Special Issue: What's in a Name?
Late Middle and Early Late Pleistocene Hominin Systematics

Nomenclature and Taxonomy of Chibanian Hominins

DENNÉ REED*
Department of Anthropology, University of Texas at Austin, Austin, TX, USA; reedd@austin.utexas.edu

*corresponding author: Denné Reed; *reedd@austin.utexas.edu*

submitted: 27 September 2023; revised: 29 May 2024; accepted: 4 June 2024

Guest Editors: Mirjana Roksandic (Department of Anthropology, The University of Winnipeg) and Christopher J. Bae (Department of Anthropology, University of Hawai'i at Manoa)

Handling Editor in Chief: Karen Rosenberg

ABSTRACT

Deciphering the taxonomic and evolutionary relationships among hominin fossils of the Chibanian (ca. 774–129 ka) is challenging. This difficulty stems from biological factors such as mosaic patterns of morphological change, evolutionary factors such as complex geographical patterns of gene flow, and practical difficulties arising from the large number of taxonomic names ascribed to Chibanian fossils. Drawing on Origins, a new information framework for paleoanthropology, this paper reviews the nomenclatural status of more than 30 taxa associated with Chibanian fossils. Among the proposed names, the review identifies 6 as unavailable (including two previously considered available), 5 as objectively invalid, and 21 as potentially valid. The analysis reveals ambiguity in the International Code of Zoological Nomenclature (ICZN) regarding conditional names and proposes a new principle for addressing these cases. Although *H. rhodesiensis* is among the potentially valid names, ethical considerations warrant its discontinuation. However, this creates nomenclatural instability, particularly for hypotheses regarding Chibanian taxa in Africa and Europe. To resolve this instability, developing a List of Available Names for Tribe Hominini under Article 79 of the ICZN is recommended.

INTRODUCTION

The Middle Pleistocene (ca. 774–129 ka), also known as the Chibanian, (Suganumam et al. 2021), was a dynamic stage in human evolution, when hominins ranged from Africa to Europe to Eastern Asia. Fossils across this geographic distribution exhibit mosaic constellations of features, which complicates analysis of their taxonomic and phylogenetic relationships (Bergström et al. 2021; Harvati and Reyes-Centeno 2022; Rightmire 2008). Phylogenetically, the Chibanian marks an important transitional stage in human evolution. Prior to it, *Homo erectus* migrated out of Africa and occupied a broad range extending to Eastern Asia (Antón 2003; Antón et al. 2002). By the end of the Chibanian, classic Neanderthals were established as the sister group to a clade including modern *Homo sapiens* (Ni et al. 2021) alongside more enigmatic, later surviving species such as *Homo floresiensis* (Brown et al. 2004; Brumm et al. 2016; Morwood et al. 2005), *Homo luzonensis* (Détroit et al. 2019), and *Homo naledi* (Berger et al. 2015; Hawks et al. 2017).

Between these endpoints, there is a suite of fossils that have been grouped under the umbrella of *Homo heidelbergensis*, or as "Early" or "Archaic" *Homo sapiens.* Ongoing efforts to resolve the taxonomic and evolutionary relationships between Chibanian hominins has resulted in what Glynn Isaac alliteratively referred to as the "Muddle in the Middle" (Isaac 1975). Unraveling the muddle remains one of the grand challenges in paleoanthropology today.

As a first step, some have called attention to the broad application of the taxon *H. heidelbergensis* (Mounier et al. 2009). The type specimen from Mauer (Schoetensack 1908; Wagner et al. 2010) is a mandible, which presents challenges for delimiting the species based on the limited, preserved anatomy (Hublin 2009). Despite this, the name has

denoted a catch-all taxon that accommodates Chibanian age fossils with mosaic or transitional morphology intermediate between *Homo erectus* on the one hand, and *Homo sapiens* and Neanderthals on the other. Eventually *H. heidelbergensis sensu lato* (*s.l.*), came to include fossils spanning an extensive, and some argued, unsupportable, geographical, temporal and morphological range, prompting a revision and reconsideration of the taxon (Athreya and Hopkins 2021; Roksandic et al. 2022a; b).

In the discourse surrounding the reframing of *H. heidelbergensis*, Roksandic et al. (2022a) proposed a novel name, *Homo bodoensis*, for Chibanian hominins from Africa including not only the Bodo specimen as the type, but also including E686 (Kabwe or Broken Hill 1) and SAM-PQ-EH 1 (Saldanha) in the hypodigm. The basis for proposing *H. bodoensis* was twofold. First, the authors argued that *H. heidelbergensis* was "poorly defined and used inconsistently" (Roksandic et al. 2022a: 20), and that European fossils representing early members of the Neanderthal lineage, including the Mauer type specimen, should be subsumed under *Homo neanderthalensis*. Second, they recognized *Homo rhodesiensis* Woodward, 1921 as having priority among the available names attached to the fossils in their African hypodigm but argued that the name should not be used because "the taxon is poorly defined" and "the name is associated with sociopolitical baggage that our scientific community is trying to dissociate itself from" (Roksandic et al. 2022: 23).

Their proposal met criticism on two fronts. First, Delson and Stringer (2022) indicated that the rules of the International Code on Zoological Nomenclature (or simply the Code) (ICZN 1999) do not permit suppressing a taxonomic name because it is politically, socially, or culturally inappropriate. The International Commission on Zoological Nomenclature (from here on, the Commission) has ethical guidelines recommending authors avoid names that are potentially problematic, but it does not review nor enforce constraints on properly proposed names (Ceríaco et al. 2023; Harvey et al. 2023). Under the Code *H. rhodesiensis* is available, potentially valid, and has priority over *H. bodoensis*. Delson and Stringer (2022) downplay ethical issues by arguing that "the rules cannot simply be changed to suit political expediency" (Delson and Stringer 2022: 235), noting that the name is a reference to the "nation/colony which yielded the specimen'' and not an explicit reference to Cecil Rhodes directly. While it is true that *rhodesiensis* is a toponym rather than a homonym, it should be noted that at the time when Woodward established the taxon in 1921, Rhodesia was the name adopted by British colonialists for Mashonaland after it was coerced from the Ndebele by false treaty and made a chartered territory of the British South Africa Company under the direction of Cecil Rhodes (Warhurst 1973). Directly or indirectly the name is a reference to the person.

Sarmiento and Pickford (2022) critiqued *H. bodoensis* on the grounds that *H. rhodesiensis* has priority, but also in recognizing that the Saldanha skull, explicitly included by Roksandic et al. (2022a) in the *H. bodoensis* hypodigm, is also a type specimen bearing the name *Homo saldanensis* Brennan, 1955, and that this name has priority over *H. bodoensis*.

In their rebuttal, Roksandic et al. (2022b) reiterated their argument that *H. rhodesiensis* should not be recognized, finding fault with the position of the Commission for not providing a mechanism to address problematic names and by aligning their argument with the larger movement to avoid eponyms and toponyms in scientific nomenclature (Guedes et al. 2023). Furthermore, Rocksandic et al. (2022b) argued that the name *H. saldanensis* is nomen nudum because Drennan (1955) failed to provide a differential diagnosis for *H. saldanensis*.

In summary, the muddle of the Middle Pleistocene reflects a nexus of challenging questions involving theoretical and methodological issues in hominin systematics:

1. If a new name is to be used as an alternative to *H. heidelbergensis*, what names are available, which have priority?
2. Should we shun eponyms and toponyms as has been suggested in recent biodiversity literature (Guedes et al. 2023), especially if they are considered problematic because they perpetuate racist and colonialist traditions in paleoanthropology?
3. How should hominin species be delimited? What is the theoretical foundation for species delimitation in paleoanthropology and how should the theory be operationalized to the fossil record of the Chibanian, especially when diverse forms of evidence (morphology, genetics, proteomics) are employed and when hominins are widespread and undergoing complex gene flow and demographic patterns?
4. Recognizing that species may be challenging to delimit, what mechanism should be employed to designate morphologically or genetically distinct lineages that are partially but not fully distinct species? Should we invoke subspecies nomenclature, or some other system for referring to geographic and regional populations below the species level?

This paper focuses on the first two challenges. Drawing on Origins, an online platform for paleoanthropology data integration (Reed et al. 2023), this paper identifies and reviews the nomenclatural status of more than 30 hominin taxa associated with Chibanian fossils with the goal of establishing a list of available, potentially valid names for Chibanian hominins. The priority and potential validity of the names is discussed and possible solutions for avoiding problematic names such as H. rhodesiensis are evaluated.

NOMENCLATURAL BACKGROUND

Nomenclature plays an important role within the larger framework of hominin systematics. It provides the basis for classification and a stable system for communicating about biological taxa, which in turn informs our estimations of species diversity, extinction, origination, and related evolutionary processes. Hominin nomenclature, especially regarding Chibanian taxa, is challenging because many of the type specimens are fragmentary (e.g., Mauer, Floris-

bad, Saldanha, Kanam), and also because many of the more complete fossils that are relevant for deciphering Chibanian systematics were discovered, described, and named during the late 19th and early 20th century when taxonomic practice was less standardized. During this time, new scientific names were minted to describe regional variants, and many names were proposed as descriptive replacements for existing names. Nearly every new and relatively complete cranium received its own taxonomic name. Furthermore, the use of names blurred the meaning of the species taxon as it is applied in paleoanthropological contexts compared to how species are defined in neontological contexts, and this difference continues to confound systematic practice in modern investigations (Howell 1999; Jolly 2001; Mayr 1950; Simpson 1963).

THE PRINCIPLES OF PRIORITY AND COORDINATION

The fossil record provides discrete samples from past biological populations that we group into biological species taxa based on our understanding of hominin biology, speciation process, evolution, ecology, morphology, and now genetics (Simpson 1955). Simpson (1940) introduced the term "hypodigm" to designate the collection of all specimens used by the author of a species as the basis for inference, including all the specimens that the taxonomist referred to the species. Simpson (1940) recognized that a taxonomist's subjective designation of a species is, at best, a subset of a true, natural species, and thus the hypodigm is at best a representative sample of a real species. At the time, Simpson (1940) was addressing a terminological confusion around the meaning of "type specimen" and he coined the term "hypodigm" to distinguish a representative sample of a species, a "type sample" if you will, from a the notion of a type specimen as a single fossil designated to bear the name of a species taxon, but not to be taken as representative of the species. Thus, if a hypodigm contains a type specimen bearing an available name then that name is potentially valid as the name of the taxon. If the hypodigm contains more than one name bearing type then Article 23.1 of the Code (ICZN 1999) stipulates that the oldest, available name has priority. Furthermore, names that are proposed within a rank are also available at related sub and super ranks. Thus, a name proposed as a subspecies is also available as a species. This is referred to as the Principle of Coordination and is articulated in Article 35.1.

AVAILABILITY AND VALIDITY

Not all the names that are proposed are available for consideration as taxonomic names. Under the Code, for a name to be considered available it must be published (Articles 8, 11 et al.), and depending on when it was published will need to meet additional criteria. For example, nomina published before 1931 must include a description or definition of the taxon (Article 12). Those published in 1931 or later must include a differential diagnosis indicating how the taxon compares to other taxa (Article 13) though no prescription is given for how detailed the diagnosis must be nor what comparisons must be included. Nomina not meeting the conditions for description or diagnosis are nomina nuda and are not available.

Nomina published after 1960 must be unconditionally proposed (Article 15), that is, names must be proposed without "stated reservations" (ICZN glossary). For example, Murrill (1981) in describing the Petrolona skull suggested that,

> "If the dating for Petralona 1 is as old as 700,000 years B.P., and if sub-specific names are most appropriately used geographically then I would say Petralona 1 should be classified as *Homo erectus petralonensis*, or given Petralona 1's similarity to Broken Hill 1, and the possibility Petralona 1 may have migrated from Africa—*Homo erectus rhodesiensis*."

In this example the use of conditional clauses beginning with "if" and the use of the subjunctive mood both indicate a proposal made with reservations, and thus the name "*petralonensis*" is unavailable. Further examples are given below and details are provided in the notes for individual names.

Names proposed after 1999 must explicitly indicate an intent to establish a new name (Article 16.1) and must also explicitly fix a type specimen (Article 16.4). Names arising in digital publications are available if published after 2011 (Article 8.5) and registered with Zoobank (Article 78.2.24). Names that are conditionally proposed are unavailable.

Names that are unavailable are not considered part of zoological nomenclature and are ignored; those that are available may then be evaluated in terms of their validity. Here again there are common circumstances that affect the validity of names in hominin systematics. If multiple names are attached to the same type specimen, e.g., as is the case for the Mauer mandible, then the principle of priority dictates that the oldest (e.g., *Homo heidelbergensis* Schoetensack, 1908) has precedence over more recent names (e.g., *Praehomo europaeus* Eickstedt, 1932); the other names are objective junior synonyms and they are considered objectively invalid. However, they remain available and in the event that a name with priority should come to be recognized as unavailable an objective junior synonym could, conceivably become valid. Similarly, homonyms are also objectively invalid.

Names that pass the tests of availability and objective validity are said to be potentially valid. The final determination of their validity is a subjective determination at the discretion of the systematist, and in this way the Code is explicitly intended to foster stability and regularity in the use of names while not restricting expressions of taxonomic opinion. Despite the complexities of the code, guides (Notton et al. 2011) and online digital resources (Reed et al. 2023) support nomenclatural practice in paleoanthropology.

FORMATTING OF SCIENTIFIC NAMES

Under the Code, a full scientific name comprises a binomen or trinomen that includes first a genus followed by a species epithet (or trivial epithet), and if appropriate a subspe-

cies epithet, usually in italics, followed by a space without punctuation, then the authorship followed by a comma and the date, for example,

Atlanthropus mauritanicus Arambourg, 1954.

I use the word epithet to distinguish a portion of a full species name. The full species name is a binomen or trinomen.

If the species is presented in a genus other than the genus under which it was first proposed, the authorship is given in parentheses, for example,

Homo mauritanicus (Arambourg, 1954).

This presentation may be confused for a citation but it is not, and by convention, the authorship provided in a scientific name is not usually included in the references cited. However, for clarity I have included the references for all authorship in scientific names mentioned in this paper.

MATERIALS AND METHODS

The chief aim of this project is to establish a listing of potentially valid nomina for Chibanian age fossils previously attributed to *Homo heidelbergensis* (*s.l.*). A full listing of hominin nomina was downloaded from the Origins website API (https://paleocore.org/origins/api/nomina) (Reed et al. 2023). This full listing was pared down to relevant nomina from the Chibanian where the type specimen has a geochronological age that potentially falls in the Chibanian, or specimens reasonably attributable to the hypodigm that fall into the time range. For example, *Homo neanderthalensis* King, 1864 has as its holotype the Neanderthal 1 skeleton dating to the Late Pleistocene ca. 40 ka (Schmitz et al. 2002), but genetic divergence dates for the Neanderthal lineage with which this taxon is associated estimate a history extending back into the Middle Pleistocene (Pääbo 2015), and thus this taxon is included in Table 1.

Omitted from the list are end member taxa *Anthropopithecus erectus* Dubois, 1892 (=*Homo erectus*), and *Homo sapiens sapiens* Linnaeus, 1758. Included are contemporaneous taxa that may be separate and unique from *Homo heidelbergensis s. l.*, such as *Homo neanderthalensis*, *Homo floresiensis*, *Homo luzonensis*, and *Homo naledi*. While *Homo neanderthalensis* is included, the other nine objectively invalid or unavailable names affiliated with the Neanderthal 1 type specimen are omitted for simplicity.

The primary literature documenting each name was then reviewed and the nomenclatural status of the name carefully assessed with regard to the Code. The results are presented in Table 1 and in the following sections. While the Code is written to provide clear rules and guidelines for establishing nominal taxa, as with the law, there is room for interpretation and disagreement regarding the nomenclatural status of names. The following sections provide the rationale underlying the nomenclatural status applied to each name.

CHIBANIAN NOMINA

Filtering the hominin nomina down to prospective names applicable to *Homo heidelbergensis s.l.* resulted in a list of 32 nomina (see Table 1). The associated type specimens range in age from 800 ka for specimen ATD 6-5 from Gran Dolina attributed to *Homo antecessor* Bermùdez de Castro et al., 1997 to specimen BOU-VP-16/1 from the Middle Awash assigned to *Homo sapiens idaltu* White et al., 2003 dated to ca. 160 ka, as well as Neanderthal 1 from Kleine Feldhofer Grotte, Germany dated to ca. 40 ka, but representing a taxon originating in the Chibanian. Using the source literature, each name was carefully reviewed to assess its nomenclatural status and, based on this review, the nomina were grouped into five categories. The first category lists 6 unavailable nomina, the second category includes 5 nomina that are available but objectively invalid, the remaining 21 potentially available nomina were grouped by geographical regions—9 from Africa, 4 from Asia, and 8 from Europe.

Of the six unavailable nomina, *Homo "altaiensis"* Derevianko, 2011 is included because it lacks a clear differential diagnosis (nomen nudum), does not explicitly signal the intent to propose a new name (no sp. nov. or subsp. nov.) and does not explicitly fix a type specimen. The proposals for *Homo erectus "petralonensis"* Murill, 1981; *"Tchadanthropus uxoris"* Coppens, 1965; *Homo sapiens "daliensis"* Wu, 1981; and *Homo sapiens "mapaensis"* Kurth, 1965, were made conditionally and thus are unavailable. Finally, *Homo "tsaichangensis"* McMenamin, 2015 does not meet the conditions for a publication or an explicitly registered digital publication of the name, and also is unavailable.

Of the remaining 26 available names, another 5 are objectively invalid—*Homo* (*Pithecanthropus*) *atlanticus* and *H.* (*P.*) *ternifinus* Dolinar-Osole, 1956, are based on the Tighennif mandibles, and thus are junior objective synonyms for *Atlanthropus mauritanicus* Arambourg, 1954. Likewise, *Praehomo europaeus* Eickstedt, 1932, based on Mauer, is a junior objective synonym for *Homo heidelbergensis* Schoetensack, 1908. In Africa, *Homo florisbadensis* Drennan, 1935 is an objective junior synonym for *Homo helmei* Dryer, 1935. Lastly, *Homo primigenius africanus* Weidenreich, 1928 based on Kabwe is an objective homonym in conflict with *Homo javanensis primigenius* Houzé, 1896 and *Homo africanus* Sergi, 1908.

Among the remaining 21 potentially valid nomina, each geographic region had multiple names that could accommodate fossils currently associated with *H. heidelbergensis s.l.* as discussed below.

DISCUSSION

Splitting or revising *Homo heidelbergensis* introduces new challenges for the nomenclature of Chibanian hominins. The goal of this discussion is to enumerate what names are available for consideration and to clarify their nomenclatural status. The discussion is organized geographically and concludes with a review of possible solutions to the challenges identified in the nomenclatural review.

TABLE 1. HOMININ NOMINA ASSOCIATED WITH CHIBANIAN TAXA THAT ARE CURRENTLY SUBSUMED UNDER OR CONTEMPORANEOUS WITH *HOMO HEIDELBERGENSIS*.

Category	Nomen	Authorship	Type Specimen	Age (ka)	Age Reference	Type Specimen Elements	Locality	Country
Africa	*Homo rhodesiensis*	Woodward, 1921	E686	299±25	Grun et al. 2020	partial cranium	Kabwe	Zambia
Africa	*Homo (Africanthropus) helmei*	Dreyer, 1935	Florisbad	ca. 259 (100–300)	Grun et al. 1996	partial cranium	Florisbad	South Africa
Africa	*Homo kanamensis*	Leakey, 1935	Kanam 1	?Pleistocene	Behrensmeyer et al. 1995	mandible	Kanam	Kenya
Africa	*Palaeanthropus njarasensis*	Reck and Kohl-Larsen, 1936	Eyasi 1	ca. 132 (>88–132)	Dominguez-Rodrigo et al. 2008; Mehlman 1989;	partial cranium	Eyasi	Tanzania
Africa	*Atlanthroupus mauritanicus*	Arambourg, 1954	Tighenif 1 and 2	ca. 700	Geraads et al. 1986	mandibles	Tighennif (Ternafine)	Algeria
Africa	*Homo saldanensis*	Drennan, 1955	SAM-PQ-EH 1	ca. 600 (1000–400)	Klein and Cruz-Uribe 1991; Klein et al. 2007	partial cranium	Elandsfontein	South Africa
Africa	*Homo sapiens idaltu*	White et al., 2003	BOU-VP-16/1	160–154	Clark et al. 2003	partial cranium	Bouri, Middle Awash	Ethiopia
Africa	*Homo naledi*	Berger et al., 2015	DH1	ca. 253 (335–236)	Dirks et al. 2017	partial skeleton	Dinaledi Cave	South Africa
Africa	*Homo bodoensis*	Roksandic et al., 2022	Bodo 1	ca. 600	Clark et al. 1994	partial cranium	Bodo D'Ar	Ethiopia
Asia	*Homo erectus narmadensis*	Sonakia, 1984	Narmada	ca. 200–250	Sankhyan et al. 2012a; b	partial cranium	Hathnora	India
Asia	*Homo floresiensis*	Brown et al, 2004	LB1	ca. 100–60	Sutikna et al. 2016	partial skeleton	Liang Bua	Indonesia
Asia	*Homo luzonensis*	Détroit et al. 2019	CCH6	>50	Détroit et al. 2019	postcanine maxillary teeth	Luzon	Philippines
Asia	*Homo longi*	Ji and Ni, 2021	HBSM2018-000018(A)	>146	Shao et al. 2021	partial cranium	Harbin	China
Europe	*Homo neanderthalensis*	King, 1864	Neanderthal 1	ca. 40	Schmitz et al. 2002	partial skeleton	Feldhofer Grotte	Germany
Europe	*Homo heidelbergensis*	Schoetensack, 1908	Mauer 1	609±40	Wagner et al. 2010	mandible	Mauer	Germany
Europe	*Homo steinheimensis*	Berckhemer, 1936	Steinheim	ca 337–300 (OIS 9)	Street et al. 2006	partial cranium	Steinheim	Germany
Europe	*Homo erectus (seu sapiens) palaeohungaricus*	Thoma, (1966?) 1972	Vertesszollos	ca. 185 (225–145)	Schwarcz and Latham 1984	partial cranium	Vertesszollos	Hungary

TABLE 1. HOMININ NOMINA ASSOCIATED WITH CHIBANIAN TAXA THAT ARE CURRENTLY SUBSUMED UNDER OR CONTEMPORANEOUS WITH *HOMO HEIDELBERGENSIS* (continued).

Category	Nomen	Authorship	Type Specimen	Age (ka)	Age Reference	Type Specimen Elements	Locality	Country
Europe	*Homo erectus bilzingslebenensis*	Vlcek, 1978	Bilzingslaben (A1, A2, B1, B2)	ca. 300 (280–454)	Schwarcz et al. 1988	partial cranium	Bilzingslaben	Germany
Europe	*Homo erectus reilingensis*	Czarnetzki, 1989	Reilingen	undated	Street et al. 2006	partial cranium	Reilingen	Germany
Europe	*Homo antecessor*	Bermudez de Castro et al., 1997	ATD 6-5	ca. 800 (949–772)	Duval et al. 2018	mandibular fragment with molars	Gran Dolina, Atapuerca	Spain
Europe	*Homo cepranensis*	Mallegni et al., 2003	Ceprano	ca. 385 (430–385)	Manzi et al. 2010	partial cranium	Ceprano	Italy
Invalid	*Homo primigenius africanus*	Weidenreich, 1928	E686	299±25	Grun et al. 2020	partial cranium	Kabwe	Zambia
Invalid	*Praehomo europaeus*	Elkstedt, 1932	Mauer 1	609±40	Wagner et al. 2010	mandible	Mauer	Germany
Invalid	*Homo florisbadensis*	Drennan, 1935	Florisbad	ca. 259 (100–300)	Grun et al. 1996	partial cranium	Florisbad	South Africa
Invalid	*Homo (Pithecanthropus) atlanticus*	Dolinar-Osole, 1956	Tighenif 1 and 2	ca. 700	Geraads et al. 1986	mandibles	Tighennif (Ternafine)	Algeria
Invalid	*Homo (Pithecanthropus) ternifinus*	Dolinar-Osole, 1956	Tighenif 1 and 2	ca. 700	Geraads et al. 1986	mandibles	Tighennif (Ternafine)	Algeria
Unavailable	*"Tchadanthropus uxoris"*	Coppens, 1965	KT Yayo	?	?	partial cranium	Koro Toro	Chad
Unavailable	*Homo sapiens "mapaensis"*	Kurth, 1965	Maba	>230; maybe >278	Shen et al. 2014; Xiao et al. 2014	partial cranium	Maba	China
Unavailable	*Homo sapiens "daliensis"*	Wu, 1981	Dali 1	ca. 250 (267–258)	Sun et al. 2015	partial cranium	Dali	China
Unavailable	*Homo erectus "petralonensis"*	Murrill, 1981	Petralona	ca. 200 (700–150)	Grun et al. 1996	partial cranium	Petralona	Greece
Unavailable	*Homo sapiens "altaiensis"*	Derevianko, 2011	Gene sequences, Denisova 4	ca. 50–40	Zubova et al. 2017	isolated phalange, teeth	Denisova Cave	Rusian Federation
Unavailable	*Homo "tsaichangensis"*	McMenamin, 2015	F051911	ca. 190–10	Chang et al. 2015	mandible	Penghu Strait	Taiwan

First, two Asian taxa, *Homo sapiens "mapaensis"* Kurth, 1965 and *Homo sapiens "daliensis"* Wu, 1981 that previously were considered available (Groves, 1989 2017; Ji et al. 2021; Ni et al. 2021; Reed et al. 2023) are revised to unavailable in this analysis. The removal of these names simplifies the list of potential taxa in Asia and highlights a key ambiguity in the application of the Code, discussed below. The second important finding is that nomenclatural stability in Africa is especially sensitive to hypodigm composition, and the exact priority of available names depends on the timing of two publications. Europe is also sensitive to hypodigm composition, though not to the same degree as in Africa. In the sections below I discuss the sources for nomenclatural instability in each region and present possible solutions.

ASIA SIMPLIFIED

Homo erectus "mapaensis" has been proposed as an available name in several discussions of Chibanian fossils from Asia. Hublin (2013: 532) suggested that "should a proper binomial denomination be proposed, *H. mapaensis* (Kurth 1965) would likely have priority," and Groves (1989, 2017) treated *"mapaensis"* as a valid subspecies of *H. sapiens* and *H. erectus*, respectively, while Groves (2017) also suggested it might rise to the level of a separate species. However, careful review of Kurth's original German text indicates the proposal was made conditionally and the epithet *"mapaensis"* is not available (see the Supplemental Materials for details). Similarly, *"daliensis"* is also determined here to be an unavailable name, though the determination is less clear-cut. Groves (1989: 287) treated *"daliensis"* as available and listed it as a subjective junior synonym of *"Homo sapiens mapaensis,"* yet, a review of Wu (1981a, in Chinese) indicates that he proposed *"daliensis"* conditionally (Xijun Ni, personal communication). Additionally, in the subsequent English version of the paper Wu (1981b) proposed the name conditionally in the body of the paper but made a more declarative statement in the abstract of that paper. The Code is ambiguous regarding how to treat split proposals where the statement in the body of the text is made with reservations, but the statement in the abstract is not. Nor is this problem unique to the case of *"daliensis,"* it applies as well to *"Tchadanthropus uxoris"* Coppens, 1965 and *Australopithecus africanus "aethiopicus"* Tobias, 1980, and perhaps others. For consistency, each of these names has been evaluated as unavailable, under the principle that any reservations expressed in the body of the publication override what is presented in the abstract. The reasoning behind this principle is that the abstract is a summary of the paper's content, and that the fuller and complete intended expression is best represented in the body text of the paper rather than the abstract.

With *"mapaensis"* and *"daliensis"* removed, only four potentially valid nomina remain for Asia. Two nomina, *Homo floresiensis* Brown et al., 2004 and *Homo luzonensis* Détroit et al., 2019, are recently established and largely accepted as valid taxa for unique forms quite distinct from *Homo heidelbergensis s.l.* That leaves *Homo erectus narmadensis* Sonokia, 1984 and *Homo longi* Ji et al., 2021 as potentially valid taxa for Chibanian forms from Asia. If *Homo longi* as represented by the Harbin cranium, and perhaps the Xiahe mandible (Demeter et al. 2022; Ni et al. 2021), and is morphologically and taxonomically distinct from Dali and Maba as Ni et al. (2021) have suggested, then the latter fossils are without a clear taxonomic affiliation, or perhaps an affiliation with Hathnora (the Narmada cranium) and inclusion in that specimen's hypodigm under *Homo narmadensis*, as has been suggested by Howell (1999).

AFRICAN COMPLEXITY

The nomenclature of African taxa presents the most complicated of the three regions. As outlined in the introduction, *H. bodoensis* was proposed as a new taxon for African representatives of *Homo heidelbergensis s.l.* Recent debates surrounding the status and suitability of *H. bodoensis* have focused on *H. rhodesiensis* and *H. saldanensis* reflecting the type fossils explicitly included in the proposed *H. bodoensis* hypodigm, which I will refer to as the minimal hypodigm. The **minimal hypodigm** includes the following type specimens (listed chronologically):

- E686 (= Kabwe, Broken Hill), holotype of *H. rhodesiensis* Woodward, 1921
- SAM-PQ-EH 1 (=Saldanha, Elandsfontein), holotype of *H. saldanensis* Drennan, 1955
- Bodo, holotype of *H. bodoensis* Roksandic et al., 2022

Roksandic et al. (2022a) also mention Salé and Ceprano (holotype of *H. cepranensis*) as specimens that could, possibly, be included, but are not considered here as part of the minimum hypodigm.

Under the minimum hypodigm, **if** *H. heidelbergensis sensu stricto* is sunk into *H. neanderthalensis*, and **if** *H. rhodesiensis* is avoided because of racist and colonialist concerns, then the analysis presented here supports *H. saldanensis* as an available and potentially valid name for the group, with priority over *H. bodoensis* (Sarmiento and Pickford 2022). However, the situation is more complex if the hypodigm is broadened to include a wider array of type fossils, as has been suggested by various authors (Harvati and Reyes-Centeno 2022; Hublin 2013; Szalay and Delson 1979). Pooling past proposals suggests a largely African hypodigm under *H. rhodesiensis* that included many of the same specimens as the bodoensis hypodigm, and others. This grouping I call the **maximal hypodigm**, and it includes the following type specimens (listed chronologically):

- E686 (= Kabwe, Broken Hill), holotype of *H. rhodesiensis* Woodward, 1921
- Florisbad, holotype of *H.* (*Africanthropus*) *helmei* Dreyer, 1935
- Kanam, holotype of *H. kanamensis* Leakey, 1935
- Eyasi 1, holotype of *Palaeanthropus njarasensis* Reck and Kohl Larson, 1935
- Tighennif (= Ternifine, Palikao), lectotype of A*tlanthropus mauritanicus* Arambourg, 1954
- SAM-PQ-EH 1 (= Saldanha, Elandsfontein), holotype of *H. saldanensis* Drennan, 1955
- BOU-VP-16/1 (= Herto), holotype of *H. sapiens idaltu* White et al., 2003

- DH1 (= Naledi), holotype of *H. naledi* Berger et al., 2015
- Bodo, holotype of *H. bodoensis* Roksandic et al., 2022

When considering the maximal hypodigm *Homo rhodesiensis* has priority under the provisions of the Code (Delson and Stringer 2022). However, if this name is bypassed for ethical reasons then *Homo helmei* Dreyer, 1935 and *Homo kanamensis* Leakey, 1935 are candidates. Their relative priority, if both are accepted as part of the hypodigm, depends on their publication dates. Preliminary bibliographic analysis indicates that Leakey's *The Stone Age Races of Kenya* was published on 17 January 1935 (Oxford University Press, personal communication). Book reviews appearing as early as 18 January 1935 further corroborate this date ("Some New Books" 1935). The Dreyer article appears in the first issue (Nos 1–5) of volume 38 of Koninklijke Adademie van Wetenschappen te Amsterdam, suggesting it too was published in January 1935. Records delivered from the archives of the Royal Netherlands Academy of Arts and Sciences (personal communication) include an invoice from the printer to produce the first issue. The invoice is dated 27 December 1934, suggesting the issue was printed prior to the Leakey volume, however, a more detailed review of archival documents is required to confirm these dates.

If Florisbad and Kanam are excluded from the hypodigm, perhaps because they are regarded as early representatives of *H. sapiens*, and if the Eyasi 1 cranium is interpreted as belonging in the African pre-sapiens hypodigm (e.g., Groves 1989; Szalay and Delson 1979), then *Palaeanthropus njarasensisis* (presumably as *H. njarasensis*) is next in the succession of priority. Following that, *A. mauritanicus* (presumably as *H. mauritanicus*) would have priority and only after that do we return to *H. saldanensis*.

The maximal hypodigm illustrates how sensitive the African group is to differences in its composition. There are many named types, and because many are fragmentary or incomplete there is little stability to the taxonomic definitions, and as a result little stability to the nomenclature. This sensitivity of the African grouping, in my view, benefits the case for *Homo bodoensis* because the Bodo specimen is a more stable representative in African Chibanian hypodigms. Using a name linked to this fossil avoids the nomenclatural instability associated with hypodigm variation that comes with using names associated with any of the other type fossils, except Kabwe. Also worth noting, if Ceprano is added to the hypodigm as Roksandic et al. (2022) suggested, then *Homo cepranensis* Mallegni et al., 2003 also has priority over *H. bodoensis*. This discussion illustrates the importance of clearly and explicitly delimiting fossil hypodigms when discussing Chibanian taxa.

EUROPEAN NOMENCLATURE

Europe, like Africa, also shows a high degree of nomenclatural instability resulting from the same causes; there are many names (eight to be exact), and several are linked to incomplete type specimens, not least of which is the Mauer mandible, type specimen of *Homo heidelbergensis*. If *Homo heidelbergensis* incorporates most of the European specimens, then there is little to discuss. The name is valid and widely used. If, however, the name is restricted to just the type specimen because it cannot be reliably compared with other specimens based on the preserved material, then the situation becomes more complicated. *Homo neanderthalensis* has priority over other available names in the European group and it is conceivable that a European hypodigm of pre-sapiens fossils is incorporated as early representatives of the Neanderthal lineage and named as such (Hublin 2013). Alternatively, the appropriate name for a taxon distinct from Neanderthals, would depend on exactly which pre-sapiens, non-Neanderthal fossil specimens are included in the hypodigm. Fortunately, there are fewer ambiguities surrounding availability, priority of publication, and ethical propriety for European nomenclature, which simplifies the application of the Code in the European context.

SOLUTIONS AND POSSIBLE RESOLUTIONS

In revisiting the nomenclature and taxonomy of Chibanian hominins it is necessary to consider the application of nomenclatural rules as laid out in the Code, the biological interpretation of the nominal taxa, the criteria for species delimitation employed to build the hypodigm, whether the paleontological taxa are commensurate with neontological practice, and the unique history of paleoanthropology, which may influence the adoption or rejection of names tied to colonial or racist people or events. With these issues in mind, the following sections outline possible solutions for stabilizing and revising Chibanian nomenclature.

CONTINUING WITH *HOMO RHODESIENSIS*

Employing *H. rhodesiensis* has practical appeal. The name has priority, and its use conforms to the Code. Furthermore, of all the names under consideration it has the widest usage in prior literature (though still relatively limited) and best suits the criteria and need for nomenclatural stability.

At the same time, this solution is at odds with current post-colonial practices in paleoanthropology. Our field has a well-documented history of developing, fostering, and perpetuating racist and colonialist ideas resulting in tremendous harm by providing scientific justification for acts of oppression, slavery, and abuse (Antón et al. 2018; Blakey 2021; Bolnick et al. 2019; Schroeder 2020; Wolpoff and Caspari 2013). Any serious effort to cleanse that stain on the science of paleoanthropology must take seriously the symbolic significance of nomenclature. Continuing to invoke *rhodesiensis* is a choice to immortalize and tacitly commemorate an avowed colonialist and racist, even if the reference is made indirectly as a toponym rather than a homonym. Nor does the Code provide cover for this act. That the Commission does not see fit to adjudicate matters of offensive names is not a suitable justification to use offensive names. The Commission has a mandate to preserve nomenclatural stability, but paleoanthropologists have a competing mandate to be conscientious stewards of the human fossil record. We must consider the special quality of nomenclature for the human lineage. Our scientific names are associated with fossil remnants that carry existential significance as human ancestors. Nomenclature in paleo-

anthropology has a deeper meaning for our fellow humans than it does in other branches of biodiversity or paleobiology and this must factor into what constitutes responsible stewardship of the fossil record. Removing *rhodesiensis* from usage would indicate a willingness for paleoanthropology to actively redress its colonial legacy and would send a positive message to African paleoanthropologists that change is possible.

A concern of the Commission is that sinking *rhodesiensis* will set a precedent possibly resulting in a cascade of appeals to revoke offensive names. I think this is possible, but unlikely. Most homonyms and toponyms are not offensive and honor people who have made tremendous contributions to the field. However, if a name is considered offensive to the point where a person or group of people are willing to invest the time and effort to make a formal appeal then the petition should be heard.

USE THE NEXT AVAILABLE NAME

Bypassing *H. rhodesiensis* on ethical grounds presents new challenges for selecting an alternative name. The Code stipulates selecting the next available name with priority, *Homo helmei*, however, doing so risks more nomenclatural instability. As outlined above, priority is sensitive to the hypodigm, and because there are many incomplete and fragmentary name bearing types, small changes to the hypodigm, i.e., including or omitting any of the types, can change the name of the taxon. This predicament arises because many new names were introduced, injudiciously, for specimens that are not easy to compare one to another. Additionally, names introduced prior to 1960 were proposed before a systematic, paleoanthropological principle of species was in place, and thus many of these early names are labels used to denote informal variants. Dryer (1935), Leakey (1935), Reck and Kohl-Larson (1936), Arambourg (1954), and Drennan (1955) used Linnaean binomials, or what G. G. Simpson (1963) called N2 names, before there was a clear species concept in place. It is likely that some or all of these names denote regional variants, or what Simpson denoted as N3 names, for which paleoanthropology still lacks a standardized system of reference (Howell 1999; Jolly 2001; Simpson 1963). Informal N3 names such as "Bertele Foot," "Denisovans," or "Neanderthals" (as opposed to *Homo neanderthalensis*) are a better system for referencing fossils or groups where the biological status of the group as an independently evolving lineage with a unique evolutionary trajectory is unclear (de Queiroz 2007; Simpson 1951, 1961).

Given the large number of name bearing types, choosing the next available name from among the candidates listed in the African maximal hypodigm does not present a good solution. The nomenclatural instability of the maximal hypodigm means sacrificing stability by adopting *Homo helmei* or *kanamensis* or *njarensis*, etc., or buttressing stability while sacrificing strict adherence to the Code by adopting a name linked to a type specimen that is relatively complete, well-preserved, and that is consistently represented in an African hypodigm, such as Kabwe or Bodo. This can be accomplished by either offering a replacement name for Kabwe or adopting *H. bodoensis*. Invoking *H. saldanensis* may also be an option, however, the Saldanha specimen is less complete than either Bodo or Kabwe and it is not as consistently invoked in the hypodigm. There is one remaining solution that permits the removal of *H. rhodesiensis* and other infrequently used names from paleoanthropological nomenclature and that complies with the Code.

HAVE YOUR CAKE AND EAT IT TOO

The Commission provides a mechanism by which research communities may propose a part of the List of Available Names in Zoology under Article 79 of the Code. By this mechanism a working group is established under the auspices of an academic society or similar authority, and the group is empowered to propose to the Commission a reduced list of names that can be considered available for the purpose of nomenclature within a taxonomic group, such as the Tribe Hominini. In establishing a list of available names, it may be appropriate to remove *H. rhodesiensis*, *H. helmei*, *H. kanamensis*, *H. njarensis*, *A. mauritanicus*, and *H. saldanensis*. None have been widely invoked in the literature and their exclusion from the list of available names would: a) provide a more inclusive and ethical nomenclature for human systematics, and b) omit many infrequently employed names that add to nomenclatural instability. Furthermore, this action would be in accord with the Code. This path requires more effort; it requires consensus building and discussion, but it has the potential to address all the outstanding issues and put human systematics on a stable foundation.

CONCLUSIONS

The taxon *Homo heidelbergensis* has played a central role in discussions of Chibanian hominin evolution as a catch-all taxon for specimens that do not fit into *Homo erectus*, or *Homo neanderthalensis*, or *Homo sapiens*. However, discussion of alternative hypotheses is hindered by nomenclatural challenges that disrupt productive communication, leading to the question, what names rightly apply to hypothesized taxa of Chibanian hominins formerly subsumed under *H. heidelbergensis*? This seemingly straightforward query is difficult to answer because there are over 30 names in contention, many of the names are affixed to type specimens that are incomplete or preserve limited anatomy, leading in turn to little consensus regarding the composition of Chibanian hypodigms. These factors, taken together mean that for some suggested taxa, such as an African species of Chibanian hominin, the name that should be given to the taxon depends on precisely which fossils are included in the hypodigm. Adding or removing key fossils changes the name of the taxon because nearly every complete specimen is a name bearing type. The root of this problem stems from poor nomenclatural practice in paleoanthropology at the start of the 20th century, and from the fact that nomina, once introduced, accumulate and cannot be removed from nomenclatural consideration. The issue is further compli-

cated in the case of an African species by the fact that the name with apparent priority, *Homo rhodesiensis*, is ethically problematic and not in keeping with anti-colonial practice in paleoanthropology.

In this paper I provided a review of all the candidate names for Chibanian hominin taxa. These names are listed in Table 1, which provides a concise summary of all the name bearing types, the nomenclatural status of the names, and their dates of publication for determining priority. This table provides the foundation for determining availability and validity of names used for Chibanian hominins. This table is supplemented by online resources such as Origins (https://paleocore.org/origins/), which provides a continuously updated online database of hominin nomenclature.

Additionally, the review of hominin nomenclature provided in this paper reveals that names for African and European taxa are especially sensitive to the hypodigm used, highlighting that Chibanian taxa are at increased risk of nomenclatural instability. I conclude that the best solution is to reduce the number of available nomina by invoking Article 79 of the Code to propose a part of the List of Available Names in Zoology for the Tribe Hominini (Family Hominidae, Order Primates) that excludes unethical and infrequently used names. This course of action requires more effort but leads to improved nomenclatural stability while working within the guidelines of the Code.

Finally, nomenclature in paleoanthropology is qualitatively different from nomenclature in other branches of biology because the scientific names of hominin species are the names attributed to our ancestors, and this has special cultural and social significance to many people. Paleoanthropology should respect this heightened social significance and stop using problematic names associated with racist or colonialist people and places.

ACKNOWLEDGEMENTS

I am indebted to the efforts of Ms. Hannah Chapman Tripp, biosciences reference librarian at the University of Texas at Austin, who helped me research the publication dates of books and articles published nearly a century ago. I live in awed admiration for reference librarians and their abilities. I am grateful to Drs. Mirjana Roksandic and Christopher Bae for organizing and inviting me to participate in the 2023 workshop on Middle Pleistocene hominins in Novi Sad, Serbia, which was the impetus for this paper. I am also grateful to the other participants at the workshop, all of whom contributed to a spirit of scientific inquiry and openness that made it a success. I am further grateful to Eric Delson for comments and guidance on interpreting the Code. Any misinterpretations thereof are mine alone. I am also grateful to Andrew Barr, Louren Schroeder, and Jyhreh Johnson for comments on sections of the manuscript.

REFERENCES

Adam, K.D., 1989. Alte und neue Urmenschen-Funde in Südwestdeutschland-eine kritische Würdigung. Quartär 39/40, 177–190.

Antón, S.C., 2003. Natural history of *Homo erectus*. Yrbk. Phys. Anthropol. 46, 126–170.

Antón, S.C., Leonard, W.R., Robertson, M.L., 2002. An ecomorphological model of the initial hominid dispersal from Africa. J. Hum. Evol. 43, 773–785.

Antón, S.C., Malhi, R.S., Fuentes, A., 2018. Race and diversity in U.S. biological anthropology: a decade of AAPA initiatives. Am. J. Phy. Anthropol. 165 Suppl. 65, 158–180.

Arambourg, C., 1954. L'Hominien fossile de Ternifine (algerie). C.R. Acd. Sc., Paris, pp. 893–895.

Ascenzi, A., Biddittu, I., Cassoli, P.F., Segre, A.G., Segre-Naldini, E., 1996. A calvarium of late Homo erectus from Ceprano, Italy. J. Hum. Evol. 31, 409–423.

Athreya, S., Hopkins, A., 2021. Conceptual issues in hominin taxonomy: *Homo heidelbergensis* and an ethnobiological reframing of species. Am. J. Phy. Anthropol. 175 Suppl. 72, 4–26.

Athreya, S., Wu, X., 2017. A multivariate assessment of the Dali hominin cranium from China: Morphological affinities and implications for Pleistocene evolution in East Asia. Am. J. Phy. Anthropol. 164, 679–701.

Bae, C.J., 2010. The late Middle Pleistocene hominin fossil record of eastern Asia: synthesis and review. Am. J. Phy. Anthropol. 143 Suppl 51, 75–93.

Berckhemer, F., 1936. Der Urmenschenschadel aus den zwischeneiszeitliche Fluss-Schottern von Steinheim an der Murr. Forschungen und Fortschritte/ Nachrichtenblatt der deutschen Wissenschaft und Technik 12, 349–350.

Berger, L.R., Hawks, J., de Ruiter, D.J., Churchill, S.E., Schmid, P., Delezene, L.K., Kivell, T.L., Garvin, H.M., Williams, S.A., DeSilva, J.M., Skinner, M.M., Musiba, C.M., Cameron, N., Holliday, T.W., Harcourt-Smith, W., Ackermann, R.R., Bastir, M., Bogin, B., Bolter, D., Brophy, J., Cofran, Z.D., Congdon, K.A., Deane, A.S., Dembo, M., Drapeau, M., Elliott, M.C., Feuerriegel, E.M., Garcia-Martinez, D., Green, D.J., Gurtov, A., Irish, J.D., Kruger, A., Laird, M.F., Marchi, D., Meyer, M.R., Nalla, S., Negash, E.W., Orr, C.M., Radovcic, D., Schroeder, L., Scott, J.E., Throckmorton, Z., Tocheri, M.W., VanSickle, C., Walker, C.S., Wei, P., Zipfel, B., 2015. *Homo naledi*, a new species of the genus *Homo* from the Dinaledi Chamber, South Africa. eLife 4, e09560.

Bergström, A., Stringer, C., Hajdinjak, M., Scerri, E.M.L., Skoglund, P., 2021. Origins of modern human ancestry. Nature 590, 229–237.

Bermúdez de Castro, J.M., Arsuaga, J.L., Carbonell, E., Rosas, A., Martínez, I., Mosquera, M., 1997. A hominid from the lower Pleistocene of Atapuerca, Spain: possible ancestor to Neandertals and modern humans. Science 276, 1392–1395.

Blakey, M.L., 2021. Understanding racism in physical (biological) anthropology. Am. J. Phy. Anthropol. 175,

316–325.
Bolnick, D.A., Smith, R.W.A., Fuentes, A., 2019. How academic diversity is transforming scientific knowledge in biological anthropology. Am. Anthropol. 121, 464–464.
Bonarelli, G., 1909. *Palaeanthropus* (ng) *Heidelbergensis* (Schoet.). Riv. Ital. Paleontol. 15, 26–31.
Brown, P., Sutikna, T., Morwood, M.J., Soejono, R.P., Jatmiko, Saptomo, E.W., Due, R.A., 2004. A new small-bodied hominin from the Late Pleistocene of Flores, Indonesia. Nature 431, 1055–1061.
Brumm, A., van den Bergh, G.D., Storey, M., Kurniawan, I., Alloway, B.V., Setiawan, R., Setiyabudi, E., Grün, R., Moore, M.W., Yurnaldi, D., Puspaningrum, M.R., Wibowo, U.P., Insani, H., Sutisna, I., Westgate, J.A., Pearce, N.J.G., Duval, M., Meijer, H.J.M., Aziz, F., Sutikna, T., van der Kaars, S., Flude, S., Morwood, M.J., 2016. Age and context of the oldest known hominin fossils from Flores. Nature 534, 249–253.
Buck, L.T., Stringer, C.B., 2014. *Homo heidelbergensis*. Curr. Biol. 24, R214–215.
Campbell, B., 1965. The nomenclature of the Hominidae, including a definitive list of hominid taxa. Occ. Pap. R. Anthropol. Inst. 22, 1–33.
Campbell, B., 1994. The nomenclature of the Hominidae. In: Meikle, W.E., Parker, S.T. (Eds.), Naming Our Ancestors: An Anthropology of Hominid Taxonomy. Waveland Press, Prospect Heights, IL, pp. 208–238.
Carbonell, E., 1995. Lower Pleistocene hominids and artifacts from Atapuerca-TD6 (Spain). Science 269, 826–830.
Ceríaco, L.M.P., Aescht, E., Ahyong, S.T., Ballerio, A., Bouchard, P., Bourgoin, T., Dmitriev, D., Evenhuis, N., Grygier, M.J., Harvey, M.S., Kottelat, M., Kluge, N., Krell, F.-T., Kojima, J.-I., Kullander, S.O., Lucinda, P., Lyal, C.H.C., Pyle, R.L., Rheindt, F.E., Luisa Scioscia, C., Welter-Schultes, F., Whitmore, D., Yanega, D., Zhang, Z.-Q., Zhou, H.-Z., Pape, T., 2023. Renaming taxa on ethical grounds threatens nomenclatural stability and scientific communication. Zool. J. Linn. Soc. 197, 283–286.
Chang, C.-H., Kaifu, Y., Takai, M., Kono, R.T., Grün, R., Matsu'ura, S., Kinsley, L., Lin, L.-K., 2015. The first archaic *Homo* from Taiwan. Nat. Comm. 6, 6037.
Chen, F., Welker, F., Shen, C.-C., Bailey, S.E., Bergmann, I., Davis, S., Xia, H., Wang, H., Fischer, R., Freidline, S.E., Yu, T.-L., Skinner, M.M., Stelzer, S., Dong, G., Fu, Q., Dong, G., Wang, J., Zhang, D., Hublin, J.-J., 2019. A late Middle Pleistocene Denisovan mandible from the Tibetan Plateau. Nature 569, 409–412.
Clark, J.D., Beyene, Y., WoldeGabriel, G., Hart, W.K., Renne, P.R., Gilbert, H., Defleur, A., Suwa, G., Katoh, S., Ludwig, K.R., Boisserie, J.-R., Asfaw, B., White, T., 2003. Stratigraphic, chronological and behavioural contexts of Pleistocene *Homo sapiens* from Middle Awash, Ethiopia. Nature 423, 747–752.
Clark, J.D., Deheinzelin, J., Schick, K.D., Hart, W.K., White, T.D., Woldegabriel, G., Walter, R.C., Suwa, G., Asfaw, B., Vrba, E., Selassie, Y.H., 1994. African *Homo erectus*: old radiometric ages and young Oldowan assemblages in the Middle Awash Valley, Ethiopia. Science 264, 1907–1910.
Condemi, S., 1996. Does the human fossil specimen from Reilingen (Germany) belong to the *Homo erectus* or to the Neanderthal lineage? L'Anthropol. 34, 69–77.
Coppens, Y., 1965. L'Hominien du Tchad. C. R. Hebd. Séances Acad. Sci. 260, 2869–2871.
Czarnetzki, A., 1989. Ein archaischer Hominidencalvariarest aus einer Kiesgrube in Reilingen, Rhein- N eckar-Kreis. Quartär 39/40, 191–201.
Czarnetzki, A., 1991. Nouvelle découverte d'un fragment de crâne d'un hominidé archaïque dans le Sud-ouest de l'Allemagne. L'Anthropol. 95, 103–111.
Dean, D., Hublin, J.J., Holloway, R., Ziegler, R., 1998. On the phylogenetic position of the pre-Neandertal specimen from Reilingen, Germany. J. Hum. Evol. 34, 485–508.
Delson, E., Stringer, C., 2022. The naming of H*omo bodoensis* by Roksandic and colleagues does not resolve issues surrounding Middle Pleistocene human evolution. Evol. Anthropol. 31, 233–236.
Demeter, F., Zanolli, C., Westaway, K.E., Joannes-Boyau, R., Duringer, P., Morley, M.W., Welker, F., Rüther, P.L., Skinner, M.M., McColl, H., Gaunitz, C., Vinner, L., Dunn, T.E., Olsen, J.V., Sikora, M., Ponche, J.-L., Suzzoni, E., Frangeul, S., Boesch, Q., Antoine, P.-O., Pan, L., Xing, S., Zhao, J.-X., Bailey, R.M., Boualaphane, S., Sichanthongtip, P., Sihanam, D., Patole-Edoumba, E., Aubaile, F., Crozier, F., Bourgon, N., Zachwieja, A., Luangkhoth, T., Souksavatdy, V., Sayavongkhamdy, T., Cappellini, E., Bacon, A.-M., Hublin, J.-J., Willerslev, E., Shackelford, L., 2022. A Middle Pleistocene Denisovan molar from the Annamite Chain of northern Laos. Nat. Comm. 13, 2557.
de Queiroz, K., 2007. Species concepts and species delimitation. Syst. Biol. 56, 879–886.
Derevianko, A., 2011. The Upper Paleolithic in Africa and Eurasia and the Origin of Anatomically Modern Humans. Institute of Archaeology and Ethnography. SB RAS Press, Novosibirsk.
Détroit, F., Mijares, A.S., 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.
Dirks, P.H., Roberts, E.M., Hilbert-Wolf, H., Kramers, J.D., Hawks, J., Dosseto, A., Duval, M., Elliott, M., Evans, M., Grün, R., Hellstrom, J., Herries, A.I., Joannes-Boyau, R., Makhubela, T.V., Placzek, C.J., Robbins, J., Spandler, C., Wiersma, J., Woodhead, J., Berger, L.R., 2017. The age of *Homo naledi* and associated sediments in the Rising Star Cave, South Africa. eLife 6, e24231.
Dolinar-Osole, Z.D., 1956. Nova pitekantopoidna oblika hominida iz Severne Afrike. Arheološki vestnik 7, 175–180.
Drennan, M.R., 1935. The Florisbad skull. S. Afr. J. Sci. 32, 601–602.
Drennan, M.R., 1955. The special features and status of the Saldanha skull. Am. J. Phy. Anthropol. 13, 625–634.
Dryer, J.F., 1935. A human skull from Florisbad, Orange

Free State, with a note on the endocranial case by C.U. Ariens Kappers. Koninklijke Adademie van Wetenschappen te Amsterdam 38, 119–128.

Duval, M., Grün, R., Parés, J.M., Martín-Francés, L., Campaña, I., Rosell, J., Shao, Q., Arsuaga, J.L., Carbonell, E., Bermúdez de Castro, J.M., 2018. The first direct ESR dating of a hominin tooth from Atapuerca Gran Dolina TD-6 (Spain) supports the antiquity of *Homo antecessor*. Quatern. Geochronol. 47, 120–137.

Eickstedt, E., 1932. Hominiden und Simioiden. Über den derzeitigen Stand der Abstammungsfrage. Z. Ärztl. Fortbild. Qualitatssich. 19, 608–613.

Eickstedt, E. von, 1934. Rassenkunde und Rassengeschichte der Menschheit. Akademia Wychowania Fizycznego im. Bronisława Czecha (Kraków). Ferdinand Enke Verlag, Stuttgart.

Geraads, D., Hublin, J.-J., Jaeger, J.-J., Tong, H., Sen, S., Toubeau, P., 1986. The Pleistocene hominid site of Ternifine, Algeria: new results on the environment, age, and human industries. Quatern. Res. 25, 380–386.

Gilbert, W.H., White, T.D., Asfaw, B., 2003. *Homo erectus*, *Homo ergaster*, *Homo "cepranensis,"* and the Daka cranium. J. Hum. Evol. 45, 255–259.

Green, R.E., Krause, J., Briggs, A.W., Maricic, T., Stenzel, U., Kircher, M., Patterson, N., Li, H., Zhai, W., Fritz, M.H.-Y., Hansen, N.F., Durand, E.Y., Malaspinas, A.-S., Jensen, J.D., Marques-Bonet, T., Alkan, C., Prufer, K., Meyer, M., Burbano, H.A., Good, J.M., Schultz, R., Aximu-Petri, A., Butthof, A., Hober, B., Hoffner, B., Siegemund, M., Weihmann, A., Nusbaum, C., Lander, E.S., Russ, C., Novod, N., Affourtit, J., Egholm, M., Verna, C., Rudan, P., Brajkovic, D., Kucan, Z., Gusic, I., Doronichev, V.B., Golovanova, L.V., Lalueza-Fox, C., de la Rasilla, M., Fortea, J., Rosas, A., Schmitz, R.W., Johnson, P.L.F., Eichler, E.E., Falush, D., Birney, E., Mullikin, J.C., Slatkin, M., Nielsen, R., Kelso, J., Lachmann, M., Reich, D., Paabo, S., 2010. A draft sequence of the Neandertal genome. Science 328, 710–722.

Groves, C., 1989. A Theory of Primate Evolution. Clarendon Press, Oxford.

Groves, C., 2017. Progress in human systematics: a review. Paradigmi 35, 59–74.

Grün, R., Brink, J.S., Spooner, N.A., Taylor, L., Stringer, C.B., Franciscus, R.G., Murray, A.S., 1996. Direct dating of Florisbad hominid. Nature 382, 500–501.

Grün, R., Pike, A., McDermott, F., Eggins, S., Mortimer, G., Aubert, M., Kinsley, L., Joannes-Boyau, R., Rumsey, M., Denys, C., Brink, J., Clark, T., Stringer, C., 2020. Dating the skull from Broken Hill, Zambia, and its position in human evolution. Nature 580, 372–375.

Guedes, P., Alves-Martins, F., Arribas, J.M., Chatterjee, S., Santos, A.M.C., Lewin, A., Bako, L., Webala, P.W., Correia, R.A., Rocha, R., Ladle, R.J., 2023. Eponyms have no place in 21st-century biological nomenclature. Nat. Ecol. Evol. 7, 1157–1160.

Harvati, K., Reyes-Centeno, H., 2022. Evolution of *Homo* in the Middle and Late Pleistocene. J. Hum. Evol. 173, 103279.

Harvey, M.S., Kottelat, M., Kluge, N., 2023. Renaming taxa on ethical grounds threatens nomenclatural stability and scientific communication: communication from the International Commission on Zoological Nomenclature. Zool. J. Linn. Soc. 197, 283–286.

Hawks, J., Elliott, M., Schmid, P., Churchill, S.E., Ruiter, D.J. de, Roberts, E.M., Hilbert-Wolf, H., Garvin, H.M., Williams, S.A., Delezene, L.K., Feuerriegel, E.M., Randolph-Quinney, P., Kivell, T.L., Laird, M.F., Tawane, G., DeSilva, J.M., Bailey, S.E., Brophy, J.K., Meyer, M.R., Skinner, M.M., Tocheri, M.W., VanSickle, C., Walker, C.S., Campbell, T.L., Kuhn, B., Kruger, A., Tucker, S., Gurtov, A., Hlophe, N., Hunter, R., Morris, H., Peixotto, B., Ramalepa, M., van Rooyen, D., Tsikoane, M., Boshoff, P., Dirks, P.H., Berger, L.R., 2017. New fossil remains of *Homo naledi* from the Lesedi Chamber, South Africa. eLife 6, 1–63.

Howell, F.C., 1999. Paleo-demes, species clades, and extinctions in the Pleistocene hominin record. J. Anthropol. Res. 55, 191–245.

Hublin, J.J., 2009. The origin of Neandertals. Proc. Nat. Acad. Sci. U.S.A. 106, 16022–16027.

Hublin, J.-J., 2013. The Middle Pleistocene record. On the ancestry of Neandertals, modern humans and others. In: Begun, D.R. (Ed.), A Companion to Paleoanthropology. Blackwell Publishing Ltd, Oxford, pp. 517–537.

ICZN, 1999. International Code of Zoological Nomenclature, fourth. ed. International Trust for Zoological Nomenclature, London.

Isaac, G.L.L., 1975. Sorting out the muddle in the middle: an anthropologist's post-conference appraisal. In: Butzer, K., Isaac, G. (Eds.), After the Australopithecines. De Gruyter Mouton, Berlin, pp. 875–888.

Ji, Q., Wu, W., Ji, Y., Li, Q., Ni, X., 2021. Late Middle Pleistocene Harbin cranium represents a new *Homo* species. Innovation (New York, N.Y.) 2, 100132.

Jolly, C.J., 2001. A proper study for mankind: analogies from the Papionin monkeys and their implications for human evolution. Am. J. Phy. Anthropol. Suppl 33, 177–204.

Kennedy, K.A., Sonakia, A., Chiment, J., Verma, K.K., 1991. Is the Narmada hominid an Indian *Homo erectus*? Am. J. Phy. Anthropol. 86, 475–496.

King, W., 1864. The reputed fossil man of the Neanderthal. Q. J. Sci. 1, 88–97.

Klein, R.G., Avery, G., Cruz-Uribe, K., Steele, T.E., 2007. The mammalian fauna associated with an archaic hominin skullcap and later Acheulean artifacts at Elandsfontein, Western Cape Province, South Africa. J. Hum. Evol. 52, 164–186.

Klein, R.G., Cruz-Uribe, K., 1991. The bovids from Elandsfontein, South Africa, and their implications for the age, palaeoenvironment, and origins of the site. Afr. Archaeol. Rev. 9, 21–79.

Krings, M., Stone, A., Schmitz, R.W., Krainitzki, H., Stoneking, M., Pääbo, S., 1997. Neandertal DNA sequences and the origin of modern humans. Cell 90, 19–30.

Kuman, K., Inbar, M., Clarke, R.J., 1999. Palaeoenviron-

ments and cultural sequence of the Florisbad Middle Stone Age hominid site, South Africa. J. Archaeol. Sci. 26, 1409–1426.

Kurth, G., 1965. Die (Eu)Homininen: Ein Jeweilsbilb nach dem Kenntnisstand von 1964. In: Heberer, G. (Ed.), Menschliche Abstammungslehre. Fortschritte Der Anthropologenie 1863-1964. Gustav Fischer, Stuttgart, pp. 357–425.

Leakey, L.S.B., 1935. The Stone Age Races of Kenya. Oxford University Press, Humphrey Milford, London.

Mallegni, F., Carnieri, E., Bisconti, M., Tartarelli, G., Ricci, S., Biddittu, I., Segre, A., 2003. *Homo cepranensis* sp. nov. and the evolution of African-European Middle Pleistocene hominids. C. R. Palevol 2, 153–159.

Manzi, G., 2016. Humans of the Middle Pleistocene: the controversial calvarium from Ceprano (Italy) and its significance for the origin and variability of *Homo heidelbergensis*. Quatern. Int. 411, 254–261.

Manzi, G., Magri, D., Milli, S., Palombo, M.R., Margari, V., Celiberti, V., Barbieri, M., Barbieri, M., Melis, R.T., Rubini, M., Ruffo, M., Saracino, B., Tzedakis, P.C., Zarattini, A., Biddittu, I., 2010. The new chronology of the Ceprano calvarium (Italy). J. Hum. Evol. 59, 580–585.

Manzi, G., Mallegni, F., Ascenzi, A., 2001. A cranium for the earliest Europeans: phylogenetic position of the hominid from Ceprano, Italy. Proc. Nat. Acad. Sci. U.S.A. 98, 10011–10016.

Mayr, E., 1950. Taxonomic categories in fossil hominids. Cold Spring Harb. Symp. Quant. Biol. 15, 109–118.

McBrearty, S., Brooks, A., 2000. The revolution that wasn't: a new interpretation of the origin of modern human behavior. J. Hum. Evol. 39, 453–563.

McMenamin, M.A.S., 2015. *Homo tsaichangensis* and *Gigantopithecus*. Meanma Press, South Hadley, MA.

Mehlman, M.J., 1989. Later Quaternary archaeological sequences in northern Tanzania. Ph.D. Dissertation. University of Illinois at Urbana-Champaign.

Morwood, M.J., Brown, P., Jatmiko, Sutikna, T., Saptomo, E.W., Westaway, K.E., Due, R.A., Roberts, R.G., Maeda, T., Wasisto, S., Djubiantono, T., 2005. Further evidence for small-bodied hominins from the Late Pleistocene of Flores, Indonesia. Nature 437, 1012–1017.

Mounier, A., Condemi, S., Manzi, G., 2011. The stem species of our species: a place for the archaic human cranium from Ceprano, Italy. PloS One 6, e18821.

Mounier, A., Marchal, F., Condemi, S., 2009. Is *Homo heidelbergensis* a distinct species? New insight on the Mauer mandible. J. Hum. Evol. 56, 219–246.

Murrill, R.I., 1975. A comparison of the Rhodesian and Petralona upper jaws in relation to other Pleistocene hominids. Z. Morphol. Anthropol. 66, 176–186.

Murrill, R.I., 1981. Petralona Man: A Descriptive and Comparative Study, With New Important Information on Rhodesian Man. Charles C Thomas Publisher Limited, Springfield.

Ni, X., Ji, Q., Wu, W., Shao, Q., Ji, Y., Zhang, C., Liang, L., Ge, J., Guo, Z., Li, J., Li, Q., Grün, R., Stringer, C., 2021. Massive cranium from Harbin in northeastern China establishes a new Middle Pleistocene human lineage. Innov. J. 2, 100130.

Nomade, S., Muttoni, G., Guillou, H., Robin, E., Scardia, G., 2011. First $^{40Ar/39}$Ar age of the Ceprano man (central Italy). Quatern. Geochronol. 6, 453–457.

Notton, D., Michel, E., Dale-Skey, N., Nikolaeva, S., Tracey, S., 2011. Best practice in the use of the scientific names of animals: support for editors of technical journals. Bull. Zool. Nomencl. 68, 313–322.

Pääbo, S., 2015. The diverse origins of the human gene pool. Nat. Rev. Genet. 16, 313–314.

Pycraft, W.P., Smith, G.E., Yearsley, M., Carter, J.T., Smith, R.A., Hopwood, A.T., Bate, D.M.A., Swinton, W.E., 1928. Rhodesia Man and Associated Remains. Trustees of the British Museum (Natural History), London.

Reck, H., Kohl-Larsen, L., 1936. Erster Überblick über die jungdiluvialen Tier- und Menschenfunde Dr. Kohl-Larsen's im nordöstlichen Teil des Njarasa-Grabens (Ostafrika) und die geologischen Yerhältnisse des Fundgebietes. Geologische Rundschau 27, 401–441.

Reed, D.N., Raney, E., Johnson, J., Jackson, H., Virabalin, N., Mbonu, N., 2023. Hominin nomenclature and the importance of information systems for managing complexity in paleoanthropology. J. Hum. Evol. 175, 103308.

Reich, D., Green, R.E., Kircher, M., Krause, J., Patterson, N., Durand, E.Y., Viola, B., Briggs, A.W., Stenzel, U., Johnson, P.L.F., Maricic, T., Good, J.M., Marques-Bonet, T., Alkan, C., Fu, Q., Mallick, S., Li, H., Meyer, M., Eichler, E.E., Stoneking, M., Richards, M., Talamo, S., Shunkov, M.V., Derevianko, A.P., Hublin, J.-J., Kelso, J., Slatkin, M., Pääbo, S., 2010. Genetic history of an archaic hominin group from Denisova Cave in Siberia. Nature 468, 1053–1060.

Rightmire, G.P., 1978. Florisbad and human population succession in Southern Africa. Am. J. Phy. Anthropol. 48, 475–466.

Rightmire, G.P., 2008. *Homo* in the middle Pleistocene: hypodigms, variation, and species recognition. Evol. Anthropol. 17, 8–21.

Roksandic, M., Radović, P., Wu, X.-J., Bae, C.J., 2022a. Resolving the "muddle in the middle": the case for *Homo bodoensis* sp. nov. Evol. Anthropol. 31, 20–29.

Roksandic, M., Radović, P., Wu, X.-J., Bae, C.J., 2022b. *Homo bodoensis* and why it matters. Evol. Anthropol. 31, 240–244.

Sankhyan, A.R., Badam, G.L., Dewangan, L.N., Chakraborty, S., Prabha, S., Kundu, S., Chakravarty, R., 2012. New postcranial hominin fossils from the central Narmada valley, India. Advances Anthropol. 2, 125–131.

Sankhyan, A.R., Dewangan, L.N., Chakraborty, S., Kundu, S., Prabha, S., Chakravarty, R., Badam, G.L., 2012. New human fossils and associated findings from the Central Narmada Valley, India. Curr. Sci. 103, 1461–1469.

Sarmiento, E.E., Pickford, M., 2022. Muddying the muddle in the middle even more. Evol. Anthropol. 31, 237–239.

Schmitz, R.W., Serre, D., Bonani, G., Feine, S., Hillgruber, F., Krainitzki, H., Pääbo, S., Smith, F.H., 2002. The Ne-

andertal type site revisited: interdisciplinary investigations of skeletal remains from the Neander Valley, Germany. Proc. Nat. Acad. Sci. U.S.A. 99, 13342–13347.

Schoetensack, O., 1908. Der Unterkiefer des *Homo Heidelbergensis* aus den Sanden von Mauer bei Heidelberg. Ein Beitrag zur Paläontologie des Menschen. Wilheilm Engelmann, Leipzig.

Schroeder, L., 2020. Revolutionary fossils, ancient biomolecules, and reflections in ethics and decolonization: paleoanthropology in 2019. Am. Anthropol. 122, 306–320.

Schwarcz, H.P., Grün, R., Latham, A.G., Mania, D., Brunnacker, K., 1988. The Bilzingsleben archaeological site: new dating evidence. Archaeometry 30, 5–17.

Schwarcz, H.P., Latham, A.G., 1984. Uranium-series age determination of travertines from the site of Vértesszöllös, Hungary. J. Archaeol. Sci. 11, 327–336.

Schwartz, J.H., Tattersall, I., 2010. Fossil evidence for the origin of *Homo sapiens*. Am. J. Phy. Anthropol. 143 Suppl. 51, 94–121.

Shao, Q., Ge, J., Ji, Q., Li, J., Wu, W., Ji, Y., Zhan, T., Zhang, C., Li, Q., Grün, R., Stringer, C., Ni, X., 2021. Geochemical provenancing and direct dating of the Harbin archaic human cranium. Innovation (Cambridge, MA) 2, 100131.

Shen, G., Tu, H., Xiao, D., Qiu, L., Feng, Y.-X., Zhao, J.-X., 2014. Age of Maba hominin site in southern China: evidence from U-series dating of Southern Branch Cave. Quatern. Geochronol. 23, 56–62.

Simpson, G.G., 1940. Types in modern taxonomy. Am. J. Sci. 238, 413–431.

Simpson, G.G., 1951. The species concept. Evolution 5, 285–298.

Simpson, G.G., 1961. Principles of Animal Taxonomy. Columbia University Press, New York.

Simpson, G.G., 1963. The meaning of taxonomic statements. In: Washburn, S. (Ed.), Classification and Human Evolution. Aldine, Chicago, pp. 1–31.

Some New Books, 1935. The Times (London).

Sonakia, A., 1984. The skull cap of early man and associated mammalian fauna from Narmada Valley alluvium, Hoshangabad area, Madhya Pradesh, India. Records Geol. Survey India 113, 159–172.

Street, M., Terberger, T., Orschiedt, J., 2006. A critical review of the German Paleolithic hominin record. J. Hum. Evol. 51, 551–579.

Stringer, C., 2012. The status of *Homo heidelbergensis* (Schoetensack 1908). Evol. Anthropol. 21, 101–107.

Suganumam, Y., Okada, M., Head, M.J., Kameo, K., Haneda, Y., Hayashi, H., Irizuki, T., Itaki, T., Izumi, K., Kubota, Y., Nakazato, H., Nishida, N., Okuda, M., Satoguchi, Y., Simon, Q., Takeshita, Y., 2021. Formal ratification of the Global Boundary Stratotype Section and Point (GSSP) for the Chibanian stage and Middle Pleistocene subseries of the Quaternary system: the Chiba Section, Japan. Episodes 44, 317–347.

Szalay, F.S., Delson, E., 1979. Evolutionary History of the Primates. Academic Press, New York.

Thoma, A., 1966. L'occipital de l'homme mindélien de Vertesszöllös. L'Anthropol. 70, 495–534.

Thoma, A., 1972. On Vértesszöllös man. Nature 236, 464–465.

Tobias, P.V., 1980. "*Australopithecus afarensis*" and *A. africanus*: critique and an alternative hypothesis. Paleontol. Afr. 23, 1–17.

Vlček, E., 1978. A new discovery of *Homo erectus* in central Europe. J. Hum. Evol. 7, 239–251.

Wagner, G.A., Krbetschek, M., Degering, D., Bahain, J.-J., Shao, Q., Falguères, C., Voinchet, P., Dolo, J.-M., Garcia, T., Rightmire, G.P., 2010. Radiometric dating of the type-site for *Homo heidelbergensis* at Mauer, Germany. Proc. Nat. Acad. Sci. U.S.A. 107, 19726–19730.

Warhurst, P.R., 1973. The history of race relations in Rhodesia. Zambezia 3, 15–19.

Weidenreich, F., 1928. Entwicklungs- und Rassetypen des *Homo primigenius*. Natur Museum, die Senckenberg-Naturzeitschrift 58, 1–62.

White, T.D., Asfaw, B., DeGusta, D., Gilbert, H., Richards, G.D., Suwa, G., Clark Howell, F., 2003. Pleistocene *Homo sapiens* from Middle Awash, Ethiopia. Nature 423, 742–747.

Wolpoff, M.H., Caspari, R., 2013. Paleoanthropology and race. In: Begun, D.R. (Ed.), A Companion to Paleoanthropology. Blackwell Publishing Ltd, Oxford, pp. 321–337.

Woodward, A.S., 1921. A new cave man from Rhodesia, South Africa. Nature 108, 371–372.

Wu, X.Z., 1981a. A well-preserved cranium of an archaic type of early *Homo sapiens* from Dali, China. Sci. Sin. 11, 200-206 (in Chinese).

Wu, X.Z., 1981b. A well-preserved cranium of an archaic type of early *Homo sapiens* from Dali, China. Sci. Sin. 24, 530–541.

Xiao, D., Bae, C.J., Shen, G., Delson, E., Jin, J.J.H., Webb, N.M., Qiu, L., 2014. Metric and geometric morphometric analysis of new hominin fossils from Maba (Guangdong, China). J. Hum. Evol. 74, 1–20.

Zubova, A.V., Chikisheva, T.A., Shunkov, M.V., 2017. The morphology of permanent molars from the Paleolithic layers of Denisova cave. Archaeol. Ethnogr. Anthropol. Eurasia 45, 121–134.

Special Issue: What's in a Name?
Late Middle and Early Late Pleistocene Hominin Systematics

Supplement 1: Nomenclature and Taxonomy of Chibanian Hominins

DENNÉ REED
Department of Anthropology, University of Texas at Austin, Austin, TX, USA; reedd@austin.utexas.edu

SUPPLEMENT 1

This section provides additional, detailed commentary supporting the decisions on nomenclatural status for each of the taxa included in this review. The commentaries are divided into five sections. The first section covers nomina that were assessed as unavailable, and the second covers nomina that were assessed as available but objectively invalid. The last three sections cover potentially valid nomina discussed by geographic area for Africa, Asia and Europe. References are in the main article.

PaleoAnthropology 2025:2 supplement to Reed 2025:2 ISSN 1545-0031
Paleoanthropology Society & European Society for the study of Human Evolution.
OPEN ACCESS
Early View available online 27 February 2025

UNAVAILABLE NOMINA

Six nomina were evaluated as unavailable under the Code. A detailed description of each nomenclatural act and a justification for the assessment of the status of each name is provided below. Nomina are presented in chronological order by publication date.

"Tchadanthropus uxoris"	1965	Conditionally proposed
Homo erectus "mapaensis"	1965	Conditionally proposed
Homo sapiens "daliensis"	1981	Conditionally proposed
Homo erectus "petralonensis"	1981	Conditionally proposed
Homo "altaiensis"	2011	Nomen nudum, no type fixed
Homo "tsaichangensis"	2015	Unpublished

***"Tchadanthropus uxoris"* Coppens, 1965 - conditionally proposed**

Coppens (1965: 2869) proposed *"Tchadensis uxoris"* with the Yayo fragmentary cranium as the type specimen. Coppens's text reads:

"Un certain nombre de caractères particuliers que cette Note a pour propos de souligner, nous a décidé, dans la tradition, à lui donner génériquement et spécifiquement un nom provisoire; nous sommes parfaitement conscient de sa précarité et persuadé que le nombre croissant de fossiles humains mis au jour permettra bientot d'alléger et de simplifier la taxonomie mais, en attendant ces éclaircissements et un diagnose du genre paléontologique *Homo* , l'Hominien du Tchad s'appellera *Tchadanthrpus uxoris*."

which translates to:

"A number of particular characteristics, which this note is intended to highlight, have led us, in keeping with tradition, to give it a generic and specific provisional name; we are perfectly aware of its precariousness and are convinced that the growing number of human fossils unearthed will soon make it possible to simplify the taxonomy, but until this clarification and a diagnosis of the paleontological genus *Homo* , the Chadian Hominian will be called *Tchadanthrpus uxoris*" (translation from https://deepl.com).

Coppen's proposal is explicitly provisional and thus the name is unavailable. The same determination was reached by Campbell (1965), Szalay and Delson (1979), and Groves (1989).

***Homo erectus "mapaensis"* Kurth, 1965 - conditionally proposed**

Kurth (1965: 382–383) proposed the subspecies *Homo erectus "mapaensis"* based on the Maba (Ma-pa) cranium:

"Es liegt dagegen weit näher und läßt sich auch morphologisch mindestens ausreichend begründen, in der Domäne der Frühmenschen ein weiteres Beispiel für die Polytypie dieses so überaus langlebigen (eu)homininen Formenkreises aufzufinden, das hier dann vielleicht als *Homo erectus mapaensis* einzustufen wäre."

This passage translates to:

"On the other hand, it is much closer and can also be justified morphologically at least sufficiently to find in the domain of the early humans a further example for the polytypy of this so exceedingly long-lived

(eu)hominin form circle, which would then perhaps be classified here as *Homo erectus mapaensis*" (translation from https://deepl.com).

Kurth's use of the word "vielleicht" (=perhaps) signals a conditional proposal and thus the name is unavailable. Despite this, the name has been employed by several authors. Groves (1989) invoked the taxon as "*H. sapiens mapaensis*," and later (2017: 71) as "*Homo mapaensis"* while remarking on the possibility of the group being fossil representative of "Denisovans." Howell (1999) invoked the epithet "*mapaensis"* (without genus) in describing affinities between Maba and Hathnora (*narmadensis*).

Bae (2010) invoked "*Homo mabaensis"* and "*Homo daliensis"* as part of a larger discussion weighing the merits of different nomenclature when referencing the East Asian fossil record, but he does not specifically indicate any intent to propose a new taxon.

***Homo sapiens "daliensis"* Wu, 1981 - conditionally proposed**

Wu (1981a, b) provided a description of the Dali cranium and proposed assigning it to the subspecies "*Homo sapiens daliensis."* Specifically, Wu (1981b: 539) stated, "It is suggested that Dali cranium [sic] probably represents a new subspecies, *Homo sapiens daliensis*." The words, "suggested" and "probably" signal a conditional proposal under Article 15 of the Code. However, in the abstract the 1981b proposal (but not in the 1981a Chinese text) is stated more definitively. There the author stated, "The cranium differs from Neanderthals in a number of racial characteristics. It is therefore considered here a new subspecies: *Homo sapiens daliensis*." The differences between the body of the text and the abstract raises the question of whether the Code should be applied to an entire publication or to segments of a publication. This issue affects other hominin nomina as well, e.g., *Australopithecus africanus aethiopicus* Tobias, 1980 and *Tchadanthropus uxoris* Coppens, 1969. For consistency, any stated reservations are taken to apply to the entirety of the publication and thus *Homo sapiens "daliensis"* is unavailable, as are the other examples.

Groves (1989) listed "*Homo sapiens daliensis"* Wu, 1981 as a subjective synonym for "*Homo sapiens mapaensis* Kurth, 1965." Groves (2017) treated Dali and Jinniushan as *Homo heidelbergensis*. Bae (2010) discussed the merits of invoking "*Homo mabaensis"* for Middle Pleistocene premodern *Homo* from southeast Asia and "*Homo daliensis"* for the taxon in northeast Asia. He concluded that it is best to retain the term, "archaic *Homo sapiens*." Manzi (2016) employed the nomen as "*Homo heidelbergensis daliensis*." Multivariate analysis by Athreya and Wu (2017) indicated a mosaic pattern exhibiting derived features in the face and primitive features in the neurocranium. These authors refrained from making a taxonomic determination based on these results.

***Homo erectus "petralonensis"* Murill, 1981 - conditionally proposed**

Murrill (1981: 256) suggested that "If the dating for Petralona 1 is as old as 700,000 years B.P., and if sub-specific names are most appropriately used geographically then I would say Petralona 1 should be classified as *Homo erectus petralonensis*, or given Petralona 1's similarity to Broken Hill 1, and the possibility Petralona 1 may have migrated from Africa—*Homo erectus rhodesiensis*."

Groves (1989: 285) listed "*Homo petralonensis* Murrill, 1975" as an available subjective junior synonym of *Homo sapiens heidelbergensis*. However, Murrill (1975) is not the source of the name. This article gave a description of the Petralona skull but did not mention the name. Murrill (1981) is the source of the original proposal, from which it is clear the epithet "*petralonensis"* was conditionally proposed and unavailable.

***Homo "altaiensis"* Derevianko, 2011 - nomen nudum and no type fixed**

Derevianko (2011) wrote a monograph-length review of anatomically modern *Homo sapiens* that included reference to four geographic subspecies, "*H. sapiens africanensis* (Africa), *H. sapiens orientalensis* (East and Southeast Asia), *H. sapiens neanderthalensis* (Europe) and *H. sapiens altaiensis* (Southern Siberia and Central Asia)" (Derevianko 2011: 512). The monograph did not explicitly signal the creation of new subspecies names

in accordance with Article 16.1 of the Code, nor explicitly fix type specimens as required by Article 16.4. Thus, it is not clear that the author intended to propose a new scientific name and rather offered the names as an informal organizing framework for describing evolutionary events in the human lineage during the Pleistocene.

Furthermore, the Derevianko (2011) monograph lacks a clear differential diagnosis in accord with Article 13.1 (nomen nudum). However it is possible to interpret the reference to Reich et al. (2010) as a reference to the genetic diagnosis of the taxon using samples from the Denisova 3 phalanx. The code is ambivalent as to the status of genetics for differential diagnosis and the use of ancient DNA to identify the Denisovan lineage marks a turning point in taxonomic practice.

Lacking an explicit intent to designate a new name, the lack of an explicit designation of a type specimen and a differential diagnosis, the name "*altaiensis"* Derevianko, 2011 is unavailable.

Zubova et al. (2017) presented a morphological analysis of isolated molars (Denisova 4 and Denisvoa 8) and attributed them to the taxon "*Homo altaiensis,"* citing Derevianko (2011). Similarly, Zubova et al. (2017) examined dental variation and invoked "*H. altaiensis,"* concluding that it is distinct genetically and morphologically from *H. sapiens* and *H. neanderthalensis*. Again, these authors did not specifically indicate their intent to propose a new species as required under the Code, nor did they fix a type specimen and thus the name in these usages remains unavailable.

***Homo "tsaichangensis"* McMenamin, 2015 - unpublished**

Chang et al. (2015) described a partial mandible, Penghu 1, purchased from an antique dealer in Taiwan. The specimen was originally recovered by a fishing boat dredging the Penghu Straits off the coast of Taiwan. Similar vertebrate fauna recovered from the straits suggested a Pleistocene age. Chang et al. (2015) attributed the specimen to *Homo* sp. indet.

McMenamin (2015), in what appears to be a self-published, 12-page digital book, proposed the name "*Homo tsaichangensis"* with the Penghu 1 mandible as holotype. It is not clear that print versions of the book were ever widely available in a manner that would fulfill the condition for numerous identical and durable copies set out in Article 8.1.3.1. It is available as a pdf online. The work is registered with Zoobank but the online book does not contain evidence that the name is so registered as required by Articles 8.5.3.1 and 8.5.3.2. For these reasons, the name is unavailable.

OBJECTIVELY INVALID NOMINA

Another four Chibanian nomina are available but objectively invalid because they are junior synonyms to other names with which they share the same type specimen. This is common for names established at the change of the 20th century, when taxonomic and nomenclatural practices were less standardized and regulated. Another nomen in this group, *Homo primigenius africanus* Weidenreich, 1938 is not an objective junior synonym like the rest, instead it is a junior homonym to *Homo africanus* Sergi, 1908 and *Homo javanensns primigenius* House, 1896. Despite the difference in reason it is also objectively invalid under the Code.

Homo primigenius africanus	1928	Objective homonym
Praehomo europaeus	1932	Objective synonym
Homo florisbadensis	1935	Objective synonym
Homo (Pithecanthropus) atlanticus	1956	Objective synonym
Homo (Pithecanthropus) ternifinus	1956	Objective synonym

***Homo primigenius africanus* Weidenreich, 1928 - objective homonym**
Weidenreich (1928) proposed *Homo primigenius africanus* for the Kabwe (Broken Hill) specimen, however *primigenius* when applied in the genus *Homo* is a primary junior homonym to *Homo javanensis primigenius* Houzé, 1896, and *africanus* is a homonym to *Homo africanus* Sergi, 1908.

***Praehomo europaeus* Eickstedt, 1932 - objective synonym**
Eickstedt (1932: 612) established *Praehomo europaeus* and *Praehomo heidelbergensis* with the Mauer mandible as the type. Campbell (1965) listed *Praehomo euopaeus* as being established in a later publication (Eickstedt 1934) but the name appears in the 1932 paper as well. Groves (1989) listed *Praehomo europaeus* Eickstedt, 1934 as an available objective junior synonym of *Homo sapiens heidelbergensis* Schoetensack, 1908.

***Homo florisbadensis* Drennan, 1935 - objective synonym**
Dreyer (1935) provided the first description of the Florisbad skull and assigned it to a new species, *Homo (Africanthropus) helmei* Dreyer, 1935. Writing shortly after, Drennan (1935) interpreted the skull as more closely resembling Neanderthals and thus offered an alternative name, *Homo forisbadensis (helmei)*. As both names refer to the same type specimen, Drennan's is an objective junior synonym to *Homo (Africanthropus) helmei* Dreyer, 1935.

***Homo (Pithecanthropus) atlanticus, ternifinus* Dolinar-Osole, 1956 - objective synonym**
Arambourg (1954) described two mandibles discovered at the Tighennif Quarry (Algeria) also known as Ternifine or Palikao, and, based on these, he established the new genus and species *Atlanthropus mauritanicus*.

Dolinar-Osole (1956) discussed the morphology of the Tighennif mandibles 1 and 2 and suggested that a genus-level distinction as proposed by Arambourg was premature. Dolinar-Osole (1956: 178) instead suggest the replacement names, *Homo (Pithecanthropus) atlanticus* or *H. (P.) ternifinus*. The original text (in Serbian) reads:

"Najdenina je nedvomno zelo važna, ker je zelo stara, varno datirana in razen tega je tu najden s šeleensko kulturo prvič na svetu njen verjetni izdelovalec. S tem je po mnenju Arambourga pojasnjeno vprašanje razvojne stopnje pred približno 300.000 leti živečega izdelovalca kulture pestnjakov.

"Po vsem tem bi pričakovali, da smo z novo najdbo dobili novega pitekantropa približno iste starosti, kot sta njegova podrodovna soimenjaka iz Čoukoutiena (Peking) in Trinila. Profesor Arambourg pravi: »Vendar se hominid iz Ternifina ne zdi strogo istoveten niti s pitekantropom niti s sinantropom; on kaže po nekih posebnostih na korpusu mandibule znake, ki so lastni njemu in izražajo v neki meri tendenco proti naprednejši stopnji. Zaradi tega bom predlagal, da označimo tega hominida, preden ga popolneje spoznamo, z začasnim imenom '*Atlanthropus mauritanicus*' (1. c., 895).

"Po našem gledanju na sistem hominidov bi se moralo glasiti ime nove najdbe *Homo* (*Pithecanthropus*) *mauritanicus*, *atlanticus* ali ternifinus, kjer bi prvi imeni označevali pripadnost po znakih, tretje pa kraj najdišča. Očitno se Arambourgu ne zdi potrebno, da bi združeval enako visoke razvojne stopnje v okvir generičnega imena. Ne gre mu za preglednost sistema in večjo enotnost. Morda — po sistemu Weinerta — naj zadostuje vzdevek »anthropus« s kakršno koli predpono, da označi določeno stopnjo razvoja (*Pithecanthropus*, *Sinanthropus*, *Africanthropus*, *Euranthropus*, *Atlanthropus*)? Iz njegovih treh poročil ne moremo natančno spoznati njegovega gledišča."

The approximate English translation is:

"The find is undoubtedly very important because it is very old, securely dated and, moreover, it is the first time in the world that its probable maker has been found here with the Selenian culture. This,

according to Arambourg, clarifies the question of the developmental stage of a fist culture maker living around 300,000 years ago.

"After all this, we would expect that the new find gives us a new pithecanthrope of about the same age as its subgenus relatives from Choukoutien (Beijing) and Trinil. Professor Arambourg says: "The hominid from Ternifin, however, does not appear to be strictly identical with either the pithecanthrope or the sinanthrope; it shows, by certain peculiarities on the corpus of the mandible, characters peculiar to itself, and expressing to some extent a tendency towards a more advanced stage. For this reason I shall propose to designate this hominid, before we know it more fully, by the provisional name '*Atlanthropus mauritanicus*' (1. c., 895).

"According to our view of the hominid system, the name ought to be from among *Homo (Pithecanthropus) mauritanicus*, *atlanticus*, or *ternifinus*, where the first names would indicate affiliation by characters, and the third the place of the find. Apparently, Arambourg does not feel it necessary to combine equally high evolutionary stages within the framework of a generic name. He is not concerned with the transparency of the system or with greater uniformity. Perhaps - following Weinert's system - the nickname "anthropus" with any prefix should suffice to indicate a particular stage of development (*Pithecanthropus*, *Sinanthropus*, *Africanthropus*, *Euranthropus*, *Atlanthropus*)? From his three reports we cannot know exactly where he was coming from." (translation from https://deepl.com)

Campbell (1965) listed the name as an available objective junior synonym of *Atlanthropus mauritanicus* Arambourg, 1954, whereas Groves (1989) lists the name as a junior synonym of *Homo sapiens heidelbergensis*.

In all, there are three mandibular specimens recovered from Tighennif. Dolinar-Osole (1956) divided them into two taxa *Homo (Pithecanthropus) atlanticus* and *Homo (Pithecanthropus) ternifinus*.

POTENTIALLY VALID NOMINA: AFRICA

If African forms are to be taxonomically delimited from their European cousins, what name is appropriate for the African hypodigm(s)? Among the available African nomina, *Homo naledi* is established and uncontroversial from a nomenclatural standpoint. Additionally, most accept the taxon as valid and distinct from the remaining Chibanian forms formerly grouped under *Homo heidelbergensis s.l.* Several other names pertaining to Chibanian fossils deserve closer scrutiny and are presented below in order of publication.

Homo rhodesiensis	1921	Potentially valid
Homo (Africanthropus) helmei	1935	Potentially valid
Homo kanamensis	1935	Potentially valid
Homo njarasensis	1936	Potentially valid
Atlanthropus mauritanicus	1954	Potentially valid
Homo saldanensis	1955	Potentially valid
Homo sapiens idaltu	2003	Potentially valid
Homo bodoensis	2022	Potentially valid

Homo rhodesiensis Woodward, 1921

Woodward (1921) established *Homo rhodesiensis* with the Kabwe skull, E686 (= Broken Hill, BH1), as the holotype. Pycraft (1928) provided a detailed morphological description and established *rhodesiensis* as the type species for a new genus, *Cyphanthropus*. Grun et al. (2020) provided updated geochronology for the holotype and commented on the taxonomy. There is additional commentary on the systematics and

taxonomy of this species (Athreya and Hopkins 2021; Delson and Stringer 2022; Groves 1989; Roksandic et al. 2022a, 2022b; Schwartz and Tattersall 2010).

This name has clear priority over other names associated with Middle Pleistocene (Chibanian) hominids from Africa and has been widely used when referring specifically to African representatives of *Homo heidelbergensis sensu lato* (e.g., Avery 2018; Cerretero et al. 2009; Hublin 2009; Mallegni et al. 2003; Szalay and Delson 1979), however, Roksandic et al. (2022) made a compelling argument for suppressing or ignoring the name to decolonize paleoanthropology (but see Delson and Stringer 2022; Sarmiento and Pickford 2022). The ICZN has no mechanism for suppressing names on these grounds and has demonstrated a reluctance to do so in prior petitions brought before the commission (Seríaco et al. 2023).

Campbell (1965) listed *Homo rhodesiensis* as an available and potentially valid taxon, as did Szalay and Delson (1979) who listed the name as an available and potentially valid subspecies, *Homo sapiens rhodesiensis*. Groves (1989) listed *Homo rhodesiensis* as an available junior synonym to *Homo sapiens heidelbergensis*. Grun et al. (2020) revised the dating to ca. 300 ka.

***Homo (Africanthropus) helmei* Dreyer, 1935**

Dryer and Kappers (1935: 124) established the name *Homo (Africanthropus) helmei* for the Florisbad cranium. Dryer and Kappers (1935) provided measurements and anatomical description of the cranium and its endocast with comparisons made to *Homo sapiens*, Neanderthals, *Pithecanthropus*, *Sinanthropus*, and "the Rhodesian."

Campbell (1965) listed the taxon as available and potentially valid. Szalay and Delson (1979) listed the nomen as a junior synonym of *Homo sapiens sapiens*. Groves (1989) included the name as an available junior synonym of *Homo sapiens heidelbergensis*. Kuman et al. (1999) advocated for retaining the name, for lack of a better, in their discussion of the paleoenvironments and archaeology at Florisbad. McBrearty and Brooks (2000) invoked *Homo helmei* in their discussion on the origins of modern human behavior. Grun et al. (1996) revised the dating.

Rightmire (1978) argued for a close association between Florisbad and Kabwe. Any taxon that combines these specimens in the hypodigm to the exclusion of Mauer and other European specimens attributed to *Homo heidelbergensis* will have *Homo rhodesiensis* and *Homo helmei* as available names. If *Homo rhodesiensis* is shunned as has been suggested (Roksandic et al. 2022), then *Homo helmei* has priority over other names among African Middle and lower Upper Pleistocene fossils, however, it should be noted that Roksandic et al. (2022a) did not explicitly include Florisbad in their hypodigm for *Homo bodoensis*, whereas they did explicitly include Saldanha. Thus, nomenclatural priority for African Middle Pleistocene fossil forms is sensitive to how hypodigms are defined for this group.

***Homo kanamensis* Leakey, 1935**

Further confounding the nomenclatural situation for the African Chibanian is the taxonomic status of the Kanam fossil mandible. Leakey (1935) established the name *Homo kanamensis* with Kanam 1 as the holotype. Kanam 1 preserves the anterior portion of a mandible. The labial side of the symphysis is obscured by a pathological growth, interpreted by some as a cancerous sarcoma (Montegu 1957; Tobias 1960). Leakey (1935) interpreted the anterior portion of the mandible as preserving a mental eminence and he attributed the age of the fossil to the later Middle Pleistocene or early Upper Pleistocene. For Leakey, the morphology of the chin and the age suggested a taxon presaging *Homo sapiens*.

Campbell (1965) recognized *Homo kanamensis* Leakey, 1935 as available and potentially valid, as did Szalay and Delson (1979), who listed it as an available subjective junior synonym of *Homo sapiens rhodesiensis*, and Groves (1989), who included the taxon as an available junior synonym of *Homo sapiens heidelbergensis*.

***Homo njarasensis* Reck and Kohl-Larsen, 1936**

Reck and Kohl-Larsen (1936: 429) established *Palaeoanthropus njarasensis* with Eyasi 1 as the holotype. They provided a description of the fossil, its geological context and comparisons with Kabwe and Neanderthals.

Campbell (1965) listed the name as available and potentially valid. He noted the Reck and Kohl-Larson (1936) spelling of the genus as an incorrect subsequent spelling (ISS) of *Palaeanthropus* Bonarelli, 1909. Szalay and Delson (1979: 509) listed *Palaeoanthropus njarensis* Reck and Kohl-Larsen, 1936 as an available junior synonym of *Homo sapiens rhodesiensis* Woodward, 1921. The Szalay and Delson spelling of the species epithet, "*njarensis*" is an incorrect subsequent spelling of the Reck and Kohl-Larson nomen. Groves (1989) listed *Palaeoanthropus njarasensis* Reck and Kohl-Larson, 1936 as an available junior synonym of *Homo sapiens heidelbergensis* Schoetensack, 1908.

***Atlanthropus mauritanicus* Arambourg, 1954**

Arambourg (1954) described two mandibles from the Tighennif Quarry (Algeria) also known as Ternifine or Palikao. In this publication he established the name *Atlanthropus mauritanicus*, though he does not explicitly fix either mandible as the holotype. He writes (Arambourg 1954: 895):

"Toutefois l'hominien de Ternifine ne paraît rigoureusement identique, ne aux Pithécanthropes, ni au Sinanthrope; il présente, dans certains détails de son corps mandibulaire, quelques traits qui lui paraissent propres, mais qui évoquent, dans une certain mesure, une tendance vers un stade plus progressif. Pour cette raison, et en attendant de le connaître plus complètement, je proposerai de désigner cet Hominien sous le nom provisoire de '*Atlanthropus mauritanicus*'. "

An approximate English translation of this passage reads:

"However, the Ternifine hominin does not appear to be strictly identical to either the Pithecanthropes or the Sinanthrope; it does show, in certain details of its mandibular body, a few features that seem unique to it, but which to some extent suggest a tendency towards a more progressive stage. For this reason, and until we know more about it, I propose to designate this Hominian under the provisional name of '*Atlanthropus mauritanicus*'." (translation from https://deepl.com)

From the passage, it is clear Arambourg made the proposal with conditions, however, Article 15.1 governing conditional assignments only applies to names published after 1960.

Campbell (1965) listed *Atlanthropus mauritanicus* as available and valid. Note that the genus name is correctly spelled in the 1965 publication but misspelled as "*Atlanthroprus*" in a later reprinting (Campbell 1994: 217). Szalay and Delson (1979) listed *Atlanthropus mauritanicus* Arambourg, 1954 as an available junior synonym to *Homo erectus* Dubois, 1892. Groves (1989: 284) listed the species as available and asserted that the Ternifine 1 mandible is the type of this taxon, but offers no additional evidence for when a lectotype may have been established.

***Homo saldanensis* Drennan, 1955 (Elandsfontein)**

Drennan (1955: 634) proposed *Homo saldanensis* with the skull from Saldanha (=Elandsfontein, Hopefield) as the holotype.

Campbell (1965) listed the name as available and potentially valid but has the species epithet misspelled as '*saldenesis*.' Szalay and Delson (1979) list *Homo saldanensis* as an available junior synonym of *Homo sapiens rhodesiensis*. Groves (1989: 204) discussed the taxon but misspelled it as '*saldanhensi.s*. It is, however, spelled correctly in the subject index and in the listing on p. 284 where it is given as an available junior synonym of *Homo sapiens heidelbergensis*.

Roksandic et al. (2022a) included the Saldanha specimen in the hypodigm for *Homo bodoensis*. In a reply, Sarmiento and Pickford (2022) noted that *Homo saldanensis* has priority over *Homo bodoensis*. In response Roksandic et al. (2022b: 241) argued that *Homo saldanensis* Drennan, 1955 is a nomen nudum because "Drennan (1955) admits that the Saldanha skull does not have any diagnostic traits" and therefore does not comply with Article 13 of the Code requiring proposed nomina include "a description or definition that states in words characters that are purported to differentiate the taxon" (ICZN 1999: 17).

Drennan (1955: 625) begins the article by saying:

"The Saldanha skull has no individual feature that is not found in one or other of the known human fossils, but it has an interesting combination of primitive characters that give it a distinctive position in the human pedigree."

Drennan goes on to provide a comparative description of the Saldanha specimen relative to Kabwe, *Pithecanthropus*, Neanderthals, and various "races" of *Homo sapiens*. Drennan argued that Saldanha has a diagnostic constellation of traits that is distinct from any other taxon. He concluded (Drennan 1955: 634):

"When with this there is taken into account the great thickness of the bones and other distinctive features of the Saldanha skull, the author considers it logical to designate Saldanha man as *Homo saldanensis*."

The comparative descriptions and concluding statements appear to conform to the requirements of Article 13, and hence *Homo saldanensis* is available and potentially valid.

***Homo sapiens idaltu* White et al., 2003**

Homo sapiens idaltu is a subspecies established by White et al. (2003) for the Herto specimen that, according to the authors, fall just outside the range of modern human variation. It is an example of employing subspecies rank for regionally (and temporally) distinct variants of the species, which is one solution to the problem of how to label distinct morphological groups of hominins below the species level.

***Homo bodoensis* Roksandic et al., 2022**

Roksandic et al. (2022 a) established *Homo bodoensis* with Bodo 1 as the holotype. They argued the taxon is necessary to represent the lineage leading up to *Homo sapiens* after the split from the last common ancestor to Neanderthals and Denisovans. Roksandic et al. (2022: 6) included "Kabwe 1 (Broken Hill), Ndutu, Saldanha (Elandsfontein), Ngaloba (LH 18) and potentially Salé in Africa" in the hypodigm for the *Homo bodoensis*. Of these specimens, Kabwe and Saldanha are types for available names that would have priority over *Homo bodoensis*. Kabwe (Broken Hill, E686) is the type for *Homo rhodesiensis* Woodward, 1921, while Saldanha is the type for *Homo saldanensis* Drenan, 1955. Roksandic et al. (2022a: 4) specifically addressed the priority of *Homo rhodesiensis*, arguing the latter name should be suppressed because:

"(1) the taxon is poorly defined and variably understood and used; and (2) the taxon name is associated with sociopolitical baggage that our scientific community is trying to dissociate itself from."

Specifically, Roksandic et al. (2022a) argued that *Homo rhodesiensis* should not be used because of its association with the colonialist Cecil Rhodes.

Delson and Stringer (2022) in response, noted that the formal suppression of names should be accomplished by a petition to the International Commission on Zoological Nomenclature (ICZN). They further indicated that *Homo rhodesiensis* is named with reference to the territory of Rhodesia (Rhodesia was not recognized as a country until 1980 when it was internationally recognized as Zimbabwe) rather than the

person Cecil Rhodes. In their view *Homo bodoensis* is a junior replacement name for *Homo rhodesiensis* under the Code.

In another response, Sarmiento and Pickford (2022) noted that if *Homo rhodesiensis* is bypassed then *Homo saldanensis* retains priority. In a later reply Roksandic et al. (2022b) argued that *Homo saldanensis* is a nomen nudum because it fails to include apomorphic traits that diagnose the species, however, Drennan (1955) does argue that Saldanha presents a unique constellation of traits and this would appear, to meet the conditions for availability under the Code.

Homo bodoensis meets the requirements put forth by the Code, however, it is a junior replacement name to *Homo rhodesiensis* or *Homo saldanensis* both of which are available and potentially valid under the Code. Whether one chooses to acknowledge the propriety of the Code with regard to these names is another matter.

POTENTIALLY VALID NOMINA: ASIA

There are four available and potentially valid Chibanian taxa with type specimens from Eastern Asia. All are recently established and nomenclaturally uncontroversial.

Homo erectus narmadensis	1984	Potentially valid
Homo floresiensis	2004	Potentially valid
Homo luzonensis	2019	Potentially valid
Homo longi	2021	Potentially valid

***Homo erectus narmadensis* Sonakia, 1984**

Sonakia (1984) established *Homo erectus narmadensis* with the Hathnora specimen as the holotype. Groves (1989) discussed the taxon and considered the name available and potentially valid. Kennedy et al. (1991) discussed systematics and relationships with *Homo erectus*. Howell (1999) discussed the nomenclature and possible affinities to Maba.

***Homo floresiensis* Brown et al., 2004**

Brown et al. (2004) established *Homo floresiensis*, with the partial skeleton LB 1 as the holotype, to accommodate fossils excavated from Liang Bua cave on the island of Flores, Indonesia. The name appears in over 200 publications written by a wide variety of authors, most of whom regard the taxon as valid.

***Homo luzonensis* Détroit et al., 2019**

Détroit et al. (2019) established the species *Homo luzonensis* to accommodate fossil material discovered in 2010 on the island of Luzon in the Philippines. Despite its recent establishment the name has over a dozen usages in print and is widely considered a valid taxon.

***Homo longi* Ji and Ni, 2021**

The species *Homo longi* Ji and Ni, 2021 was established by Ji et al. (2021) to accommodate the Harbin skull, a nearly complete hominin cranium found in northeastern China, dating to the Middle Pleistocene. Ji et al. (2021) presented anatomical comparisons to *Homo sapiens*, Neanderthals, and to *Homo heidelbergensis*/*Homo rhodesiensis*. They concluded that "the Dali and Hualongdong crania should be referred to "*H. daliensis.*" The Harbin cranium, on the other hand, shows clear diagnostic features differing from Dali and Hualongdong crania." They (Ji et al. (2021: 2) further proposed that the Xiahe mandible (Chen et al., 2019) may also belong to *H. longi.*

POTENTIALLY VALID NOMINA: EUROPE

In Europe there are eight names associated with Chibanian age fossils. Several of these European nomina are well established and, nomenclaturally, uncontroversial including *Homo neanderthalensis* King, 1864 and *Homo heidelbergensis* Schoetensack, 1908. However, as is the case in Africa as well, nomenclature may be complicated depending on how hypodigms are defined.

Homo neanderthalensis	1864	Potentially valid
Homo heidelbergensis	1908	Potentially valid
Homo steinheimensis	1936	Potentially valid
Homo erectus (seu sapiens) palaeohungaricus	1972	Potentially valid
Homo erectus bilzingslebenensis	1978	Potentially valid
Homo erectus reilingensis	1991	Potentially valid
Homo antecesor	1997	Potentially valid
Homo cepranensis	2003	Potentially valid

***Homo neanderthalensis* King, 1864**

King (1864) established the name *Homo neanderthalensis* based on the Neanderthal 1 specimen recovered from Klein Feldhofer Grotte near Dusseldorf, Germany in 1856. Schmitz et al. (2002) provided an analysis of the context of the original discovery site at Feldhofer Cave. Krings et al. (1997) established an early DNA record of Neanderthals. Green et al. (2010) provided the first genomic analysis of Neanderthals. The name is potentially valid and has been widely used for over 100 years. It has priority over other names associated with the Neanderthal hypodigm. However, the scope of this hypodigm has shifted significantly since the early 1990's to include not only Late Pleistocene representatives, or "classic" Neanderthals, but also many specimens showing some but not all the apomorphic morphology of Neanderthals and thus interpreted as early representatives of a lineage evolving toward Neanderthals. Depending on how early representatives are treated, other names become relevant including *Homo heidelbergensis* Schoetensack, 1908.

***Homo heidelbergensis* Schoetensack, 1908**

Schoetensack (1908) provided a monograph treatment of the Mauer mandible and established the nomen *Homo heidelbergensis* with the Mauer mandible as the holotype. Mounier et al. (2011) included the Mauer mandible as part of a detailed morphometric analysis of mandibles. Stringer (2012) and Buck and Stringer (2014) argue for the continued usage of the nomen. Athreya and Hopkins (2021) provided an alternative view on the nomenclature of Middle Pleistocene *Homo*. The name is potentially valid, and has been widely applied, with many authors regarding the taxon as valid. The name has priority for a nominal taxon that includes specimens, separate from Neanderthals, that bridge the temporal gap between *Homo erectus* and *Homo sapiens*. However, the taxon represents something of a nomen vanum, based as it is on a single mandible. Application of the name to other, more complete material continues to pose challenges. If the name is considered in a more restricted sense geographically, alternate names become relevant for Africa and Asia. Similarly, if the hypodigm is restricted in Europe then other names come to bear depending on how hypodigms are arranged.

***Homo steinheimensis* Berckhemer, 1936**

Berckhemer (1936: caption to Figure 1: 349) established the name *Homo steinheimensis* based on the Steinheim skull as the type, and he provided description and comparison to Neanderthals and modern humans. Campbell (1965) listed *Homo steinheimensis* Berckhemer, 1936 as available and potentially valid as did Szalay

and Delson (1979) and Groves (1989). The former included Steinheim as part of a *Homo sapiens heidelbergensis* hypodigm and the latter as part of a *Homo neanderthalensis* hypodigm. If *H. heidelbergensis* is restricted, then *Homo steinheimensis* has priority for a Chibanian hypodigm if Steinheim is regarded as lying outside Neanderthals.

***Homo erectus (seu sapiens) palaeohungaricus* Thoma, 1972**

Thoma (1966) provided a description of the occiput recovered from the site of Vertesszöllös, Hungaria. In the view of Thoma, the Verteszöllös occipital fragment is distinct from *Homo habilis* and potentially related to Mauer and Tighennif (Ternifine) despite a lack of comparable anatomical material. A footnote on page 531 proposed the taxon *Homo (erectus seu sapiens) palaeohungaricus*.

The author writes:

"Nous donnons à l'Homme de Vértesszöllös le 'nom de trouvaille' d' 'Euranthrope' et la dénomination systématique d'*Homo* (*erectus seu sapiens*) palaeohungaricus n. ssp. Ce taxon provisoire est nettement séparé de l'*H. habilis* (Tobias, 1964) mais en même temps ouvert vers les Hommes de Mauer et de Ternifine, vu l'ignorance où nous sommes de sa mandibule."

This passage roughly translates to:

"We give the Man of Vértesszöllös the 'name of discovery' of 'Euranthrope' and the systematic denomination of *Homo (erectus seu sapiens) palaeohungaricus* n. ssp. This provisional taxon is clearly separated from *H. habilis* (Tobias, 1964) but at the same time open to the Men of Mauer and Ternifine, given our present ignorance of its mandible" (Translation from https://deepl.com).

Thoma (1966) does not explicitly fix Verteszöllös I or II as a type and explicitly denotes the proposal as provisional and thus unavailable. However, an unambiguous declaration is given in Thoma (1972) where Verteszöllös II is fixed as the holotype and the taxonomic proposal is made unconditionally.

Groves (1989: 205) listed "*Homo erectus (seu sapiens) palaeohungaricus* Thoma, 1965 [sic]" with no remarks that would indicate it is unavailable or conditionally proposed. On page 285, Groves ascribed the taxon to Thoma (1966) in *L'Anthropologie* (Paris) 70: 530. This article was published in 1966, not 1965, and in the Thoma article the name appears in a footnote on page 531 not 530. However, as noted above, the proposal in Thoma (1966) is made conditionally, and 1972 is the year of authorship.

***Homo erectus bilzingslebenensis* Vlcek, 1978**

Vlcek (1978) established the name *Homo erectus biltzinglabenensis* with the specimens Bilzingsleben A1 + A2 and B1 + B2, presumed to come from the same individual, as the holotype. Vlcek provides a detailed description and comparison with African, Asian and European fossils.

Szalay and Delson (1979) included the Bilzengsleben locality in the hypodigm of *Homo sapiens heidelbergensis*, though the nomen is not listed as a synonym, possibly because it was too recently published. Groves (1989) listed the taxon as an available junior synonym to *Homo sapiens heidelbergensis*.

***Homo erectus reilingensis* Czarnetzki, (1991)**

Czarnetzki (1991) established *Homo erectus reilingensis* with the Reilingen specimen from Germany as the type. An English translation of the relevant passage is provided by Condemi (1996), which quotes Czrnetzki (1991) as writing:

"In spite of the mosaic of its evolved or unique and archaic features, the Reilingen specimen represents an evolutionary stage which is more *Homo erectus* than *sapiens*, and different than all forms already

known of this taxon … Thus it may be formally designated under the name of *Homo erectus reilingensis*." (Czarnetzki 1991 as translated by Condemi 1996: 72).

An earlier paper (Czarnetzki 1989) in German provided a morphological description of the fossil and comparisons with other relevant taxa. This paper also included the first use of the name. The author writes (Czarnetzki 1989: 200):

"Nach Abwägung der Art und der Anzahl der Merkmale sowie der daraus resultierenden Zahl von Generator- und Strukturgenen wird für die Bezeichnung derartiger Merkmalskombinationen und speziell für den hier untersuchten Fund die vorläufige Bezeichnung: *Homo erectus reilingensis*."

This passage loosely translates as:

"After considering the type and number of characteristics and the resulting number of generator and structural genes, the provisional designation for such combinations of characteristics and especially for the find examined here is: *Homo erectus reilingensis*."

The use of the phrase "vorläufige Bezeichnung" in the 1989 article signals a conditional proposal (Article 15), and thus the 1991 article is taken as the year of authorship. It should also be noted that the establishing nomenclatural act in the 1991 article does not use "sp. nov." to explicitly indicate a novel species or subspecies name in accordance with Article 16, however, this requirement only affects names published in 2000 or later, and thus the name is available and potentially valid, though not widely used.

Adam (1989) interpreted the Reilingen specimen as an early representative of *Homo sapiens* and referenced the subspecies name in quotes. Condemi (1996) concluded the fossil to be more closely aligned with Neanderthals and discussed the history of interpretation, including an unquoted use of the subspecies name *reilingensis*. Dean et al. (1998) also interpreted the specimen as an early Neanderthal and mentioned *Homo erectus reilingensis* without quotes. Street et al. (2006) referenced the subspecific name with quotes, whereas, Athreya and Hopkins (2021) listed the name, unqualified, i.e., without quotes.

***Homo antecessor* Bermùdez De Castro et al., 1997**

Carbonell et al. (1995) provide the stratigraphic and faunal context of the finds from level TD6 at Gran Dolina, Atapuerca, Spain, and they hint at the taxonomic implications but do not name a new taxon. Bermudez de Castro et al. (1997) established *Homo antecessor* with ATD6-5 as the holotype. While its phylogenetic position is actively debated, nomenclaturally the taxon is uncontroversial and established. Duval et al. (2018) provided dating.

***Homo cepranensis* Mallegni et al., 2003**

Ascenzi et al. (1996) initially described the Ceparano 1 cranium as *Homo erectus*. Manzi et al. (2001) presented a morphometric analysis highlighting affinities between Ceprano, Kabwe, Bodo, and Gran Dolina, but stopped short of making a definitive taxonomic assignment. Mallegni et al. (2003) established the nomen *Homo cepranensis*. Manzi et al. (2010) reviewed the geochronology but did not use the species name. Nomade et al. (2011) reviewed the geochronology and provided dating. Gilbert et al. (2003) referenced the name in quotes and commented on relations to the Daka specimen. Numerous subsequent publications refer to the Ceprano cranium in the context of *Homo erectus* or *Homo heidelbergensis*, (e.g., Athreya and Hopkins 2021; Rightmire 2008; Stringer 2012) but do not employ the nomen *Homo cepranensis*.