SETTLING THE EARTH

In this worldwide survey, Clive Gamble explores the evolution of the human imagination, without which we would not have become a global species. He sets out to determine the cognitive and social bases for our imaginative capacity and traces the evidence back into deep human history. He argues that it was the imaginative ability to “go beyond” and to create societies where people lived apart yet stayed in touch that made us such effective world settlers. To make his case, Gamble brings together information from a wide range of disciplines: psychology, cognitive science, archaeology, palaeoanthropology, archaeogenetics, geography, quaternary science and anthropology. He presents a novel deep history that combines the archaeological evidence for fossil hominins with the selective forces of Pleistocene climate change, engages with the archaeogeneticists’ models for population dispersal and displacement, and ends with the Europeans’ rediscovery of the deep history settlement of the earth.

Clive Gamble is Professor of Archaeology at the University of Southampton and is one of the world’s leading authorities on the archaeology of early human societies. He is founder of the Centre for the Archaeology of Human Origins at the University of Southampton. Gamble has travelled extensively to see first-hand the evidence for social change from our earliest past, and most recently visited every continent while filming an acclaimed six-part documentary entitled Where Do We Come From? for the UK’s 5 network. He has held visiting positions at the Australian National University; the Museo de la Plata, Argentina; Boston University; and the universities of LaTrobe and Alaska. He is much sought after as a keynote speaker at international conferences and has been a frequent contributor to national radio. His many groundbreaking books include The Palaeolithic Settlement of Europe (1986); Timewalkers: The Prehistory of Global Colonisation (1993); The Palaeolithic Societies of Europe (1999), the 2000 winner of the Society of American Archaeology Book Award; Archaeology: The Basics (2001); and Origins and Revolutions: Hominin Identity in Earliest Prehistory (2007). In 2005, Gamble was awarded the Rivers Memorial Medal by the Royal Anthropological Institute in recognition of his outstanding contribution to the field, and in 2008, he won the Henry Stopes Medal from the Geologists’ Association. He was elected a Fellow of the British Academy in 2000.
Settling the Earth

The Archaeology of Deep Human History

CLIVE GAMBLE

University of Southampton
For Lewis Binford
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Writing a book about brains and global settlement has to be a cooperative enterprise. I was particularly fortunate in being assisted by Fiona Coward, Peter Morgan, Elaine Morris and James Cole in finding references, correcting mistakes, data digesting, discussing the issues, mapping and illustrating stone tools.

The circle of people that I need to thank for advice, information and argument is wide indeed: James Adovasio, Jim Allen, Nick Ashton, Geoff Bailey, Graeme Barker, Ofer Bar-Yosef, Anne Best, Bill Boismier, Luis Borrero, Ariane Burke, Richard Cosgrove, Iain Davidson, Robin Dennell, Rob Foley, Nena Galanidou, Nigel Goring-Morris, Chris Gosden, Bjarne Grønnov, Rob Hosfield, Geoff Irwin, Marta Lahr, Julia Lee-Thorp, Adrian Lister, Ian McNiven, Paul Mellars, David Meltzer, Steven Mithen, Clive Oppenheimer, Stephen Oppenheimer, Mike Petraglia, Gustavo Politis, Mark Pollard, Matt Pope, Martin Richards, John Robb, Stephen Shennan, Mike Smith, Chris Stringer, Mike Walker, Dustin White and David Yesner.

Participation in three projects helped to structure my excursion into deep history. The British Academy Centenary Project From Lucy to Language: The archaeology of the social brain proved immensely stimulating, as it brought evolutionary psychology together with archaeology and anthropology. My co-directors Robin Dunbar and John Gowlett and our steering committee of Garry Runciman, Wendy James and Ken Emond were most influential. While this book was being planned, I also led the NERC thematic programme Environmental factors and chronology in human evolution and dispersal (EFCHED). EFCHED had eleven projects that spanned the world and brought quaternary science and Palaeolithic archaeology together, several of which are reported here. My thanks to the NERC team and in particular Chris Franklin and Sally Palmer. Finally, the Radcliffe...
Seminar on deep history, hosted by Daniel Smail and Andrew Shryock, made me realise that prehistory had had its day.

During the writing of the book, I travelled from a Geography to an Archaeology Department.

At Royal Holloway, I owe a debt to colleagues who patiently answered quaternary questions, and from the Centre for Quaternary Research these include Simon Armitage, Simon Blockley, Ian Candy, Scott Elias, Rupert Housley, Rob Kemp, John Lowe, Jim Rose, Danielle Schreve and Tom Stevens, as well as Felix Driver, Vicky Elefanti, Hilary Geoghegan, Gil Marshall and Katie Willis. Ian Barnes answered questions about ancient DNA, while Matt Grove and Dora Moutsiou were both very generous in allowing me to use aspects of their doctoral research.

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I dedicate this book to Lewis Binford, friend and mentor since we first met in 1980. I'm only saddened that you are not here to see the result. You are much missed.
Glossary

Dates

C¹⁴  Radiocarbon dating. All radiocarbon ages in this book have been calibrated.
b₂k  Before AD 2000, equivalent to BP (before present)
ka   Thousand years ago b₂k, based on science-based dating such as C¹⁴ and OSL
Ma   Million years ago, based on science-based dating such as K/Ar
OSL  Optically stimulated thermoluminescence dating
K/Ar Potassium–argon dating
Molecular clock  Estimates based on mutation and coalescent rates
ka molecular Indicates the basis of the age estimate

Climate

MIS   Marine Isotope Stage, divisions based on oxygen isotope readings of O¹⁸ (heavy) and O¹⁶ (light) from foraminifera skeletons in deep-sea cores. Oceans enriched with O¹⁸ indicate small ice sheets.
Milankovitch cycles Predictable changes in the earth’s orbit (eccentricity), rotation (precession) and tilt (obliquity) that force climate change
Stadial  Cold period, low sea level and ice advance
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Interstadial</td>
<td>Warmer interval during a stadial</td>
</tr>
<tr>
<td>Interglacial</td>
<td>Warm period with temperatures equal to or above today’s, high sea level</td>
</tr>
<tr>
<td>GS</td>
<td>Greenland stadial recognised in the ice cores</td>
</tr>
<tr>
<td>GI</td>
<td>Greenland interstadial</td>
</tr>
<tr>
<td>LGM</td>
<td>Last Glacial Maximum 25–18ka when ice sheets reached their greatest extent</td>
</tr>
<tr>
<td>Effective Temperature</td>
<td>A measure of productivity and the length of the growing season based on modern temperature, expressed in ET °C</td>
</tr>
<tr>
<td>Genetic</td>
<td>mtDNA Mitochondrial DNA: only inherited through the female line</td>
</tr>
<tr>
<td></td>
<td>MSY Male-specific segment of the Y chromosome: only inherited through the male line</td>
</tr>
<tr>
<td>HLA</td>
<td>A gene family which provides instructions for making a group of related proteins known as the human leukocyte antigen (HLA) complex. The HLA complex helps the immune system distinguish the body’s own proteins from proteins made by foreign invaders such as viruses and bacteria.</td>
</tr>
<tr>
<td>Ancient DNA</td>
<td>The extraction of DNA from dead rather than living organisms</td>
</tr>
<tr>
<td>Haplogroups</td>
<td>Branches of the mitochondrial DNA phylogenetic tree that consist of a collection of related haplotypes and where each haplotype represents a unique pattern of DNA substitutions (Haplo = single)</td>
</tr>
<tr>
<td>Clade</td>
<td>A branch on a phylogenetic lineage resulting from a split in an earlier lineage that formed two new taxa</td>
</tr>
<tr>
<td>Motif</td>
<td>A distinctive and usually recurrent genetic sequence found in a geographical area and used to distinguish populations and their migration histories</td>
</tr>
<tr>
<td>Effective population size</td>
<td>Refers to how many individuals actually contribute alleles to the next generation as opposed to the total number of individuals in a population</td>
</tr>
</tbody>
</table>
### Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td><strong>Coalescence</strong></td>
<td>When two genetic lineages find a common ancestor</td>
</tr>
<tr>
<td><strong>Population bottleneck</strong></td>
<td>Occurs when the size of a population is reduced for at least one generation. When the population is small, this can result in a faster reduction in genetic variation through the process of genetic drift. Such bottlenecks show up in mtDNA and MSY data.</td>
</tr>
</tbody>
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### Archaeology

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td><strong>FGH</strong></td>
<td>Fisher-gatherer-hunter; used to describe modern societies and those before the advent of farming</td>
</tr>
<tr>
<td><strong>FACE</strong></td>
<td>The social activities of Fragmentation, Accumulation, Consumption and Enchainment that result in patterns in archaeological data</td>
</tr>
<tr>
<td><strong>Encephalisation</strong></td>
<td>Growth in brain size</td>
</tr>
<tr>
<td><strong>EQ</strong></td>
<td>Encephalisation quotient that scales brain to body size</td>
</tr>
<tr>
<td><strong>Mode</strong></td>
<td>Five modes are recognised among stone tools based on techniques of manufacture and dominant artefact type</td>
</tr>
<tr>
<td><strong>Technounit</strong></td>
<td>A discrete component of an artefact. When all the technounits in an artefact are added up, it provides a measure of its complexity.</td>
</tr>
<tr>
<td><strong>PCT</strong></td>
<td>Prepared Core Technology; e.g. Victoria West, Levallois, Prismatic blade</td>
</tr>
<tr>
<td><strong>LCT</strong></td>
<td>Large Cutting Tools; stone picks, cleavers and bifaces</td>
</tr>
<tr>
<td><strong>Biface</strong></td>
<td>Any piece of stone worked on both faces; e.g. Acheulean hand axes, Clovis projectile points</td>
</tr>
<tr>
<td><strong>Core</strong></td>
<td>What remains after a stone nodule has been knapped</td>
</tr>
<tr>
<td><strong>Flake</strong></td>
<td>Less than twice as long as it is wide</td>
</tr>
<tr>
<td><strong>Blade</strong></td>
<td>Must be twice as long as it is wide</td>
</tr>
<tr>
<td><strong>A-List, B-List</strong></td>
<td>An alternative way to group archaeological classifications</td>
</tr>
<tr>
<td><strong>IUP</strong></td>
<td>Initial Upper Palaeolithic</td>
</tr>
</tbody>
</table>
Web resources for skulls and stone tools

These have been selected for the illustrations they contain of stone tools, fossil skulls and climate data that supplement the text figures. There are many more to explore, while search engines will enhance the glossary.

The online Encyclopedia of Quaternary Science (2013) edited by Scott Elias and frequently updated is an essential on-line resource for all things ice age, including hominins.

A comprehensive array of hominin skulls can be found at the Smithsonian Institution’s Human Origins Program. http://humanorigins.si.edu/evidence/human-fossils as well as some stone tools at its http://humanorigins.si.edu/evidence/behavior/tools.

Many images of Mode 2 artefacts from across Terra 2, and which bring home their variability, are at http://archaeologydataservice.ac.uk/archives/view/bifaces/index.cfm.

Old Stone Age.com has a range of resources in Old World Palaeolithic: http://www.oldstoneage.com/default.shtml.


For an interactive simulation of changing sea levels with a focus on Sunda and Sahul see Monash University’s Sahul-Time: http://sahultime.monash.edu.au/.