KROMDRAAI
a Birthplace of *Paranthropus* in the Cradle of Humankind

A South African Heritage Site
<table>
<thead>
<tr>
<th>CONTENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF AUTHORS</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
</tr>
<tr>
<td>FOREWORD</td>
</tr>
<tr>
<td>CHAPTER 1</td>
</tr>
<tr>
<td>José Braga, Jean-Baptiste Fourvel, Benjamin Lans, Laurent Bruxelles and John Francis Thackeray</td>
</tr>
<tr>
<td>CHAPTER 2</td>
</tr>
<tr>
<td>Jean Dumoncel, Benjamin Lans, José Braga, Gérard Subsol, Jean-Pierre Jessel, John Francis Thackeray, Benjamin Moreno, Norbert Plate, Frikkie de Beer and Ntombi Ngoloyi</td>
</tr>
<tr>
<td>CHAPTER 3</td>
</tr>
<tr>
<td>Laurent Bruxelles, Richard Maire, Raymond Couzens, John Francis Thackeray and José Braga</td>
</tr>
<tr>
<td>CHAPTER 4</td>
</tr>
<tr>
<td>José Braga, Jean Dumoncel, Benjamin Duployer, Christophe Tenailleau, Frikkie de Beer and John Francis Thackeray</td>
</tr>
<tr>
<td>CHAPTER 5</td>
</tr>
<tr>
<td>Jean-Baptiste Fourvel, James Brink, Amélie Beaudet and Marco Pavia</td>
</tr>
<tr>
<td>CHAPTER 6</td>
</tr>
<tr>
<td>José Braga and John Francis Thackeray</td>
</tr>
<tr>
<td>INDEX</td>
</tr>
</tbody>
</table>
LIST OF AUTHORS

Amélie Beaudet
Laboratoire d’Anthropologie Moléculaire et Imagerie de Synthèse, UMR 5288 CNRS, Université de Toulouse (Paul Sabatier), France

José Braga
Laboratoire d’Anthropologie Moléculaire et Imagerie de Synthèse, UMR 5288 CNRS, Université de Toulouse (Paul Sabatier), France
Evolutionary Studies Institute, University of the Witwatersrand, Johannesburg, South Africa

James S Brink
Department of Quaternary Palaeontology, National Museum, Bloemfontein, South Africa

Laurent Bruxelles
Institut National de Recherches Archéologiques Préventives, Nîmes, France
Laboratoire TRACES, UMR 5608 CNRS-Université de Toulouse (Jean Jaurès), Toulouse, France
School of Geography Archaeology and Environmental Studies, University of the Witwatersrand, Johannesburg, South Africa

Raymond Couzens
School of Geography Archaeology and Environmental Studies, University of the Witwatersrand, Johannesburg, South Africa

Frikkie de Beer
South African Nuclear Energy Corporation, Pelindaba, North West Province, South Africa

Jean Dumoncel
Laboratoire d’Anthropologie Moléculaire et Imagerie de Synthèse, UMR 5288 CNRS, Université de Toulouse (Paul Sabatier), France

Benjamin Duployer
Centre Inter-universitaire de Recherche et d’Ingénierie des Matériaux, UMR 5085 CNRS, Université de Toulouse (Paul Sabatier), France

Jean-Baptiste Fourvel
Laboratoire TRACES, UMR 5608 CNRS-Université de Toulouse (Jean Jaurès), Toulouse, France

Jean-Pierre Jessel
Equipe VORTEX, IRIT, Université de Toulouse (Paul Sabatier), France

Benjamin Lans
UMR 5185 ADES, Maison des Suds, CNRS-Université Bordeaux 3, Pessac, France

Richard Maire
UMR 5185 ADES, Maison des Suds, CNRS-Université Bordeaux 3, Pessac, France

Benjamin Moreno
IMA Solutions company, Toulouse, France

Marco Pavia
Museo di Geologia e Paleontologia, Dipartimento di Scienze della Terra, Torino, Italy

Norbert Plate
iQlaser company, Mogale City, South Africa

Gérard Subsol
ICAR Project-Team, LIRMM, Montpellier, France

Christophe Tenailleau
CIRIMAT, UMR 5085 CNRS-Université de Toulouse (Paul Sabatier), Toulouse, France

John Francis Thackeray
Evolutionary Studies Institute, University of the Witwatersrand, Johannesburg, South Africa
In 1999, the United Nations Educational, Scientific and Cultural Organization (UNESCO) officially listed the first three South African World Heritage sites – a truly historic national moment.

The ‘Cradle of Humankind’, an area in the Gauteng Province considered to represent an invaluable record of the early stages in the evolution of humanity, was listed along with Robben Island and the Greater St Lucia Wetland Park. During the same year, the South African Heritage Resources Authority established the National Heritage Resources Act No. 25 to introduce an integrated and interactive system for the identification, assessment and management of the South African heritage resources; to establish the South African Heritage Resources Agency (SARHA), and together with its council to coordinate and promote the management of heritage resources at national level.

According to the South African Government Brief 14 of 2012, the South African heritage is “characterised by peoples’ identification with particular spaces and places shaped by historical events and collective memory” (www.gcis.gov.za). The South African national and provincial authorities have designated the South African heritage as one of the major domains to develop new strategies in order to balance the need for business development and the creation of jobs, with the need to maximise the benefits for the education of as many people as possible. Arising from these opportunities, the South African heritage, maintained in the present and restored for the benefit of future generations, represents an increasingly important educational/economic resource that generates substantial public interest from local and international visitors.

It is also through international scientific relationships that South Africa shares the technological skills and expertise needed to achieve greater understanding of the value that its heritage has for the world. The multidisciplinary and intersectorial ‘Erasmus Mundus’ programmes of the European Union are designed to contribute to the development of new professional profiles to face rapid changes in practices and to use South African national symbols, cultural and natural heritage as vectors for sustainable partnership. Within the ‘Erasmus Mundus’ framework, European and South African joint efforts through collaborations between universities, public and private companies, management authorities of tourism lead to innovative ideas in the knowledge triangle of education-research industry.

This book is dedicated to one of the most well-known heritage sites of the ‘Cradle of Humankind’ – Kromdraai – the birthplace of one of our distant relatives called Paranthropus (www.kromdraai-origins.org). In addition to the ongoing academic research in this area, the Kromdraai Research Project is associated with two ‘Erasmus Mundus’ collaborative networks, AESOP and AESOP+ (‘A European and South African Partnership on Heritage and Past’), and composed of 21 South African and European universities, as well as six associated partners. They organise mobilities for masters, PhD, post-doctoral fellows and academic staff in several fields including sciences and humanities in order to meet employment needs and to facilitate intercultural exchanges and mutual enrichment of European and South African societies. These actions promote the South African natural and cultural heritage and enhance the expertise and capability of teachers, students and researchers to assimilate new technical developments.

The scientific results presented in this book would not have been obtained without the early support of the South African National Research Foundation (NRF), the Department of Science and Technology (DST) of South Africa, the Centre National de la Recherche Scientifique (CNRS, France), the French Ministry of Foreign Affairs, the French Embassy in Pretoria, the Institut des Déserts et des Steppes in Paris (France) and the Andrew Mellon Foundation.

It is a pleasure to present this volume and we hope that it shows how the study of our common past can bring people together.

acknowledgements

J. Braga and J.F. Thackeray
When Francis Thackeray brought me a copy of the text of this remarkable book, I was delighted to see the great detail in which he and his French colleagues were undertaking their research at the Kromdraai fossil site in the Sterkfontein valley. It was here, in 1938 that a 15-year-old schoolboy, Gert Terblanche found the first fossil of a robust ape-man weathering out of a block of cave-breccia on the dolomite hillside of Kromdraai, about 2 km east of the Sterkfontein Cave where Dr. Robert Broom had described a fossil of the first adult ape-man, *Australopithecus africanus* in 1936. Gert Terblanche used to work as a guide for visitors to the Sterkfontein Cave on Sundays and he showed his Kromdraai fossil to the site manager who immediately bought it from him and passed it on to Dr. Broom who then visited the Kromdraai site with Gert and obtained more pieces of this beautifully preserved skull.

For over fifty years I have been involved in excavations at the Swartkrans Cave. Close to Sterkfontein, this cave-filling has proved to be a rich source of fossils of the robust ape-men with remains of over 80 individuals coming from there. Here, we also have evidence of the co-existence of the robust ape-men with early humans who continued to evolve after the extinction of the robust ape-men. The Swartkrans cave showed me that the hominids – our ancestors and the robust ape-men – were constantly being preyed upon by predators, by leopards and sabre-toothed cats – who consumed their prey at the cave entrance, the scraps of which found their way into the fossilisation site below. My work at the Swartkrans Cave also showed us just how complicated the stratigraphy of a dolomite cave filling is likely to be. When I started work at Swartkrans I had assumed that the oldest part of a cave filling would be at the bottom with the youngest parts at the top. This proved to be wrong, with parts of the oldest calcified filling adhering to the north wall undercut by much younger infillings lying beneath them. This was because of successive cycles of erosion and deposition in the cave with some parts being carried away and some parts remaining intact. It now seems likely that these events were linked to the worldwide cycles of glacial and interglacial climatic change that have characterised the last few million years.

The ongoing investigations at Kromdraai described in this book will reveal the complexity of the fossil-bearing sediments there, and I am delighted and impressed at the quality of the work. Congratulations to the authors and may they stimulate many upcoming students to do the same. Good luck!
Evolutionary, chrono-cultural and palaeoenvironmental backgrounds to the Kromdraai site: A regional perspective

José Braga, Jean-Baptiste Fourvel, Benjamin Lans, Laurent Bruxelles and John Francis Thackeray

INTRODUCTION

The Plio-Pleistocene site of Kromdraai (26°00'41"S, 27°44'60"E) in Gauteng Province, South Africa is situated approximately 2 km east of Sterkfontein Caves, on the southern side of the Blaauwbank stream (Figure 1.1). It is an unroofed dolomite cave partially shaped by the erosional surface and filled with fossil-bearing deposits and has long been considered as two main and distinct localities – Kromdraai A (KA) and Kromdraai B (KB) – of relatively limited extent. The Kromdraai C (KC) locality is less important as no fossils of artefacts have been previously reported from this area (Figure 1.2).

Before 2014, the older Kromdraai B locality yielded the type specimen of *Paranthropus robustus* (TM 1517), the only partial skeleton of this species known thus far (Broom 1938a, 1938b, 1942, 1943, as well as other fossil hominin individuals (Thackeray et al. 2001; Braga et al. 2013) (see Chapter 4) and is referred to as the ‘hominin site’. The KB sedimentary deposits fill an east-west deep fissure of about 46 m formed by the dissolution of limestone by water and occur on either side of a rib of ‘dolomitic bridge’ located near the western end of the KB site (Figure 1.2). Vrba (1981) and Partridge (1982) have named these two fillings, ‘KB East’ and ‘KB West’ formations.

The younger KA locality, situated about 30 m to the west of KB (Figure 1.2), has not yielded hominin fossils yet and is therefore called the ‘faunal site’. Only the easternmost part of KB yielded a single Oldowan stone tool (a polyhedral core), whereas circa 100 artefacts associated with the early Acheulean or developed Oldowan were found at KA (Kuman et al. 1997). The presence of cultural material at KA also indicates a hominin presence but, as suggested by faunal seriations, during a period likely younger than the one represented at KB (McKee et al. 1995). Interestingly enough, KB has been considered as ‘nearly contemporaneous’ with the Member 5 (a ‘member’ is a stratigraphic layer) deposits at Sterkfontein (McKee et al. 1995:244). These deposits mark the appearance of the earliest lower Oldowan tools in South Africa, currently dated at 2.18 +/- 0.21 millions of years ago (Ma) (Granger et al. 2015).

As discussed in this chapter, the current KB faunal and archaeological samples are primarily derived from at least three distinct depositional phases securely tied in a stratigraphic context and often incorrectly mixed into one single sample in several studies. Previous reports published by scientists involved in excavations at Kromdraai clearly indicated that the site was “far from containing a temporally homogeneous breccia” (Vrba 1981:19; Vrba & Panagos 1982:21) because, first, its faunal assemblage was not recovered from a single stratigraphic unit, and second, most of its sample (discovered before the 1970s) is of unknown stratigraphic origin (Brain 1981) (see details below and in Chapter 4). Therefore, even though some