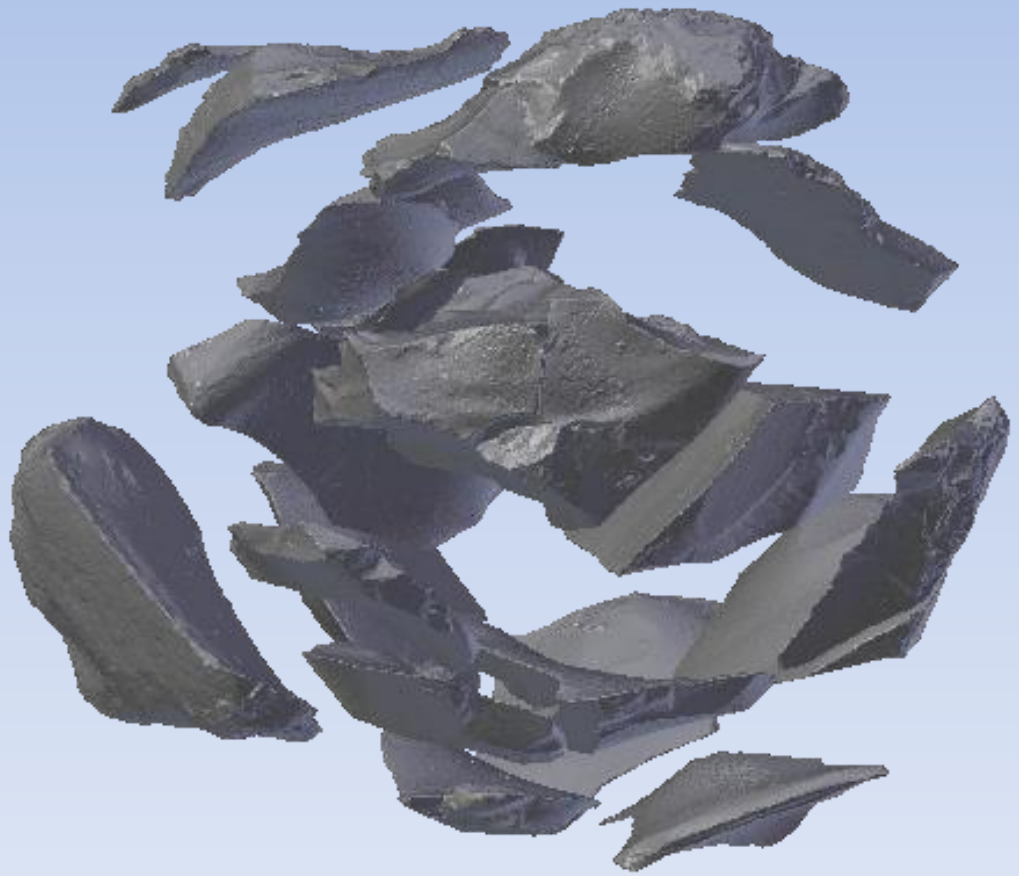
21ST ANNUAL MEETING OF THE EUROPEAN ASSOCIATION OF ARCHAEOLOGISTS GLASGOW 2015 2-5 SEPTEMBER
EAA GLASGOW 2015

NEANDERTHAL MUSEUM

UNIFE

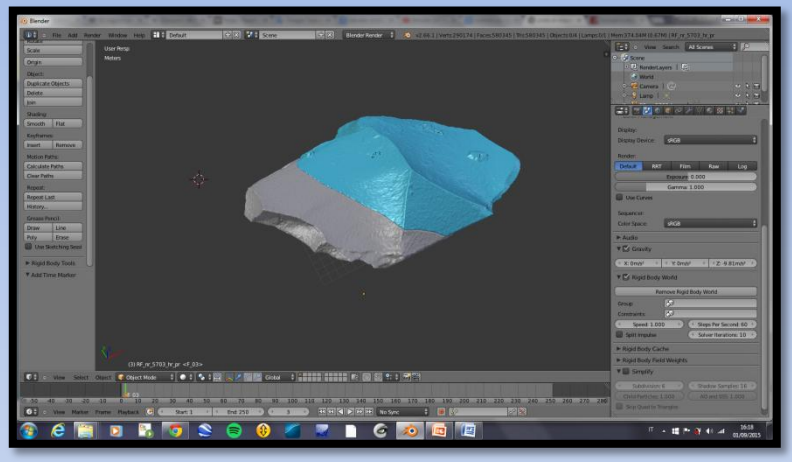
Davide Delpiano, Marco Peresani & Andreas Pastoors

Exploring Neanderthal skills from 3D knapping reconstruction

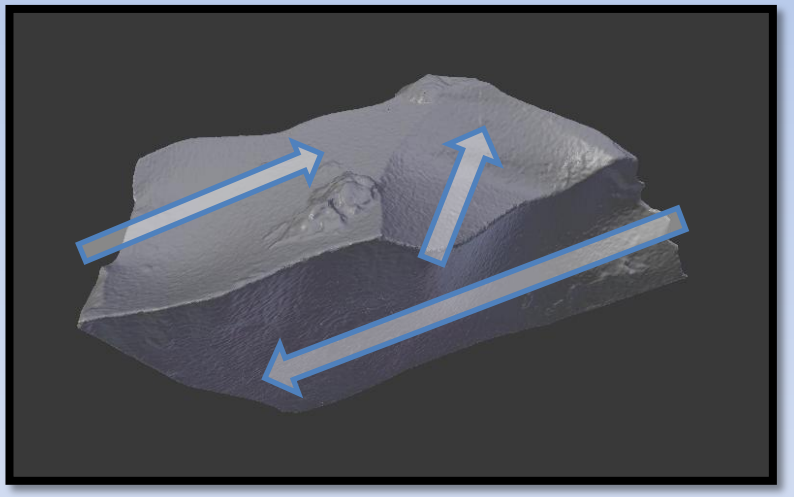


Objectivs: Verify the contribution of 3D approach for the analysis of Lithic Refitting

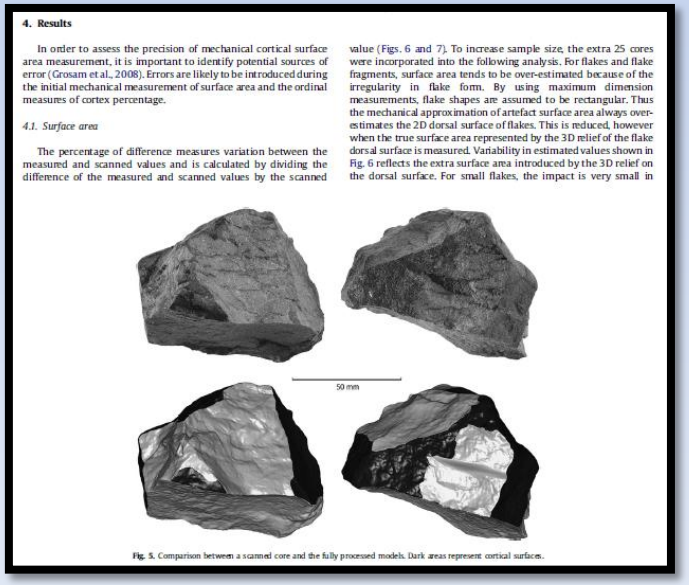
- **TECHNICAL**



- **ANALYTICAL/RESEARCH**



- **INFORMATIVE**



4. Results

In order to assess the precision of mechanical cortical surface area measurement, it is important to identify potential sources of error (Grosam et al., 2008). Errors are likely to be introduced during the initial mechanical measurement of surface area and the ordinal measures of cortex percentage.

4.1. Surface area

The percentage of difference measures variation between the measured and scanned values and is calculated by dividing the difference of the measured and scanned values by the scanned value (Figs. 6 and 7). To increase sample size, the extra 25 cores were incorporated into the following analysis. For flakes and flake fragments, surface area tends to be over-estimated because of the irregularity in flake form. By using maximum dimension measurements, flake shapes are assumed to be rectangular. Thus the mechanical approximation of artefact surface area always over-estimates the 2D dorsal surface of flakes. This is reduced, however when the true surface area represented by the 3D relief of the flake dorsal surface is measured. Variability in estimated values shown in Fig. 6 reflects the extra surface area introduced by the 3D relief on the dorsal surface. For small flakes, the impact is very small in

50 mm

Fig. 5. Comparison between a scanned core and the fully processed models. Dark areas represent cortical surfaces.

3D scanning in lithic studies

GRAPHICAL DOCUMENTATION OF LITHIC ARTEFACTS: TRADITIONAL HAND CRAFT VERSUS 3-D MECHANICAL RECORDING

Andreas Pastoors and Gerd-Christian Weniger

Experiences with … scanner

Erfahrungen mit niedrig- und hochpreisigen 3D Oberflächenscannern

Astrid Slizewski[1]* & Patrick Semal[2]

…urface scanning - New Perspectives for Archaeological Data Management and Methodology?

Bernd Breuckmann[1], Pablo Arias Cabal[2], Nicolas Mélard[3], Roberto Ontañón Peredo[2], Andreas Pastoors[4], Luis César Teira Mayolini[2], Pedro Ángel Fernandez Vega[5] and Gerd-Christian Weniger[4]

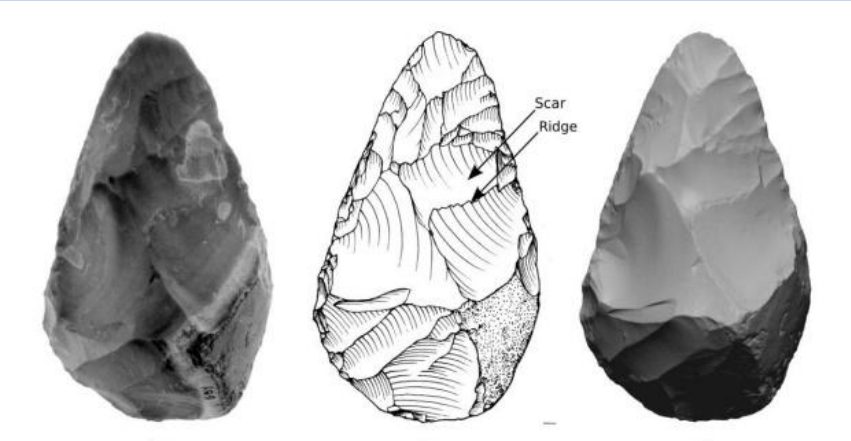
Exploring the Application of Digital, Three-Dimensional Technologies for the Study of Lithic Artifacts

SURF Conference Panel Session 6A

By: Nicole Lang

Mentor: Dr. Lisa Maher, Anthropology

- Use for papers and information sharing (vehicle of spreading scientific informations)



From Richardson et al., 2011

- Objectivity (no personal interpretation)
- Real representation (no graphical conventions)
- All important features are recorded and communicated (documentation)
- No reduction in 2D format (direct approach to shape, depths, volumes)
- Easy to publish and print

- Use for Computer Analysis

Evaluating morphological variabi… in lithic assemblages using 3D models of stone artifacts

Knut Bretzke [a,*], Nicholas J. Conard [a,b]

Extracting Scar and Ridge Features from 3D-scanned Lithic Artifacts

Eitan Richardson [1], Leore Grosman [2], Uzy Smilansky [2] and Michael Werman [1]

EXPERIMENTAL THREE-DIMENSIONAL PRINTING OF A LOWER PALAEOLITHIC HANDAXE: AN ASSESSMENT OF THE TECHNOLOGY AND ANALYTICAL VALUE

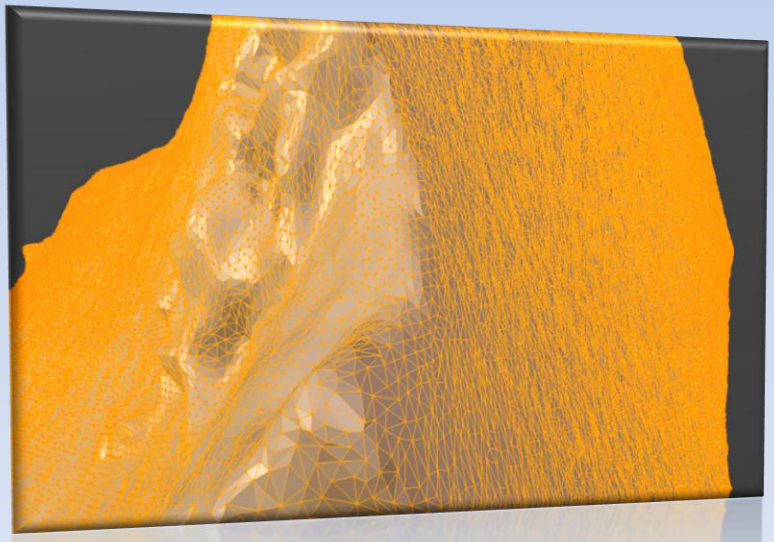
BRANDON R. OLSON[1], JODY M. GORDON[2], CURTIS RUNNE… STEVE CHOMYSZAK[2]

The application of 3D laser scanning technology to the assessm… and mechanical cortex quantification in lithic analysis

Sam C.H. Lin [a], Matthew J. Douglass [a,b], Simon J. Holdaway [a,*], Bruce Floyd [a]

Estimating original flake mass from 3D scans of platform area…

Chris Clarkson [a,*], Peter Hiscock [b]



STRENGHTS

- Accuracy in quantification and detail
- High scientific value
- Objective measurement
- Direct access to morphometric features
- Transparency and truthfulness

- Use for Computer Analysis

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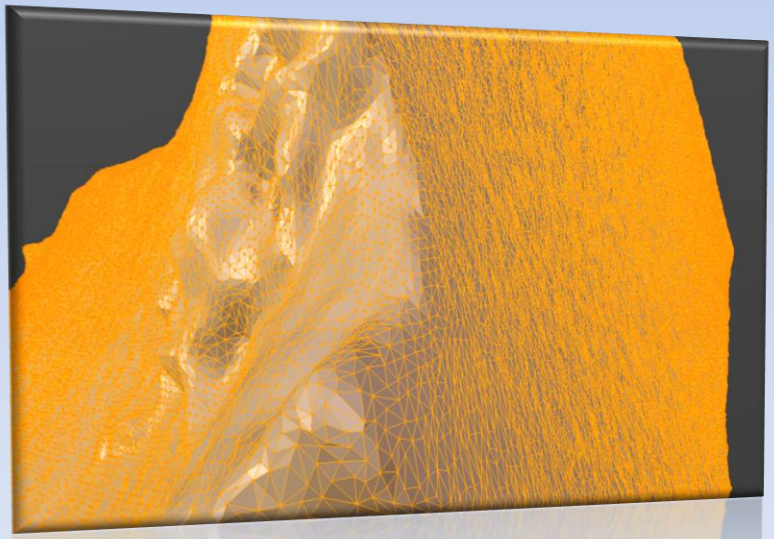


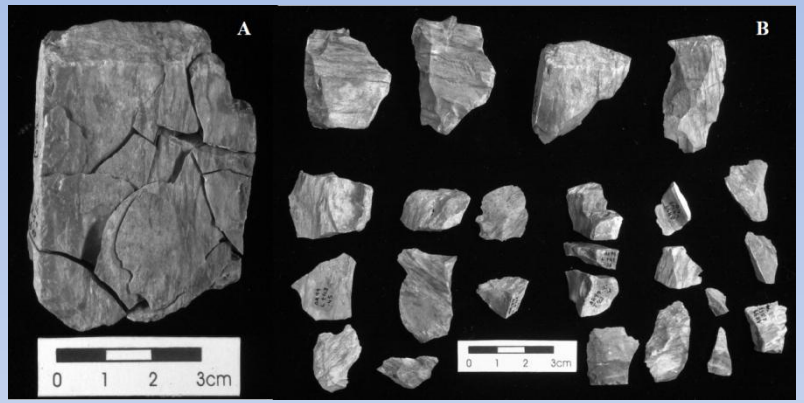
DEFECTS

- Textures not reliable
- Problems with high-reflecting materials
- holes in thin pieces
- High cost equipment
- No technical preparation and propension to innovation

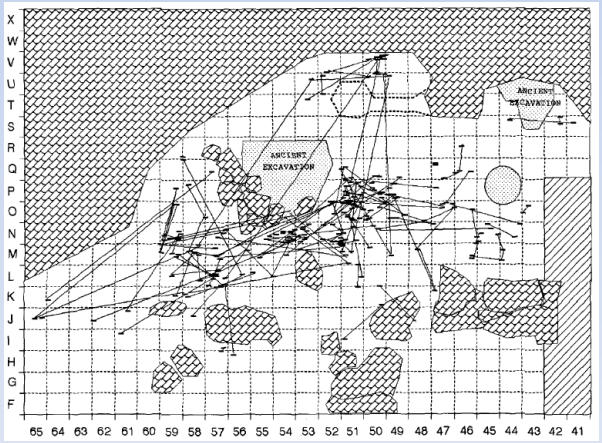
Refittings: what they are and what are their benefits

Technological: reconstructions of Reduction Sequences

- Knapping methods
- Volumetric concepts (multiple refittings)



Behavioral: Intra-Site spatial analysis



- Space organization strategies
- The "*Neanderthal question*": behavioral and cognitive capacities

From Vaquero et al., 2007

Refittings: issues and unresolved questions

Contents lists available at ScienceDirect

Journal of Archaeological Science

journal homepage: http://www.elsevier.com/locate/jas

Experimental analysis of the practical limits of lithic refitting

John P. Laughlin [a], Robert L. Kelly [b,*]

[a] Wyoming State Historic Preservation Office, 2301 Central Ave., Cheyenne, WY 82002, USA
[b] Department of Anthropology, University of Wyoming, Laramie, WY 82071, USA

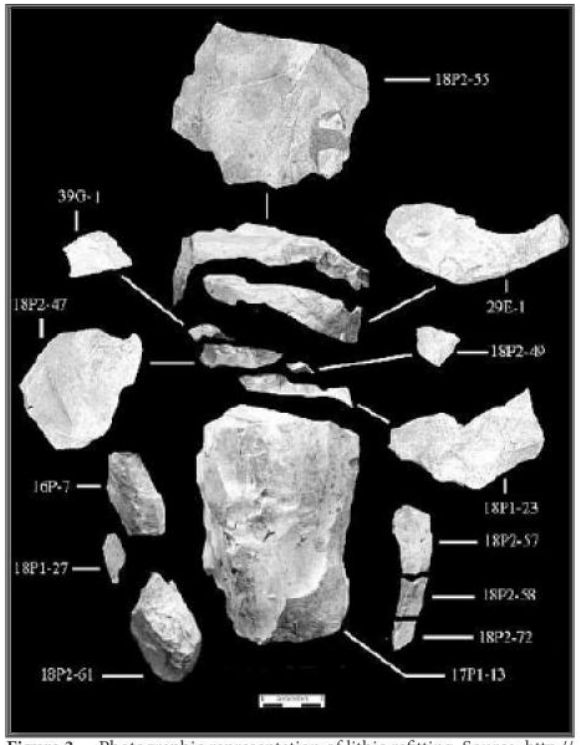


Figure 3. Photographic representation of lithic refitting. Source: http://www.texasbeyondhistory.net/pavoreal/paleoindian.html

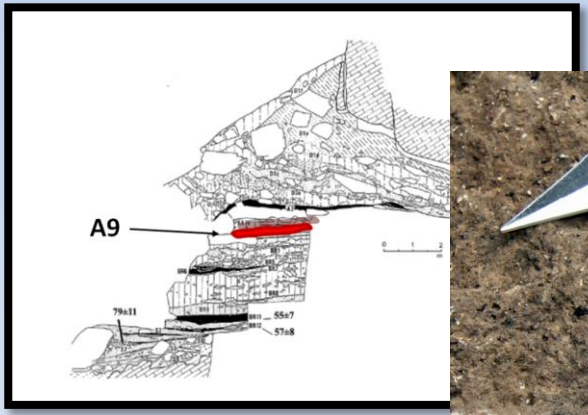
Very high time consuming

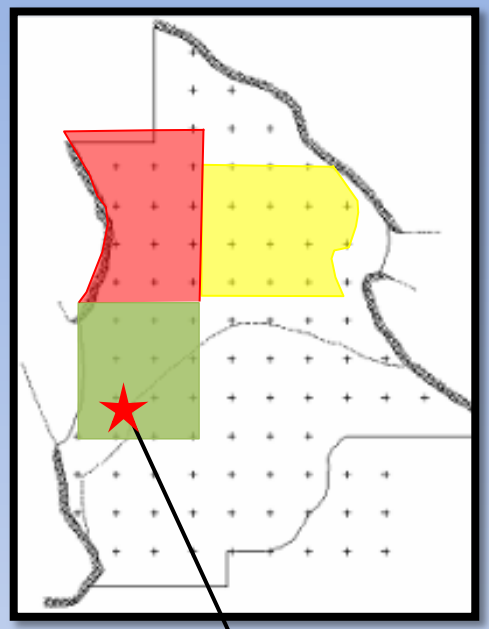
It depends on too many variables:

- Type of reduction sequences
- Variability of raw materials
- Scholars skills
- Lithic assemblage dimensions
- Artifacts size
- Post-Depositional contaminations
- Behavioral economy of groups and fragmentation of *Chaîne opératoires*

Can the 3D technique help?

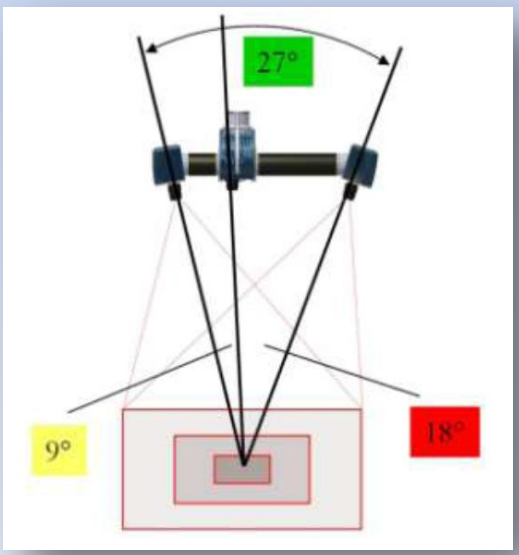
Proposal: test the utility of 3D approach for lithic refittings to an archaeological context

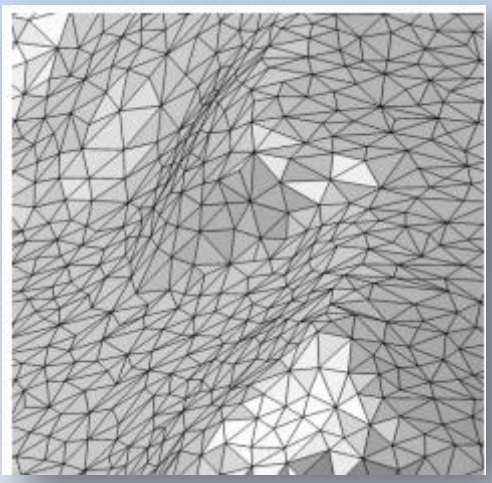




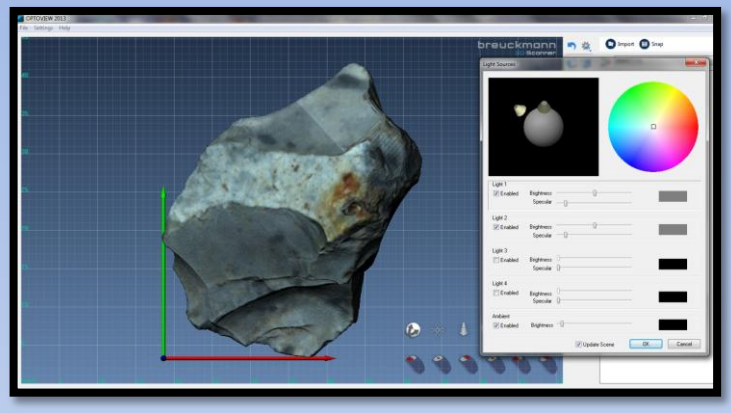
0 5 cm

Breuckmann smartSCAN 3D

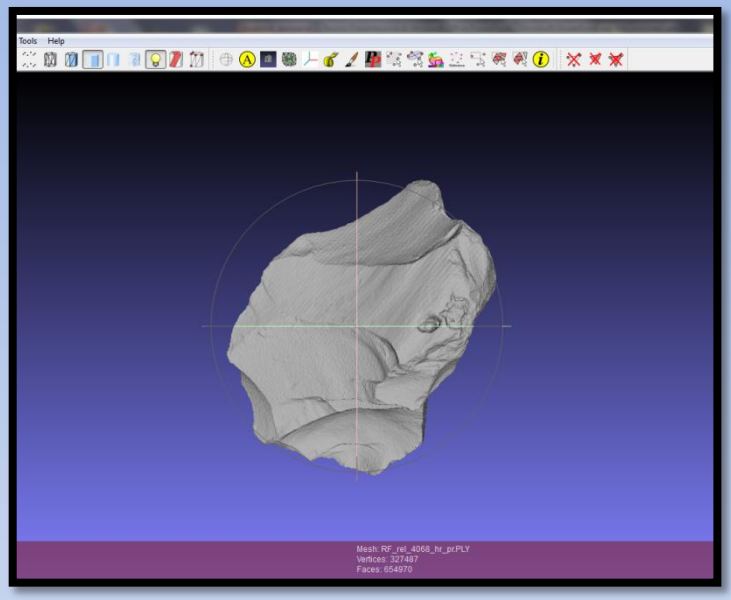




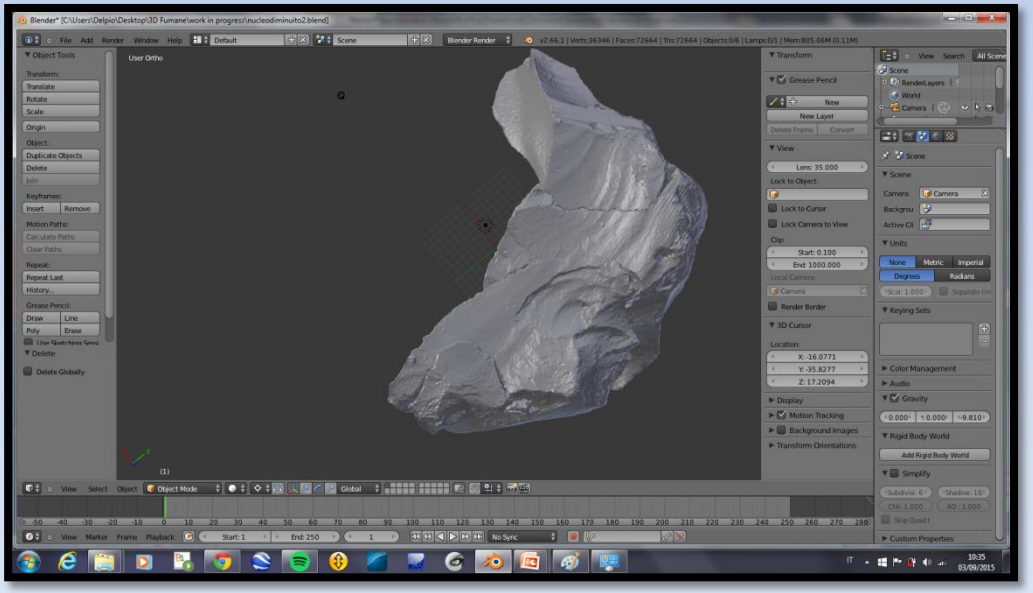
3D processing steps



1. **OptoVIEW**: .ply file with texture



2. **Meshlab**: .ply file reduced in size and without texture

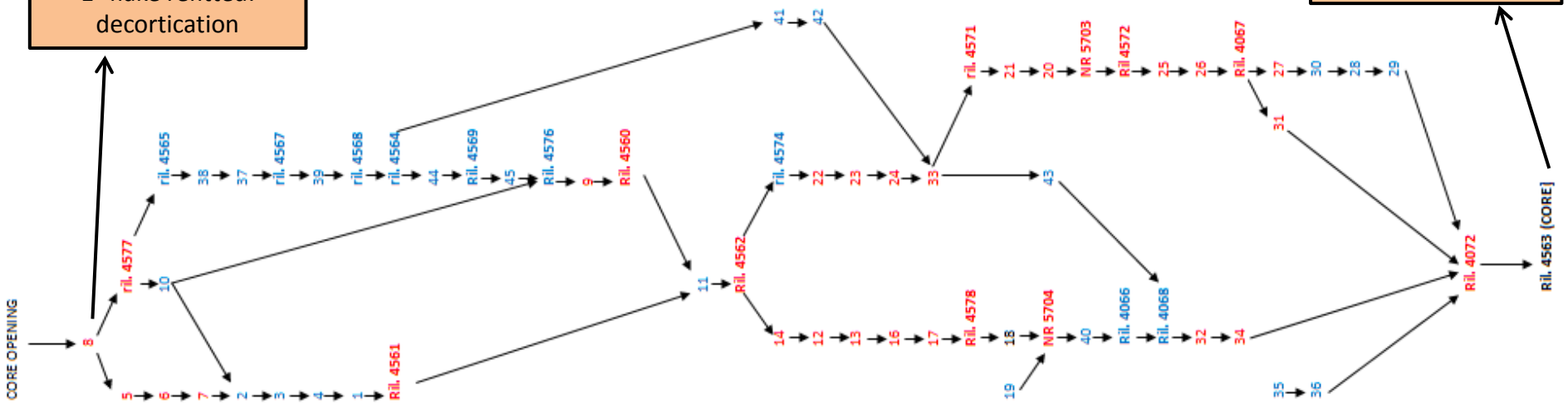


3. **Blender**: .blend file with many objects

Reconstruction of Reduction Sequence

1° flake refitted: decortication

Residual core

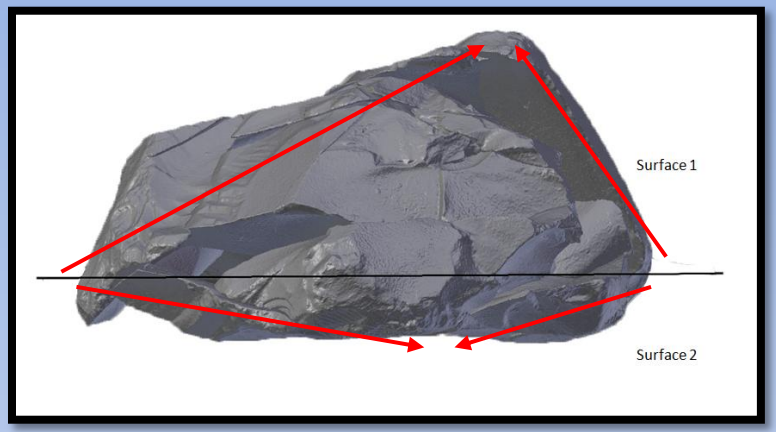


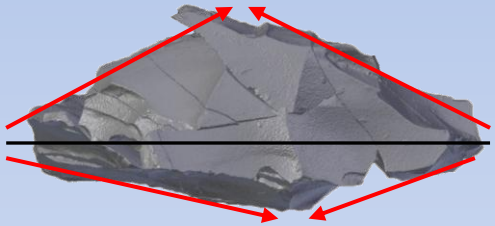
Obtained from:

- Refittings (direct relationships)
- Negatives (direct relationships)
- Handiest gesture
- Core shape and convexities

Chaine operatoire arranged around 2 surfaces

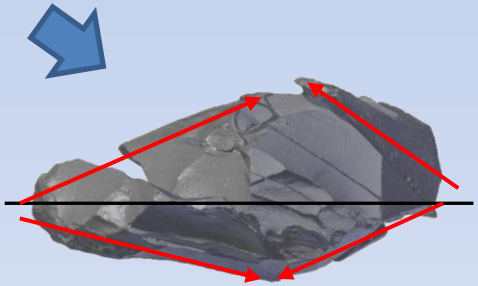
- not hyerarchised
- opposite
- adjacent
- secant
- convex?

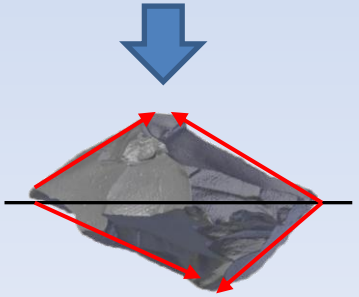


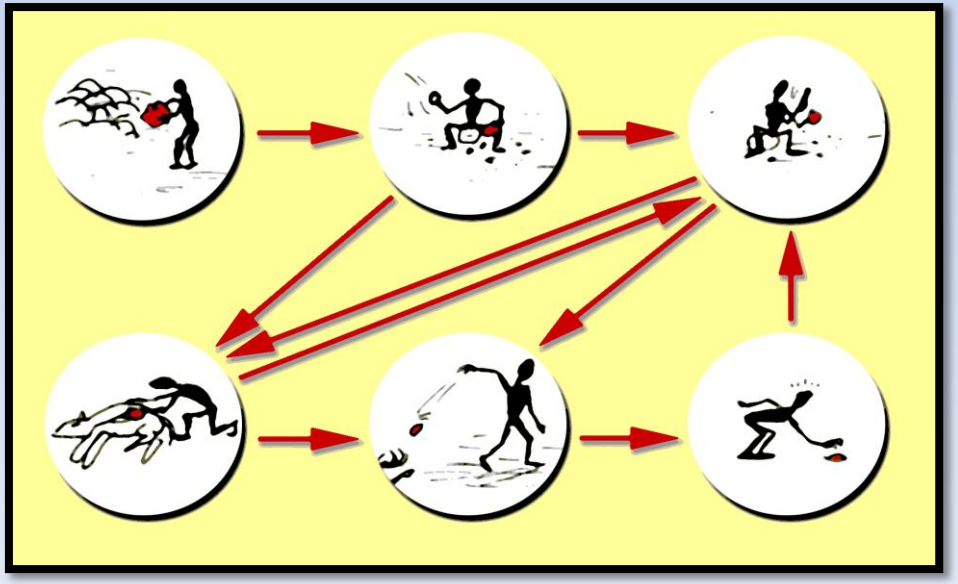


Complete Chaine operatoire:

- collection in stream bed
- preparation
- production
- abandonment

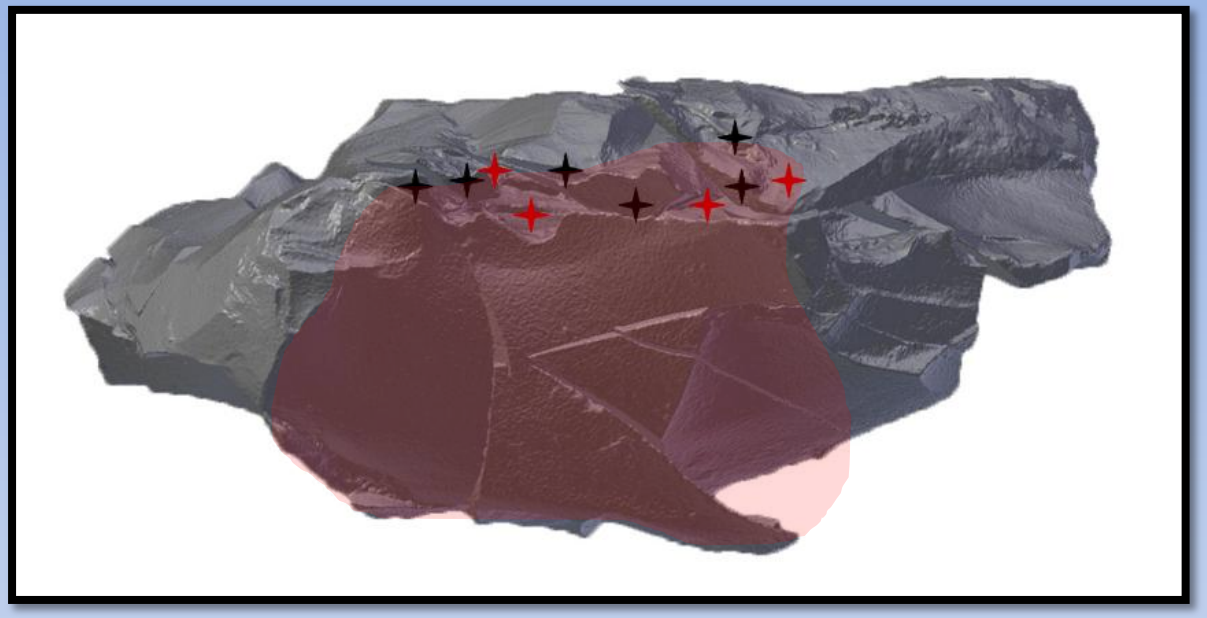


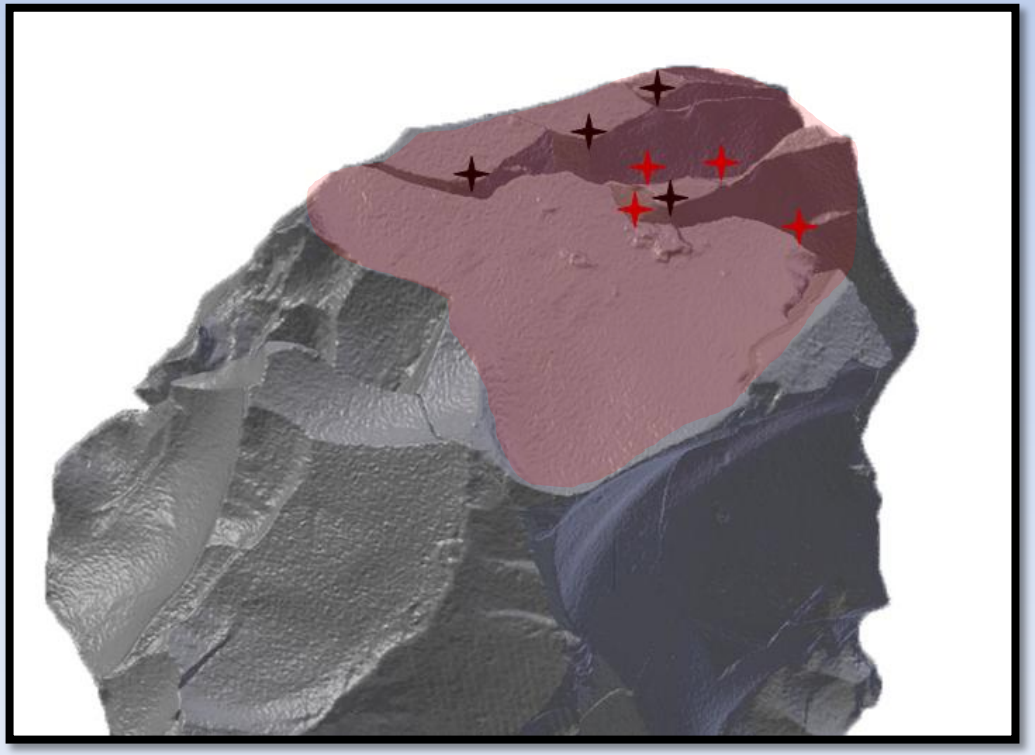




Striking Platforms

- wide and flat
- large flakes detachments



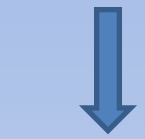


Exploitation:

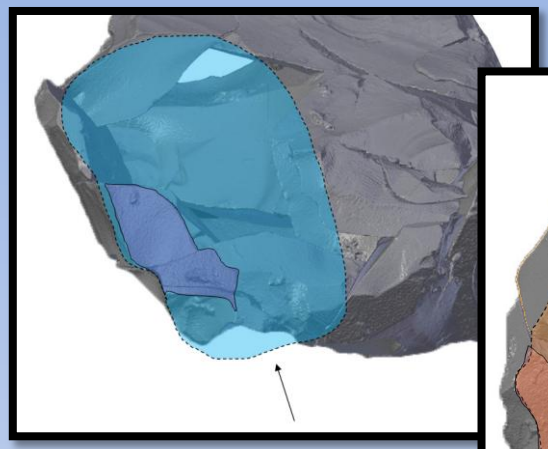
- proximal or lateral portion
- flat/not prepared butt

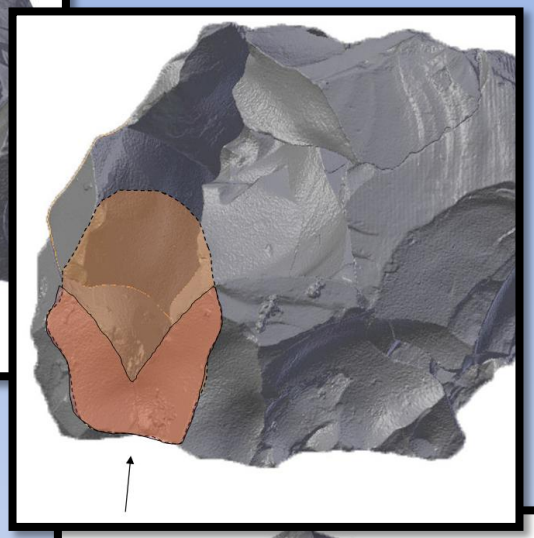
Final Products

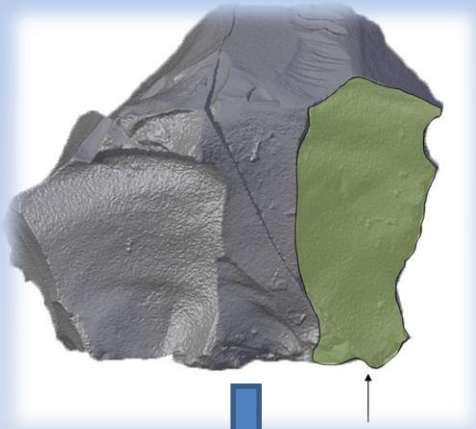
Removed flakes

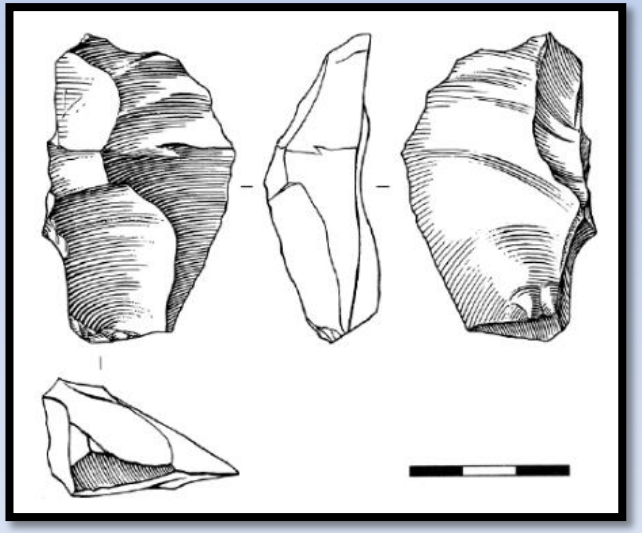


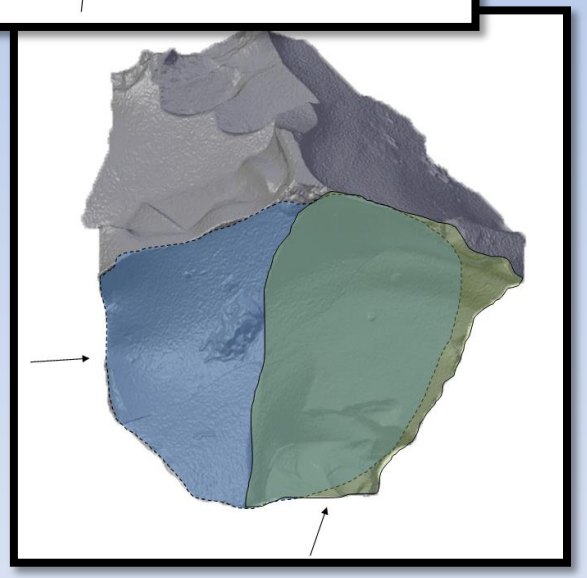
Reconstructed interacting with negatives and 3D holes and gaps

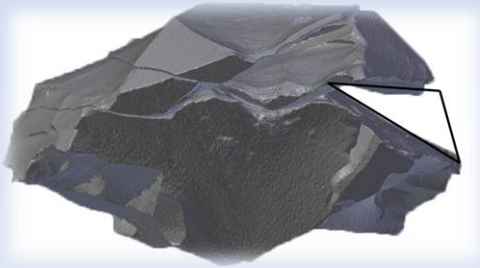






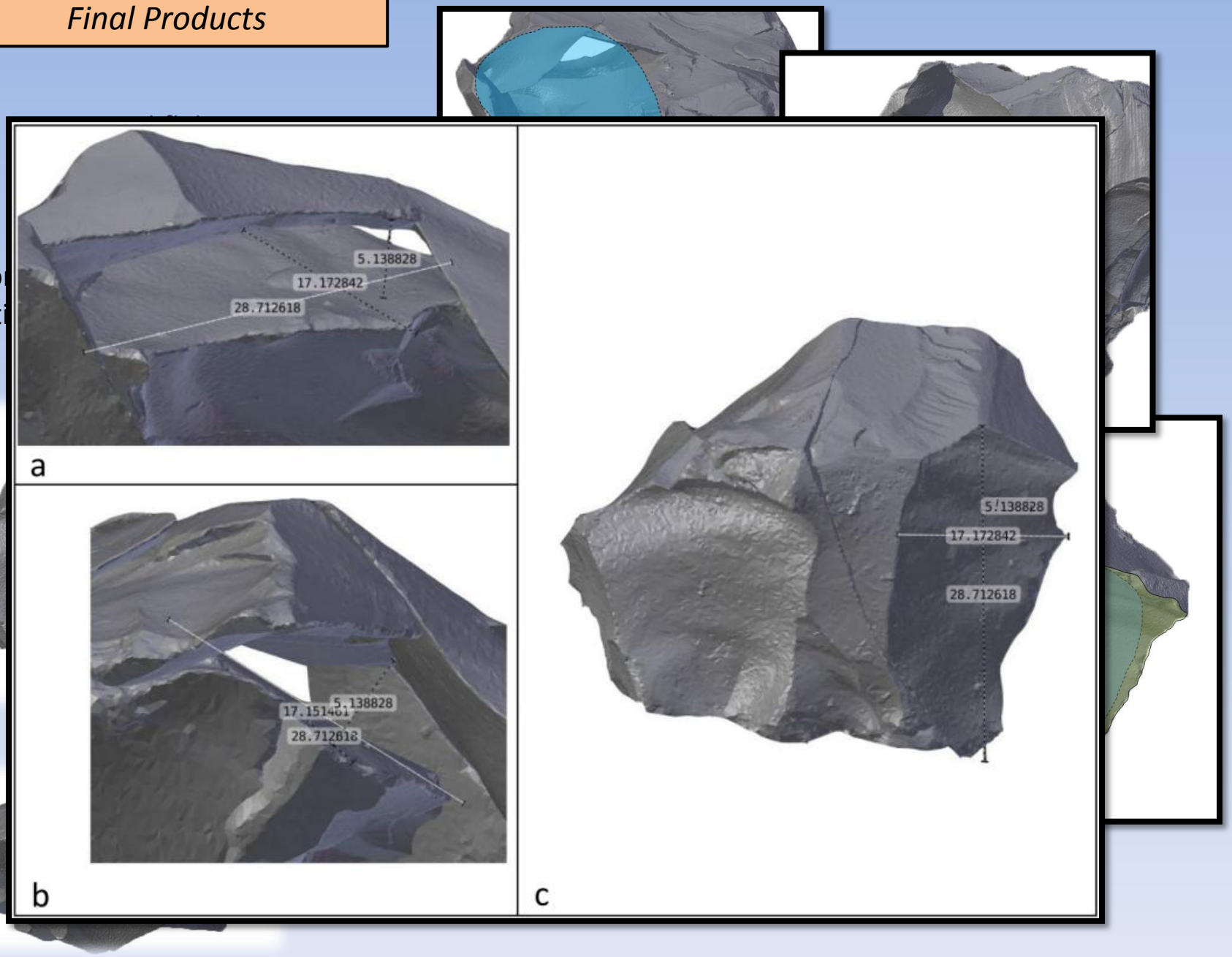




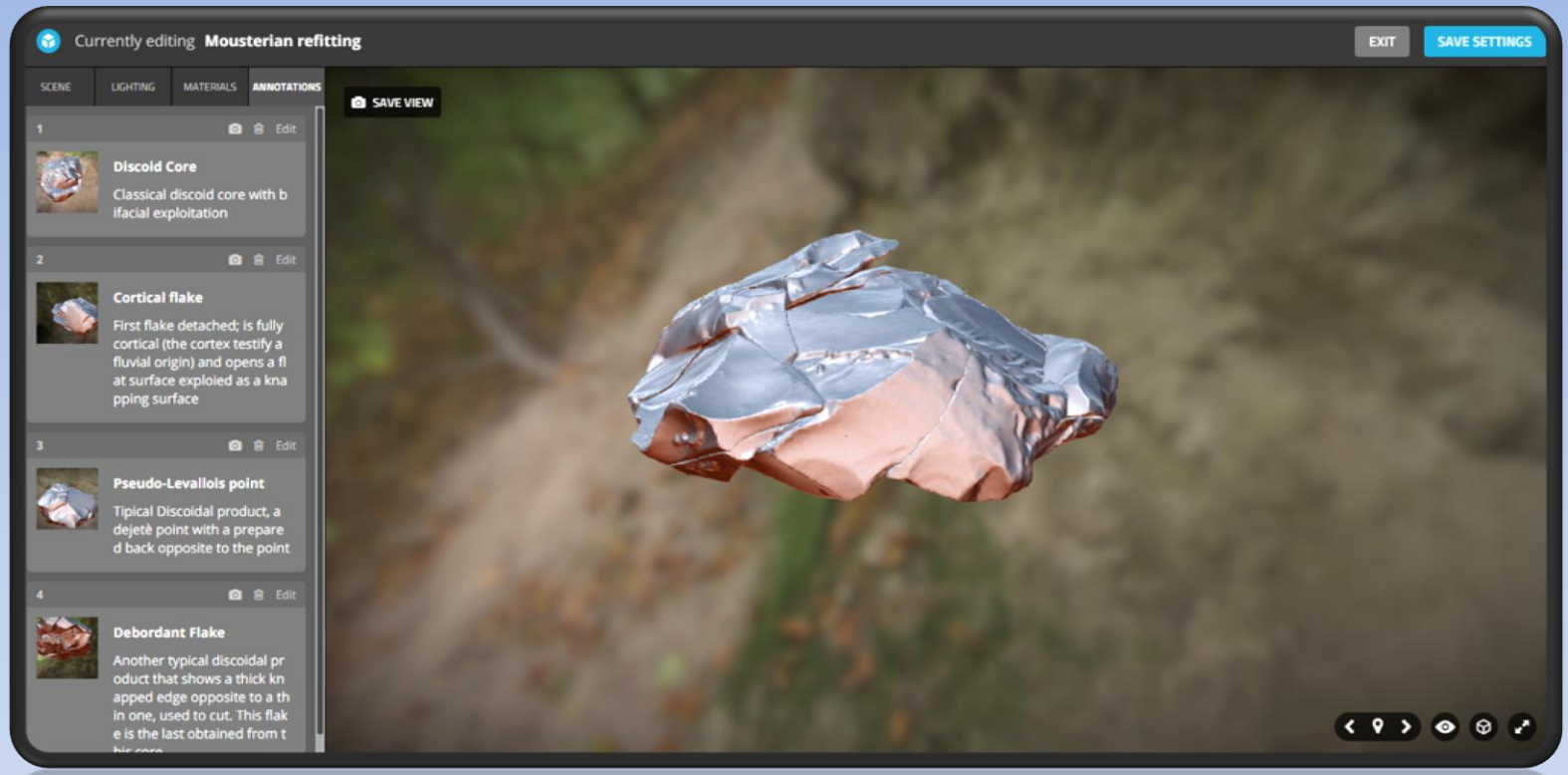


Final Products

Recon
negati



Divulging: publication on SKETCHFAB



Advantages:

- Free access to everybody
- Easy advertisement (social network, online papers)
- Direct comparison

Limits:

- Unique piece (.obj file)
- Not demountable (no interaction)
- Only annotations

https://sketchfab.com/models/9926470b878244f985d8835123a43ee1

Behavioural economy of the Neanderthal knapper

Expedient and opportunistic behavioral economy

- all actions carried out within the site
- expedient use of raw material

Concentration = lithic workshop waste

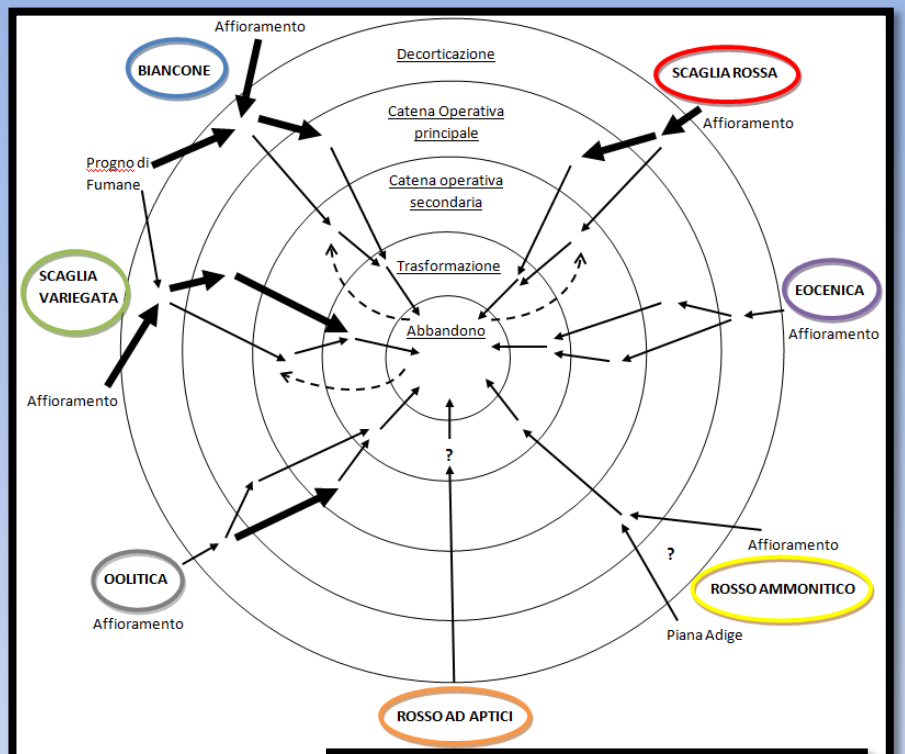
- only residual is present, primary products have been picked up

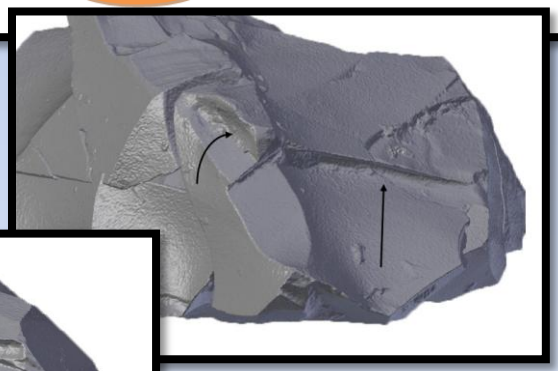
Clearly Discoid reduction concepts, “manual way”

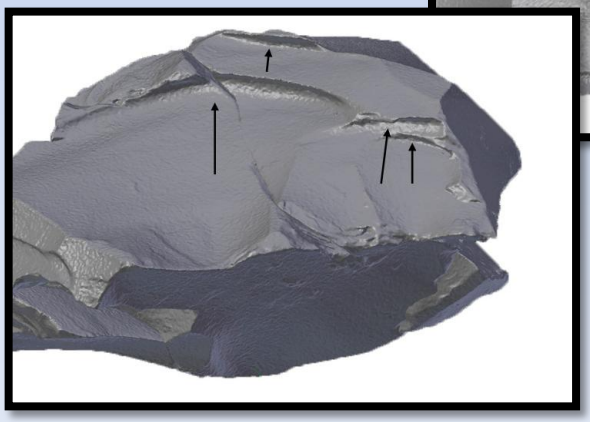
- but it doesn’s show the entire variety of Fumane’s discoid

Clear concepts but low care, approximation in gestures or not hign skills?

- knapper not very accurate or careful
- (relative) low productivity







Conclusions:

Excellent impact and many benefits:

1. **Maneauvrability**
2. **Interaction**
3. **Preservability**
4. **Reality of representation**
5. **Spreading**