Supplemental Text 1. Modeling Relationships between Space, Movement, and Lithic Geometric Attributes

Calculating the Cortex Ratio for a given assemblage requires knowledge of the volume (which can be approximated using mass) and the cortical surface area of the assemblage. For flakes and fragments, surface area is estimated by multiplying maximum length by maximum width. The surface area of cores, following Douglass (2010), is estimated using the equation for the surface area of an ellipsoid:

$$S= 4π\left(\frac{\left(a^{p}b^{p}+a^{p}c^{p}+b^{p}c^{p}\right)}{3}\right)^{1/p}$$

where $a$, $b$, and $c$ correspond to three axial dimensions and $p$ ≈ 1.6075. Cortical surface area is estimated by multiplying the surface area by the decimal value of the midpoint of cortex estimate (0 for none, 0.25 for 1-50%, 0.75 for 50-99%, and 1 for 100%). The values for observed surface area and observed cortical surface area for all artifacts are summed to give assemblage level values.

In addition to known dimensional characteristics of assemblages, the ratio calculation requires an estimation of expected cortical surface given the geometric qualities of the original nodules of stone used to produce them. The dimensions of nodules used by people in the past is not known, and different methods have been used to model this value. Following Lin and associates (2016), axial dimensions for original nodules were modeled using the upper quartile values of archaeological cores retaining more than 50% cortex. These were then used to estimate original nodule surface area using Equation 1, and original nodule volume using the equation for an ellipsoid:

$$V= \frac{4}{3}πabc$$

where *a*, *b*, and *c* are the modeled axial dimensions. To estimate the number of nodules represented in the assemblage, the recorded volume of the assemblage is multiplied by original nodule volume. This value is then multiplied again by the estimate for original nodule surface area to give the expected cortical surface area. Finally, the Cortex Ratio is obtained by dividing the observed cortical surface area by the expected cortical surface area. If all products of reduction are present, the Cortex Ratio should approximate one. Cortex ratios below one suggest that there is less cortex than should be present for the assemblage, while Cortex Ratios higher than one indicate that there is more than should be present.

References Cited

Douglass, Matthew J.

2010 The Archaeological Potential of Informal Lithic Technologies: a Case Study of Assemblage Variability in Western New South Wales, Australia. PhD dissertation, Department of Anthropology University of Auckland, Auckland, New Zealand.

Lin, Sam C., Matthew J. Douglass, and Alex Mackay

2016 Interpreting MIS3 Artefact Transport Patterns in Southern Africa Using Cortex Ratios: An Example from the Putslaagte Valley, Western Cape. *South African Archaeological Bulletin* 71:173-180.