THE NILE BASIN

The Nile Basin contains a record of human activities spanning the last million years. However, the interactions between prehistoric humans and environmental changes in this area are complex and often poorly understood. This comprehensive book explains in clear, non-technical terms how prehistoric environments can be reconstructed, with examples drawn from every part of the Nile Basin. Adopting a source-to-sink approach, the book integrates events in the Nile headwaters with the record from marine sediment cores in the Nile Delta and offshore. It provides a detailed record of past environmental changes throughout the Nile Basin and concludes with a review of the causes and consequences of plant and animal domestication in this region and of the various prehistoric migrations out of Africa into Eurasia and beyond. A comprehensive overview, this book is ideal for researchers in geomorphology, climatology and archaeology.

MARTIN WILLIAMS is Adjunct Professor in Earth Sciences at the University of Adelaide, Australia. He has worked with archaeologists in the Sahara, Nile Valley and Ethiopia, and has written more than 200 research papers and a dozen books, including *Climatic Change in Deserts* (2014), *A Land Between Two Niles* (with Donald Adamson, 1982) and *The Sahara and the Nile* (with Hugues Faure, 1980). He received the Farouk El-Baz Award for Desert Research from the Geological Society of America in 2008.

THE NILE BASIN

Quaternary Geology, Geomorphology and Prehistoric Environments

MARTIN WILLIAMS
The University of Adelaide

CAMBRIDGE UNIVERSITY PRESS

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India

79 Anson Road, #06–04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning, and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781107179196
DOI: 10.1017/9781316831885

First published 2019

Printed in the United Kingdom by TJ International Ltd. Padstow Cornwall

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

Library of Congress Cataloging-in-Publication Data
Names: Williams, M. A. J., author.
Title: The Nile Basin : quaternary geology, geomorphology and prehistoric environments / Martin Williams.
Description: Cambridge, United Kingdom ; New York, NY : Cambridge University Press, 2019. | Includes bibliographical references and index.
Identifiers: LCCN 2018027622 | ISBN 9781107179196 (Hardback)
Subjects: LCSH: Geology – Nile River Watershed. | Geomorphology – Nile River Watershed. | Nile River Watershed – Antiquities. | Geology, Stratigraphic – Quaternary.
Classification: LCC QE328 .W55 2019 | DDC 556.2–dc23
LC record available at https://lccn.loc.gov/2018027622

ISBN 978-1-107-17919-6 Hardback

For Frances, who shares my love of wild, remote and rugged places

Contents

Preface

The Nile Basin has been a reliable haven for prehistoric human groups for more than a million years. Early, Middle and Late Stone Age artefacts can be seen scattered throughout the Nile Basin, including in areas that are now waterless and inhospitable for all but the hardiest of present-day human communities. Another feature of the Nile Basin is the abundant evidence that the climate has been very much wetter than today on innumerable occasions in the past. All of this prompts us to ask what caused these dramatic changes in climate.

The Nile Basin covers the northeast quadrant of Africa and contains a generous slice of the climatic history of the Earth. It falls under the influence of three major climate systems. In the far north the westerly winds that blow across the eastern Mediterranean in winter bring sporadic rain today to northern Egypt. At intervals in the recent past the influence of these winter rains extended much farther south, bringing precipitation to the Red Sea Hills in the east and, possibly, to the great sandstone plateau of the Gilf Kebir in the west.

In the equatorial south of the Basin the seasonal migrations of the Intertropical Convergence Zone (ITCZ) bring summer rain to the centre of the Basin and to the valleys of the Blue and White Nile Rivers in central Sudan. Here again, there is strong evidence that the influence of the ITCZ once extended much farther north, well into Nubia and the now hyperarid eastern Sahara adjoining the Nile Valley. The most recent northward excursion of the ITCZ was during the Early to Middle Holocene, when groups of Mesolithic people made a living from fishing, hunting and gathering wild plant foods. By about 8,000–7,000 years ago we see the inception of plant and animal domestication in the Nile Valley, several thousand years after its adoption by Neolithic communities in the Fertile Crescent of the Levant and Anatolia. Why was the onset of the Neolithic so late in the Nile Basin compared to farther north?

The African summer monsoon is the third main climate system. The summer floods in the Nile that so intrigued the great Greek traveller and historian Herodotus (484–425 BC) some 2,500 years ago depend on the African summer monsoon in the Ethiopian headwaters of the Nile. During the Early Holocene, the summer monsoon was considerably stronger than today so that the Blue Nile and Atbara Rivers contributed far more water and sediment to the main Nile than they do today. The result was widespread flooding in northern Sudan and

Egypt, and the progressive build-up of the Nile flood plain and Nile Delta. These alluvial sediments, when appropriately deciphered, can tell us a great deal not only about both the flood history of the Nile during the last 15,000 and more years, but also about the timing and significance of local contributions to the Nile sediment load from local wadi systems and, later, as the climate became drier, from wind-blown sand and dust.

There is also good evidence that the regional climate has become progressively drier during the last several hundred thousand years. The eastern Sahara was studded with large lakes, including in the region between Bir Sahara and Bir Tarfawi in the presently arid desert west of Aswan at intervals during the Early and Middle Stone Age. The valley of the White Nile was filled with a vast lake during the Last Interglacial. This lake had attained an elevation of 386 m by 110,000 years ago and was more than 500 km long from north to south and up to 80 km wide. A second big lake that refilled the White Nile Valley with the abrupt return of the summer monsoon 14,500 years ago attained an elevation of only 382 m, and although still vast, was much smaller than the Last Interglacial mega-lake. Whether or not these lakes facilitated northward movement through the Nile Valley remains an open question.

The aim of this book is to explore the issues mentioned here in appropriate detail and to seek answers to some of the questions raised. The approach adopted is geographical rather than chronological, allowing the evidence from each of the fifteen or so major physical regions in the Nile Basin to be assessed according to the local geological and geomorphic contexts. Our focus is on the reconstruction of past environmental changes in the Nile Basin, thereby allowing archaeologists to see their work in a more rounded context. We conclude with a review of the uniquely important contributions that marine sediment cores recovered from the submarine Nile Cone have provided to our understanding of Nile flood history and changing patterns of sediment sources and delivery.

Some chapters in this book are quite long and detailed, others less so. By way of defence I can do no better than quote from the introduction to L. C. Beadle (1974), *The Inland Waters of Tropical Africa: An Introduction to Tropical Limnology*:

'Though I have made some effort to maintain a balance, I cannot pretend to have avoided giving relatively more prominence to certain subjects and regional studies than a dispassionate reader might think they deserve. I can reply that it is better for a student to hear about subjects of which the author has a direct knowledge and in which he is especially interested. It is impossible to disguise the fact that I know more from direct experience about eastern than about western tropical Africa.' In my own case, I know a great deal more at first-hand about the Nile and its tributaries in Ethiopia and the Sudan than I do about the Nile in Egypt and the White Nile headwaters in Uganda, although I have travelled and worked throughout much of the Nile Basin. I leave the last word to Geoffrey Blainey (1966) in his preface to *The Tyranny of Distance*: 'I found I had ended up with a kind of history . . . not a comprehensive history, but then every history of every country is a mirror of the author's own interests and therefore selective rather than comprehensive.'

Acknowledgements

Many friends and colleagues have helped over the years in enlarging my appreciation of the Nile Basin and its people. I was introduced to the Nile in October 1962, after joining Hunting Technical Services to work as a soil surveyor in the Sudan as part of the Roseires Dam Project. My job was to map soils in the lower Blue and White Nile Valleys and I was fortunate to work under the experienced eye of Colin Mitchell, who spoke fluent Arabic and had worked many years in the Sudan. During 1963–64, I led a nomadic life as a reconnaissance soil surveyor in the lower White Nile Valley. I retain ineffable memories of the unfailing courtesy and generosity of the people of the central Sudan, whether villagers or nomads, and the hospitality freely offered by Sayed Idris Habbani, Umda of Hashaba, by the late Sayed Omar Mustafa, Umda of Esh Shawal, and the late Sayed el Hadi Abdl Rahman el Fadi el Mahdi, who so generously made available his private rest-house on Aba Island on the White Nile during Ramadan in 1964.

During leave from Sudan local guides helped me to explore the Nile Valley in Egypt, visiting Luxor and the Valley of the Kings before the Aswan High Dam was completed and certain monuments had to be moved. In late 1969 and early 1970 I was able to explore some of the Ugandan Lake Plateau and visit Lake Victoria. The late Professor Bill Bishop advised me on questions of Ugandan tectonic and sedimentary geology.

During later visits to Sudan in the 1970s and 1980s, friends and colleagues old and new at the University of Khartoum shared their knowledge of and enthusiasm for the Nile. Dr Ekhlas Abd el Bari and Professor Mohamed Obeid Mubarak of the Botany Department; Professor John Vail, Professor Ismail el Boushi, Dr Yassin Abdel Salaam and Dr Salah el Raba'a of the Geology Department; and Dr Asim el Moghraby of the Hydrobiology Research Unit were at all times pillars of support, as was my great friend Dr Donald Adamson, who shared my passion for the Nile and proved an inspiring and indefatigable field companion during the 1970s and early 1980s.

Dr El Sammani Abdalla Yacoub and Dr Ali Mohayad Bannaga of the National Council for Research helped to facilitate my research and brought me into contact with Dr Hassan Hag Abdalla of the Gezira Research Station at Wad Medani, and most helpfully with Sayed Abdel Latif Widatalla, Sayid Yusif Sulieman, Sayed Abdulla Hassan Ishag and Sayed el Tayeb M. Saeed of the Sudan Geological Survey. The Khartoum staff of Hunting Technical Services (HTS) and Sir Murdoch Macdonald and Partners (MMP) were invariably helpful,

for which I thank them warmly, as also Mr Vernon Robertson (HTS), Mr Ian Matthews (MMP) and Mr Martin Adams (HTS), all of whom encouraged my studies of the Nile.

In December 1971 Dr Bill Morton and Dr Getaneh Assefa (Geology, Addis Ababa University) invited me to join a student field excursion to the Blue Nile gorge, after which I explored the glaciated mountains around Ras Dashan in the Semien Highlands of Ethiopia.

In January 1972 Sayed Awad Medani showed me the shell beds at Wadi Mansurab west of the White Nile, while Tony and Pat Harris and Professor John Cloudsley Thompson introduced me to the rock carvings at Jebel Qeili in the Butana Desert.

Professor J. Desmond Clark and his archaeological team from the University of California, Berkeley, joined us in early 1973. We were able to excavate and date several Mesolithic, Neolithic and Iron Age sites in the White Nile Valley and at Jebel Moya. Sayed Negm-ed-Din Sherif, Director of Antiquities, smoothed our way and visited our excavations. Desmond and I later worked on Early, Middle and Late Stone Age sites in Ethiopia and the Afar Desert.

During January 1976 my future wife Frances Dakin and the late Dr Bill Morton, both from the Geology Department of the University of Addis Ababa, accompanied us in a rapid survey up the Blue Nile and an intensive survey of the piedmont deposits around Jebel Marra volcano directed by Dr David Parry. In December of that year Dr John Gowlett, archaeologist at the University of Khartoum, accompanied us on a survey along the west bank of the White Nile.

I am most grateful to Professor Fred Wendorf (Southern Methodist University, Dallas, Texas) for inviting me to take part in the 1987 fieldwork at Bir Tarfawi and Bir Sahara in the Western Desert of Egypt, and to Dr Bahay Issawi, Dr Hani Hamroush and Ms Angelika Hamroush for help, hospitality and stimulating discussion while in Cairo. During the field sampling programme I profited greatly from the wide experience and sage advice of Professor Fred Wendorf, Professor Romuald Schild and Dr Achilles Gautier. More recently, Abdallah Sami Zaki Bakri has guided my understanding of Egyptian geomorphology.

Between 2005 and 2012 I worked with local and international teams throughout central and northern Sudan. Special thanks go to Dr Abdelrazig Ahmed and Dr Yusif Elsamani (respectively, past and present directors of the Geological Research Authority of the Sudan), Dr Yasin Abdl Salaam, formerly University of Khartoum, Professor Osman et Tom, former Director of Soils Research at Wad Medani, and Neil Munro, for their patience, wisdom and guidance during my more recent visits and their sterling help with fieldwork. I also give warm thanks to Dr Donatella Usai and her husband Dr Sandro Salvatori for inviting me to join their Italian archaeological team excavating at El Khiday west of the lower White Nile in November 2011 and to Professor Matthieu Honegger for inviting me to work with him and his Swiss archaeological team at Kerma in northern Sudan during January 2012.

I am especially grateful to the members of my research team who were funded by my Australia Research Council grant to study the history of floods and droughts in the Nile Basin over the past 30,000 years: Professor Mike Talbot, University of Bergen; Professors

Geoff Duller and Mark Macklin, Aberystwyth University; and Professor Jamie Woodward, University of Manchester. During 2006 Dr Timothy Barrows and Dr David Haberlah helped in mapping the White Nile mega-lake, and in 2009 Tim joined us in the Semien Highlands of Ethiopia to collect samples of glacial moraine for surface exposure dating.

Over the years I have benefited greatly from the enlightened financial support of the Australian Research Council and the US National Science Foundation. My final debt is to the librarians and staff of the Australian National University Menzies Library, the National Library of Australia, the Cambridge University Library, the Khartoum University Library, Macquarie University Library, Monash University Library, the Barr Smith Library, University of Adelaide, the CNRS Quaternary Geology library at Meudon-Bellevue and the CNRS CEREGE library at the Europôle de l'Arbois near Aix-en-Provence, France. As always, friends and colleagues from around the world have sent me books and reprints of their work relating to the Nile Basin, which is one of the joys of belonging to the international community of scholars.

I thank Professor Emi Ito for her sage advice on the subtleties of isotope geochemistry and Professor Peter Mühlhäusler for clarifying some arcane aspects of linguistics.

Over the years Karl Butzer, Dan Livingstone, Mike Talbot, Claudio Vita-Finzi, Fred Wendorf, Romuald Schild, Desmond Clark and many others assisted with wise advice and welcome publications. I remain in their debt and treasure the memories of my interactions with them.

I thank Dr Matt Lloyd for sustained support, Mariela Valdez-Cordero at Cambridge University Press, New York, for her patient and wise editorial advice; Theresa Kornak for copy-editing; Zoe Pruce and Sunantha Ramamoorthy for managing the production of this book.

Finally, and by no means least, I thank my wife, Frances, for drawing the figures with her customary elegance and clarity, and for those memorable field trips to the Ethiopian Rift Valley; Jebel Marra volcano, Darfur, Sudan; and the glaciated Semien Highlands of Ethiopia.