

# Thin on the Ground: Neanderthal Biology, Archeology and Ecology

Steven E. Churchill

Hoboken, NJ: Wiley-Blackwell, 2014, 472 pp. (hardback), \$149.95.

ISBN-13: 978-1-118-59087-4.

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In this impressive work, Churchill comprehensively summarizes current knowledge on Neanderthals and develops a model to explain their demise. *Thin on the Ground: Neanderthal Biology, Archeology and Ecology* is the first volume of the 'Advances in Human Biology' textbook series, aimed at professionals as well as students. It compiles evidence from a range of disciplines (genetics, biology, archaeology, climatology, bioenergetics, carnivore and human ecology) and with this broad approach forms a unique, well-needed and up-to-date volume on Neanderthal behaviour. The central focus is on the question: What was it about Neanderthal ecology that kept their population densities low? In other words, why were they dispersed so thin on the ground?

Each of the 12 chapters tackles a different aspect of Neanderthals, including their biological, archaeological, and ecological context. All chapters are well illustrated with black and white figures and purposefully compiled tables. These often summarize large quantities of data and are an extremely valuable component of the book. Footnotes are compiled at the end of each chapter, providing additional detail and further references. The number of studies Churchill draws upon is impressive, results in a very extensive bibliography list (ca. 80 pages) and makes the book an invaluable starting point for anyone interested in Neanderthals. The book is well organized, each chapter building upon the previous with a strong line of argumentation throughout, orientated towards constructing a demographic demise model.

Chapter 1 introduces the plethora of explanations that have been brought forward for Neanderthal disappearance. Churchill describes the claimed technological dichotomy between modern humans and Neanderthals, with the latter lacking regular innovations of tool forms and new ways of using material items for symbolic expression. The book promotes the idea that Neanderthals and modern humans had similar cognitive abilities (with the acceptance of substantial technological innovation and recurrent symbolic behavior for Neanderthals) and that social and demographic factors prevented its consistent expression. Irregular manifestations of innovation and symbolic behavior across the early MSA and Mousterian are linked to momentary increases in population size and connectedness, with the persistent expression of behavioral modernity in the LSA and Upper Paleolithic also related to demographic factors rather than cognitive differences. This viewpoint

forms the backbone of this book. However, this first chapter leaves the reader with a lot of questions about how this conclusion was reached and how cognitive aspects (e.g., differences in brain structure, Gunz et al. 2010; Prüfer et al. 2014) were dismissed. In that sense a chapter on cognition would have been a welcome addition to the book.

Chapter 2 aims to define Neanderthals in terms of their physiology, geographic, and temporal boundaries. It is acknowledged that defining these aspects is not easy and depends often on existing dogmatic perspectives. A temporal distribution of MIS 7–3, ca. 240 to 30 ka BP, is proposed (dates throughout the book are generally reported uncalibrated). However, the many problems with pinpointing the exact timing of Neanderthal disappearance, including methodological limitations of radiocarbon dating, are unfortunately not discussed in detail. In contrast, a very detailed overview is given of the morphological features that distinguish Neanderthals from other hominins. This is presented in an excellent, extensive, and referenced table, alongside illustrations of Neanderthal skulls from different viewpoints. Current knowledge on Neanderthal DNA and their evolutionary history also is discussed, although the former is a quickly changing domain making it difficult to really present an up-to-date overview. Moreover, some DNA studies are taken at face value, without referencing replies to papers or ongoing debates. However, this does not take away from the very informative nature of this introductory chapter.

Chapter 3 discusses Neanderthal material culture, with a focus on lithic and subsistence technologies. Representative Mousterian tool forms are illustrated with black and white photos, which unfortunately do not allow a clear view of the characteristic retouch. Moreover, the varying scale bars make it hard to cross compare types. Besides the defining record in Southwest France, the lithic industries from other geographic areas (e.g., Levant and Zagros) also are discussed and are used to highlight interesting patterns of variation across time and space. Although there is little discussion about the end of the Mousterian, the Châtelperronian or potential Neanderthal/modern human interactions, there is a balanced debate on how most of the inter-assembly variation can be understood in adaptive terms, although some trends could reflect regional styles, at least in an incipient way. In general, Churchill promotes the idea that technology was responding to changing environmental conditions and mobility demands, suggesting a high

level of behavioral flexibility. The chapter further discusses how the use of composite technology is evidenced through birch bark pitch, dental calculus, and lithic use wear, although their various methodological issues, e.g., with reliably identifying use wear (e.g., Rots and Plisson 2014), could have been highlighted more.

Chapter 4 discusses Neanderthal body size and composition, its costs and benefits. The section on body size is a good example of the data richness of the book. It presents estimates of body mass and stature for the main Neanderthal fossils, as well as circumpolar modern human groups and provides further charts assessing the data by geographic regions and climatic conditions. It is concluded that Neanderthals had massive bodies with great masses of muscle tissue. Subsequently, the cost of feeding such a large body and brain are discussed, again presenting a series of data tables, including figures on the nutritional value of different types of animals. A central question is how Neanderthals would have overcome dietary shortfalls and what benefits were available to outweigh the costs of these large bodies. Therefore, it is of great interest that Neanderthals also are placed within their ecological context, incorporating the general idea that colder temperatures led to a selection towards larger body size in animals.

Previous claims that Neanderthals were a cold-adapted species have been questioned recently. Therefore, Chapter 5 provides an extensive overview of the climate between 240–30 ka BP and related morphological and behavioral adaptations. Throughout this chapter, Churchill develops a most parsimonious model linking the energetically-costly Neanderthal bodies to adaptations to the cold, a key foundation on which the rest of Churchill's demise model relies heavily. He supports this statement by various sets of data, discussing general human adaptations and physiological solutions to cold environments, alongside several morphological features (e.g., craniofacial morphology) that reflect cold adaptation and characterize Neanderthals. It is argued that the costly bodies of Neanderthals and their high energetic costs must have developed under selective pressures associated with the cold, similar to modern arctic peoples.

In Chapter 6 interglacial phases (MIS 7, 5e), temperate interglacials (MIS 5d–a, 3) and cold steppe environments (MIS 6, 4) are all discussed with a focus on their caloric economy, including the available edible resources. The problems with these environmental and ecological reconstructions are acknowledged, noting that only broad frameworks can be constructed. These do, however, permit an understanding of how modern foragers would have reacted to these environmental setting. Chapter 7 builds on from these ideas and discusses Neanderthal diet, based predominantly on the evidence coming from associated faunal assemblages. It is refreshing to see the problems with identifying human versus carnivore agents in site formation acknowledged. This chapter includes a very useful table of the main large mammals, their habitat preference, and temporal occurrence. Other data sources, including small mammals, macrobotanical remains, dental wear, food residues, stable isotopes, trace element analyses, and evidence

for cannibalism, also are incorporated. This results in a long but balanced discussion on Neanderthal diet, also touching upon some of the interpretive difficulties, e.g., in relation to high  $\delta^{15}\text{N}$  values (also see Smith 2015) or the genuine dietary importance of plants. The overall conclusion of this chapter is rather strong and has been stipulated before—the dietary breadth of Neanderthals was rather narrow, relied heavily on meat in all ecological conditions, and focussed on a few key species (horse, bison, aurochs and deer).

Chapter 8 discusses how Neanderthals obtained these herbivores and Churchill nicely stresses how scavenging was no doubt a part of Neanderthal subsistence. A series of relevant Neanderthal skeletal features, e.g., the scapular glenoid fossa and humeral diaphyseal cross-sectional geometry, are assessed first. A comparison with older hominin species would have been an interesting addition to see their evolutionary origin. Overall, this whole chapter is orientated towards demonstrating that Neanderthals were close-range predators, which limited the prey that they could target, restricted their dominance over other carnivores, and increased the risk for hunting injuries. These conclusions are key in Churchill's demographic model since they are seen as crucial factors limiting Neanderthal population growth and density. However, reconstructing the mechanisms and strategies by which Neanderthals gathered their daily calorie intake remains very difficult in my opinion, probably varied over time and space, and by the end of this chapter I was left with many questions on the generalized applicability of Churchill's viewpoint.

A very interesting aspect of this book is that it places Neanderthals within the context of contemporaneous large-bodied carnivores. In Chapter 9, the main carnivore species, sabre-toothed cats, cave lions, leopards, hyenas, wolves, and dholes, are described alongside a discussion on their competition for available resources, based on prey body size, habitat preference, and feeding strategy. Churchill concludes that Neanderthals were not socially-dominant members of the carnivore guild, in contrast to modern humans. The parallels with carnivore ecology further provide interesting insights into Neanderthal subsistence strategies and its links with Neanderthal population densities and mobility patterns is discussed in the next chapter. Chapter 10 also builds on from the caloric estimates developed through Chapters 4 and 5 and focuses on the caloric costs of finding and procuring food, water, shelter, raw materials et cetera. Discussing several lines of archaeological evidence, Churchill stipulates that Neanderthals used mixed subsistence and mobility strategies but were overall heavily dependent on a circulating mobility strategy, demanding relative high levels of mobility. The reasoning throughout this chapter is sometimes rather convoluted, based on a series of estimates, each not without interpretive problems, e.g., in relation to lithic raw material movement (Turq et al. 2013).

Chapter 11 continues the Neanderthal energetics discourse by considering their social organization, a topic that again is rather difficult to reconstruct. Churchill, therefore, postulates several working hypotheses based on current

evidence. He describes Neanderthals as polygynous, living in open, patrilocal, small groups with high dependency ratios and limited social network sizes. Next, key events in Neanderthal life are discussed, including gestation and weaning length. It is suggested that Neanderthals had a high adult mortality which necessitated high fertility rates. Estimating Neanderthal population density is very difficult and has recently rightly been critiqued and described as very inexact science (Dogandžić and McPherron 2013; Kuhn 2012). However, a generally low population density is agreed upon and Churchill draws further comparisons with various carnivores, stating that competition with other carnivores was a major limiter of Neanderthal population growth and they consequently only filled a small portion of the carnivore biomass.

Chapter 12 tackles two final questions: were the factors that kept Neanderthals at low population densities also operating on contemporaneous hominin populations in Africa, and what conditions would have allowed groups to grow to larger sizes? In relation to the latter, Churchill assigns the demographic expansion of modern humans during the later MSA to a series of developments, including a wetter climate, long-range projectile weapons, body size reduction, and extended social networks. He also links increased cultural complexity to demographic factors. In other words, he sees the larger series of examples of complex or symbolic behavior in MIS 3 resulting from increased Neanderthal populations. However, in my opinion, both these aspects are not without problems, with the vast majority of Mousterian sites not reliably dated, and the utilitarian aspect of the handful of MIS 3 symbolic objects not comprehensively dismissed. It therefore depends largely on the reader's dogmatic perspective if he/she follows Churchill's argumentation, and hence his demographic disappearance model, or not. In my opinion, a key aspect in further discussions will be the 'transitional' entities, such as the Châtelperronian, on which work is currently ongoing and which are not discussed by Churchill due to persisting doubts on their makers (also see Hublin 2015).

Overall, Churchill has compiled an impressive, data-driven discourse promoting a demographic model for Neanderthal extinction. A final concluding chapter would have really helped to draw together all the various lines of his argumentation. Small omissions in terms of some up-to-date citations are inevitable in a work of this size, and disappear in light of the immense bibliographic list provided. At several points throughout the book more caveats could have been built in, recognizing additional studies or viewpoints that paint a more blurred or complex picture of Neanderthal behavior, subsistence, diet, and ecology. In fact, several of the building blocks of Churchill's model continue to be highly debated, for example, the cold adaptation of Neanderthal physiology, their competition with other carnivores, the demographic increase in MIS 3, the predominance of close-range hunting, or the cognitive ca-

pacities of Neanderthals, and future findings could fundamentally shake several foundations of the presented theory. However, this potential for further discoveries is one of the most exciting aspects of studying the Paleolithic and I highly value the data-driven approach Churchill has taken to support his hypothesis. Therefore, I warmly recommend this book to anyone with an interest in Neanderthals, their physiology, behaviour, and/or demise. Despite its steep price, both for the hard cover and e-book version, this book has everything to fulfil the role of the most up-to-date and comprehensive reference work on the different types of evidence that can inform us on Neanderthal life.

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