ANTHROPOLOGIE • XXXV/2 • pp. 101 – 107 • 1997

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EARLY HOMINID EXPANSION INTO EURASIA: BIOGEOGRAPHICAL AND ECOLOGICAL ISSUES

ABSTRACT: Early Pleistocene hominid expansion beyond Subsaharan Africa is discussed with Reference to varying and habitat conditions, environmental change, natural obstacles, and probable dispersal routes throughout Eurasia, and to concepts from historical zoogeography. The oldest securely identified and dated anthropic evidence points to a 1.4 my datum, coincidig with Homo erectus *and a mode 2 (Acheulian, Non-Acheulian) repertoire. Hominids followd natural dispersal routes along the substropical and tropical zones of Asia, then into the Far East and Central Asia, adapting to conditions characteristic of these regions. They may have colonized Europe directly out of Africa by crossing the Gibraltar Strait.*

KEY WORDS: Biogeography – Faunal regions – Dispersal routes – Ancient hominids – Early Pleistocene – Endemism – Biomes – Mode 2 technology – Landbridges – Glacio-eustatic sea levels – Anthropic evidence – "Long" and "short" chronologies

The initial hominid colonization of Eurasia was momentous, doubling eventually that primate species' realm, involving adaptation to diverse and unfamiliar biomes. Few surveys cover this theme comprehensively e.g. Bosinski (1992) or in aspects (Turner 1982) other than toolmaking or chronology. We review issues relating to the biogeographic and ecological frameworks of Eurasia's first settlement, and how the anthropic record articulates with it.

CONCEPTS

Hominids originated as members of the Ethiopian faunal region evolved somatically in semi-arid tropical savanna/bushland habitats. Biogeographic concepts apply to ancient humans (Rolland 1996), providing insights about how they overcame physical, climatic or ecological barriers during the Pleistocene, after dispersing beyond their Subsaharan cradle. Dispersal probabilities include *corridors* or movements across environments presenting few impediments, *filters*, involving more obstacles, and *sweepstake routes* where barriers restrict emigrations to few species. The dominant geomorphological structure of Eurasia consists of a network of West to East trending high altitude mountains and plateaus ranges. This factor, along with a diversity of biomclimatic conditions, from tropical and subtropical to temperate and boreal, along with sharp variations in seasonal temperatures and daylight durations confronted human populations expanding into this landmass.

Human/animal/plant relationships varied according to hominid omnivorous aptitudes, and already developed technological, organisational and cognitive repertoires. Subsistance scheduling had to shift from broad-spectrum to specialized exploitation patterns, with increased reliance on animal proteins and fats in temperate and boreal zones.

ANTECEDENTS

Zoological and palaeontological evidence testify that Africa remained a major mammalian evolution centre and reservoir for emigrant species. The Mio-Pliocene witnessed the emergence of anthropoids in increasingly open environments, especially in East Africa, the locus for anthropogenesis, which was followed by successive biocultural formative stages and adaptive radiation episodes among *Australopithecus* and early *Homo*. Toolmaking began by 2.5 my (Kada Gona, Omo Valley), expressed by the Oldowan or mode 1 Complex (Koobi Fora, Olduvai), coinciding with increased carnivorous propensities. *Homo erectus* appears by 1.7 my. Toolmaking developed into Acheulian or mode 2 large cutting tool assemblages by 1.5 my (Peninj, Olduvai).

East/Central Africa's unusually rich ungulate diversity and biomass conditioned the shift, uncommon among primates, to meat-eating, which was to involve hominids in coevolutionary relationships with several medium and large gregarious herbivores species as well as carnivore competitors, in Africa and beyond during the Quaternary. The same trends created expanding home-ranges, leading to movements out of Africa (Turner 1982). The *Homo erectus* landuse system probably consisted of "riparian forest core-areas" surrounded by open landscapes (Clark 1987). Whether ancient humans mastered fire-making, a crucial technological aid for dispersing populations with major ecological consequences, prior to mid-Pleistocene times, remains debated (Perlès 1987, Schüle 1992).

NORTH AFRICA – NEAR EAST

North Africa remained an Ethiopian biogeographic island throughout most of the Pleistocene, while Southwest Asia, a major corridor and crossroad (Bar-Yosef 1987) belonged mostly to the Palaearctic region. An outstanding question concerns the timing of hominid expansion beyond Subsaharan Africa, polarized into "long" versus "short" chronological alternatives, the latter benefitting from more substantial empirical support in most regions.

Late Pliocene finds such as Ain Hanech, 1.8 my (Sahnouni *et al.* 1995), Algeria, Yiron Plateau > 2.4 my and Erq al Ahmar, 1.8 my, Israel, or Dmanisi, 1.8 my, Georgia, would imply that these immigrant populations belonged to a pre-*erectus* and mode 1 biocultural stage but the earliest confirmed and securely dated anthropic occurrences beyond Subsaharan Africa correspond with *Homo erectus* and mode 2 technology, datable to Lower Pleistocene, by 1.4 my. They comprise Thomas Quarry, 1.0–0.8 my, Atlantic Morocco (Raynal *et al.* 1995), Ubeidiya, 1.4 my, Israel, and some ocurrences in Syria, with assemblages displaying a polythetic variation within the Acheulian (typical and atypical i.e. no handaxes) technocomplex.

Movements across the Sahara into the Maghreb could take place through oasis or refugia areas (Mauretania, Hoggar, Tibesti corridors), during wetter palaeoclimatic cycles. Evidence showing that the Nile did not run towards its Mediterranean outlet until Middle Pleistocene seems to rule out dispersal further East. The first Lower Palaeolithic finds in Egypt coincide with the Dandara arid phase, by 300 – 400 ky (Vermeersch *et al.* 1990). These findings, combined with a comparison of the respective anthropic datum lines in the Maghreb and the Levant suggest that the earliest hominid expansion beyond Subsaharan Africa must have occurred directly into Southwest Asia by a colonization route across the Horn of Africa, through the Bab al Mandib Strait, when glacio-eustatic sea level regression with climatic and tectonic factors converged to create a narrow landbridge or channel (Chabalier, Avouac 1994). The Barogali occurrence, 1.4 my, Djibouti, could be an indication. Movements in the Arabian peninsula would be inland and northwards, along the wetter Yemen foothills, reaching the Negev boundary (Shuwaihitiya Lower Palaeolithic occurrences?).

Beyond the Levant

These regions' deficiency in direct evidence is due to lack of research. Population movements beyond the Levant could spread in several directions: Northwest along Anatolia's coastal plain up to the Western Taurus, a barrier whose effectiveness is shown by long-lasting faunal endemicity, and with probings into southern Central Taurus intermontane areas, e.g. Dursunlu, of late Matuyama age; Northeast following the Fertile Crescent foothills and Assyrian steppe arc, then down toward the Mesopotamian lowlands and Euphrates Delta, further on along Iran's coastal plain (broadened during Pleistocene marine regressions) up to the gates of the Indian subcontinent.

Dispersals directly into the Anatolian and Iranian plateaus would meet with the Taurus, Armenian Knot and extensive Zagros orogenic barriers and their harsh winter climate. Occurrences such as Dmanisi, Caucasus, or the Kashafrud basin, Northern Iran, suggest nevertheless that ancient hominids managed to settle these regions with their favourable habitats at an early date. Accepting Dmanisi's Plio-Pleistocene (>1.8 my) dating is premature until definitive verdicts are supplied by investigations in progress. Its mammal fauna, diagnosed previously as mid-Pleistocene, and its *erectus* mandible's evolved traits are at variance with its proposed age (earlier than any known African *erectus* specimens!). The record from the Zagros indicates that durable settlement actually coincides only with the Middle Palaeolithic and the onset of human transhumance (Smith 1986). Early anthropic sites in the Caucasus and Northern Iran could have resulted from less problematic filter route movements out of Central Asia (*ibid* 1986).

TROPICAL ASIA

This main portion of the Indo-Pacific region, characterized by hot semi-arid biomes to the West, becoming progressively more humid and oceanic to the East, belongs entirely to the Oriental faunal region.

The Indian subcontinent

This vast area offered incoming hominid immigrants favourable and varied tropical habitats reminiscent of Subsaharan Africa. Its mammalian fauna, however, was not part of the Oriental region throughout the Pleistocene, being mostly endemic with Palaeoarctic elements (Kretzoi 1961–64), implying the existence of an ecological barrier, perhaps in Assam, Bengal or Burma. Mode 2 Acheulian ocurrences abound but mostly from disturbed contexts. Lower Pleistocene evidence remains elusive, probably due to geomorphological causes (Mishra *et al.* 1995), because India was a likely dispersal route towards the Far East. Lithic materials for toolmaking were readily available but bamboo and tropical hardwoods must have been used. Actualist studies (Schaller 1964) show that several areas contained animal biomass conditions matching those of some East/Central African ones, underscoring again India's importance for Palaeolithic occupation.

Southeast Asia

This main and perennial part of the Oriental region comprises mainland Southeast Asia, insular Southeast Asia (Java, Borneo, Sumatra, Bali), and Wallacea, East of the Wallace Divide. Its vegetational landscape is dominated by the Indo-Malaysian forest complex (evergreen, monsoon, montane, thorn and mangrove). The fauna varies, becoming more endemic, with insular gigantism or dwarfism. Herbivores game species tend to be solitary.

Pleistocene climatic fluctuations and tectonic activities impacted significantly on the geography and life of Southeast Asia. Sea level regressions added Sundaland by the emergence of the continental shelf connecting the mainland and major islands West of Wallacea. These and volcanic eruptions influenced vegetation patterns, enlarging open landscape stretches and inducing plant recolonization (Semah 1993). The monsoon forest offered more dependable subsistance conditions for early humans than the evergreen forest, deficient in carbohydrates (palms excepted). The fossil mammal record displays varying degrees of endemism (Groves 1985), a consequence of episodic filter-bridges. Absence of equids or camelids, however, testifies to the persistence and prevalence of forest habitats (Pope 1985).

The widespread recurrence of inner seas, lagoons, coastlines and islands in a tropical setting, amplified or reshaped by repeated sea level changes, induced long-term adaptive tendencies for humans to specialize in settling maritime habitats, resulting in Late Pleistocene insular colonization into Near Oceania, culminating eventually with the Polynesian occupation of Pacific Islands.

Lower Palaeolithic evidence from mainland Southeast Asia remains elusive or inconclusive (Hutterer 1985) though a hominid presence there is certain. It becomes well represented by several *erectus* occurrences and artifacts (Ngebung) in Java (Semah *et al.* 1992). Definitive dating there is still debated, ranging between 1.8 and 1.2 my (Semah 1986, Bergh van den *et al.* 1995). The possibility that some *erectus* groups were isolated, following marine transgressions, could account for this evolutionary group's survival until Late Pleistocene, as implied by recent radiometic dates for the Ngandong fossil, though this conclusion calls for substantial confirmation. Alternatively, recent researches in Flores, Wallacea, show that human capabilities for crossing between islands existed by 700 ky, indicated by stratified artifact finds in horizons also coinciding with animal extinctions, perhaps anthropogenic (Sondaar *et al.* 1994).

A widely distributed Lower Palaeolithic pattern throughout the Far East is the occurrence of assemblages diagnostic of the Chopper and Flake Tool complex, henceforth Non-Acheulian mode 2 technology, especially common throughout China. This 'Movius Line' separated these regions from those containing the Acheulian repertoire to the West. It fits with habitat characteristics dominated by tropical forests peopled by low density ungulate species. If hominids appeared into this part of Tropical Asia before 1.5 my, a datum for the Acheulian emergence in Subsaharan Africa, this non-handaxe toolmaking complex would constitute a linear offshoot of mode 1 or Oldowan technological horizon. A more likely scenario, however, on the basis of the "short" chronology, is that it represents a specialized development derived by reduction-segregation processes, of an originally mode 2 Acheulian repertoire, a toolkit adaptation better suited for exploiting hardwood and bamboo materials in forested environments (Watanabe 1985).

EAST ASIA (CHINA)

Environments here change from tropical and subtropical bamboo/karst forests to broadleaf belts, loess steppes, and mixed, cold climate forests. The Qingling mountains divide present-day North and South China into Palaeoarctic and Oriental regions.

Anthropic occurrences, fossil and Lower Palaeolithic, cluster along lower altitude areas bordering the South and East China Seas and Yellow Sea coastlines, becoming scarcer or absent in the higher relief interior. Luchterhand (1984) argued that the northern region was settled first, directly from Central Asia and the Near East, because South China functioned as a geographic and ecological barrier. Pleistocene mammal occurrences, diagnostic of Palaeoarctic and Oriental regions respectively, overlap on both sides of the Qingling, indicating instead that these regions' boundary shifted episodically in response to Pleistocene climate changes, and that the mountain range

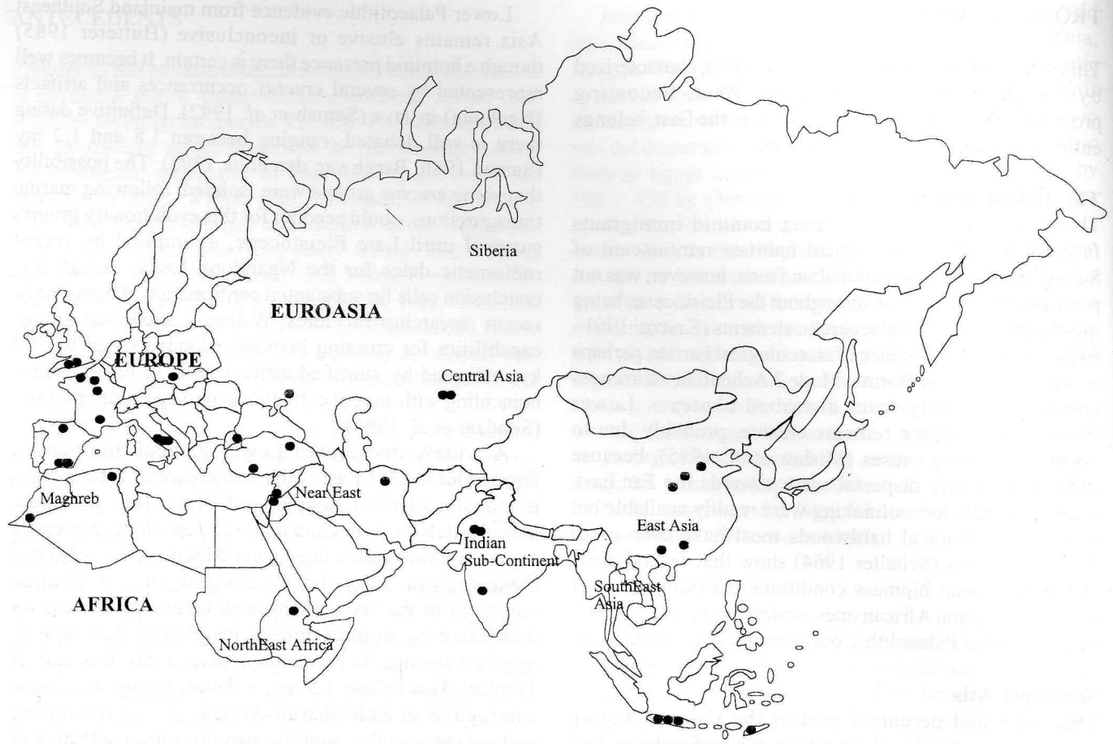

FIGURE 1. Major early (1.4–0.6 my) anthropic occurrences beyond Subsaharan Africa.
Maghreb and African Horn: Casablanca, Ain Hanech, Barogali. **Southwest Asia**: 'Ubeidiya, Bizat Ruhama, Dursunlu, Dmanisi. **Central Asia**: Khonako, Kul'dara. **Indian Subcontinent**: Jalalpur, Dina, Bori. **Southeast Asia**: Sangbungmacan, Trinil, Modjokerto, Mata Menge. **East Asia**: Yüanmou, Gwanyindong, Gongwangling, Zhukoudian, Nihewan Basin. **Europe**: Southwest – Feuntenueva, Cullar-Baza, Soleihac. Northwest – Abbeville, Boxgrove, High Lodge, Miesenheim, Mauer. Italy – Fontana Ranuccio, Isernia, Venosa. Central – Stránská Skála. Eastern – Gerasimovka, Yarim Burgaz.

was a filter rather than a barrier. Furthermore, early mid-Pleistocene anthropic localities e.g. Yüanmou, Gwanyindong, confirm that South China must represent the area of initial dispersal from Southeast Asia.

Northern China contains well-known early anthropic sites such as Zhudoudian, Gongwangling, 1.0 – 0.8 my, and the Nihewan basin occurrences associated with an early Pleistocene or Sanmenian fauna, datable to 1.0 my (Schick *et al.* 1991). The latter lies North, near the edge of the Eurasian steppe, implying that *Homo erectus* could already cope with mid-latitude conditions with marked seasonal contrasts. All these Lower Palaeolithic assemblages continue displaying Non-Acheulian mode 2 artifactual characteristics, a pattern related partly to continued availability of bamboo resources but mainly to remoteness from interactive contacts with populations manufacturing Acheulian repertoires.

Present-day Western China (Xinjiang/Uighur regions, Qinghai) is dominated by desolate arid environments (Ala Shan, Takla Makan), with a continental climate. Historic communication routes followed narrow river valleys, e.g. Qaidam depression. Quaternary research findings (Zhang 1988) on the other hand, show that milder, wetter conditions, with more oasis-type rivers and palaeolakes prevailed, hence habitat circumstances more attractive for human settlement, before ongoing orogenic uplift and the onset of climatic deterioration made this region less hospitable. Direct evidence for early human occupation remains inexistant, for the time being. More focussed and sustained palaeoanthropological investigations in the future should determine whether *erectus* populations actually dispersed into Western China by the Lower Pleistocene.

CENTRAL ASIA

This vast, remote and topographically complex arid inland region, progressively cut off from monsoon Asia by tectonic uplift, yields growing evidence for Lower Palaeolithic occupation (Ranov 1995), in a series of stratified horizons with a loess and pedocomplex succession which can be correlated with analogous loess and glacio-fluvial

sequences in East Asia (Schäfer *et al.* 1996). Datable occurrences from the Khovaling area comprise Khonako II, PK8 (700 ky), and Kul'dara, PK11 and 12, (850 ky), whose Non-Acheulian mode 2 artifactual contents resemble those from the Nihewan Basin.

Colonization of this distant region directly across the Near East (Zagros, Iranian Plateau) (Gladilin, Ranov 1986) is conceivable but, as for the Caucasus, implies overcoming major mountain obstacles. An East Asian origin (Bordes 1968:89, Chard 1974:10, Rolland 1992:94–99), would involve hominid population movements along a less problematic expansion route, following lateral intermontane paths, analogous to those by Palaeoarctic mammalian migrations North of the Hindu Kush, Pamirs, Karakorum, Tien Shan, Hymalaya and Kunlun orogenic systems. It would connect similar Lower Palaeolithic occurrences from East to West, such as the Nihewan sites, Kul'dara, Khonako II, Kashafrud basin and Dmanisi. This alternative hypothesis, however, requires a more robust, unambiguous data base.

EUROPE

This narrower prolongation of the Asian landmass combines a variety of biomes, from Mediterranean to boreal and arctic latitudes, all bearing oceanic influences. Pleistocene ice ages altered these environmental characteristics, with glacial advances creating widespread periglacial zones, marine regressions, and reshuffling vegetation zones into mosaics with few extant parrallels. Year-round climates became more continental, with pronounced seasonal variations. The Palaeoarctic faunal succession records the alternations of cold-adapted species originating in Eurasia's high latitude core areas, during stadials, and temperate species refluxes out of refugia during interglacials (Bonifay 1980: Fig. 1.). The absence of Pleistocene landbridges across the Mediterranean precluded species exchanges between North Africa's Ethiopian fauna and that of Palaeoarctic Europe.

Obstacles confronting ancient humans reaching Europe include water barriers, mountain range filters, and high latitudes winter conditions, with short daylight, especially during ice ages. Settlement boundaries would undergo displacements into Southern refugia during glacial advances. Palaeoanthropic research began much earlier in Europe, focussed at first in establishing human antiquity, producing a comparatively abundant and better dated Lower Palaeolithic record (Balkans excepted). Discussions opposing "long" and "short" chronologies for identifying and dating Europe's first occupants have remained intense to this day e.g. Bonifay and Vandermeersch (1991), Bosinski (1996) for the "long" position, Roebroeks and van Kolfschoten (1995) for the "short" one. The latter outlines these methodological and documentary issues sharply, concluding from a critical evaluation of all evidence, that the peopling of Europe did not take place before a 500-600 ky datum, synchronous with Cromerian IV and *Arvicola terrestris cantiana's* appearance, and correlated with oxygen isotopic stage 13. This implies a substantial time lag in settling Europe, compared with adjacent regions, and raising fundamental questions. Factors such as climatic or ecological barriers are at variance with evidence from Northern China, while invoking a conceivable shift in human social and landuse organization remains difficult to test, and without concrete indications from other regions.

New finds from Iberia i.e. Atapuerca TD6, Fuentenueva 3, however, may push back the date from initial entry into Southern Europe back to Late Mauyama times (0.8–1.0 my) but this amounted to little more than isolated exploratory forays, until a more rapid and sustained spread beyond the Pyrenees (or southern Balkans) filters by 400–600 ky (Dennell, Roebroeks 1996). Either alternatives, whether caused by a mutation-like shift in hominid organization or by sudden breaching of physical barriers, suggest an irruptive, "sweepstake route" – like colonization model, spreading rapidly throughout Europe. One possible trigger physical factor may have been a hitherto unidentified short-lived combination, in the Gibraltar Strait, of intense tectonic activity, with deeper marine regression caused by a severe glacial episode (stage 16?), narrowing the Strait and creating less forbidding current conditions for crossing.

The settlement of Europe, on the other hand, may have proceeded more progressively than appears from available evidence, with a series of small-scale punctuated dispersal stages, building on the initial presence of founder populations in Europe's southern boundaries. Recent findings from Stránská Skála (Musil *et al.* 1995) provide new indications of anthropic activities from fire traces and diagnostic butchering traces on animal bone fragments. This documentary development revives the notion that short-lived incursions reached as far as Central Europe before 500–600 ky. Stránská Skála and the Červený kopec locality, where a possible quartzite ore or manuport came from the PK X horizon (Late Matuyama), consequently deserve renewed investigations.

CONCLUSION

Diagnosed anthropic evidence (*Figure 1*) allows the conservative conclusion that ancient hominids had settled and adapted to substantial portions of Eurasia not later than 1.4 my (putting aside disagreements over the age of some of the occurrences), encompassing a wide range of continental and coastal biomes, across the Palaeoarctic and Oriental regions. This record testifies that *Homo erectus* had already developed versatile technological, organizational and cognitive strategies. When fitting the distribution of anthropic occurrences against the outstanding features of Eurasia's physiographic relief, the pattern is compatible with a reconstruction of dispersal movements whose tendency was to espouse a lateral axis,

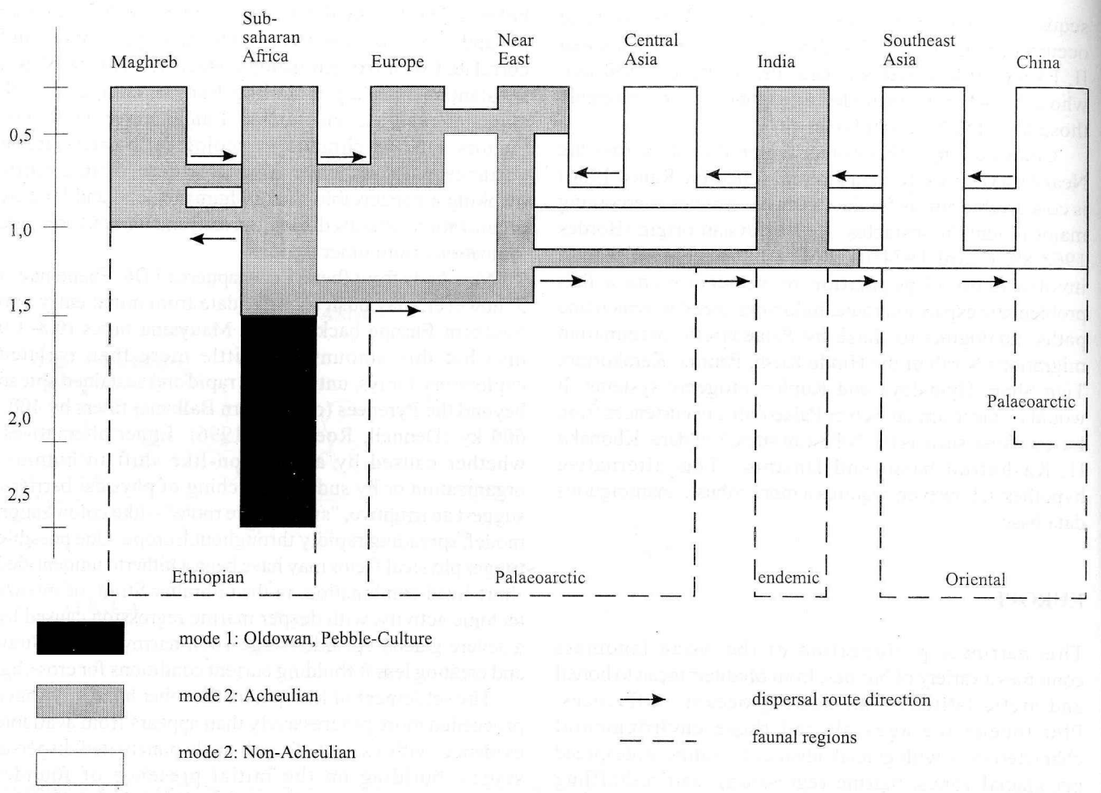

FIGURE 2. General hypothesis for hominid dispersals beyond Subsaharan Africa.
Homo erectus and a mode 2 technology represent the first anthropic horizon beyond Subsaharan Africa. The inital despersal involved movements directly into Southwest Asia, by a filter route across Bab al Mandib Strait, and toward the Levant and the Palaearctic region, then around the Fertile Crescent and along coastal Iran into the Indian Subcontinent. Further dispersals into the Far East and Oriental region witnessed a repertoire adaptive modification from Acheulian into mode 2 Non-Acheulian. Hominids moved into North China and the Palaeoarctic region, following next a lateral inland filter migration route into Central Asia, up to Southwest Asia's northern fringe, maintaining a Non-Acheulian Toolkit. Another early dispersal involved crossing the Sahara into Maghreb. The colonization of Europe may have taken place by a "sweepstake" route across Gibraltar, under short-lived but favourable conditions and also from the Near East by a filter route, with perhaps some time lag.

from Southwest to the Far East, bypassing major interior mountain and high plateaus barriers, subsequently penetrating North of these barriers from East Asia, along a chain of filter routes of the Palaearctic region, to reach the Caucasus (*Figure 2*). The null hypothesis, at present, would be that early hominid expansion beyond Subsaharan Africa was initiated by *Homo erectus* with a mode 2 technology.

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