DIGITISATION OF A PETROGLYPH SITE BOASTING UNIQUENESS AND DIVERSITY

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South Africa has a diverse collection of rock art sites featuring both pictograms and petroglyphs scattered across vast areas of the country. Petroglyphs are predominantly found in the central regions such as the south-western Free State, the Northern Cape and the south-western parts of the North West province, typically in open fields at or near low hills. Some of the most beautiful petroglyphs are situated in the northern Free State and the southern and western parts of the North West province.

Fig. 1: Depiction of a rhinoceros at the site near Klerksdorp. Petroglyph number B11.3.

Research on the petroglyphs in the North West province has been widely published since the 1900s by renowned researchers such as Van Riet Lowe (1937), the artist Batiss (1948), Mason (1962), Dowson (1992), Ouzman (2001) and Hollmann (2007). A growing interest in rock art led to some rocks containing petroglyphs being taken from their natural environment either for private ownership or to be relocated to museums in South Africa and abroad. Documented relocation efforts suggest that Europe has been a popular destination for these artifacts (Henry 2007).

Unfortunately, removal often resulted in damage to or the complete destruction of petroglyphs. Moreover, the artifacts face ongoing threats from both anthropogenic factors, such as vandalism and mining operations (eg at Gestoptefontein and Redan), and environmental conditions, including the freeze-thaw cycle that can cause rocks to crack. The digital documentation of petroglyphs helps to preserve them in another medium, but has rarely been undertaken in South Africa for various reasons, the foremost being the challenging terrain where the petroglyphs are located that makes the work logistically difficult and financially demanding.

Despite these challenges, Lynette Boardman has identified a provincial heritage site near Klerksdorp in the North West province as the case study for her dissertation on digitising petroglyphs (Boardman 2022). The unique features and diversity of the petroglyphs at the site made it an ideal study area. The site boasts hundreds of petroglyphs created by the indigenous Khoe-San who inhabited or travelled through the region from a few thousand years ago to a few hundred years before the present. These artworks include many depictions of animals such as antelopes, baboons, birds, lions, elephants, zebras, ostriches, leopards, hippos, etc. (Ouzman 2001).

Notably, the site contains numerous detailed petroglyphs of human figures, which is quite unique for Khoe-San petroglyph sites. In addition to the ancient petroglyphs, more recent visitors to the site have left their marks, mainly in the form of dates from 1880 to 1996 and names or initials. The visits to and reports on the site by many local and foreign researchers and rock art enthusiasts have resulted in depictions like the beautifully engraved rhinoceros shown in Fig. 1 being featured in several publications

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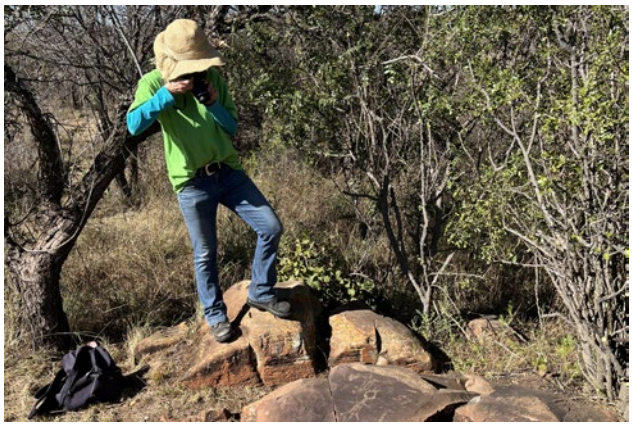

Fig. 2: Photographing the petroglyphs from various angles

(Orford 1934; Van Riet Lowe 1941; Batiss 1948; Mason 1962; Dowson 1992; Ouzman 2001). Some of the site's petroglyphs are even showcased on the website of the British Museum in London (British Museum 2013).

Boardman's research, conducted from 2019 to 2021, focused on developing and testing a workflow for digitally capturing petroglyphs within their spatial setting, followed by enhancement and dissemination

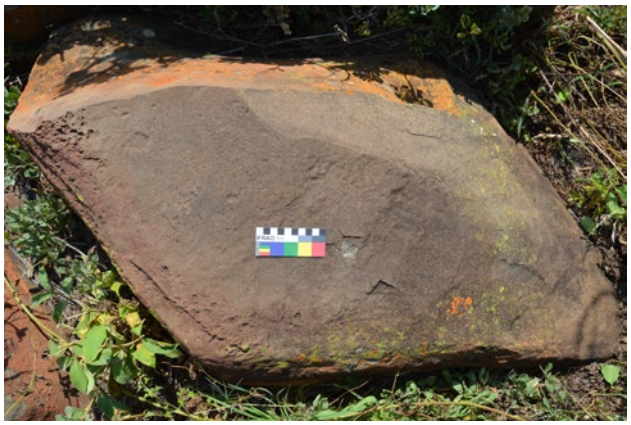

Fig. 3: Rock I23, depicting an ostrich and human figure

of the digitised images. These capturing and enhancement objectives were achieved by using remote sensing techniques and cost-efficient software technology (Boardman and De Klerk 2022). The research served as a pilot project laying the groundwork for the further development of methods for capturing and studying of the site and its petroglyphs.

Inspired by Boardman's findings, a Petroglyph Research Group (PRG) was established in 2022 by academics at North-West University who share an interest in both the artistic brilliance portrayed in ancient Khoe-San petroglyphs and the petroglyphs research value across various disciplines. The PRG's aim is to utilise specialised equipment and expertise from fields such as geographic information systems (GIS), ancient languages, geology, history and software engineering to create a comprehensive digital database of all the petroglyphs at the site.

An endeavour such as this one, namely the documenting of an 11 ha section of terrain containing the petroglyphs as a unit had not been attempted before at the heritage site. Guided by the pilot project, PRG members began by using an unmanned aerial system (UAS) to capture nearly a thousand aerial images of the site. This enabled the creation of an orthophoto map of the terrain and was followed by months of fieldwork, in the first phase of which the geographic location of each rock containing one or more petroglyphs was recorded on the orthophoto map, with each rock being assigned a reference number. During the second phase of the fieldwork, between 40 and 70 photographs were taken of each rock and its petroglyphs from various angles using a Nikon D3200 (Fig. 2).

After each field trip, the datasets captured by the camera were organised and processed in the laboratory to the required formats for database importation. The processed dataset for each rock containing petroglyphs thus consisted of the following:

- A 2D image of the entire rock.
- A 2D image of each petroglyph or cluster of petroglyphs when located closely together on the rock.
- A 3D model of each petroglyph or cluster of petroglyphs.

The orthophoto map and processed images were then integrated into the database to establish a cohesive data-presentation flow for end users. In addition, enhancement tools such as digital shading for the 3D models and a combination of the Decorrelation Stretch (DStretch) and Contrast Limited Adaptive Histogram Equalisation (CLAHE) algorithms for the 2D images have been incorporated into the database to ensure optimal analysis capabilities for the data presented. Users can also upload their own 2D images, apply the tools and download the enhanced result.

The application of a combination of these built-in enhancement tools to the data captured at the Klerksdorp site has enabled the PRG team

Fig. 4: 2D image of Rock I23, enhanced and traced

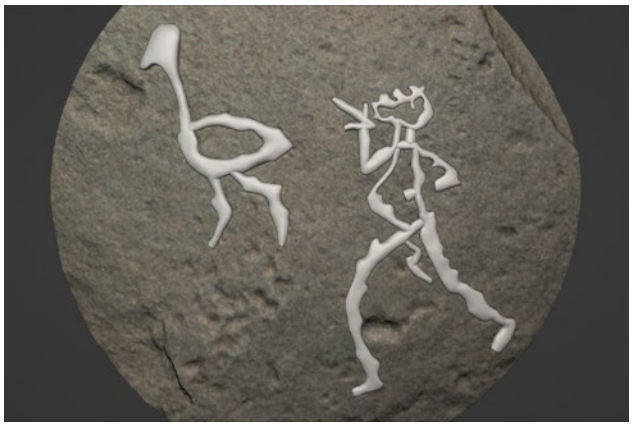

Fig. 5: A 3D rendering of the section featuring the engraved ostrich and human figure, along with its 3D tracing viewed at a rotated angle of 4o along the X-axis. Scene number I23.1.

to create digital tracings of some of the faintest petroglyphs in both 2D (on the images) and 3D (on the models). These tracings will be incorporated into the database to complement the enhancement tools. This additional activity is important for advancing the study of the petroglyphs, given that the lines of some of them have become faint to the extent of not being clearly visible to the naked eye, whether by viewing the rock first-hand or in unenhanced photos. The tracings, therefore, facilitate easier discernment of the morphology of the petroglyphs, especially in the 2D images of the entire rock where certain details are lost when photographed from a distance (Figs 3, 4 and 5).

Given the substantial number of petroglyphs that exist at this remarkable site, the database will be populated and continually updated and integrated into a desktop application created for this project.

Acknowledgements

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100 YEARS SINCE TAUNG CHILD DISCOVERY

It has been 100 years since the discovery of the skull of the Taung Child, a find described as one of the biggest in the field of palaeontology. It was the first time researchers saw evidence of early humans walking in an upright position. The skull of a three-year-old child dating back some three million years, was found in 1924 in the Taung limestone quarry in the North West province.

Celebrating the centennial of the discovery of the Taung skull in South Africa and the 50th anniversary of the discovery of the Lucy fossil in Ethiopia, Breakthrough Initiatives and the Palaeontological Scientific Trust (PAST), along with the African Astronomical Society and the SA Radio Astronomy Observatory, hosted the third Life in the Universe Conference in Cape Town in August. The CEO of PAST, Kimberleigh Tommy, said: 'We celebrate these discoveries because they put Africa on the map. It gave us an understanding of human evolution that we didn't know before and it ties in nicely with the recent celebration of three Unesco World Heritage Sites in the two countries.'

The Taung Child fossil (Wits University)

Tommy said the discovery of the Taung Child and Lucy skulls set off a journey of discoveries that shaped the way of understanding human evolution and humanity, as well as leading to Africa being seen as the Cradle of Humankind.

Tracy-Lynn Ruiters, 06/08/2024