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# Throwing Light on the Past

## A New Methodology for Analysing Activity-related Skeletal Changes in Humeri

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The **medial epicondyle of the humerus** is a particularly relevant anatomical area to reveal **physical activities** performed during an individual's lifetime <sup>1-3</sup> (e.g. throwing of objects, the use of axes and stone tool manufacture)<sup>4,5</sup> and the **sexual division of labour** in past human groups. However, the qualitative recording of osseous alterations in this area remains particularly subjective and prevents large-scale comparisons.

The **main aim** of this research is to develop a novel method to record these alterations quantitatively through non-invasive 3D-imaging.



### Collection

#### Collection of data

- **Prerequisite:** 3D model of humerus
- Can be obtained through CT-scanning, 3D surface scanning, or photogrammetry

### Preparation

#### Pre-processing of models

- Crop
- Orientate
- Filter (i.e. simplification, smoothing)

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## Quantitative Analysis

### What? Topographical analyses

- quantify the whole-surface morphology,
- through complementary variables such as curvature, relief and complexity

### How? molaR package<sup>6</sup> in an R environment

### Which analyses?

- **Dirichlet Normal Energy (DNE)**(curvature measure that quantifies the degree of surface bending)
- **Relief Index (RFI)** (relief measure calculated through the ratio of the 3D surface area to the 2D footprint)
- **Orientation Patch Count (OPC)** (complexity measure that counts the number of similarly oriented regions)



## Conclusions & Prospects

- **Complementary shape variables** can be applied to quantify osseous alterations of the humeral medial epicondyle.
- Through **3D-imaging**, the method offers a **non-invasive** approach to more **objective** recording of these alterations.
- Application to **identified osteological** collections will improve understanding of the analyses' results and their interpretation.
- The method can **create new insights into physical activity and sexual division of labour in the past.**

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