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OLDUVAI GORGE 1951–61

VOLUME I

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OLDUVAI GORGE

1951–61

VOLUME I

A PRELIMINARY REPORT ON THE
GEOLOGY AND FAUNA

BY

L. S. B. LEAKEY

WITH CONTRIBUTIONS BY

P. M. BUTLER, M. GREENWOOD, G. GAYLORD SIMPSON
R. LAVOCAT, R. F. EWER, G. PETTER
R. L. HAY AND M. D. LEAKEY

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1967

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Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo, Delhi

Cambridge University Press
The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org
Information on this title: www.cambridge.org/9780521105170

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First published 1965
This digitally printed version (with additions) 2009

A catalogue record for this publication is available from the British Library

ISBN 978-0-521-05527-7 hardback
ISBN 978-0-521-10517-0 paperback

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L. S. B. Leakey
Frontmatter
More information

CONTENTS

List of maps and text-figures *page* vi

List of plates vii

Introductory Note ix

Foreword by Professor G. Gaylord Simpson xi

Introduction xiii

I The general geological evidence 1

II Review of earlier reports on the fauna 7

III Mammalian fauna: other than Bovidae 12

IV Mammalian fauna: Bovidae 37

V Non-mammalian fauna 70

VI Review of the faunal evidence 73

VII The problems of the climatic sequence 79

VIII Dating by the potassium–argon technique 86

IX Note on fossil human discoveries and cultural evidence 92

Appendix 1 Preliminary notes on the stratigraphy of Beds I–IV, Olduvai Gorge, Tanganyika, *by Dr Richard L. Hay* 94

Appendix 2 Descriptive list of the named localities in Olduvai Gorge, *by M. D. Leakey* 101

References 108

Index 115

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CAMBRIDGE

Cambridge University Press
978-0-521-10517-0 - Olduvai Gorge 1951-61, Volume I: A Preliminary Report on the Geology and Fauna
L. S. B. Leakey
Frontmatter
More information

LIST OF MAPS AND TEXT-FIGURES

Sketch-map of Olduvai Gorge and its environs *page* 95
Olduvai Gorge. Stratigraphy of Beds I–IV 96
Map of the named localities in Olduvai Gorge 110 *and* 111

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Cambridge University Press
978-0-521-10517-0 - Olduvai Gorge 1951-61, Volume I: A Preliminary Report on the Geology and Fauna
L. S. B. Leakey
Frontmatter
More information

LIST OF PLATES

Frontispiece Olduvai Gorge: view near second fault

between pp. 112 and 113

1 The 'marker bed' at the top of Bed I
2 'Desert roses' *in situ* near the top of Bed I
3 General view of the FLK area from the camp road, with the *Zinjanthropus* site indicated
4 Bed III at site HWK
5 Torrent gravels in Bed II and unconformity in Bed III
6 Bed III torrent gravels
7 Boulder gravel in Bed II
8 Bed IV at site FK
9 Gravel beds of Va near the camp
10 Close-up of gravel beds of Va
11 Bed V unconformable on Bed I at the third fault
12 Excavating a small mammal mandible
13 Lagomorph tibiae: *Oryctolagus*; *Lepus* sp. from Olduvai; *Serengetilagus* from Laetolil; *Lepus capensis*
14 Felid mandibles: modern lion; *Felis* cf. *tigris* from Olduvai; modern tiger
15 *Felis* sp. humerus, no. M. 14676 from Olduvai compared with modern lion and modern leopard; *Felis* sp. tibiae, nos. M. 20231 and M. 20230 from Olduvai compared with modern leopard and modern lion
16 *Elephas* cf. *africanavus*. Broken molar
17 *Elephas* cf. *africanavus*. Part of mandible
18 *Elephas recki* (early form), no. M. 21465. Plate of molar
19 *Stylohipparion* and *Equus*. Lower dentitions
20 *Stylohipparion*. Anterior dentitions
21 *Potamochoerus majus* and modern *Koiropotamus*. Canines
22 *Afrochoerus nicoli* and modern *Phacochoerus*. Canines
23 *Promesochoerus mukiri* mandible. Type, no. G. 356, 1960
24 Canines of *Promesochoerus mukiri*, compared with modern *Phacochoerus* and a Miocene suid
25 *Ectopotamochoerus dubius* skull. Type, no. FLK N I 1235
26 *Ectopotamochoerus dubius* mandible. Type, no. FLK N I 1236
27 *Ectopotamochoerus dubius* canines, compared with modern *Phacochoerus*
28 *Potamochoerus intermedius*. Type, no. FLK NN I 177. Upper dentition and crushed skull
29 *Notochoerus* cf. *euilus*, no. FLK N I 335, 1960. Mandible
30 *Tapinochoerus* indet. Lower dentition
31 *Tapinochoerus* indet. 2nd and 3rd lower molars
32 *Tapinochoerus* indet. Lower 3rd molar
33 *Giraffa gracilis* femur, compared with that of *Giraffa camelopardalis*
34 *Giraffa gracilis* tibia, compared with that of *Giraffa camelopardalis*
35 *Giraffa gracilis* metacarpal, radio-ulna and humerus, compared with those of *Giraffa camelopardalis*
36 *Giraffa camelopardalis* mandible, compared with Type of *Giraffa jumae*, no. M. 21466
37 Enlargement of the posterior part of the mandibles of *Giraffa camelopardalis* and *Giraffa jumae*
38 *Strepsiceros grandis*. Type, no. M. 21461. Cranium and horn cores
39 *Strepsiceros grandis*. Type. Enlargement of right side of skull
40 *Strepsiceros maryanus*. Type. Cranium and horn cores
41 *Strepsiceros maryanus*. Type. Side view
42 *Strepsiceros maryanus*. A second specimen
43 *Taurotragus arkelli*. Type, no. F. 3665. Cranium and horn cores
44 *Taurotragus arkelli*. Type. Cranium and horn cores, side view
45 *Taurotragus oryx*. Skull and horn cores of modern eland
46 *Bularchus arok*. Type, no. M. 14947. Horn cores
47 *Bularchus arok*. Paratype, no. M. 14948. Horn core
48 *Bularchus arok*. Skull and horn cores, compared with modern ox (in Coryndon Memorial Museum)
49 *Gorgon olduvaiensis*. Type, no. M. 21451. Side view
50 *Gorgon olduvaiensis*. Type, no. M. 21451. Frontlet and horn core
51 *Gorgon taurinus*. Skull and horn core of modern wildebeest
52 *Gorgon olduvaiensis*. Horn core: no. M. 21452 from the front and vertically from above
53 Reduncini indet. Cranial fragment

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978-0-521-10517-0 - Olduvai Gorge 1951-61, Volume I: A Preliminary Report on the Geology and Fauna
L. S. B. Leakey
Frontmatter
More information

LIST OF PLATES

54 *Hippotragus niro*. Type, no. M. 14561. Right horn core
55 *Hippotragus niro*. Additional horn cores
56 *Hippotragus gigas* (male). Type, no. P.P.T. 2. Cranium and horn cores, side view
57 *Hippotragus equinus*. Skull and horn cores of modern roan antelope
58 *Hippotragus gigas* (male). Type. Cranium and horn cores, front view
59 *Hippotragus gigas* (female). Paratype, no. P.P.T. 3. Cranium and horn cores, side view
60 *Hippotragus gigas* (female). Paratype. Cranium and horn cores, front view
61 *Hippotragus gigas* (male), no. M. 21448. A further specimen
62 *Oryx* sp. indet., no. FLK I G. 390, 1960. Left horn core
63 *Damaliscus angusticornis*, no. M. 14553. Right horn core. (The original paratype described by Dr Schwarz)
64 *Damaliscus angusticornis*, no. M. 21425. Cranium and horn cores, side view
65 *Damaliscus angusticornis*, no. M. 21425, front view
66 *Damaliscus angusticornis*, no. M. 21422. Additional specimen
67 *Damaliscus antiquus*. Type, no. P.P.T. 3. Cranium and horn cores, side view
68 *Damaliscus antiquus*. Paratype, no. M. 21428. Cranium and horn cores, side view
69 *Damaliscus antiquus*. Paratype, no. M. 21428, front view
70 *Parmularius altidens*. Type, no. M. 14689. Skull and mandible
71 *Parmularius altidens*, no. M. 14514. Left horn core
72 *Parmularius altidens*, no. FLK I Ba. 126, 1960. Frontlet and horn cores
73 *Parmularius altidens*, FLK N I, no. 1315, 1960. Frontlet and horn cores
74 *Parmularius altidens*, FLK I, no. F. 206, 1960. Left horn core
75 *Parmularius rugosus*. Type, no. M. 21430. Skull and horn core
76 *Parmularius rugosus*. Type, no. M. 21430. Palate
77 *Parmularius* indet., no. F. 3001. Left horn core
78 *Alcelaphus* cf. *kattwinkeli*, no. F. 3013. Frontlet and horn cores
79 *Alcelaphus howardi*. Type, no. M. 14950. Frontlet and horn cores, side and front views
80 *Beatragus antiquus*. Paratype, no. M. 21446. Front and side views of left horn core.
81 *Xenocephalus robustus*. Type, no. M. 21447. Skull and horn core
82 *Xenocephalus robustus*. Palate of Type (enlarged)
83 *Gazella* sp. (*a*) no. M. 21464. Cranium and horn cores
84 *Gazella* sp. (*a*) no. M. 21463. Second specimen
85 *Gazella* sp. (*d*) no. M. 21462. Cranium and horn cores
86 *Gazellae* indet. (*j*). Examples of horn cores
87 *Phenacotragus recki*, no. M. 21460. Plaster cast of Type
88 *Thaleroceras radiciformis*, no. P.P.F. 4. Side view of left horn core
89 Bovinae, incertae sedis (*a*). Frontlet and horn core
90 Bovinae, incertae sedis (*a*). Side view
91 Bovinae, incertae sedis (*b*) (cf. Alcelaphini), no. M. 21429. Cranium and horn cores
92 Bovinae, incertae sedis (*e*). Alcelaphini indet. Horn core
93 *Pultiphagonides africanus*. Type, no. M. 14688. Skull and horn core
94 *Pultiphagonides africanus*. Type, no. M. 14688. Palate
95 *Pelorovis oldowayensis*, no. P.P.F. 8, from site BK II (on view in the Coryndon Memorial Museum), compared with merino ram
96 Fossil ostrich femur, compared with that of modern *Struthio*
97 Fossil ostrich tibio-tarsus and tarso-metatarsus, compared with those of modern *Struthio*

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Frontmatter
More information

Introductory Note to the 50th Anniversary of the Discovery of 'Zinjanthropus'

The Olduvai Gorge in the Republic of Tanzania came to the attention of the world shortly after my mother Mary discovered the 'Zinjanthropus boisei' skull on July 17th 1959. The field of African prehistory, and in particular the study of human evolution, has changed and developed dramatically over the past 50 years. I am particularly pleased that Cambridge University Press have decided to republish the 5 monographs that comprehensively cover the many scientific studies that have been undertaken on the Olduvai material collected by my parents, Louis and Mary, working with a number of colleagues. As the Golden Anniversary of the discovery approaches, it is timely to reflect on the importance of that find.

I was lucky to arrive at Olduvai two days after the discovery and I well recall the excitement of the occasion. My parents were operating on a very tight budget and the field season was short. Fortunately, on hand was world-renowned photographer Des Bartlett who, aided by his wife Jen, fully recorded on film the first few days of excavations and reassembly of bone fragments back in camp. As pieces were glued back together, and the shape of the skull and its morphology became clear, my parents showed uncharacteristic and unrestrained emotion! At the time, ages for fossils were wild guesses and radiometric dating had not been done anywhere in Africa. The best, guessed age for Zinj was a little more than 500,000 years. Some months later, a real Potassium/Argon date was obtained by Jack Evenden and Garniss Curtis, and the 1,750,000 age was announced. This ignited huge excitement worldwide and for the first time my father was able to raise financial support for extended field work at Olduvai. Everything changed. The unqualified enthusiasm and support of the National Geographic Society from 1960 onwards had a major impact on the later work at Olduvai, and indeed on the growing international interest of Africa as the cradle of humanity.

Since those first exciting years at Olduvai, the investigation of human origins has gone forward and extended to many other sites in Africa. The age of hominins has been taken back to beyond five million years and the collected fossils and lithic records are now numerous. International multi-disciplinary teams are working in many parts of the world and, with the exception of a few fundamentalist 'flat earth' types, the acceptance of the fossil record of our past is widely accepted. Much of this has come about because of the initial Olduvai finds.

The pioneering work at Olduvai was the launch of this fantastic 50-year period when we as a species have come to realize and appreciate our common evolutionary past. Olduvai, conserved and protected by the Republic of Tanzania, remains as a landmark in the epic story of humanity, and these monographs are a wonderful testimony to that landmark.

Richard Leakey, FRS

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L. S. B. Leakey
Frontmatter
More information

FOREWORD

BY PROFESSOR G. GAYLORD SIMPSON

There is no spot on earth more fascinating and more deeply significant for all of us than Olduvai Gorge. It has, to begin with, extraordinary scenic beauty. In one direction stretches the great, open Serengeti Plain, broken here and there by hills that are massifs of old, weathered rock piercing the younger sediments. In the opposite direction is the rifted Balbal depression and, beyond it, the towering slopes of the Ngorongoro Caldera. Other volcanoes, extinct and living, crenellate the long horizon. The varicoloured gorge itself displays high vertical cliffs, steep, sweeping slopes, and fantastic eroded forms. For those of us who enjoy occasional escape from our own teeming species, the gorge has an added charm: few places in the world are so free from recent works of man. It has been thousands of years since any human maintained a permanent dwelling there. The occasional visitors are all sporadic nomads: wandering tribesmen and palaeontologists.

The desert grandeur of the scene is, however, only an unexpected bonus at Olduvai. The true significance lies literally deeper, in the successive strata exposed in the walls of the gorge. The stunning dimension of the gorge is not in space but in time, not in the seemingly ageless and unchanging face of pristine Africa but in a dated sequence of major events with repercussions everywhere on earth. Here, one after another, are chapters in history ranging from sometime in the early Pleistocene to the present day. The span in years cannot yet be considered established with sufficient accuracy, but by any count it is extremely impressive. The best evidence so far available indicates at least one and three-quarter million years.

Practically every literate person in the world now knows that the Leakeys and their associates have found at Olduvai a succession of human (or to be more conservative and technical, of hominid) cultures beginning with one of the earliest and most primitive yet surely identified. Now probably even better known is the Leakeys' discovery within the most recent years of skeletal remains of several distinct kinds of humans and near-humans at various levels in time. The present status of those studies is the subject of other volumes of this work, and I am not directly concerned with it here. Suffice it to say that this sequence of cultures and of hominid remains is unique and that no other one place on earth has yielded so much information about the early history of the human family.

The present volume deals with discoveries less generally appreciated but far greater in extent and at least as important. The beds at Olduvai also contain an extremely rich succession of fossil faunas, mainly of mammals but also including 'the richest find of avian fossils known to date from the whole of Africa' (p. 71) and a more limited variety of lower vertebrates and molluscs. On present evidence, the oldest of these faunas probably belongs somewhere in the latter part of the Villafranchian in correlation with the European sequence—that is, sometime toward the end of what is now formally and somewhat arbitrarily designated as early Pleistocene. That oldest fauna at Olduvai contains ancestors or close relatives of mammals still present in the same region, but it is also notably archaic. Almost all the species and a number of the genera differ from any now living. Here also are some strange, ancient, wholly extinct groups surviving later than in most other parts of the world: clawed ungulates (chalicotheres, *Metaschizotherium*); enormous, distantly collateral relatives of the elephants (deinotheres, *Deinotherium*); three-toed horses (*Stylohipparion*).

Later Olduvai mammalian faunas show, as would be expected, increasing approach to the recent African fauna, but the story is not that

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L. S. B. Leakey
Frontmatter
More information

simple. What is seen is not merely ancestral forms evolving into the present species but also, and extensively, more complex changes suggestive of movements of range and fluctuations of climatic and other ecological conditions as yet imperfectly understood. Examples of the unexpected and extraordinary developments include the great diversity and striking peculiarity of the pigs (Suidae) in Bed II and the prevalence of gigantism among the animals of that bed. It is evident that Olduvai will eventually give us a standard, dated sequence for most of the Pleistocene in Sub-Saharan Africa, as well as a priceless paradigm for evolutionary processes in faunas in general.

In comparison with previous publications, especially Leakey (1951), the present work marks a great step forward. In 1951 (written in 1949) the mammals of Beds I and II were treated as if they belonged to a single fauna. Later work by Leakey soon made it clear that such is not the case, but his cautionary notes have been overlooked in some quarters, and only now is fully adequate evidence available and published. The most important general point in the present volume is conclusive proof that quite different faunas occur in Beds I and II. Indeed it is strongly suggested but not yet worked out in detail that these two 'beds' contain not merely two faunas but a whole series of related and transitional but distinguishable faunas. Geological evidence, also included here in a preliminary way, agrees in indicating that these are not single beds by a strict geological definition of 'bed' but are in fact complex sedimentary sequences, stratigraphic members or formations, covering a long span of time and also with numerous hiatuses of varying extent. It should be further emphasised that although collection, preparation, and study have not yet reached a point permitting the most refined distinctions of faunal succession, the data for such analysis are being gathered. Recent collections of specimens *in situ* have meticulous records of precise levels *within* each of the 'beds'.

This is a progress or interim report in two different aspects. In the first place, study of the collections involved has not been completed. Palaeontology is necessarily a slow science, costly in labour and time in each phase from discovery through collection and laboratory preparation to comparison, identification, and analysis. Thus although some groups, such as the Suidae, are here given rather full treatment, others, such as the rodents, are discussed only in a highly preliminary and vague way. Secondly, work at Olduvai is continuing apace, but in order to issue a report without immoderate delay a terminal date for it had to be set arbitrarily. This volume includes only collections and field observations through the Leakeys' campaign of 1960–1. Since then work both geological and palaeontological has continued, and while it does not seem to contradict the essential conclusions of the present study, it has already resulted in highly significant clarification and addition of details.

For work of less complexity, of less urgent importance, and of less worldwide interest to anthropologists, archaeologists, palaeontologists, and geologists, we might be willing to await more nearly definitive monographic publication. We are not willing to wait for available information on Olduvai, and indeed cannot do so if we are to continue our related studies effectively. All will therefore applaud Leakey's decision to bring out the present strictly preliminary publication, and will admire the energy and devotion that have given us so prompt and useful a record of results up to 1962.

G. G. S.

Harvard University
Cambridge, Massachusetts, U.S.A.

February 1963

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L. S. B. Leakey
Frontmatter
More information

INTRODUCTION

In the first chapter of my earlier book (Leakey, 1951) on Olduvai Gorge and on the evolution of the Hand-axe culture there, I outlined the sequence of events which led to my first expedition to Olduvai in 1931. I also summarised the work carried out from 1931 to 1947. There is no need to refer here to any of that earlier part of the story, since it can easily be found in the first book and I shall discuss the sequence of the events from 1947 onwards.

In 1947 the first Pan-African Congress of Prehistory met in Nairobi and at its conclusion I arranged an excursion to sites in Tanganyika, including Olduvai Gorge. One of the first places to which I took the visiting scientists on that occasion was FLK I, for it was there, during the 1931–2 season, that we had first proved the existence of a primitive Stone Age culture *in situ* in Bed I. This is the culture which I later described under the name of Oldowan and which has sometimes been erroneously referred to as the 'Pebble culture'. Other parts of the Gorge were, of course, also visited, but both on that occasion and on many others, from 1947 to 1958, I took visiting scientists to see the site FLK I. Thus the place which eventually gave us such a wealth of new information about earliest man and the evolution of the Oldowan culture is one which many leading Prehistorians and Pleistocene geologists had seen, before these discoveries were made.

Although the earlier book on *Olduvai Gorge* was only published in 1951, it was completed for press in 1949. Until the first book was finished, all our efforts, ever since 1931, had been devoted to a preliminary survey. This consisted of:

(*a*) establishing a sequence of evolutionary stages of culture within the geological horizons exposed in the Gorge;

(*b*) locating as many different sites as possible, at as many different levels as possible, with a view to carrying out more detailed excavations when funds and time became available;

(*c*) obtaining an overall picture of the geological history of the Gorge and its possible link with the climatic fluctuations of the Pleistocene period, which we were trying to elucidate elsewhere in East Africa.

When the preliminary work was over and the first results had been sent to press, I decided that we could start upon the next phase of our study. What we needed most, was to locate and uncover in Olduvai Gorge a series of living-floors of early Hand-axe man and also of the preceding Oldowan culture. We hoped to find living-floors similar to those studied at Olorgesailie during the period 1940–6, which had revealed the more evolved stages of the Hand-axe culture.

In 1949, therefore, we did a further brief period of exploration, this time reviewing the various sites we knew, with a view to starting excavations in 1951. My wife and I decided that the most profitable place to start a detailed excavation was a site which we had found in 1935 and which is known as BK II (Leakey, 1959*a*). This site is two and a half miles up the southern fork, or 'side gorge' of Olduvai. We set up camp there for the first time in 1951, and in a few weeks it was clear that we had a rich living-floor in Bed II. At that time we believed this belonged to Chellean Stage 1 and that it was at the base of Bed II. We now know that it is very much higher in the sequence and the preliminary report published in 1959 will therefore need much modification (Leakey, 1959*a*). During the exploratory stages of our work at Olduvai we had needed relatively few workmen, but to excavate we required a larger labour force and it became a major difficulty to supply enough water for the staff, with the limited funds that were then available. At Olduvai itself it seldom rains, but in wet weather there is a little water in the Gorge from rain which falls on the neighbouring mountains. This water seldom lasts more than a few weeks and mostly not more than a few days, so that

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L. S. B. Leakey
Frontmatter
More information

water has to be transported from many miles away. For our work at the site BK II in 1951 and subsequent years we had to bring our water a distance of a little over thirty miles. The drain upon our financial resources caused by the cost of water transport for the workmen was a major limiting factor in the amount of excavation that could be carried out in any one season.

Because of this and other difficulties the excavations which we carried out from 1951 until 1958 at site BK II, and also at a nearby site SHK II, were not conducted with the same degree of detailed recording as has been possible in recent years, now that we have ample funds at our disposal. Our principal aim during this early period was to obtain a large series of stone tools and other associated material (including fossil fauna) *in situ* on living-sites, in order to achieve a better understanding of the nature of a full assemblage of stone tools of the various stages of the Hand-axe culture.

Most of the funds for this period of our work came to us through the generosity of Mr Charles Boise; first, in the form of direct financial contributions, and later through the Boise Fund, which he set up for this purpose at Oxford University. We are very deeply indebted to Mr Charles Boise for all the help he has given us. We also received assistance from other sources during this period. Most of it was for the purpose of capital equipment such as the purchase of vehicles, tents, water trailers, but some was also used to augment the money received from Mr Boise for the recurrent costs of excavation. Our other benefactors were the Wenner-Gren Foundation, the Wilkie Brothers Foundation, the Shell Company of East Africa, the newspaper *Reveille* and Mr Malin Sorsbie, to all of whom we acknowledge our deep gratitude.

We also wish to thank the Tanganyika Government and, especially, the administrators of the Northern Province, as well as the director and staff of the Tanganyika National Parks, for all the help given to us in connection with water supplies and in many other ways too numerous to detail. I am very grateful to the Trustees of the British Museum of Natural History, as well as to the staff in the department of palaeontology, for making available to me study material in the fossil collections. I also wish to thank the staff of the department of zoology for providing me with comparative material during the course of many weeks of study spent at the Museum. We also express our warmest thanks to the Trustees of the Coryndon Memorial Museum for allowing me to go to Olduvai for several weeks at a time to take part in this research work.

During this period we had a number of voluntary helpers in the field and to them we also offer our thanks; among them were Mrs Jean Brown, Miss Jane Goodall, Miss Gillian Trace, and our son Jonathan. Throughout this time our African staff was headed by Mr Heselon Mukiri, my very able senior technical assistant. The other African staff varied from year to year.

By the end of 1958 my wife and I felt that for the time being we had done enough work on these sites in Bed II and that we should turn our attention to the Oldowan culture in Bed I and to the deposits at Laetolil, south of Olduvai. In 1959, therefore, we first of all revisited Laetolil, a site which we had discovered and worked for a few weeks in 1935 and where Dr Kohl-Larsen had subsequently collected fossils. These were described by Dr Dietrich, who referred to this site as *Vogelflüss*.

After three weeks at Laetolil it became evident that we would not find any living-floors of the Oldowan culture there and we, therefore, transferred our camp to Olduvai Gorge. We began examining sites in Bed I, with a view to choosing one of them for more detailed excavation. We revisited many of the sites which had been located by us in earlier years and we had still not decided where to start an excavation, when Mr Heselon Mukiri unexpectedly found a very well preserved hominid lower molar in a block of hard rock, at the site known as MK I, which had yielded Oldowan tools from 1931 onwards. This discovery was so important that we decided that excavations must be put in hand as quickly as possible.

Our funds for that year were then exhausted so we returned to Nairobi, where I successfully arranged for an overdraft on my research account. We then went back to Olduvai with the intention of excavating at site MK I for about three weeks. It had been agreed that Mr Des Bartlett, a partner

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978-0-521-10517-0 - Olduvai Gorge 1951-61, Volume I: A Preliminary Report on the Geology and Fauna
L. S. B. Leakey
Frontmatter
More information

of Armand and Michaela Denis, should come to Olduvai with my son Richard on 17 July in order to make a film of the stages of the excavation at the MK I site. Since we did not wish to start excavations until Des Bartlett had arrived, my wife and I spent 15 and 16 July doing general survey work.

On the morning of 17 July I was ill with influenza and my wife went out alone and spent the morning on the site FLK I, where we both considered there might be a living-floor of the Oldowan culture. At about 11 a.m. she noticed what seemed to be part of the petrous portion of a human temporal bone. Looking closer, and brushing away the surface scree a little, she exposed two pre-molar teeth. Satisfied that these were hominid she hurried back to camp to fetch me. We had, at length, found promising remains of a hominid in Bed I.

Since Mr and Mrs Bartlett and my son were due to arrive that afternoon, equipped with ciné cameras, we most reluctantly delayed work on this exciting new find until they arrived. The next day Bartlett began to photograph each stage of the process of uncovering the remains and, later, of fitting together the pieces of the skull. Only a small area could be excavated with the money (overdraft) available, but sufficient work was done to establish that we had discovered a living-floor of the Oldowan culture. This will be described in another volume.

I gave a preliminary report on this important discovery at the opening meeting of the third Pan-African Congress of Prehistory at Leopoldville in August (1959*b*) and also published a short note in *Nature* (1959*c*). This was dated 15 August, but did not actually appear until September, owing to a printers' strike in London. The find was also described in the *Illustrated London News* in August (1959*d*).

Renewed grants by the Wilkie and by the Wenner-Gren Foundations enabled me to pay off my overdraft and initiate new work at the site. In October I went to America to take part in the Darwin Centenary celebrations at Chicago University and I took the opportunity to try to raise funds for extensive work at Olduvai during 1960. In this I was successful, as the Research Committee of the National Geographic Society agreed to support our work. Early in February 1960, therefore, we were able to start extensive excavations at site FLK I, where the *Zinjanthropus* skull and a tibia had been found. That season continued until the end of February 1961—a little over twelve months—during which some 92,000 man-hours of work were completed, compared with only about 40,000 man-hours in all the preceding thirty years. We are, indeed, deeply grateful to the Research Committee of the National Geographic Society for thus making it possible for us to work on such a large scale. We are also very grateful for the generous help that the Wenner-Gren and Wilkie Brothers Foundations gave to us during the interim period at the end of 1959, which enabled us to start work on the site before the National Geographic grant became available.

In 1958, a year before the discovery of *Zinjanthropus*, Dr Jack Evernden of Berkeley, University of California, had become interested in the possibility of dating the Olduvai deposits by means of the potassium–argon technique. I took him to the Gorge on a special visit, so that he himself could collect samples of the rocks. At intervals, after this, I sent further samples to him and in 1961 Dr Garniss Curtis (Evernden's partner in the potassium–argon studies) came to East Africa to collect additional specimens. The results of this study are given in chapter VIII, in which the article published in *Nature* on 29 July 1961 is reprinted (Leakey, Evernden and Curtis, 1961) together with one or two other notes.

As a result of the success of the 1960–1 season, the Research Committee of the National Geographic Society made further generous funds available to continue the work in 1961–2. The Wilkie Brothers Foundation also made another contribution towards the capital costs. We are deeply grateful for this help.

The 1960–1 season resulted in uncovering a very large area of the living-floor, or camp-site, of *Zinjanthropus* and in the discovery, at a nearby site, of juvenile and adult hominid remains. The former is represented by pieces of the skull, the mandible, an upper molar and hand bones, and the latter by the greater part of the left foot, parts of a hand and

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a clavicle. Whilst *Zinjanthropus* is undoubtedly an Australopithecine, preliminary work suggests that the other remains represent a distinct type of hominid.

At the close of the season a hominid skull was found in Bed II at site LLK, and a site rich in cultural and fossil remains was located at the top of Bed I at FLK N I.

The new evidence for dating the various Olduvai deposits which has become available during the past few years is of very great importance. This is, in part, the result of the development of the potassium–argon dating technique. Fully as important, however, is the extensive fossil fauna found *in situ*. As will be seen in the subsequent chapters, this indicates an Upper Villafranchian (Lower Pleistocene) age for Bed I. The lower part of Bed II probably also belongs to this period, whilst the upper part of Bed II, upwards to Bed IV, is Middle Pleistocene.

PERSONNEL DURING THE 1960–1 SEASON

by M. D. Leakey

The 1960–1 season at Olduvai lasted almost exactly twelve months. Work at FLK I, the *Zinjanthropus* site, was begun on 24 February 1960, and camp was finally packed up on 26 February 1961. From the beginning of the season until the end of November 1960 I was most fortunate in having the able assistance of my eldest son, Jonathan, who undertook vehicle maintenance, supervision of water and food supplies (both for ourselves and the African staff), radio operator duties, etc. Moreover, it was he who discovered and excavated site FLK NN I. When Jonathan left at the end of November to open the Snake Park attached to the Coryndon Memorial Museum, my second son, Richard was fortunately able to take over general camp duties. Our special thanks are due to him for tackling the long-outstanding problem of ascertaining, by levelling, the difference in height between the Balbal depression and the top of the fifth fault.

I would like to express my thanks to the African staff, headed by Mr Heselon Mukiri, for the excellent work they did, under conditions which were often very trying.

We were most fortunate in having the help of Mrs S. C. Coryndon, my husband's assistant at the Coryndon Memorial Museum, and of Miss Margaret Cropper who has since left Kenya to study Prehistory in England.

To Mr M. J. Tippett, who came to us early in January 1961 and remained until the close of the season, are due my special thanks for his reliability and efficiency in carrying out the duties assigned to him.

Dr Maxine Kleindienst, who joined us the following season to carry out excavations at site JK 2 in Bed IV, was with us during the final three weeks of the season. I am most grateful to her for her help on the excavations, and for taking charge during my enforced absence in Nairobi for one week.

NOTES ON SECOND IMPRESSION

(1) Page 32: it would appear that the name *intermedius* for a species of *Potamochoerus* is preoccupied, having been used by the late Dr Lonnberg for what is in fact not a new species, nor even a race of the living bush pig. However, my name *intermedius* is thus invalid, and will have to be changed.

(2) Page 92: the account of subsequent volumes has been brought up to date.

L.S.B.L.

January 1967

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