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Chapter

Introductory Chapter: Pleistocene Archaeology - Migration, Technology, and Adaptation

Rintaro Ono and Alfred Pawlik

1. About this book

This book aims to review the current and latest research outcomes in the field of Pleistocene Archaeology around the world. From our understanding, the major purpose of Pleistocene Archaeology is to research the deep human history of hunter-gatherers before the development of agricultural or Neolithic societies and civilizations during the Holocene. The current geological timeline of the Pleistocene is regarded to be between about 2.58 million years ago and 11,700 years ago [1–3]. It is then followed by the Holocene as the present geological period. In terms of human history during the Pleistocene times, a variety of human species have been existed, and most important for us as modern-day *Homo sapiens* are the emergence, evolution, and dispersal of the genus Homo during this time range.

With such understanding, this book mainly focuses on archaeological studies of our species, from archaic hominins like *H. erectus*, H. *neanderthalensis*, H. *floresiensis*, to *Homo sapiens* as anatomically modern humans (AMH). The main topics of this book are: (1) human migrations in and out of Africa by Homo species, particularly by *Homo sapiens* who migrated into most regions of the world and various environments, (2) the development of human technology from early to archaic Homo species and *Homo sapiens* (e.g. stone and bone tool production and use, ornaments, rock art, hunting, fishing, gathering, resource exchange), and (3) human adaptation to new environments or environmental changes caused by past climate changes during the Pleistocene. With such perspectives in mind, this book contains a total of eight insightful and stimulating chapters related to these topics which review and discuss human history during the Pleistocene times.

It is true that the main human actors during the Pleistocene are Homo erectus and similar archaic hominins as Homo erectus appeared by 2 million years ago (2 Ma) in Africa and existed at least by around 110 ka in Java, Indonesia [4]. Homo erectus or their related species (e.g. H. rudolfensis, H. heidelbergensis, H. ergaster, and possibly H. habilis as well) most probably originated in Africa and are considered to be the first hominin group that succeeded to move "Out of Africa" and migrate into Asia and Europe possibly after [5–7]. Homo erectus and Homo heidelbergensis were also the likely ancestors to Neanderthals (H. neanderthalensis) and Denisovans in Europe and Siberia [8–10], as well as ancestral to small-bodied hominins like H. floresiensis, a recently found species in Flores Island in Indonesia [11] and H. luzonensis another newly discovered species in Luzon Island in the Philippines [12].

Although these facts clearly support Homo erectus and other archaic hominin species can be one of the main targets for Pleistocene Archaeology, this book mainly

focuses on migration, technology and adaptation by Homo sapiens as anatomically modern humans. This is partly because of their wider migration area which covered almost the entire inhabitable world and the various and increasingly compex technologies they invented. Therefore, we consider Homo sapiens as the most important species and main actor in our discussion of Pleistocene Archaeology. In fact, Japan including the Ryukyu Islands, Oceania, Australia and New Guinea, and the American continent as the New World were initially reached and colonized by Homo sapiens, and no traces of other Homo species have been found, so far.

Another reason for us to focus on Homo sapiens is the on-going project "Cultural History of PaleoAsia" as the scientific research of a MEXT Grant in Aid Project in Japan (headed by Prof. Yoshihiro Nishiaki during 2016-2020) in which both editors of this book (Ono and Pawlik) have participated since the beginning. This project aims to analyze an extensive set of relevant field and theoretical data from Asia in order to interpret the nature of distinct patterns in the formation of modern human cultures across Asian region after the Out of Africa event, and has already produced a number of publications (e.g. [13–15]). The basic idea and major topics of this book were originally evoked by joining this interdisciplinary project and we are grateful for the opportunity to publish this book in the last year of this important project.

2. Introduction of the chapters

This volume is divided into four sections with a total of eight chapters which constitute a diverse but generally coherent collection on Pleistocene human migration, lithic tool use, and adaptation to changing environments and climate conditions in the world. The geographical focus extends from Eastern Asia including South China and Japan (Ryuku Islands), Insular Southeast Asia (both Sunda and Wallacea region), South Asia, Central Europe to the American continent (**Figure 1**). On the other hand, we have no chapter that reports about the Palaeolithic of the African continent as the most likely place for the origin of humans, thus this book focuses on the human migration and adaptation to new and changing environments after

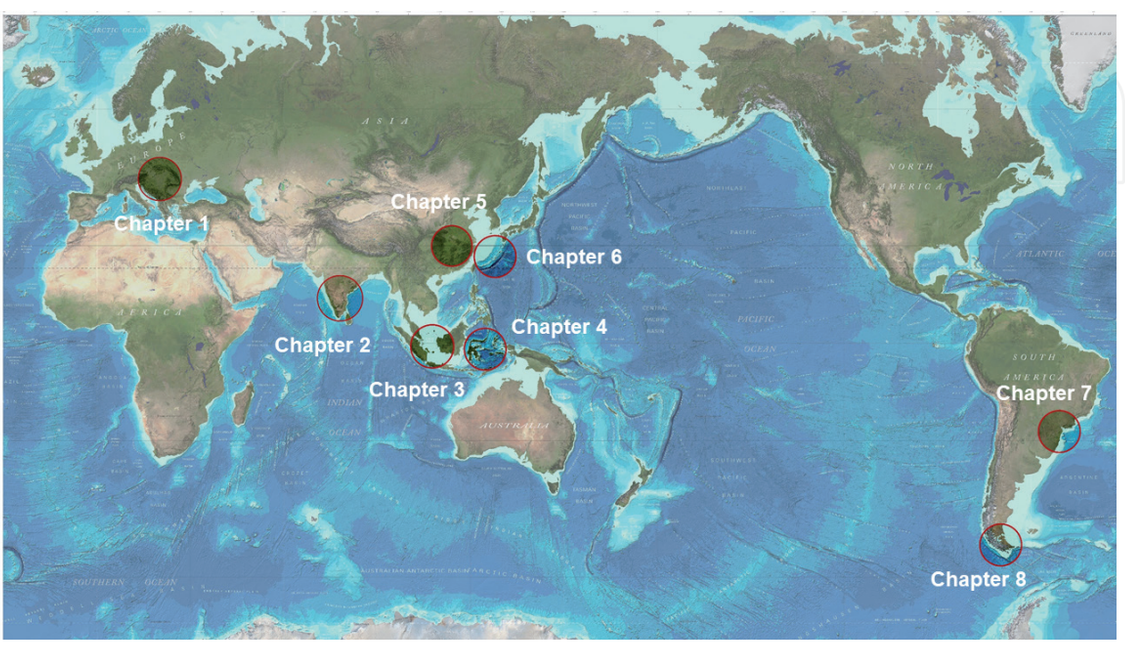


Figure 1.
Research location of each chapter of this book.

the "Out of Africa" events, especially by Homo sapiens during the Pleistocene. Since there is already a wealth of literature on the Palaeolithic archaeology of the African continent, it is not necessary to fill this gap here. Consequently, this book features reports on the prehistory of regions outside the classical Palaeolithic centres of Europe and Africa, and for this very reason these contributions convey new knowledge and introduce the reader to prehistoric regions unknown to many.

The first section "Pleistocene environment change and human evolution in Europe and South Asia" contains two important papers. Chapter 1 by Adriano Banak and Davor Pavelic entitled "Pleistocene Climate Change in Central Europe" investigates distinctive Loess-Paleosol-Successions in the Baranja region in north-eastern Croatia and discusses the results of their stable oxygen isotope analysis (δ18O) and stable carbon isotope analysis (δ13C) of malacofauna during the Upper Pleistocene (130 ky - 20 ky) to quantify paleo-temperature changes in Central Europe and their effect to the environment and human populations [16]. Their analysis shows that stable carbon isotope values point to a dominance of C3 vegetation type during the Late Pleistocene in the southern part of Central Europe and that the overall climate was much cooler than present. The authors propose that climate change in the Late Pleistocene was very likely a significant but not the only factor that influenced the extinction of Neanderthal populations and paved the way for the prevalence of anatomically modern humans (AMH) in Central Europe.

Chapter 2 is entitled "Human evolution in the center of the Old World - An updated review of the South Asian Palaeolithic" by Parth Chauhan and presents us with an overview on the recent outcomes of Pleistocene archaeology in South Asia and its long chronology [17]. Chauhan discusses in his chapter the development of lithic technology from the Lower Palaeolithic to the Middle and Upper Palaeolithic with its early appearance of microlithic technology, and the timeline of the initial arrival of *Homo sapiens*. It also tackles the potential interactions between the archaic population and emerging modern humans, the marginal occurrence of symbolic behavior, the absolute dating of rock art and the potential role of hominins in specific animal extinctions and ecological marginalization.

The second section "Pleistocene Human Migration and Adaptation in Southeast Asia" contains two papers on the prehistory of the Sunda shelf region and the Wallacean islands. Chapter 3 by Halmi Insani and Masanaru Takaki is entitled "Mainland versus Island Adaptation: Palaeobiogeography of Sunda Shelf Primates Revisited" and focuses on dispersal events and phylogeographic analysis of human and non-human primates in the Sunda shelf region and mainly the Malay Peninsula and the islands of Sumatra, Java, and Borneo [18]. Southeast Asian primates, including humans are one of the most successful mammals in responding to the dynamic palaeoclimatic changes since at least 1 mya, and human and non-human primates reflect the complex history of a wide range of ecological and geographic variation. With this understanding, Insani and Takaki discuss body and cranial size of each primate, including Homo erectus, as well as their biodiversity changes and, eventually, their extinction, both in mainland and island environments to highlight the peculiarity of the effect of insularity

Chapter 4 is entitled "Island migration, resource use, and lithic technology by anatomically modern humans in Wallacea" by Rintaro Ono, Alfred Pawlik and Riczar Fuentes and discusses the evidence and timeline for island migrations into the Wallacean islands (mainly East Indonesian islands, East Timor, and the Philippines, except Palawan Island) by early modern humans, and their adaptation to these unique island environments during the Pleistocene [19]. The continuously existing open sea gaps between the Wallacean islands and both landmasses are very likely the major factor for the relative scarcity of animal species originating from Asia and Oceania and the high diversity of endemic species in Wallacea. They were

also a barrier for hominin migration into the Wallacean islands and Sahul continent. With this understanding, the authors summarize the results of three recent excavations on the islands of Talaud, Sulawesi and Mindoro in Wallacea, and discuss the evidence and timeline of migrations of early modern humans into the Wallacea region and their island adaptation during the Pleistocene, also under consideration of the development of lithic technology and tool use.

The third section "Pleistocene Human Migration and Technology in East Asia" also contains two papers on cases from South China and the Ryuku Islands in Japan. Chapter 5 is entitled "A Macroscopic Perspective on Lithic Technology and Human Behavior during the Pleistocene in Zhejiang Province, southeastern China" and written by Hong Chen, Jiying Liu, Xinmin Xu, and Huiru Lian, presents us with an overview of the Pleistocene sites in Zhejiang province and discusses the possible development of lithic technology in the South China region [20]. With the use of macroscopic analysis, the authors point out that the lithic industry in Zhejiang province basically belongs to the technological tradition of southern China as a transition from pebble-tool-industries in the Early and Middle Palaeolithic to flake-tool-based industries in the Upper Palaeolithic. This was accompanied by developing raw material selection and flaking techniques as flint was used as the main lithic raw material as well as the widespread use of the bipolar flaking method during the Upper Palaeolithic times

Chapter 6 entitled "The Migration, Culture, and Lifestyle of the Palaeolithic Ryukyu Islanders" and written by Masaki Fujita, Shinji Yamasaki and Ryohei Sawamura reports on the recent excavation of Palaeolithic deposits at Sakitari Cave, Okinawa Island [21]. The site provided a variety of shell artifacts including beads, scrapers, and fishhooks as well as the remains of aquatic animals, especially freshwater crabs. The initial appearance of humans on many of the remote islands in the Ryukyu Group can be traced back to at least 35,000 to 30,000 years ago, and their new findings at Sakitari Cave site clearly demonstrate that these early modern human are hunting-fishing-gathering people with considerably high seafaring and nautical skill to cross sea gaps of over 100-200 km to reach these islands. The currently oldest shell-made fishhooks in the world are dated to 23,000 years ago, thus supporting such interpretation. Together with the contribution in Chapter 4, it is now widely recognized that an intensive maritime and island adaptation of early modern humans (Homo sapiens) had developed in maritime Asia such as Wallacea and the Ryukyu Islands, as well as along the islands in Oceania during the Pleistocene

The final section of this volume focuses on the cases of the American continent as the New World. With the title of Pleistocene to Holocene Human Technology and Interaction in New World, this section contains two interesting papers. Chapter 7 entitled "The technological diversity of lithic industries in Eastern South America during the Late Pleistocene-Holocene transition" by João Carlos Moreno de Sousa provides us with an overview on the cultural traditions and lithic industries of this vast region and discusses the diversity and development of the prehistoric technologies of these Palaeoindian cultures [22]. Archaeological research began rather late and systematic archaeological investigations were conducted only from the late 1960s onwards. While there is only sparse evidence for human presence during the Late Pleistocene of this region, a significant increase in human settlements occurred during the Terminal Pleistocene and Early Holocene transitional phase. The chapter by Moreno de Sousa is a useful work of reference for this important period in the early human history of South America.

Chapter 8 is entitled "Socio-cultural interaction and symbolism in prehistoric South America: Quartz crystal manuports from Tierra del Fuego" by María Estela Mansur, Hernán Horacio De Angelis, Vanesa Esther Parmigiani, María Celina Alvarez Soncini, and Anna Franch Bach [23]. Their report introduces the

archaeology of Tierra del Fuego, an archipelago located at the southern end of the continent. Various researches have produced a variety of archaeological, ethnohistorical, and palaeoecological data on this interesting region [23–25]. Mansur and colleagues discuss the use and meaning of distinctive minerals with special characteristics, particularly quartz crystals, not only as a raw material for the manufacture of lithic tools but especially their role in ornamental or ceremonial contexts. Quartz crystals appear at several sites of Tierra del Fuego in various forms and often with pyramidal and prismatic shapes. The authors inform about their techno-functional analysis of these artifacts, present evidence of their circulation over long distances and reflect on the interaction and symbolism of the hunter-gatherer populations in Tierra del Fuego on the basis of their appearance, and discuss their role in the ritualistic and ideological practices of the earliest inhabitants of the southernmost region ever settled by humans.

The editors of this book "Pleistocene Archaeology: Migration, Technology and Adaptation" wish to thank all authors for their invaluable and informative contributions to this volume. The topics, research and results presented in the chapters show how important it is to explore and investigate the earliest periods of our existence in order to understand and respond to the many challenges that our species faces in the present and future. Just as our early ancestors who migrated out of their homeland to discover and conquer new territories, reached new continents and colonized land- and seascapes around the world, and adapted to a variety of different environments along their voyage, so today's archaeologists are discovering the deep human history of these regions, revealing new sites, artifacts, fossils, material and immaterial culture. In this way we learn about the evolution of human behavior, cognition and technology as response to the constantly changing climatic conditions and ecosystems of the Pleistocene and early Holocene, and hopefully the data and information gained from Palaeolithic archaeology and palaeoecology can provide us with information and inspiration for our response to today's rapid changes in environment and climate.

Lastly, we like to thank IntechOpen for giving us the opportunity to publish this edited volume and in particular Mateo Pulka for his continuous help and support.

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References

[1] Arzarello M. and C. Peretto 2017 Les plus anciens peuplements de la Péninsule italienne. *L'Anthropologie* 121: 173-178.

[2] Banak A. and D. Pavelic 2020 Pleistocene Climate Change in Central Europe. London: IntechOpen.

[3] Chauhan, P. Human evolution in the center of the Old World- An updated review of the South Asian Palaeolithic. London: IntechOpen.

[4] Détroit, F., Mijares, A., Corny, J., Daver, G., Zanolli, C., Dizon, E., Robles, E., Grün, R. Piper, P.J. 2019 A new species of Homo from the Late Pleistocene of the Philippines. *Nature* **568**: 181-186.

[5] Fujita, M., S. Yamasaki, and R. Sawaura 2020. The Migration, Culture, and Lifestyle of the Paleolithic Ryukyu Islanders. London: IntechOpen. DOI: 10.5772/intechopen.92391.

[6] Gibbard, P and Head, M.J. 2009 The definition of the Quaternary System/ Period and the Pleistocene Series/ Epoch. *Quaternaire* 20: 125-133.

[7] Gibbard P., Head, MJ.and Walker, M. and the International Subcommission on Quaternary Stratigraphy 2009 Formal ratification of the Quaternary System/Period and the Pleistocene Series/Epoch with a base at 2.588 Ma. *Journal of Quaternary Science* 25: 96-102.

[8] Hong Chen, Jiying Liu, Xinmin Xu, and Huiru Lianc 2020 A Macroscopic Perspective on Lithic Technology and Human Behavior during Pleistocene in Zhejiang Province, southeastern China. London: IntechOpen.

[9] Insani H. and M. Takaki 2019 Mainland versus Island Adaptation: Palaeobiogeography of Sunda Shelf Primates Revisited. London: IntechOpen. DOI: 10.5772/ intechopen.90051

[10] Klein, R. 1999 *The Human Career: Human Biological and Cultural Origins*. Chicago: University of Chicago Press.

[11] Krause J., Fu Q., Good J.M., Viola B., Shunkov M.V., Derevianko A.P., Pääbo S. 2010 The complete mitochondrial DNA genome of an unknown hominin from Southern Siberia. *Nature* 464: 894-897.

[12] Lordkipanidze, D. 2017 The History of Early Homo. In Tibayrenc, M., Ayala, FJ. (eds.). *On Human Nature: Biology, Psychology, Ethics, Politics, and Religion*. Academic Press. pp. 45-54. ISBN 978-0-12-420190-3.

[13] Mansur M.E. and H. De Angelis 2016 Lithic resource management in mountain environments: The Andean sector of Tierra Del Fuego. *Quaternary International* 402: 117-128.

[14] Mansur, M.E., H. De Angelis, V.E. Parmigiani, M. Soncini and A. Bach 2020 Sociocultural Interaction and Symbolism in Prehistoric South America: Quartz Crystal Manuports from Tierra del Fuego. London: IntechOpen. DOI: 10.5772/ intechopen.90851

[15] Moreno De Sousa, J.C. 2019 The Technological Diversity of Lithic Industries in Eastern South America during the Late Pleistocene-Holocene Transition. London: IntechOpen. DOI: 10.5772/intechopen.89154

[16] Nishiaki, Y. and T. Akazawa (eds.) 2018 *The Middle and Upper Palaeolithic Archeology of the Levant and Beyond*. Singapore: Springer Nature.

[17] Ono, R., Fuentes, R., Pawlik, A., Sofian, H.O., Sriwigati., Aziz, N., Alamsyah N., Yoneda M., 2020a. Island migration and foraging behaviour by

anatomically modern humans during the late pleistocene to Holocene in Wallacea: New evidence from Central Sulawesi, Indonesia, *Quaternary International*. https://doi.org/10.1016/j.quaint.2020.03.054.

[18] Ono, R., Pawlik, A., Fuentes, R. 2020b Island Migration, Resource Use, and Lithic Technology by Anatomically Modern Humans in Wallacea. DOI: 10.5772/intechopen.93819.

[19] Orquera L.A., Piana, E.L., Fiore D., Zangrando, A.F. 2012 *Diez mil años de fuegos: arqueología y etnografía del fin del mundo*. Buenos Aires: Editorial Dunken.

[20] Rightmire, G.P., Lordkipanidze, D., Vekua, A., 2006. Anatomical descriptions, comparative studies and evolutionary significance of thehominin skulls from Dmanisi, Republic of Georgia. *Journal of Human. Evolution* 50: 115-141.

[21] Rizal, Yan; Westaway, Kira E.; Zaim, Yahdi; van den Bergh, Gerrit D.; Bettis, E. Arthur; Morwood, Michael J.; Huffman, O. Frank; Grün, Rainer; Joannes-Boyau, Renaud; Bailey, Richard M.; Sidarto. 2020 Last appearance of Homo erectus at Ngandong, Java, 117,000-108,000 years ago. *Nature* 577 (7790): 381-385. doi:10.1038/s41586-019-1863-2. ISSN 0028-0836. PMID 31853068. S2CID 209410644

[22] Romagnoli, F., Y. Nishiaki, F. Rivals, and M. Vaquero (eds.) 2018 *Multidisciplinary Approaches in the Definition of High-resolution Events to Interpret Past Human Behaviour: A New Challenge in Archaeology.* Quaternary International 474, Part B. Oxford: Elsevier Ltd.

[23] van den Bergh, Gerrit D.; Kaifu, Yousuke; Kurniawan, Iwan; Kono, Reiko T.; Brumm, Adam; Setiyabudi, Erick; Aziz, Fachroel; Morwood, Michael J. 2016 Homo floresiensis-like fossils from the early Middle Pleistocene of Flores. *Nature* 534 (7606): 245-248.

[24] Walker, M., Head, M.J., Berkelhammer, M., Björck, S., Cheng, H., Cwynar, L., Fisher, D., Gkinis, V., Long, A., Lowe, J., Newnham, R., Rasmussen, S., Weiss, H., 2018. Formal ratification of the subdivision of the Holocene Series/Epoch (Quaternary System/Period): two new Global Boundary Stratotype Sections and Points (GSSPs) and three new stages/subseries. E*pisodes* [online]: https://doi.org/10.18814/epiiugs/2018/018016

[25] Wood, B. 2011 Did early Homo migrate "out of" or "in to" Africa?". *Proceedings of the National Academy of Sciences* 108 (26): 10375-10376. doi:10.1073/pnas.1107724108. PMC 3127876. PMID 21677194.