

## 14. Non-metric variation in recent humans as a model for understanding Neanderthal-early modern human differences: just how “unique” are Neanderthal unique traits?

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**Keywords:** Neanderthals, Species, Systematics, Apomorphies, Non-Metrics, Human Evolution, Modern Human Origins

### Abstract

Using living humans as an extant referent, this paper examines the probability that the frequency differences in Neanderthal “unique” non-metric traits observed between Neanderthals and Upper Paleolithic modern humans could be sampled from two major populations of the same species. Neanderthal-like features occur in very low frequencies in living humans, if present at all. Rather, other features distinguish major human populations. The population frequency differences of these features are used as a model by which the Neanderthal – Upper Paleolithic frequency differences are assessed using a resampling simulation. This methodological approach tests the null hypothesis that the observed Neanderthal – Upper Paleolithic differences are not greater than what can be sampled from between two major human populations (Amerindians and Euroamericans). Results of the analysis fail to falsify this null hypothesis. Implications of these results for Neanderthal taxonomy are examined.

### Introduction

The taxonomic position of Neanderthals has been the longest ongoing debate in paleoanthropology (cf., Trinkaus and Shipman, 1993). Since the late 1980s, this debate has been framed within the contemporary controversy surrounding modern human origins. In many respects, the taxonomy of Neanderthals has become the lynchpin of the modern human

origins debate (Wolpoff et al., 2000). If Neanderthals were not one of us and were rather “*Homo neanderthalensis*,” Multiregional Evolution could be regarded as incorrect, at least for Europe, while if Neanderthals were *Homo sapiens*, Recent African Evolution could be regarded as incorrect.

Greater morphometric difference between Neanderthals and modern humans than among living human populations and non-human

primate species and subspecies has been interpreted as evidence that Neanderthals were a separate species (e.g., Harvati et al., 2004). Such an argument is based upon the assumption that fossil species should be comparable to extant species in their range of variation. Although there is good reason to doubt that such an extant referent “yardstick” can ever effectively *falsify* a single species hypothesis in fossil contexts (Kimbel and Rak, 1993; Ahern et al., 2005), the degree of variation in extant referents could potentially be used to *support* either a single or multiple species interpretation. Rigid hypothesis testing is preferable to such a probabilistic approach (i.e., where hypotheses are “supported” or not “supported” rather than “falsified” or “tentatively accepted”), yet it is clear that many multiple species controversies in the hominid fossil record lack the evidentiary resolution to effectively falsify a single species hypothesis (i.e., Frayer et al., 1993; Kramer et al., 2001; Henneberg and De Miguel, 2004; Wolpoff et al., 2004; Hawks, this volume; but see Ponce de León and Zollikofer, this volume; Rosas et al., this volume; Tattersall and Schwartz, this volume; Zollikofer and Ponce de León, this volume; for assumption of the

contrary). Despite a relatively extensive late hominid fossil record, sufficient evidence has not yet accumulated to falsify a hypothesis of Neanderthal and modern human conspecificity. Thus, we are faced with either ignoring the issue and assuming a single species, or attempting to assess the probability that Neanderthals and modern humans represent more than one species.

#### NEANDERTHAL “AUTAPOMORPHIES”

A variety of non-metric traits have been posited as uniquely-derived (autapomorphic) for Neanderthals (see Table 1; Santa Luca, 1978; Stringer et al., 1984). Applying either the Phylogenetic Species Concept (Cracraft, 1989; cf. Rak, 1993) or the Morphospecies Concept (Cronquist, 1978; cf., Tattersall and Schwartz, 1998), the presence of unique derived features would be consistent with a separate species designation for Neanderthals. Yet, recent studies (e.g., Frayer, 1992a, b; Franciscus and Trinkaus, 1995; Quam and Smith, 1998; Stefan and Trinkaus, 1998; Jabbour et al., 2002; Trinkaus et al., 2003; Wolpoff and Frayer, 2005; Cartmill and Smith, in prep.) have reported that many of

Table 1. A list of purported Neanderthal non-metric cranial autapomorphies<sup>1</sup>

<i>Trait</i>	<i>Reference</i> <sup>2</sup>
<b>Mandibular</b>	
Asymmetrical Mandibular Notch	Rak, 1998; Rak et al., 2002
Horizontal-Oval Mandibular Foramen	Stringer et al., 1984
Medial Crest of the Mandibular Notch	Rak, 1998
Retromolar Space	Stringer et al., 1984
<b>Cranial</b>	
Anterior Mastoid Tubercle	Santa Luca, 1978; Stringer et al., 1984
Occipital Bun	Stringer et al., 1984
Suprainiac Fossa	Santa Luca, 1978
Large Occipitomastoid Crest	Stringer et al., 1984

<sup>1</sup> Other non-metric Neanderthal craniomandibular traits, that have been called autapomorphic, were excluded from the present analysis because of limited published data and/or unclear and contentious definitions. See Materials and Methods.

<sup>2</sup> References for the data used in this study are given in Table 2.