Exploring Neanderthal skills from 3D knapping reconstruction

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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 (Gosse et al., 2009). Errors are likely to be introduced during the initial mechanical measurement of surface area and the final measurements of error percentage.

4.1. Surface area

The percentage of difference measure variance between the measured and scanned values 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 exact 25 core were incorporated into the following analysis. For flakes and flake fragments, surface area tends to be overestimated because of the irregularity in flake form. By using any dimension measurement, flake edges are assumed to be rectangular. Thus, the mechanical approximation of cortical surface area always overestimates the true cortical surface area. This is reduced, however, when the true surface area represented by the 3D relief of the flake is analyzed. Sandblasting (Fig. 3) shows how it reduces the extra surface area introduced by the 3D relief on the cortical surface. For small flakes, the impact is very small in
3D scanning in lithic studies

- 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

STRENGTHS

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

Experimental analysis of the practical limits of lithic refitting

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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
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

Obtained from:
- Refittings (direct relationships)
- Negatives (direct relationships)
- Handiest gesture
- Core shape and convexities
Chaine opératoire arranged around 2 surfaces
- not hyerarchised
- opposite
- adjacent
- secant
- convex?

Complete Chaine opératoire:
- 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

Reconstructed interacting with negatives and 3D holes and gaps.
**Advantages:**

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

**Limits:**

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

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[Divulging: publication on SKETCHFAB](https://sketchfab.com/models/9926470b878244f985d8835123a43ee1)
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’t show the entire variety of Fumane’s discoid

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

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

Excellent impact and many benefits:

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