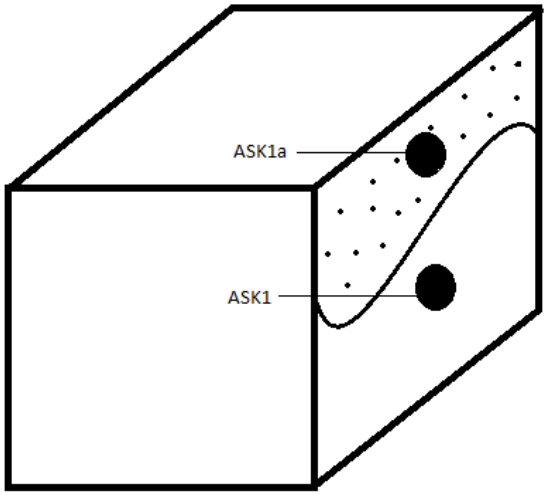
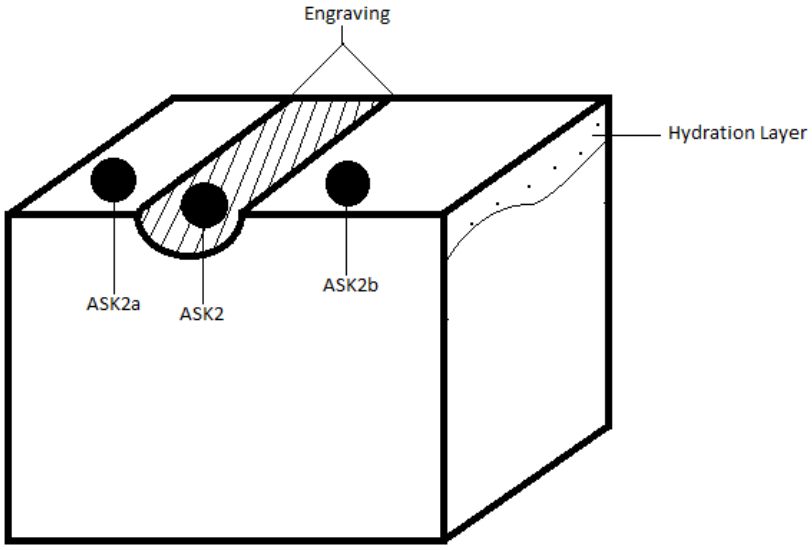
Dating the Engravings of Askari Game Reserve by D. Havenga

The sample was cut from the edge of the rock located at the staff quarters. The cut out section remaining on the actual stone was marked by Dr Blundell of Wits to record the date (2 September 2015) the sample was taken. The sample was cut out using a diamond edged blade and a 1000W angle grinder with the assistance of E.P.Burger a PhD Geology candidate from the university of Pretoria. In order to minimize damage to images the section targeted was removed from the natural edge and included a portion of engraved line running toward the Eland on the rock.



On 2 October 2015 the sample was subjected to proton beam at 3MeV to a charge of 100nC on the iThemba van der Graaf Generator by D.S. Havenga and M. Madhuku of iThemba labs. The sample taken from ASK1 was analysed in terms of Iron (Fe), Silicon (Si) and Uranium (U) in order to obtain an idea of the ratio between engraved sections and the general patina of the rock face. Two samples were run for PIXE spectra analysis using GUPIXWIN.

Sample 1 was take from the natural edge of the larger Askari sample and 2 from the engraved surface. Two points ASK1 Layer) and ASK1a (Hydration Layer) were analysed from Sample 1 and three points ASK2 (engraved section), ASK2a and ASK2b were analysed from Sample 2. Patina samples were taken from the points on either side of the engraved line.



Represented as a linear cross section of the stone the samples represent different layers of the stone. ASK1 would be the deepest layer, beyond the hydration layer, while ASK1 should be roughly equivalent with ASK2 provided that the engraving has cut through the hydration layer. ASK1a should be more similar to ASK2a and ASK2b.

By bombarding the target with accelerated ions PIXE (Particle Induced X-ray Emission) stimulates the release of particles within the valence bands of certain molecules. This releases X-ray emissions and gamma-rays. These rays can then be measured and analysed within a single measurement to calculate molecular percentage composition (Tuurnala *et al*. 1985: 93).

Graphically represented it is clear that the sample concentrations do not support the hypothesis that the engraved section ASK2 should be more similar in composition to point ASK1. ASK2 is in fact more similar to ASK2a and ASK2b than to other points sampled on the rock. The extreme deviatin of ASK2b in terms of % U measurement will not be considered due to possibility of error in analysis or contamination. The trend indicated is that the closer to the surface of the stone the sample is taken

the higher the U and Iron and lower the Si levels will be. This is due to the possibility for U to exchange with the atmostphere at the rock surface and the soluability of Si molecules enabling their leaching from the rock.

The similarity of the engraved section to other patina sections has two possible implications. The engraving is possibly too shallow to have penetrated the hydration layer. However, from the visible changes in rock colouration and the depth of the engraving vs. the hydration layer this is unlikely to be the case. The second implication is that although the engraving may have penetrated the hydration layer that sufficient time has passed for the engraved section to approach the molecular conditions of the weathered patina.

As such it is impossible at this time to determine a date for the engravings at Askari until a better understanding of the weathering processes of the diabase in the region, including local climatological conditions, is reached.