mousterian". This paper explores the problems that named stone tool industries (or "NASTIES") cause for Paleolithic archaeology, and it explores alternatives to them.

1. Introduction

The archeological record has unique potential to shed light on the course of human evolution. Archaeological sites outnumber human fossils by several orders of magnitude. At best, each hominin left behind only one fossil of which we rarely recover more than fragments. In contrast, Pleistocene hominins littered Africa and Eurasia with virtually indestructible stone tools. Each lithic artifact preserves a "snapshot" of hominin behavior, of the decisions and actions earlier hominins made at particular times and places. Properly analyzed, the lithic record can shed light on change and variability in hominin behavior with sample sizes and statistical power that the sparse hominin fossil record simply cannot equal. And yet, there is often a mismatch between how Paleolithic archaeologists analyze and interpret the lithic record and the "big questions" in human evolution (Shea, 2011a,b).

"Big questions" are the ones that unite archaeologists, paleontologists, and geneticists in the larger enterprise of paleoanthropology. Whether we can detect hominin evolutionary relationships in Levantine Later Middle Paleolithic (MP) lithic variability is potentially a big question. Indeed, the nature of the evolutionary relationship between *Homo sapiens* and *Homo neanderthalensis* (Neandertals) is one of the longest-running debates in human origins research (Trinkaus and Shipman, 1993). Recently, a comparison between DNA from Neandertal fossils and DNA from living humans showed that living non-African humans' genomes contain 1–4% Neandertal DNA (Green et al., 2010). This study further proposed that significant introgression of Neandertal DNA into the human genome occurred in the Middle East between 50 and 100 ka, during the Later MP. This finding challenges a well-entrenched view that Neandertals contributed little or nothing to the genome of living humans (Klein, 2003). That it has been widely embraced as decisively refuting hypotheses of evolutionary discontinuity between Neandertals and *H. sapiens* is something of a surprise (Stringer, 2012). Until very recently, the strongest evidence for chronological overlap and for the retention of Neandertal morphologies among Upper Paleolithic *H. sapiens* came not from Southwest Asia, but from Europe (Trinkaus et al., 2003).

Paleo-genetics is a young science (Hawks, 2013). Claims that its findings overturn decades of paleoanthropological research have to be treated skeptically (Marks, 2013). Evolutionary hypotheses based on genetic data gain strength when they are corroborated by evidence from the paleontological and archaeological records. They are correspondingly weakened when they do not. Green and colleagues (2010: 710) identify the period 50–100 ka as that during when such interbreeding occurred because, "During that time, Neandertals presumably came into contact with anatomically modern humans in the Middle East from at least 80,000 years ago and subsequently in Europe and Asia." They specify the Middle East (i.e., the East Mediterranean Levant and montane Southwest Asia) as the most likely place for such interbreeding to have occurred because "Such a scenario is compatible with the archaeological record, which shows that modern humans appeared in the Middle East before 100,000 years ago whereas the Neandertals existed in the same region after this time, probably until 50,000 years ago" (Green et al., 2010: 721).

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NASTIES are to Paleolithic archaeology more or less like what named human "races" were to earlier research in physical anthropology, inductively and intuitively derived folk-taxonomic entities re-purposed for use in 19th Century science (Wolpoff and Caspari, 1997; Marks, 2009). It was only after physical anthropologists discarded race as an analytical construct that they began to make serious progress in understanding the actual sources of patterned biological variability among living humans (Montagu, 1945; Wolpoff and Caspari, 1997). As long as NASTIES remain in use by archaeologists, as long as they are perceived as a legitimate means by to infer social, cultural, and/or evolutionary relationships among prehistoric humans and earlier hominins, there will be no strong selective pressure for archaeologists to develop legitimate theoretically-justifiable methods for accomplishing these goals. The sooner we abandon NASTIES, the sooner we will make progress towards developing these new methods and contributing to answers to the big questions in human origins research. Paleolithic archaeology and paleoanthropology are better off without them.

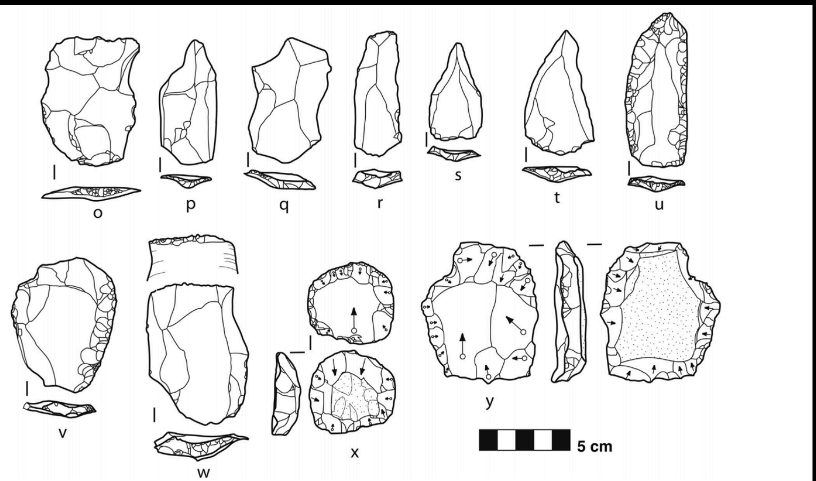

Fig. 1. Later Levantine Mousterian artifacts (a–n., above line) and Interglacial Levantine Mousterian artifacts (o–y, below line). a–d. Levallois points, e–f. naturally backed knives, g. Levallois blade, h. Levallois flake, i. Mousterian point/convergent scraper, j. Levallois flake with ventral retouch, k–l. core-trimming elements (with flake scar directionality indicated), m–n. Levallois cores with unidirectional-convergent preparation. o–q. Levallois flakes, r. Levallois blade, s–t. Levallois points, u–v. double scrapers, w. truncation, x–y. Levallois cores with radial-centripetal preparation. Sources: Kebara (a–n), Qafzeh (o–y).

EVALUATING "FOLSOM" POINTS IN THE BLACKWATER DRAW MUSEUM'S CALVIN SMITH COLLECTION

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Introduction

This poster presents preliminary research of an ongoing project, meant to evaluate the authenticity of "Folsom points" within the Calvin Smith Collection housed at the Blackwater Draw Museum and determine whether the points within this collection fall within or outside a range of metric and qualitative characteristics for Folsom points in the Southern High Plains. This poster presents the results of the morphological and technological analyses of Folsom points from a variety of archaeological contexts across the Southern High Plains.

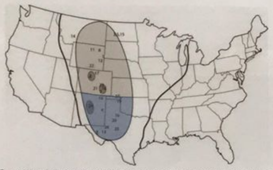

Figure 2. Overview of Great Plains and Folsom sites, with Southern High Plains highlighted in blue (Modified from Andrews et al. 2008:466).

Folsom Background

Folsom refers to a Paleoindian culture that proliferated in the Great Plains region from approximately 10,900 to 10,200 B.P. (Amick 1995). These mobile hunter-gatherers used distinctive projectile points fluted on one or both faces, or not at all (Midland), and specialized in hunting *Bison antiquus* (Figure 1) (Hofman 1995; Holliday 1987). Across the Southern High Plains (Figure 2), Folsom groups were observed to curate projectile points and raw materials by reworking or rejuvenation, creating variation in point sizes and shapes (Buchanan 2006). Additional sources for point variation include differential reduction sequences based on situational responses (i.e. environment, raw material stores), hafting constraints, copying errors made while trying to replicate a normative template, and cultural drift (Amick 2002; Eerken and Bettinger 2001; Hayden 1987).

Figure 1. Photo of Midland point (left) and Folsom point (right). Photo by author.

Calvin Smith Background

The Calvin Smith Collection, housed at the Blackwater Draw Museum at Eastern New Mexico University, is a donated collection of lithic projectile points from various time periods. This collection contains so-called "Folsom" projectile points that are not accompanied by information confirming the primary archaeological context from which they came, therefore they have yet to be analyzed and authenticated.

Research Goal

The goal of this preliminary analysis was to identify a range of variation of Folsom point attributes that represent artifacts from the Southern High Plains.

Materials

Eighty-five Folsom points, primarily from the Blackwater Draw site, were measured in millimeters between various landmarks (Figure 3) using a set of digital calipers. An attribute key was used to provide a list of codes for classifying and recording qualitative and quantitative attributes (Tables 1 and 2). An ultraviolet flashlight was used to determine raw material types of points. Metric measurements and qualitative attributes were analyzed in Minitab to determine the range of characteristics that can be considered diagnostic of the sample of known Folsom points.

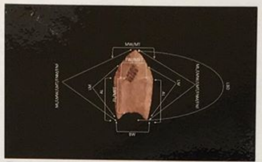

Figure 3. Landmarks used for measuring Folsom points. Photo by author.

Methods

A variety of interlandmark metric measurements were recorded with digital calipers. Measurements or attributes that could not be recorded due to the conditions of points (i.e. fragmentation, visibility of attributes such flake scarring due to dirt or calcification) or to the presence or absence of these attributes were recorded as N/A. Microsoft Excel was used to generate pie charts of qualitative attributes. Boxplots and histograms of these attributes were generated to visually present ranges of variation of point attributes. Descriptive statistics were generated in Minitab to acquire means, ranges, and coefficient of variation. Outliers identified in box plots were removed from the samples to provide a true representation of Folsom point characteristics, leaving sixty-eight points in the sample.

Table 1. Qualitative Data.

Variable
Biface Size
Biface Condition
Raw Material
Raw Material Type
Cortex Percentage
Blade Shape
Basal Shape
Presence/Absence of Fluting on Face A/Face B
Presence/Absence of Fluting Platform
Presence/Absence of Flake Scars after Fluting along Basal Concavity
Presence/Absence of Flake Scars after Fluting along Lateral Margins
Presence/Absence of Flake Scars after Fluting at Distal Tip
Presence/Absence of Edge Abrasion on Lateral Margin
Presence/Absence of Edge Abrasion on Basal Margin
Projectile Point vs Preform

Table 2. Quantitative Data and their Abbreviations as Used in the Landmark Photo.

Variable	Abbreviation
Max Length	ML
Max Width	MW
Length of Max Width	LMW
Max Thickness	MT
Length of Max Thickness	LMT
Basal Width	BW
Length of Basal Concavity to Distal	LBD
Flute Length A/B	FL
Flute Width A/B	FW
Maximum Flute Thickness	MFT
Number of Flake Scars on Face A/Face B	FNF
Length of Margin A/Margin B	LM
Number of Flake Scars for Margin A/Margin B	FNM
Length of Abrasion of Lateral Margin A/Margin B	AL

Results

Raw material types used to make most of the projectile points in the sample (Figure 4) were dominated by Edwards chert (82%), while a few were made from Alibates Dolomite (7%). A few other raw materials could not be positively identified (11%). Conditions of most points (Figure 5) were proximal fragments (41%), and only a few points were complete (24%). Basal shapes (Figure 6) were predominately Folsomoid (35%). A greater majority of point base shapes were too fragmented to be identified (37%). Maximum point lengths (Figure 7) ranged between 20 and 20 mm. Maximum point widths (Figure 8) ranged between 14 to 24 mm. Maximum point thicknesses (Figure 9) ranged between 3 to 5 mm. Boxplots for maximum lengths, widths, and thicknesses (Figures 10-12) show little variation in the measurements. Maximum width shows a slight skew that might indicate outliers within the dataset. A boxplot for number of flake scars on face A (Figure 13) shows outliers above one of the whiskers that indicates points with high flaking on this face, but I disregard these as being abnormal as such outliers might point towards true Folsom points that were resharpened. Descriptive statistics of quantitative values (Table 3) identified small values for standard deviations and coefficient of variance for the following attributes: max width, max thickness, basal width, flute width, and maximum flute thickness. These attributes may provide the closest measure of definitive attributes for Folsom.

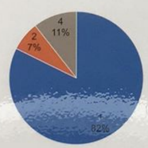

Figure 4. Frequencies of raw material types.

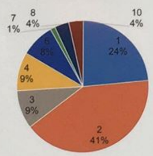

Figure 5. Frequencies of biface conditions.

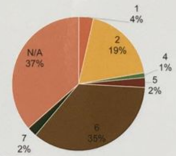

Figure 6. Frequencies of basal shapes.

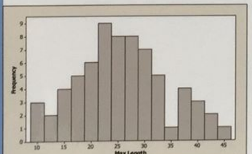

Figure 7. Histogram of Max Length.

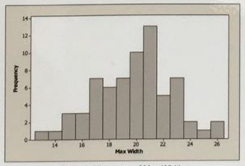

Figure 8. Histogram of Max Width.

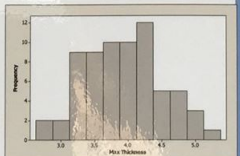

Figure 9. Histogram of Max Thickness.

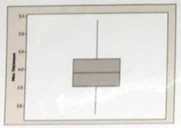

Figure 12. Boxplot of Max Thickness.

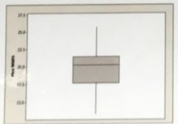

Figure 11. Boxplot of Max Width.

Figure 10. Boxplot of Max Length.

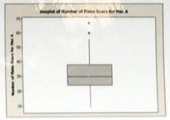

Figure 13. Boxplot of Number of Flake Scars for Face A.

Table 3. Descriptive Statistics of Qualitative Variables.

Variable	Total Count	Mean	StDev	CoefVar	Q1	Median	Q3	Range	IQR
Max Length	68	25.87	8.51	32.89	19.98	25.45	30.88	34.98	10.91
Max Width	68	19.811	2.717	13.71	17.692	20.285	21.443	12.340	3.750
Length of Max Width	68	17.356	7.376	42.50	12.805	16.240	22.465	29.170	9.660
Max Thickness	68	3.9309	0.5550	14.12	3.5200	3.8950	4.2750	2.6100	0.7550
Length of Max Thickness	68	14.019	6.815	48.61	8.140	14.060	18.640	27.710	10.500
Basal Width	68	17.034	1.709	10.03	15.958	17.080	18.343	6.880	2.385
Length of Basal Concavity	68	26.19	7.70	29.41	20.99	25.82	30.67	31.26	9.68
Flute Length A	68	17.443	6.588	37.77	12.297	18.270	22.153	29.970	9.855
Flute Length B	68	18.791	6.348	33.78	13.905	19.420	23.282	26.740	9.377
Flute Width A	68	13.012	2.503	19.24	11.583	13.055	14.355	10.900	2.773
Flute Width B	68	12.368	2.717	21.97	10.550	12.300	14.383	12.940	3.833
Maximum Flute Thickness	68	3.5155	0.4765	13.55	3.2450	3.5200	3.8950	2.0500	0.6500
Number of Flake Scars on Face A	68	44.84	17.96	40.05	32.00	46.00	58.00	75.00	26.00
Number of Flake Scars on Face B	68	42.69	16.55	38.77	29.00	42.00	59.00	72.00	30.00
Length of Margin A	68	23.166	7.854	33.90	17.768	23.100	28.465	35.760	10.697
Length of Margin B	68	22.44	7.97	35.52	16.23	22.45	27.83	38.18	11.60
Number of Flake Scars for Margin A	68	32.49	12.14	37.38	24.00	30.00	38.00	58.00	14.00
Number of Flake Scars for Margin B	68	32.18	12.93	40.17	21.00	31.00	41.00	51.00	20.00
Length of Abrasion of Lateral Margin A	68	19.382	6.310	32.55	14.500	19.940	22.580	25.950	8.080
Length of Abrasion of Margin B	68	18.90	6.45	34.15	14.76	17.12	24.34	25.78	9.58

Discussion/Conclusion

The results so far suggest that Folsom points relate closely to one another in terms of the five attributes shown above, yet, given the presence of outliers in my samples that may be skewing my data, this is as yet inconclusive. Further research and an even greater sample size is needed in order to further analyze variation in attributes. As well, the further removal of the outliers that may not represent true Folsom points might help to better represent the range of variation in my region of focus. Removing outliers to demonstrate a true range of Folsom point variation, though, must be done by careful consideration of the artifacts in question.

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- Fellow graduate students

References Cited

See handout for References Cited.

Summary

Retouch

Chaîne opératoire

Classification