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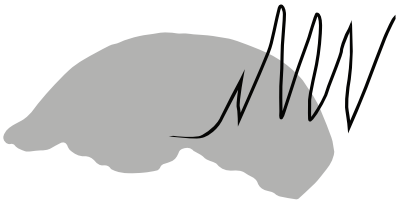

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Cover image: *Homo erectus* holotype cranium and shell engraving, Trinil, Indonesia (Dubois Collection, Naturalis, Leiden, The Netherlands)

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MicroWeaR: a new tool for dental microwear analysis and its application to paleoanthropology and paleontology

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From the 1970s, dental microwear analysis on the tooth surface has been widely employed for the reconstruction of the feeding behaviour and tooth use in both extant and fossil vertebrate taxa. This approach relies on the microscopic scars present on the dental enamel left by ingested foods during the last few (i.e., days, hours) meals of the animal, thereby providing crucial information about short-term changes in the dietary behavior of a species. More specifically, microwear analysis has proven to be an important tool for the dietary ecology of fossil hominins [1,2]. The frequency, morphology, distribution and orientation of the microscopic scars on the enamel surface are a consequence of the action of both chewing forces and type of consumed food on the tooth during the mastication. The most common, traditional way to observe and study these scars is using high definition pictures of a selected working area at low or high magnification, by means, respectively, of a standard stereomicroscope or a scanning electron microscope. There are a number of image analysis software tools for counting and studying these features on a single or multiple images, but all they require a costly license or are generic image processing programs not calibrated for a specific type of analysis such as the microwear one. Here, we propose a new free and open access software to examine and score microwear scars in a semi-automatic way; the code is stored in the MicroWeaR R package. This tool needs an image (at the moment the file formats supported are "jpg", "tif" and "png") as input, with a metric reference for the definition of the scale factor. After loading and scaling of the image, the operator defines the placement and size of a working area. Once the working area is defined, features can be tracked starting a sampling session in which the operator defines 4 points for each scar: the first two for the length and the latter two for the width. Then, the tool classifies automatically each scar within one of the two macro-groups of features: "scratch" and "pit". For each of these two groups, the tool recognizes different sub-categories: "small" and "large" pits, "fine" and "coarse" scratches. In addition, MicroWeaR package provides the user with a summary statistic for each macro- and micro-group (count, mean and standard deviation) and the input picture with the sampled scars that can be exported in different formats. Automatic classification parameters can also be manually edited and set allowing to customize each sampling session. In sum, this easy to use, fast, and semi-automatic tool of classification of the microwear features represents a great advance for the study of the dietary adaptations, paleobiology and paleoecology of any vertebrate, including fossil hominins. Furthermore, due to its free an open access nature, further implementations can be also developed in order to make MicroWeaR a more versatile and powerful tool for dietary assessment of living and fossil species.

*Presenting Author

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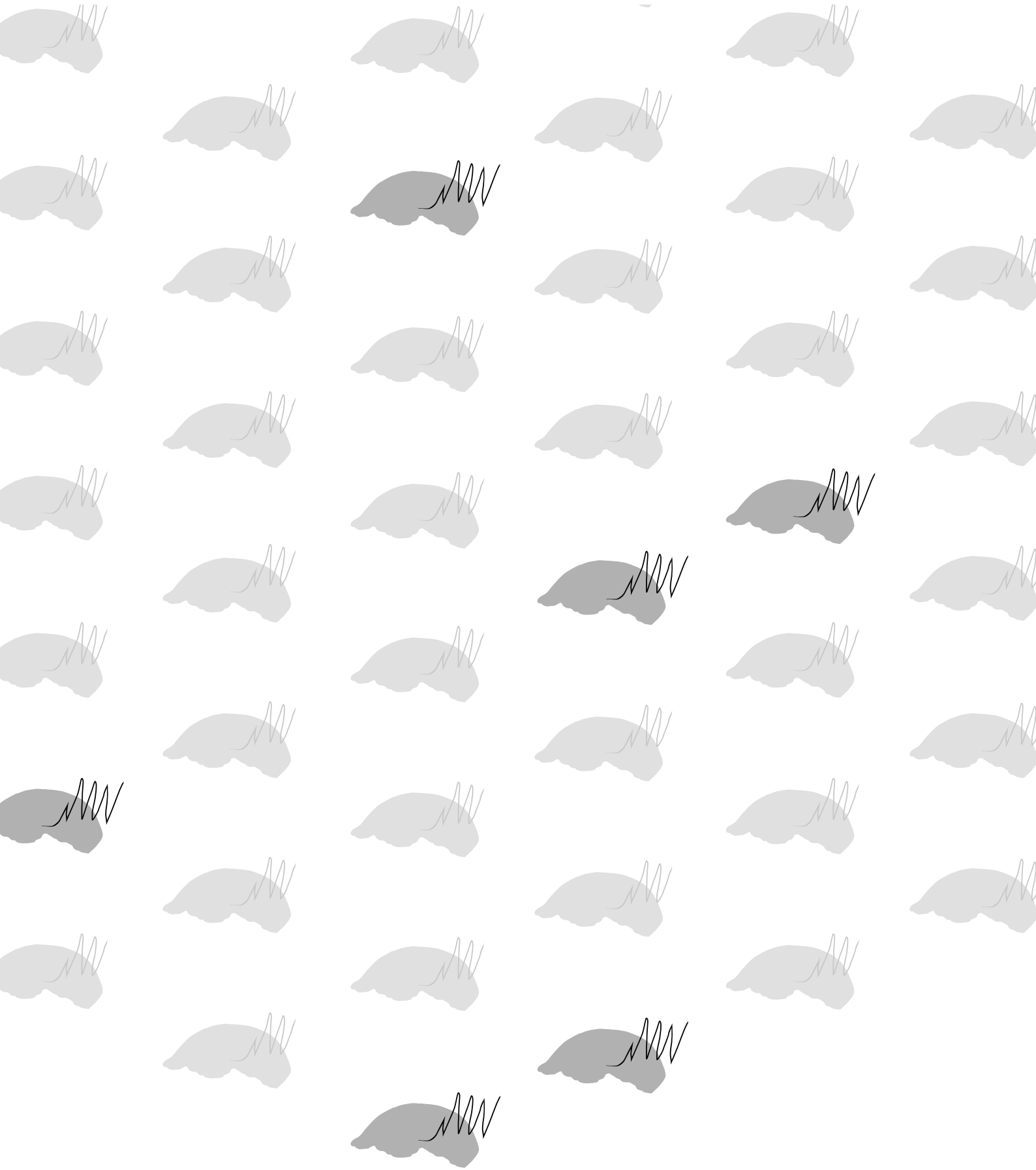

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