

■ SOUTH AFRICA

Beyond Taung:
Palaeoanthropological research at
Groot Kloof, Ghaap Escarpment,
Northern Cape Province, South
Africa

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Abstract

We describe some early findings of a project commencing in 2004 to investigate the palaeoanthropological potential of part of the escarpment of the Ghaap Plateau, Northern Cape and North West Provinces, South Africa. This escarpment contains the World Heritage site of Taung, but its potential for pre-Holocene research has remained largely unexplored for the 80 years since the discovery of these important hominin remains. The region is also known for open fluvial and pan sites yielding Lower and Middle Pleistocene tool types and the long though, discontinuous sequence of Wonderwerk Cave. Surface collection and excavation of Groot Kloof site B have yielded fossils from the Florisian Land Mammal Age and lithics that may reflect a late ESA/early MSA type industry. Geological research at Groot Kloof site D provides a preliminary U-Th age for fossil-bearing tufa, and palaeomagnetic analyses show normal magnetic polarities throughout the locality. Together they suggest a late-Middle Pleistocene age for these deposits. Small largely intrusive pockets of LSA bearing breccia are also being investigated. The significance of our discovery is underscored by current debate about the emergence of modern humans.

Introduction

South Africa has occupied a central position in research about modern human origins for more than two decades. Sites such as Border Cave and Klasies River have been widely cited as providing some of the earliest evidence for modern humans dating to around 100 ka (Stringer 2000). Moreover, the archaeological record of South Africa has featured prominently in discussions about the emergence of modern human ecology and behaviour (for detailed reviews see Klein 1999; Mitchell 2002). Unfortunately, the available sample of Middle Pleistocene fossil hominins is small (Haile-Selassie *et al.* 2004). While recent significant discoveries have been made in Ethiopia (White *et al.* 2003), the pace of discovery in South Africa has been much slower with only three hominin specimens (isolated dental fragments) recovered from two sites in the last 40 years (Klein 1999). Over the 80 years of palaeoanthropological research in South Africa, breccia deposits associated with major karst formations such as the Cradle of Humankind (surrounding

Sterkfontein cave and Makapansgat), have been a major source of Pleistocene fossils. Unfortunately, breccias from the Middle Pleistocene are rare and have only been systematically excavated at a small number of sites, including Sterkfontein and the Cave of Hearths. Investigations have also occurred of Middle Pleistocene open deposits in the central interior of southern Africa, associated with the Vaal drainage (Brink *et al.* 1999; Churchill *et al.* 2000), but no hominin remains have been found.

In 2004, palaeoanthropological research commenced in the area around Ulco, about 60 km north-west of Kimberley, Northern Cape Province, South Africa. In January and June of that year, DC located and investigated two major localities of fossiliferous and lithic-bearing breccia within the escarpment of the Ghaap Plateau. In 2005, a multi-disciplinary project involving Australian, British and South African researchers began with the aim of investigating the palaeoanthropological potential of these and other deposits within this part of the Ghaap escarpment.

The broader region is known for its long archaeological sequence. Around Barkly West, within sediments associated with the Vaal River, a number of sites have been found including Canteen Kopje (possibly Lower and Middle Pleistocene) and Pniel 6 (Middle Pleistocene to Holocene) (Morris and Beaumont 2004). Nearby, Doornlaagte (possibly Middle Pleistocene) is in a pan-side setting, as are the sites at Rooidam and Biesiesput where three localities have provided evidence for the Fauresmith industry (Morris and Beaumont 2004). On the Ghaap Plateau, rich open archaeological sites have been studied (e.g., Kathu Pan), while the spectacular site of Wonderwerk Cave has provided well preserved sequences discontinuously spanning the Earlier to Later Stone Ages (Humphreys and Thackeray 1983; Binneman and Beaumont 1992; Morris and Beaumont 2004).

Project

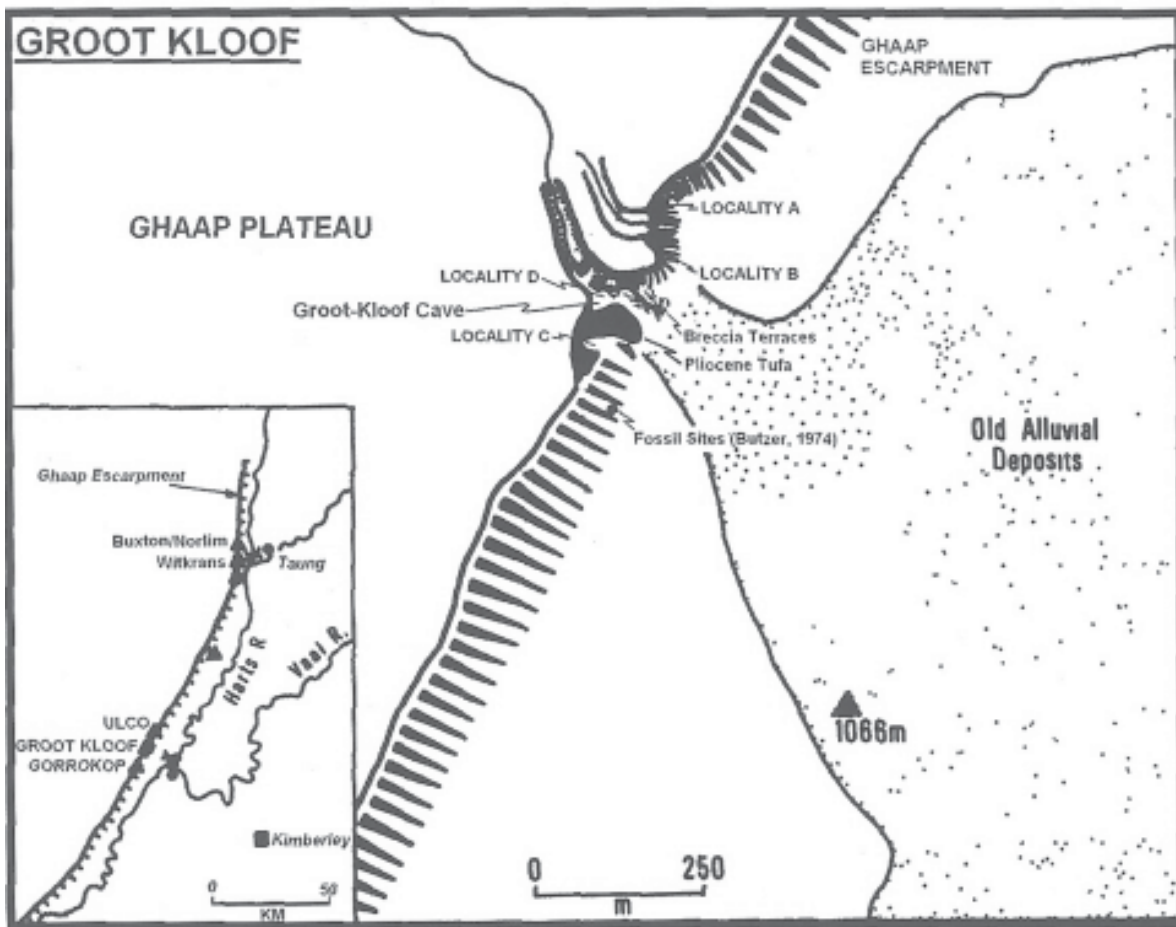
To date, 12 fossil-bearing and archaeological localities of possible Pliocene and Pleistocene age have been located in and around Ulco (Figure 1). At two of them, a major program of survey, collection and excavation began in June 2005 (discussed in more detail below). Previous geological research was undertaken in the Ulco area by Butzer (1974) and Beaumont and Vogel (1993) who suggested that much

of its sedimentology was of late Upper Pleistocene age. Butzer (1974) noted a small amount of young, tool bearing and *ex situ* breccia on a slope at one locality. The present project is, however, the first to document extensive fossil and tool-bearing tufa and breccia deposits in the vicinity.

The first and largest of the two localities studied so far is Groot Kloof ('Great Ravine') (Figures 1 and 2). The locality includes four major palaeontological and archaeological sites (named GKA to GKD) comprising major multi-age deposits consisting of tufa, breccia, calcified terraces and surfaces, a large cave, and rock shelters. GKA is approximately 86 m in length (maximum) and more than 30 m in width. GKB contains a main breccia unit of about 110 m in length, width of at least 34 m and thickness up to about 8 m. GKC consists of a semi-circular collapse bowl within tufa T1 (Figure 2). Stone tools and fossils cover a calcified talus cone that is around 50 m in length, suggestive of Upper Pleistocene/Holocene occupation. This site is broadly associated with the tools mentioned by Butzer (1974) (see above). GKD contains breccias of more than 100 m in length, width greater than 40 m. Additionally, GKD contains two large tufas, the oldest being about 100 m in height and over 50 m in thickness. Deposits rich in well-preserved fossils and tools have so far been located within one tufa (T2; Figure 2). On preliminary analysis, another very large and ancient tufa (T1) may be Lower Pleistocene or Pliocene in age, possibly making it comparable to hominin-bearing deposits at Taung.

Surface collection and excavation commenced in June 2005. Fossils collected to date include representatives of the Florisian Land Mammal Age, dated ca. 10 ka to ca. 600 ka (Klein, 1984; Grün *et al.* 1996; Brink 2005). Extensive samples of micromammals have been found, but are yet to be analyzed for palaeoenvironmental and dating purposes. The localities are rich in stone tools, and a sample recovered so far includes large, unifacial forms consistent with an Earlier Stone Age industry (Figure 3) and smaller forms more akin to the Middle Stone Age. Preliminary diagnosis suggests the presence of a transitional ESA to MSA industry (Fauresmith?) or a mixing of deposits of ESA and MSA age. Stone tools diagnostic of the Fauresmith Industry (e.g. small handaxes) also occur in the open landscape around Groot Kloof, below the site and on the plateau above. The Fauresmith assemblage is dated in this region

Figure 1. Location of Groot Kloof and Gorrokop (containing Moloney's Kloof) within the escarpment of the Ghaap Plateau (modified from Butzer 1974).



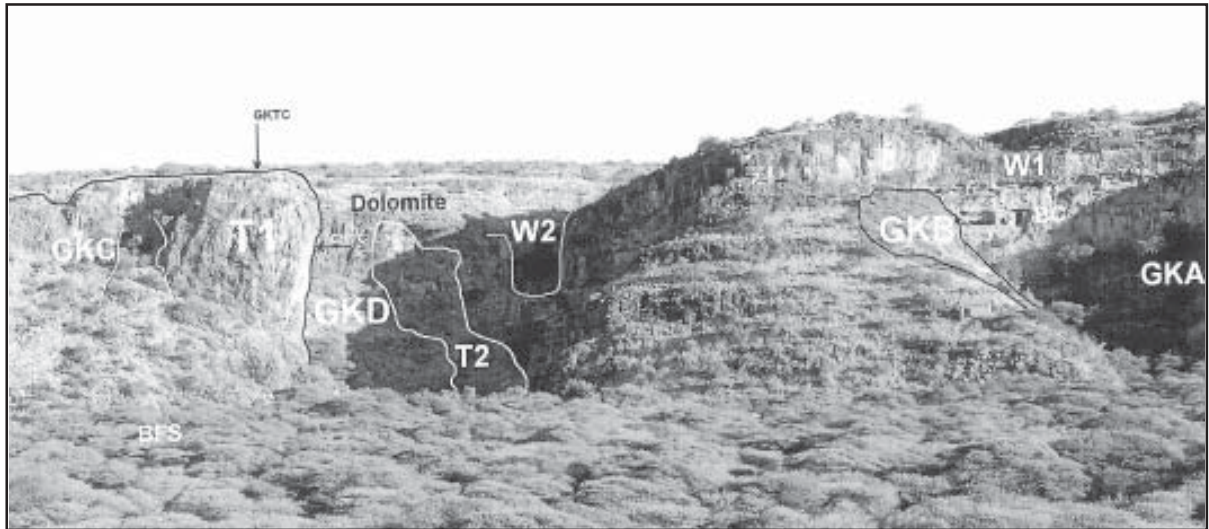
and East Africa from about 154 ka to around 350 ka (McBrearty and Brooks, 2000).

A program to determine the age of the sites has commenced and some uranium-series and palaeomagnetic analyses have been undertaken. A preliminary MC-ICP-MS U-Th date of about 250 ka has been obtained for an area rich in macro- and micro-fauna, and is being tested through further laboratory analysis at the University of Bristol. Palaeomagnetic analyses of this and other deposits have revealed a normal polarity, suggesting deposition occurred within the last 780 ka. Thus, fauna, stone tools and numerical dating methods converge on a late Middle Pleistocene age for areas containing a large volume of fossils and stone tools.

The second major locality studied in 2004 and 2005 is a section of the area Gorrokop known as Moloney's Kloof ('Moloney's Ravine': refer to

Gorrokop in Figure 1). Moloney's Kloof comprises three rock shelters with loose sediment and extensive breccias both containing fossils and stone tools. Breccia is 174 m in width around its base, maximum length about 42 m and maximum thickness greater than 3 m. In June 2005, an excavation trench (3 m x 1 m x 1.5 m) was dug at Moloney's Kloof Rock Shelter A (Figure 4). Approximately three cubic metres of breccia was also removed and processed from a talus slope that commences at the opening of this shelter. Fossils collected are all representative of the Florisian Land Mammal Age. Stone tools from excavations appear to be Later Stone Age (less than 35 ka), possibly of late Upper Pleistocene or Holocene age (cf. Humphreys and Thackeray 1983). Palaeomagnetic analyses of this and other deposits have revealed a normal polarity. Survey in other parts of Moloney's Kloof (adjacent to Rock Shelters B and C) has revealed a large volume of

Figure 2. Panoramic view of Groot Kloof showing localities A to D. GKB is a breccia locality with stone tools and fossils associated with the W1 waterfall. GKC is a rock-shelter eroded within the ancient (T1) tufa and contains rock art and a calcified talus slope of stone tool bearing deposits. The original fossil blocks noted by Butzer (1974) occur at the base of this slope (BFS). GKD consists of a rubble slope from the lower entrance of the Groot Kloof Tufa Cave (GKTC) and a series of tufa deposits with the fossiliferous Middle Pleistocene (T2) tufa. This is associated with the development of the W2 waterfall. The upper entrance of the GKTC is also noted and shows how the cave is eroded within the T1 tufa, close to its contact with the dolomite. Numerous rock-shelters occur at the lower entrance to the GKTC and down the rubble slope to almost the base of the T1 tufa. The GKB baboon sleeping caves (BC) are also shown.



Middle Stone Age tools on the surface and in situ in breccia deposits. Excavation is planned for this area during field research in 2006-2007.

Significance

Unfortunately, breccias from the Middle Pleistocene are rare and have only been systematically excavated at a small number of sites, including Sterkfontein and the Cave of Hearths. The fact that fossil and lithic-bearing tufa and breccia at Groot Kloof and Moloney's Kloof have not been mined or excavated previously underscores the unique nature of our discoveries. The extensive fossil bearing deposits with their good preservation also offer the potential to yield hominin remains. The hominin site of Taung, around 100 km northeast of Groot Kloof, is contained within the same geological formation and was formed under similar conditions. Some deposits at Groot Kloof may also be chronologically similar to Pliocene hominin-bearing deposits at Taung.

A late Middle Pleistocene uranium-series date for fossil-bearing tufa at Groot Kloof shows the locality to be contemporaneous with several important palaeoanthropological sites in South Africa. These include the Oxland Tufa at Taung (ca. 260 ka: Vogel and Partridge, 1984), the spring deposits at Florisbad, including the hominin cranium (ca. 260 ka: Brink 1997, 1998; Grün *et al.* 1996), Rooidam (dated >170-500 ka: Morris and Beaumont 2004), parts of the Wonderwerk Cave sequence (Binneman and Beaumont 1992), Fauresmith layers at Canteen Kopje where there is also a human cranium of modern anatomical form (Morris and Beaumont 2004; Curnoe, personal observation of a cast), and the Cave of Hearths hominin (probably 250-350 ka: Mason 1962, 1988).

The palaeoanthropological record of the Middle Pleistocene is poorly understood, yet vital to understanding the emergence of modern *H. sapiens*. Recent research in East Africa has shifted the focus of this debate somewhat from South Africa. The discovery of new fossil remains and extension of the

Figure 3. Unifacial tool probably attributable to an ESA or early MSA industry. Scale bar is 5 cm.



Figure 4. Moloney's Kloof 'Rockshelter A' during excavation in June 2005 ('B' indicates breccia deposits).



chronology for existing remains (McDougall *et al.* 2005) have indicated that aspects of modern cranial anatomy evolved in East Africa during the Middle Pleistocene. Moreover, the emergence of modern human ecology and behavior has been argued by some researchers to have occurred during the transition from the Earlier Stone Age to Middle Stone Age across southern and eastern Africa, some 250 ka to 350 ka (McBrearty and Brooks 2000). All of this indicates that African Middle Pleistocene hominins played a fundamental evolutionary role in the origins of modern humanity and underscores the potential significance of the sites we have found.

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