SYNOPSIS OF THE PALEOLITHIC EUROPE & WESTERN ASIA

Period **Period dates in this column are for Africa**	**Sites** (n = 184)	**Tools** **Symbolic Behavior** **color pigments**	**Fauna*/Hominids***
Early Oldowan (~2.0-2.6 Ma):	General technology: cores and flakes, bipolar reduction, utilized unmodified flakes, flakes not retouched, not yet standardized tool form or might label *Australopithecus* tools and symbolic behavior as 'Pre-Oldowan' *(JBH)*		
'Classic Oldowan' (~1.4-2.0 Ma) 1.8 Ma = Plio-Pleistocene Boundary	General technology: hammerstone/anvil bipolar continues adding direct percussion in hand; cores: choppers, polyhedrons, discoids, spheroids and subspheroids. Standardized small tools appear: 'light and heavy-duty' scrapers on flakes or fragments, rare burins and protobifaces; utilized unmodified flakes; rare worked bone*; Homo habilis and Homo rudolfensis*		
	Chilhac 3, Haute-Loire, central France ~1.9 Ma (*CJ2009)*	Mode I, 46 artifacts, split pebbles and rocks of gneiss, anatexite, basalt: cores, choppers, denticulates, flakes (Chavaillon 1991; Guth & Chavaillon 1985); contra, tephrafacts (Raynal, Magoga & Bindon 1995)	
Aullan climatic event and faunal turnover, ca. 1.6-1.8 Ma Olivola faunal unit, Italy, Aullan called 'Wolf event', arrival of small coyote-sized *Canis etruscus* 1.8 Ma via China, 3.0 Ma, from No. America; *Pachycrocuta* arrival, leads to extinction *Megantereon* ~ 500 ka (1.5 Ma East Africa), yields loss of carcass flesh for hominids; Tasso faunal unit, large wild dog *Canis falconeri,* arrival Europe, 1.7-1.8 Ma; (*AA1999*; Azzaroli 1983*)*	Venta Micena, Orce River, southern Spain Venta Micena (VM) (Aullan, ca. 1.6-1.8 Ma) (biostratigraphy, palaeomag.) **1.65 Ma** *(GJ1998; AA1999, AJ200* = FN1 & 2*)* but (AAR mollusca) 983±58 ka (Torres et al 1997); ~1.3 *(SG2009)*	*Homo* fossils (?): VM-0 skull fragment is *Homo (GJ1998; PP1997)* but probably ruminant (Martinez-Navarro 2002), VM-1960 and VM-3691 humerus fragments, BL5-0, tooth frag. *(MB2005)*;	Fauna: 15,000 fossils, hyena main accumulator; African immigrants: *Hippopotamus antiquus, Equus altidens=Equus numidicus* (// modern zebra *Equus grevyi)*; carnivores, *Megantereon whitei,* wild dog *Canis* (*Xenocyon*) *falconeri*, large hyena *Pachycrocuta brevirostris;* Asian immigrants: 4 bovids: *Praeovibos* sp., *Bubalus* sp., *Soergella minor*, *Capra alba*, 2 cervids *Cervidae* gen. et sp. indet., *Praemegaceros solihacus*; and Villafranchian developments: *Mammuthus meridionalis, Dicerorhinus etruscus brachyceph. Homotherium latidens, Ursus etruscus (PP1997; MB1995)*;

	Lézignan-la-Cèbe, Hérault, Languedoc-Roussillon, France Locus 1 and 2 (Ar/Ar lava basalt cap) means 1.57±0.01, thus **> ~1.57 Ma** (*CJ2009)*	Locus 2: Oldowan [Classic], 20 artifacts, quartzite and basalt; cores, (one discoidal core possibly a percussor), choppers, choppingtools (// Belle-Roche), LEZ 427 (basalt, pointed bloc, unifacially flaked, perhaps a chopper // a Chilhac III artifact), retouched flakes, flakes (// FN3, Nolhac-Briard) (*CJ2009)*	Fauna: Villafranchian (MNQ18): 400 specimens, *Mammuthus meridionalis or indet.; Dicerorhinus etruscus etruscus, Equus altidens, Eucladoceros, Leptobos etruscus*, antelopes, *Eucladoceros ctenoides*, *Cervidae* indet., rhino, *Meles thorali*, *Prolagus* indet., *Tesudo* nov. sp., birds, *Homotherium crenatidens, Canis etruscus, Pachycrocuta brevirostris* (*CJ2009)*
	Senèze, France		Fauna: Villafranchian (MNQ18) (*CJ2009)*
	Nolhac-Briard, Haute-Loire, central France ~1.5 Ma (*CJ2009)*	Mode I not tephrafacts (Raynal, Magoga & Bindon 1995)	
	Pirro-Nord, Foggia, southern Italy (biostratig., palaeomag. Matuyama post-Olduvai subchron not much younger than 1.7 Ma (Napoleone et al 2003) **~1.3 to 1.7 Ma** *(AM2007; CJ2009);* **~1.4 Ma** *(DH2009)*	Pirro 10, 13, 21: Mode I, [Early Oldowan], flint pebbles; 3 cores, 7 flakes, plus waste debris; hyena den *(AM2009; AM2007);* 'Pre-Oldowan' *(DH2009)*	Late Villafranchian (Pirro Nord Faunal Unit): Pirro 10: *Axis* sp., *Equus altidens, Canis mosbachensis*, *Ursus etruscus, Megantereon whitei*; Pirro 13: *Axis* sp., *Equus altidens, Canis mosbach.*, *Homotherium crenatidens, Pachycrocuta brevir.;* Pirro 21: etc. Also: *Steph. etruscus, Bison degiulii, Praemega-ceros obscurus,* large porcupine *Hystrix refossa, Theropithecus oswaldi, Homotherium latidens; Acinonyix pardinensis; Lycaon lycaonoides*; *Vulpes* sp., pond terrapin, tortoise, ibis, variety species waterbirds, falcon, partridges, crane, owl, corvids *(AM2009; AM2007;* Rook et al 2004*)*

Developed Oldowan (~1.2-1.7 Ma)	General technology: pebble core-flake tools ('Mode I') with standardized small tools (variable random to regular retouch), bipolar and single platform cores; reduced % core-choppers, discoids, polyhedrons and heavy-duty scrapers, more refined light-duty scrapers, burins; 1st appearance of awls, edge-trimmed flakes and in later phases of Developed Oldowan a few crude bifaces (influence of Early Acheulian)*; Homo ergaster/Homo erectus*		
Cassian event, 'end-Villafranchian' and arrival Galerian fauna (0.9-1.2 Ma) *(AA1999)*	Orce, Guadix-Baza Basin, Orce River, southern Spain Barranco Leon (both BL and FN3 fauna and paleomag. reversed, Matuyama) between 1.07 and 1.77 Ma = ~1.3 Ma but slightly older than FN3 *(TI2009)* BL5, **1.4 Ma** *(CJ2009)* or ~1.25 Ma *(SG2009; AA1999)* BL2-3, ~1.3 Ma (*AA1999)* BL1, ~1.07 Ma *(AA1999)* Fuente-Nueva FN1, ~2.0 Ma *(AA1999)* FN2 // Venta Micena 1 & 2 *(AA1999)* FN3 (both BL and FN3 fauna and paleomag. reversed, Matuyama) between 1.07 and 1.77 Ma = ~1.3 Ma but slightly younger than FN3 *(TI2009);* **1.25 Ma** *(CJ2009; SG2009)* or probably ~1.04 Ma *(AA1999; OO2000, AJ2000)*	BL5: Developed Oldowan, 1292 artifacts; flint, chert, limestone; discoid cores, choppers, flakes, including Kombewa flakes, retouch (sidescraper), other tools; flaked bone flake; fabrication on site; no carnivore tooth marks *(TI2009; SM2006; OO2000)* but 'Pre-Oldowan' *(DH2009)* FN3: Developed Oldowan, 932 artifacts; limestone, flint, rare quartzite; unifacial, bifacial; bipolar and centripetal; cores, flakes, retouch (sidescrapers, denticulates, notches), other tools; low-energy environment excludes geofacts, near absence of carnivores, no toothmarks, so no role in accumulation of fauna *(TI2009; OO2000; AA1999:* Carbonell et al 1999*)* but 'Pre-Oldowan' *(DH2009)*	BL and FN3 fauna comparable: *Mammuthus meridionalis, Hippo. antiquus, Megaloceros* cf. *obscurus, Pseudodama* sp., *Bovini* gen. et sp. indet., *Caprini* indet (n. sp.), *Hemitragus* cf. *albus, Equus altidens, Stephanorhinus* cf. *hundsheimensis, Megantereon* cf. *whitei*, *Pachycrocuta brevirostris, Ursus* sp., *Canis mosbachensis, Vulpes* sp. (cf. *V. praeglacialis*), *Meles* sp., *Hystrix* sp., *Oryctolagus* cf. *lacosti*, *Bufo bufo* (Martínez Navarro et al. 2003; Agustí et Madurell, 2003) (TI2009)

	Sima del Elefante, Atapuerca, Burgos, Spain Level TE9: (biostratig., palaeomag. reversed, Al/Be burial dating) 1.22±0.16, 1.13±0.18, ~**1.1-1.2 Ma** // TD6 *(CE2008)* but micromammals, min. 1.3-1.4 *(SM2006)*	Mode I [Early Oldowan], 32 artifacts, chert, free hand percussion, flakes show plane rather than cortical butts, unidirectional knapping; 4 simple, flakes, (2 apparent refits to core), 5 waste flakes; 23 indet. due to chemical weathering; faunal remains evidence human processing, fracture on bovid mandible, percussion marks and cutmarks on macromammal long bones *(CE2008)*	Fauna: bovid, birds, etc. *Homo antecessor,* tooth, mandible fragment, phalange *(CE2008)*
	Cher à Lunery-Rosières, Cher Valley, France Nappe de 'Rosière' **~1 to 1.1 Ma** (Guérin et al 2003) *(DJ2009)*	Mode I, [Early Oldowan], 'La Terre-des-sablons' site: Ensemble 1 (800 ka): unidirectional flake production; cores and flakes on oolitic calcareous cobbles and on flint pebbles; Ensemble 3 (1.1 Ma): flint; core and flakes *(DJ2009)*	Fauna: *Mammuthus meridionalis, Stephanororhinus etruscus, Equus altidens, Sus strozzi, Bos* sp. *Megaceroides* sp., *Canidé, Xenocyon, Panthera gombaszögensis; grand carnassier* indet. *(DJ2009)*

Early Acheulian (~1.0-1.7 Ma)	General technology: (Africa): flake blanks used as cores, in turn used as tools ('core tools'), including crude handaxes with sinuous edges and large flake scars, trihedral picks, rare cleavers; large component of flakes; hand-sized flakes from large cores; secondary flaking rare; small flakes with no secondary retouch; sharp edges made by intersect dorsal flake scar and ventral surface; Kombewa technique common; pointed working edge more important than shaping; chopper, polyhedron, spheroid, heavy-duty scrapers; hard hammer; absence of Levallois or other prepared core techniques; *Homo erectus*		
	Cueva Victoria, Jara Mountains, Spain all levels, 1.1-1.4 Ma Cueva Victoria (CV) (geo- and biostratigraphy) ~ 1.05 Ma *(MB2005; AA1999; PP1996)*		Fauna: Villafranchian, *Mammuthus meridionalis, Dicerorhinus etruscus, Theropithecus oswaldi*, *Homotherium latidens, Canis etruscus, Pachycrocuta brevirostris,* micromammals (Gibert et al 1992) *(PP1996);* *Homo (?)* CV-1 and CV-2 distal humeri, poorly preserved (Gibert et al 1992); CV-0 complete phalanx (Gibert & Pons-Moyá 1985; Pons-Moyá 1985), *Theropithecus oswaldi (MB2005)* but *Homo (GJ2008;* Palmqvist *et al 1995, PP1996; Pérez-Pérez 1989);*

	Kozarnika Cave, Oreshetz, Bulgaria Layers 13-11a: (paleomag.) ~1.1-1.4 Ma or 1.4-1.6 Ma *(GA2004)* Layers 13-12: (fauna) MNQ17 and 18 Layers 11c and 11b: (fauna) MNQ19 Layers 13-11c (? 11b) *Panthera schaubi,* only known from MNQ17 = **1.4-1.6 Ma** *(SN2010)* Layers 10c-10b: Mousterian with leaf-shaped points (no preceding Acheulian); Layers 10-9a: Mousterian and IUP Layer 5: 'Kozarnikien', local, backed blades; Layers 4-3a: Middle Kozarnikien and recent Kozarnikien *(SN2010)*	Mode I, [Developed Oldowan] 10,000 artifacts; Layers 13-11b lower: Mode I, 'core-and-flake without pebble tools', flint, unipolar and bipolar débitage, resembles Clactonian, aim short flakes, retouched flakes (side- and endscrapers, borers), core-tools; Layers 11b upper, 11a: continues previous technique and adds tending toward Levallois and discoid core; Layer 12: 1 Marmot phalanx with oblique cut marks indicative of skinning (earliest evidence for skin working) *(SN2010)* Layer 12: 8cm-long bovid tibia, 4 sets of regular parallel stroke marks (4th set incomplete set) *[? JBH: image seems to show 3 sets of 2, 4 and 3 stroke marks]*; cervid bone incised 27 marks along its edge; no meat on these bones, not like cutmarks, not butchering, 'symbolism' *(GA2004; SN2010)*	1 molar tooth, skull fragment *Homo* sp.; Fauna: Villafranchian, *Macaca sylvanus, Dolicopithecus?, Mammuthus trogontherii/meridionalis, Dicerorhinae* sp., *Equus* cf. *stenosis* and *altidens? Sus* sp., *Cervalces* cf. *Alces latifrons, Cervus philisi, Eucladoceros* sp., *Capra,* various *Hemitragus*, *Rupicapra* sp., *Ovis* sp., *Soergelia* sp., *Gazellospira* sp., *Bos primigenius*, *Bison* sp., *Ursus deningeri, Homotherium* cf. *crenatidens* and *latidens, Canis etruscus, Vulpes, Felis silvestris, Lynx, Martes* sp., *Meles* sp., *Xenocyon* sp., *Panthera schaubi, Panthera gombaszögensis, Pachycrocuta perrieri (SN2010; GA2004)*

Jaramillo, main window of early hominin with elephant immigration from arid Africa across Po Valley to Europe refugia (Muttoni, Scardia & Kent 2010)	Vallparadis, Barcelona, Spain (biostratigraphy, ESR, normal polarity, Jaramillo) **0.99 to 1.07 Ma** *(MK2010)*	Mode I, [Early] Oldowan, bipolar technique, smashing small pebbles on anvils; bones with cutmarks and spiral fractures *(MK2010)*	Elephant, hippo, rhino, cervids, equids, bovids, jaguar, hyena *(news release)*
	Le Vallonet, maritime Alps, near Nice, France (biostratigraphy, ESR, normal polarity, Jaramillo) **0.99 to 1.07 Ma** (Bonifay 1991) *(CE1995; CD2009)*	Unit III (B1, B2, C): Mode I, Oldowan: 70 pieces, primarily limestone pebbles, rare flint; bipolar on anvil and direct percussion; choppers, choppingtools, flakes (sidescraper), percussors; traces of fire (de Lumley 1988) *(CE1995; CD2009)*; bison bone used as a percussor; 'Pre-Oldowan' (DH2009) contra, geofacts *(RW1994)*;	Assemblage III: *Ammotragus europaeus* (Moulle et al 2004); *Macaca sylvanus flor., Mammuthus meridionalis, Stephanorhinus hundsheimensis, Equus stenosis, Sus* sp., *Cervus nestii vallonnetensis, Praeovibos* (musk ox), *Panthera gombaszögensis, Acinonyx pardinensis, Pachycrocuta brevir.* And species more evolved, Mid-Pleistocene: *Bison schoetensacki, Hemitragus bonali* (tahr), *Canis mosbach., Lynx spelaea, Alopex praeglac.* (fox) (DH2009)
	Soleilhac, Massif Central, France (biostratigraphy, ESR, normal polarity, Jaramillo) 0.99 to 1.07 Ma *(CE1995)*	Mode I, 4 flakes, 5 limestone pebble tools; but geofacts, fauna could be Cromerian *(RW1994);* Soleilhac-Centre, 446 objects, quartz, basalt, flint (Bracco 1991) not tephrafacts (Raynal, Magoga & Bindon 1995) *(CE2006)*	Bed 0.93 Ma, earliest *Palaeoloxodon antiquus* (Gilbert & Asfaw eds. 2009)
	Pont-de-Lavaud, Creuse Valley, Indre, France (ESR quartz) between 0.905 and 1.187 Ma (Falguères 2003) **1.1 Ma** *(DJ2006)* (U-series sediments) 1,071±90 ka *(BJ2007)* La Chaudronnière à Crozant *(DJ2009)*	Mode I, [Developed Oldowan], pebble tools, unifacial choppers, bifacial chopping tools, polyhedrons, retouched flakes (becs, notches, denticulates, side- and endscrapers) *(CE2006; DJ*2009) Mode I, quartz	(JBH - *DJ2009: fig 5* lower right, possible mammoth sculpture?)

Middle Acheulian (~500 ka to 1 Ma)	MA General: (Africa): hardhammer, standardization of blank shape and reduction techniques (e.g., Kombewa, Victoria West); more regularized biface shapes: cordiform, amydaloid, lanceolate, oval handaxes; cleavers with bits made from single flat surface scars, trihedral picks; flake and flake tools (mostly denticulates, notches, scrapers); some assemblages only core-choppers and flakes; few polyhedrons, spheroids; *Homo erectus*		
Interglacials: OIS 25 = ~960 ka OIS 23 = ~900 ka OIS 21= ~850 ka OIS 19 = ~780 ka (begin paleomag. reversal 0.78 Ma) OIS 17 = ~700 ka OIS 15e = ~620 ka OIS 15a = ~580 ka	Gran Dolina, Sierra de Atapuerca, Burgos, Spain (ESR, U-Series dates Falguères et al 1999; TL Blasco 2010) TD1-3: no fossils TD4: *Equus stenoid*, *St. etruscus, Dama nestii*, etc. TD5 carnivore den TD6, Aurora stratum (biostratigraphy, reversed polarity, Matuyama) **780-858 ka** (Carbonell et al 2005) *(MA2009)* (ESR teeth) 731±63 *(BJ2007)* TD7: (ESR, U-series: 730 ka; TL: 960±120) *Praeovibos/Ovibus* TD8: (ESR, U-series: 602 ka; TL: 820±140) *St. etruscus*, *Hipp. amphibius, Dama* sp., *Equus* sp., *Megaloceros* sp., *Cervus elaphus*, *Bison* sp., carnivores TD10: (ESR, U-series: 372 ka; TL: 430 ka) *Homo heid*. *Bos/Bison*, *Equus* sp., *St. hemitoechus*, *Cervus elaphus*, *Sus scrofa, Dama* dama *clactoniana, Caprini* indet., *Panthera leo* TD11: (ESR, U-series: 337 ka; TL: 244 ka) *Bos/Bison*, *Equus* sp., *St. hemitoechus*, *Cervus elaphus* (van der Made 1998) (*PJ1995)*	TD3-4, 5, 6, 7, 10, 11, all abundant tools TD4: 4 lithic pieces TD6: Aurora, Mode I, [Developed Oldowan]: 268 lithic artifacts, mostly flint, quartzite, limestone, sandstone, quartz; replication indicates technique, throwing and then orthogonal multifacial flaking, no centripetal; 10% cores and heavy duty tools, 2 unifacial choppers, flakes, retouched pieces, denticulates, scrapers; use-wear indicates use on meat, bone, wood plant working not evident; may infer butchery, defleshing; possibly hide, working, supported by cutmarks on some animal phalanges; also bone breakage (Carbonell et al 1999); Human bones randomly distributed and mixed with fauna and artifacts; 25% human bones, peeling (bending) fracture, cutmarks, percussion pits, chop marks, (// Neolithic Fontbrégoua) , butchered like animals, suggesting cannibalism for consumption, not ritual *(FY1999)* TD10: tools, hunting camp; *Panthera leo* cutmarks (Blasco et al 2010) TD11: Mousterian	TD4 *Ursus dolinensis* TD6 fauna: Middle Galerian basal Mid. Pleistocene: MNI~22: *Mammuthus* sp., *Stephanorhinus etruscus, Equus altidens*, *Sus scrofa*, *Cervus nestii vallonnetensis, Cervus elaphus*, *Eucladoceros giulii, Bison* cf. *voigtstedtensis, Marmota marmota*, *Castor fiber*, *Hystrix major*, *Ursus praearctos / U. deningeri*, *Panthera gombasz., Lynx* sp., *Felis silvestris, Crocuta* sp. *(DH2009; CE1995; AA1999)* predominantly infant and juvenile; low axial elements, suggest hominid carcass transport into site (Díez et al 1999); TD6: 36 human fossil remains, 'primitive form of *Homo', Homo antecessor;* 6 MNI: 2 infants 3-4 yrs; 2 adolescents, ~11 and 14 years; 2 young adults ~16-18 years // spectrum of large mammal predominantly infant and juvenile individuals *(FY1999; AA1999; CE1995)*

	Happisburgh, Norfolk, UK Bytham River HSB3, Hill House Form. Beds C, D, E: (geo- and biostratigraphy, reverse polarity) **0.78-0.99 Ma** *(PS2010)*	Beds C, D, E: Mode 1, [Classic Oldowan], 78 flint artifacts, hardhammer percussion, 3 cores, 62 flakes, 13 flake tools (7 notched or multiple notches, 5 limited retouch, 1 scraper) with no evidence of handaxe manufacture; predominance of large flakes (up to 145mm) with sharp cutting edges and opposing cortex; knapping done elsewhere, brought to site for use *(PS2010)*	*Mammuthus* cf. *meridionalis, Mammuthus* sp.*, Equus suessenbornensis, Equus* sp.*, Cervus elaphus, Cervalces latifrons, Cervidae* indet.*, Bovidae* indet.*, sturgeon, pike, carp, Pisces* indet., *frog or toad, Castor fiber, Trogontherium cuvieri,, lemming, mice, vole, Hyaenidae* gen. (coprolites) *(PS2010)*
	Monte Poggiolo, Emilia-Romagna, Italy (biostratigraphy, reversed polarity, Matuyama) ~1.15 Ma (Carbonell et al 1999) (U-series sediments) 1.065±0165 Ma *(BJ2007)* or (reversed zone) 780 ka to 1 Ma *(DH2009)*	Mode I, [Classic Oldowan], orthogonal reduction, small flint nodules, low % retouch (Carbonell et al 1999); 'Pre-Oldowan' *(DH2009)*	*Stephanorhinus hundsheimensis* (Sala & Fortelius 1993);
	Terrassa, Catalonia, Spain (fauna) ~**900 ka** *(DH2009)*	Mode I, 'Classic Oldowan' *(DH2009)*	*Elaphus antiquus, Steph. hundsheimensis, Equus stenosoid, Sus* sp.*, Cervus nestii vallonnetensis, Panthera gombaszögensis (DH2009)*
	Estrecho del Quípar, Guadix-Baza Basin, Spain (paleomag. reversed >780; micromammals // Huéscar-I 10m below boundary) **~900 ka** *(SG2009)*	**Acheulian (1st** occurrence in Europe, date // Ubeidiya), 80% chert: small disc cores and flakes, some platforms, centripetal and recurrent flaking, abrupt or semi-abrupt retouch; limestone handaxe, large bifacial chopper; *(SG2009)*	Rock shelter, teeth, *Homo* sp. Fauna: *Macaca* sp., *Steph. etruscus, Bison* sp., *Sus* sp., *Equus altidens, Megaloceros* sp., *Dama nestii vallon.,* Ursus sp., *Canis mosbachensis, Crocuta crocuta (SG2009)*
	Ceprano, Latium, Italy (K/AR on volcanic gravel above clay level) 0.7 ka (Ascenzi et al 1996) *(AA1999)* > 780 ka *(CE2006)* **~800-900** (Segre et al 2009)	Campo Grande di Ceprano, Mode I, 'Classic Oldowan', chopper, chopping tool, denticulated scraper, endscraper *(DH2009)*	*Homo erectus* calvarium *(AA1999)*

	Korolevo, Tisza River, Ukraine Units VI, VII (reversed polarity) >0.78 (Koulakovska, Usik & Haesaerts 2010)	Units VI, VII: EP	
	Azykh Cave, Azerbaijan Lower levels >0.78 Ma *(CE1995)*	Layer 7-10: Mode I, a few core choppers	
	Solana del Zamborino, Guadix-Baza Basin, Spain (lithostratigraphy, micromammals, paleomag. at Brunhes-Matuyama 0.78 boundary few m. below, est. sedimentation rate yields 750-770 ka), thus **~760 ka** *(SG2009)*	Acheulian (2nd earliest occurrence in Europe, date // Ubeidiya); chert, quartzite, quartz artifacts; several handaxes; evidence of fire *(SG2009)*	Lacustrine, Fauna: *Macaca* sp., *Mammuthus trogontherii, Bison* sp., *Sus* sp., *Equus* cf. *suessenbornensis, Canis mosbachensis (SG2009)*
	Colle Marino, Anagni Basin, southern Italy (below volcanic layer, lower limit 700 ka) > 700 ka *(NE2009)*	Mode I *(NE2009)*	Fauna: Villafranchian, *Pachycrocuta brevir. (NE2009)*

	Pakefield, Suffolk, UK Bytham River Cromer Forest Bed (450-780 ka) (geo- and biostratigraphy, palaeomag., AAR) max OIS19, ~750 ka min. OIS17, ~680 ka **circa 700 ka** *(PS2005)*	Mode I, [Classic Oldowan], 32 flint, quartz, quartzite artifacts, flaked core, crudely retouched flake, waste flakes *(PS2005)*	Interglacial fauna: riverine: *Hippopotamus,* oak woodland and open grassland: *Mammuthus trogontherii, Steph. hundsheimensis, Megaloceros savini, Megaloceros dawkinsi, Bison* cf. *schoetensacki*, and their predators & scavengers *Homotherium* sp., *Panthera leo*, *Canis lupus, Crocuta crocuta (PS2005)*
	Colne Valley Assemblage (CVA), Watford, Hertfordshire, UK site A1: highest terrace of ancient Bytham River (based on stratum profile similarity to neighboring Gerrards Cross gravels [Bridgland 1994; Catt 2010, 2009]) OIS22 and OIS23, ~860-900 ka *(RW 2010; personal communication 2006-2010)*	Mode I, Developed Oldowan, direct freehand and bipolar technique; multi-platform and multi-directional flaking; cores, choppers chopping tools, flakes, scraper *(RW2010; personal communication 2006-2010)*	Worked flints interpreted as figurative, representations, categories identified: 'mammoth', 'elephant', 'bison', 'horse', 'goat', 'seal', 'walrus?', 'stickleback fish', 'bird', 'goose'; '*Homotherium*', 'lion'; '*Macaca*', '*Homo* face/portrait', 'mask', 'female' figurines, and polymorphic combinations: 'mammoth+lion', 'horse+lion+bird' *(collector, interpreter, Richard Wilson, RW2010; personal communication 2006-2010)*

	Isernia la Pienta, Molise, central Italy (biostratigraphy, reversed polarity, Matuyama) 0.78-0.99 Ma, but faunal record younger, begin Mid-Pleistocene*(CE1995)* (ESR bovid tooth) 560±84 ka (ESR 5 rhino teeth) 345±67 ka, Ar/Ar 606±2 ka, paleomag. normal *(BJ2007);* ~600-700 ka *(HU2009);* **604-620 ka** *(DH2009)*	Mode I: 'Classic Oldowan' *(DH2009)*; flint, limestone; flaked limestone pebbles; cores, choppers, retouched flakes, percussors (RM2009) [fig. 4 JBH possible elephant sculpture on quadrangular core?] Archeosurface 3a: faunal MNI indicates specialized exploitation MNI 75 bison, MNI 36 rhino, MNI 15 bears, MNI 12 elephants, MNI 5 Megaloceros; Level 3colluvio: MNI 7 bison; MNI 3 rhino and 3 bear; cutmarks, percussion notches, bone fracturing *(HU2009)*	*Elaphus antiquus, Stephanorhinus hundsheimensis, Bison schoetensacki*, *Sus scrofa, Megaceroides solilhacus, Cervus elaphus, Dama dama* cf. *clactoniana, Capreolus* sp., *Hemitragus cf bonali, Ursus deningeri, Oryctolagus, Panthera leo, Panthera pardus*, *Emys orbicularis* (pond terrapin), mallard, little grebe (= mixed aquatic, prairie and woodland environments *(HU2009)*

	Loire, Creuse, Cher valleys, France Cher Valley, Sector 'Berry', 'la Noira' à Brinay: basal bifaces (RPE) **680±30 ka** Sector 'Sologne', site de 'la Morandiére' à Gièvres (Loire-et-Cher): (RPE for the 'sheet'): **between 610±90** and **690±40 ka** (DJ2009)	1st arrival of Acheulian to Loire region **600-700 ka** (DJ2009) site de 'la Morandiére' at Gièvres (Loire-et-Cher): Lower Level: biface Series 2: polyhedral cores, centripetally worked, Levallois flakes, Levallois point, limande; (DJ2009) [Fig 21: hexagonal core – intentional geometric? JBH] Level 1.5 m below Upper (RPE: **370±110 ka**): including (fig. 21) a cordiform in brown flint (brought from 15 km away) with very rare decoration of an 'ocelle' (eye marking); Upper Level: biface Series 1: trihedral pic, handaxes, bifacial scraper, Levallois core (DJ2009)	

	Notarchirico, Venosa, Basilicata, Italy Level F (tephra below F, above Level E1: TL quartz **640±70, ESR 654±11**) Level E1 Level E Level D Level C Level B Level A1 Level A Level *alpha* (U-series) 358±154/97 *(SM2006)*	Levels F: Acheulian (3rd earliest occurrence in Europe); artifacts left in situ, some bifaces; Level E1: 244 artifacts, no bifaces; Level E: 155 artifacts, no bifaces; Level D: 300 artifacts, 2 bifaces (handaxe); Levels C, 78 artifacts, no bifaces; Level B: 351, 10 bifaces, incl. handaxes; Level A1, Acheulian, 41 artifacts, 9 bifaces; tools scattered among elephant (1 subadult male) remains; pebble cores, 2 handaxes, chopper, denticulated flake near upturned mandible, "the only large sized faunal element not lying in anatomical position and clearly intentionally displaced form its original position"; an elephant butchery site, with utilization of soft skull parts (brain, tongue, trunk); very limited post-depositional disturbance *(PM1998);* Level A: 316 artifacts, 2 bifaces; Level *alpha*: 950 artifacts, no bifaces *(SM2006)*	*Elephas antiquus*, cervids, indet. *(PM1998)* Level *alpha*: femur, *Homo cf. erectus* *(SM2006)* Most Notarchirico bifaces are amygdaloids with twisted edges, low degree of standardization; In biface assemblages, absence of flake cleavers, picks, trihedrals, double-pointed bifaces and spheroids *(SM2006)*

	Carpentier Quarry, Abbeville, Somme River, France (ESR) 600±90 **OIS15 or OIS16** *(SM2006)*	Acheulian, Abbevillian type handaxe (Boucher de Perthes 1847)	
	Grafenrain Pit, Mauer, Heidelberg, Germany 'Fluvial sand' stratum: (micro-mammals, palaeomag.) OIS 13 or OIS 15 (stratigraphy) interglacial **OIS 15,** thus **~600 ka** *(WG2010)* (micromammals) OIS 15 *(SC2002)* (TL) 600-720 (Zöller 1993), 640-735 ka = OIS15 (Hambach 1996) *(MA2009)*	No tools were found in immediate association to the hominid find, but Mode I tools from same 'fluvial sand' stratum: 276 chert artifacts, (1910-1932) (Beinhauer 1996, 2007; Fiedler 1996: pebble and block cores, flakes, points, notches, scrapers, protobiface); (new finds Löscher 2002; flakes, retouch, fragments, blade fragment?) // Ubeidiya 'Developed Oldowan' *(LM2007; BK2007);* (Rust 1956 'Heidelbergian culture') [JBH: typology and ~3cm size = micro-CCC / Jabeekian?]	1 MNI, mandible, *Homo erectus/Heidelbergensis* (Schoetensack 1908) *(HK2007);* // African (e.g., Tighenif) and European (e.g., Sima de los Huesos) specimens, but also differences *(MA2009);* Fauna: late Cromer interglacial – *Palaeoloxodon antiquus*, *(SC2002; LM2007)* [*JBH:* LM2007: p. 276, (2002 find) illus. L. Fiedler – seems to be an odd piece, apparently a 'retouched core', possibly retouched area = sculpture representing elephant head and trunk? P. 271 photo seems to show 'eye' chip of elephant head?]

	Sima de los Huesos, 'Pit of Bones', Cueva Mayor, Atapuerca, Spain SH: (U-series) 600+ /-66 ka, hence **530 ka** (Bischoff et al 2007) *(MI2008)* = OIS14	SH: Cranium 14, age >5 years, craniosynostosis, probably of traumatic origins before birth, severe cranial deformities, implying likely facial asymmetries, motor/cognitive disorders; may infer special caretaking despite severe handicaps *(GA2009)*	SH: 5,500 human bones, 28 MNI *Homo erectus/Heidelbergensis* (Bermúdez de Castro et al 2004); traces of human habitation absent; bones of herbivores absent; but great variety of carnivores, MNI 23 fox, 3 great felines, 1 wolf, 4 mustelidae, 166 *Ursus deningeri (CE2003)* 2 hyoid bones, metric and morphological variation "of same magnitude as that found to characterize living humans" and same for Neanderthal specimens in this study *(MI2008;* Martínez et al 2009*)*
	Kudaro Cave, Azerbaijan Kudaro III Level 8a: (TL) 560±112 ka Layer 5 (TL) 252±51 and 245±49 *(PM1998)* Kudaro I Layer 5c lowermost Acheulian: Fauna: 250-300 ka (TL) 360±90 and 350±70 Layer 6 (below it, palaeomag. reversed; Galerian fauna, suggests earlier date) *(PM1998)*	Kudaro III Layers 6-8: Acheulian, bifaces and flake tools *(PM1998)* Bed 5: hearth (LV2000) Kudaro I, Upper Acheulian, core choppers, bifaces mostly of elongated shape, flake cleavers, high % retouch, sidescrapers *(PM1998)* clusters of charcoal (LV2000) Kudaro I and III: fishing (LV2000)	Fauna: KI(5c): 3 teeth, *Homo sp., Macaca sp., Steph. hundsheimensis, Cervus elaphus, Capreolus capreolus, Alces alces (?), Megaloceros, Bison, Soergelia, Rupicapra, Capra caucasica, Ovis cf. ammon; Ursus deningeri, Ursus thibetanus medit., Meles meles, Martes foina, Vormela, Mustela nivalis; Canis mosbachensis, Cuon sp., Vulpes vulpes (red fox), Panthera pardus, Panthera gomb., Lynx lynx, Felis silvestris (BG2002)*

	Stránská Skála, Brno, CZ, c. 600-700 ka *(VK1987)* contra, chert fragments show no clear workmanship (no bulbs, no ripples), geofacts *(RW1994)*	Mode I, 3 dozen chert artifacts *(VK1987)* (Natural and/or possibly incised object) elephant vertebrae with 2 converging u-shaped, perhaps natural, lines with a fan of 7 divergent rays of v-shaped, intentional grooves as well as pair of symmetrical, natural holes *(VK1987)* = ['Convergent Line Motif and 'Divergent Line Motif']; contra, natural, vascular grooves *(DF1998)*	

'Later Acheulian' (~200-650 ka) Interglacials: OIS 13 = ~470 ka OIS 11 = ~400 ka OIS 9 = ~300 ka OIS 7 = ~230 ka	General technology: (Africa, SW Asia, Europe): bifaces more symmetrical and refined, cordiform, amygdaloid, ovate handaxes, some assemblages ovate dominates (ovates appear Olduvai FLK Masek and HK); greater use of soft hammer; increase use of Levallois technique, but some sites no Levallois; disappearance of core-choppers; often length of handaxes decreases; denticulates, notches, scrapers continue; few blades late contemporaneous with Final Acheulian; and during this time period prior technological modes may persist at some sites; (India): low % bifaces, high ratio cleavers to handaxes; high % flake tools; more refined and increased retouch and bifacial thinning/flaking; *Homo rhodesiensis/heidelbergensis*; late *Homo erectus*		
recent UK OIS site dating (WF2004; WM2000; AN1998; BD1989) Anglian Glacial OIS12: 478-423 ka *(BD1986)*	Boxgrove, UK OIS 13, c. 470 ka // Warren Hill, UK *(PM1998)*	Acheulian, rounded (or pointed) ovates and pointed cordiform (with cordiforms verging on ovates) *(PM1998)*; wooden spear; John Mitchell examined 40 ovate handaxes and all, except one which also displayed dry hide polish, had nothing but meat and bone polish suggesting 'butchery' *(PM1998: 286-7)*; ovate shape was probably selected to maximize circumferential cutting edge, which was well-designed for meatcutting as revealed by experimental studies *(WM1995)*	1 MNI, tibia, *Homo erectus/Heidelbergensis (PM1998)* Re handaxes one pattern is quite puzzling: at two kill sites—the Rhino Butchery Site and the Horse Butchery Site, handaxes were carried in or flaked on the spot but none abandoned on either site, but conversely, hundreds were found discarded at a spring in a still sharp, non-worn-out, pristine condition; microscope showed a very fine polish, which experiment indicated could be due to gently flowing water. "Whatever the reason for discarding the axes it had nothing to do with them being worn out. It looked as if they might have been used only once… and then forgotten." Roberts asks why, but comes up with no answer *(PM1998: 274, 287)*

	High Lodge, UK OIS 13, c. 470 ka *(AN1992)*	Acheulian,	
	Waverley Wood Farm, Warwickshire, UK OIS 13, c. 470 ka or older *(BS2003; SF1993)*	Acheulian, 4 handaxes, 3 of volcanic andesite, for which nearest outcrop Lake District and North Wales, possibly human transport or natural *(SF1989;* BS2003*)*	*Elaphas antiquus (SF1989)*
	Barnham, Suffolk, UK (geostratig. OIS 13, c. 470 ka *(BD1989; AN1994)*	Area I, 2500 artifacts; gravel cores worked by alternating platform technique; flakes, retouched flakes, called Clactonian (Paterson 1937; Wymer 1985); but 1 biface, Area IV manufacturing site, Area V, Acheulian, in same stratum *(AN1994)*	Fauna: riverine/marsh: salmon, eel, pike, perch, frog, toad; pond terrapin; pine vole, water vole, sparse large fauna: fallow deer (*Dama dama*), *Panthera leo*, *Ursus* sp., *Elaphas antiquus (AN1994)*
	Fordwich, UK OIS12-13? (Ashton 1992) *(WF2004)*	Abbevillian-style handaxes; statistical analysis of handaxe assemblage, mean thickness/breadth ratio of 0.69. Subsequent Later Acheulian handaxes at Swanscombe Middle Gravels have a ratio of 0.55; Baker's Farm, 0.58; Wolvercote, 0.56; Corfe Mullen, 0.42; and Oldbury Mousterian, 0.41 *(RD1981: 107)*	
	Fontana Ranunccio quarry, Anagni Basin, southern Italy (fauna) OIS11, ~400 ka (K/Ar) **458 ka** (Biddittu et al 1979) *(SN2009)*	Acheulian, flint, lava; flint scrapers and denticulates, 3 bifaces in flint and lava worked (mostly elephant) bone industry *(SN2009)*	4 teeth, intermediate between *Homo erectus* and *Homo neanderthal.* fauna: *Elaphus antiquus, Bos primigenius*, *Bison schoetensacki*, *Equus mosbachensis,* Steph. *hemitoechus, Hippo. amphibius, Sus scrofa ferus, Megaloceros solilhacus, Cervus elaphus, Dama clactoniana, Megaceroides verticornis, Castor fiber, Macaca sylvanus florentinus, Ursus deningeri, Cuon alpinus, Panthera leo spelaea,* bean goose, wigeon duck *(SN2009)*

	Cagny-la-Garenne, Somme River, France Garenne Form. (27-29 m) (ESR quartz) 400±100, 443±53 (ESR teeth) 448±68 ka, ave. **OIS12** (Bahain et al 2001, Laurent et al 1994) *(AP2004)*	Acheulian artifacts	
	Arago, Tautavel, southern France 'Caune de l'Arago' **450 ka** *(MA2009)* Lower Levels OIS 11, c. 400 ka Upper Levels OIS 9, ~300 ka *(DH1976)*	Lower: Micro-CCC or 'pebble tool tradition': bipolar technique, microlithic core and flake tools 1-3cm. in size, notches, denticulates, microlithic choppers and choppingtools; less frequent heavy-duty choppers, polyhedrons *(SJ1987)* // Bilzingsleben, Vértesszöllös) *(DH1976)* Upper: Acheulian, lanceolate, amygdaloid and oval [= all three divisions of the Bordes handaxe diagram] *(SJ1987)*	*Homo erectus/Heidelbergensis*
	Bultel and Tellier Pit, St. Acheul, Somme River, France Garenne Formation (V interglacial tufa at top of alluvial sequence) (malacofauna) **OIS11** (ESR quartz, strata below artifacts) **403±73 ka** Bahain et al 2001, Laurent et al 1994) *(AP2004)*	Levels H & K: Acheulian type-site (Commont 1909); numerous cores, hammers, tools of which 20% bifaces, including 'beautiful' lanceolates, some ovate limandes, a few with twisted edges, cordiforms and cleavers *(BF1968)*	

	Swanscombe, Barnfield Pit, Kent, UK Middle Gravels OIS 11, c. 400 ka *(WF2004, WM2000; AN1998; BD1989)* Lower Gravel: Clactonian	Lower Middle Gravel: Acheulian, 'pointed handaxe tradition' of primarily pointed cordiforms and subtriangulars with a few ficrons and rare ovates *(RD1981)*; At Swanscombe handaxes are the predominate tool form almost to the exclusion of anything else except a few flake tools; specialized flake tools are rare, but distinctive in being fashioned with same soft-hammer flaking as the finished handaxes (*WJ1982: 108)* Middle Gravels: handaxe with five-pointed sea urchin at its plan face center (//West Tofts handaxe with fossil shell;); [= 'Divergent Line Motif']; 2 pieces of chert containing Jurassic fossil coral in which the corallites are on average five-sided pentagons associated with handaxes. The chert pieces are manuports, the only known location for coral-bearing chert in Britain being 193 kilometers away *(OK1973; OK1981)*; these reflect the emergence of "art as human behaviour" and "higher thought" *(OK1981)* // Later Acheulian scraper with five-pointed echinoid cast, Saint-Just-des-Marais, France *(OK1973); [*one of the chert pieces I interpret as possible polymorph sculpture, representing perhaps hominid profile / head + Bos + Lion ? *(JBH, see originsnet.org)*	Fauna: *Trogontherium cuvieri, Dama dama clactoniana* (LAB), *Equus ferus; U. spelaeus* (LAB) *Oryctolagus cuniculus* (LAB), *Macaca sylvanus, S. kirchbergensis* (FAB), *S. hemitoechus* (FAB), *(SC2002); Bos primigenius*; *Panthera leo* (Stuart 1982) 3 cranial bones, occipital, 2 parietal, est. capacity ca. 1300 ml, *Homo erectus / Heidelbergensis* oldest such fossil with Neanderthal affinities *(SC1999)* Handaxes of nonutilitarian value: Hundreds and sometimes thousands of handaxes have been found at a single location, such as Swanscombe Middle Gravels, Furze Platt, Knowle Farm, Warren Hill, and Dunbridge in England; Kalambo Falls B5, Isimila, Olorgesailie, Olduvai HK, Melka Kontouré, Cape Hangklip and Doornlagte *(RD1981: 274)*. It is hard to reconcile this with the probably small hunter bands associated with these sites. It may be due to artifacts accumulating over many years at a favored spot, but this seems unlikely to account for all such concentrations *(WJ1982: 103)*.
	Swanscombe, Kent, UK Upper Loam OIS 11, c. 400 ka *(WM2000; AN1998; BD1989)*	Acheulian, 'ovate handaxe tradition' of predominately ovates (pointed or rounded, with twisted edges and *tranchet* finish), also some pointed cordiforms verging on ovates *(RD1981);*	

	Clacton-on-Sea, UK Clacton Channel deposits underlying Butlin's site (mollusks, ostracods; pollen; fauna) interglacial immediately following Anglian / Elster, **OIS 11, c. 400 ka** *(BD1999; SR1993)*	Clactonian type site, 'non-handaxe tradition' (continues into OIS 9), utilizes technique of striking a flint nodule against anvil to make broad flakes and using the flake scar for successive direct percussions to make various flake tools including scrapers, denticulates and bill-hooks, backed knives and becs as well as chopper and choppingtools made from flint nodules; spear, *(SR1993)*; 'bipolar percussion or CCC'; Clacton and Hoxne flake tools were used for butchery, woodworking, hide preparation, bone boring, and plant cutting; three Hoxne handaxes (an ovate, a cordiform verging on ovate, and a discoid) and one from South Woodford (an ovate) were used for meatcutting *(KL1980)*	Hoxnian fauna: deer (*Dama* sp.); aurochs (*Bos primigenius?*), horse? (*Equus* sp.); Bed 1: salmon (sea trout or char); Bed 2: smelt, eel, 3-spined stickleback; chub/dace, bleak, rudd, bream, roach, carp, vole *(BD1999)* Handaxes, flakes, worked flints interpreted as figurative, representations, categories identified: 'elephant', 'mammoth', 'rhino', 'bear', 'boar', 'bison/aurochs', 'ibex', 'seal', ''lion', various 'birds', 'parrot', 'owl', 'snake,' '*Homo* face/portrait', 'trekker, standing figure with backpack', 'mother and child', 'Venus', 'bear mother'; and polymorphic combinations: 'lion+2 eleph./mammoths', 'bison+boar+bird-+egg/sun' (*JvE*), geometric signs 'V' incised on 'bison/aurochs' and large intrusive 'V' flakes; 'owl' in wood *(collector, interpreter, Simon Parkes, personal communication 2005-2010)*

	Southfleet Road, Ebbsfleet, Kent, UK ~1 km from Swanscombe Barnfield Pit and adjacent Baker's Hole (fauna, mollusca, pollen, geostratig., prelim. AAR) **OIS 11, c. 400 ka** *(WF2006)*	Unit 1, 2 and 3: Clactonian, cores, flakes, notched flake-tools; Unit 3: ca. 100 lithic artifacts, mostly medium/large flakes, some notched, some with use-damage, (with refits), 6 cores, alongside and amongst bone scatter of elephant carcass; suggests "on-the-spot production of large sharp-edged flakes and simple flake tools for butchery of meat or other soft tissue from the carcass", no handaxes or handaxe débitage; thus typology indistinguishable form Clactonian horizons at Clacton, Barnfield Pit and Barnfield Area I; Trench D: 1500-2000 artifacts, with similar globular cores, large unworked flake-tools and simple notched flakes, and unidentifiable large bone pieces*;* Unit 5 overlying Units 1-3: 50 handaxes, pointed, thick,// Swanscombe Middle Gravel handaxes; 'but notably sparse débitage though sieved; reflects behavioral bias for discard in Southroad vicinity following manufacture elsewhere' *(WF2006)*	Riverine; Unit 1: large bovid (*Bos* or *Bison*); Unit 2 (herbaceous vegetation) fauna: 50% fish (pike, stickleback, perch or ruffe, carp, eel, etc.); but also cold adapted *Mammuthus* sp., ground squrrel *Spermophilos* sp., rabbit *Oryctolagus cuniculus,* a thermophile (also in Unit 3); *Panthera leo*; Unit 3 woodland with local open habitats): *Palaeoloxodon antiquus* butchery site, *Stephanorhinus hemitoechus* skull, jaw; *Castor fiber*, wild boar *Sus scrofa*, red deer *Cervus elaphus*; roe deer *Capreolous capreolus*; voles *(WF2006)*

	Hoxne, UK Upper, OIS 9, ~300 ka Lower, Stratum C, OIS 11 (Hoxnian) or 10, ~350-400 ka *(WF2004; WM2000; AN1998; BD1989)* Stratum C (U-series/ESR) Mean age **404-42/+33 ka** = OIS11, possibly at boundary OIS10 (GR2000)	Hoxne Upper, 'Middle' Acheulian, 'pointed handaxe tradition', 8 of 8 pointed cordates; Hoxne Lower, 'Middle' Acheulian, 'ovate tradition', of 12 bifaces 7 oval-formed (1 discoid, 4 ovates, 2 elongated, 1 limande, 1 naviform) and 3 pointed cordates *(SR1993);* hutfloors, stone spread over silt or clay to make a stable floor *(WJ1982; MD1999)*; closely packed clusters of bones, the largest of many hundreds of minute pieces of the broken skulls of deer, horse, and aurochs—"the three most important sources of food for the hunters"—indirect evidence for plaited baskets or bags, and these may have had function in "some form of ceremonial or magical rite" *(WJ1982:126)*;	Hoxnian fauna: *Dama* sp.; *Bos primigenius*, *Equus* sp. (Stuart 1982) Hoxne and Clacton flake tools were used for butchery, woodworking, hide preparation, bone boring, and plant cutting *(KL1980)* Huts apparently made from brush and/or hides with stones to support the base and poles to support the top *(WJ1982);* agreeing with Binford fire hearths are demonstrated, but material scatter patterns interpreted as tents or huts may be simply material tossed away from hearths and also any scatter patterns must rule out site disturbance *(GC1986)* [although contra Gamble it would not be likely that hominids living in cold Eurasian climates did not make hut and tent structures?]
	Beeches Pit, West Stow, Suffolk, UK (Hoxnian fauna, U-series >400 ka, TL burnt flint 414±30 ka, AAR) **OIS 11, ~400 ka** *(PR2006)*	Acheulian, flint, many refits; abundant charred material, many bones and flints burnt, indicating repeated occurrence of fire; discrete burnt areas of sediment appear to be hearths, fireside knapping *c*	Deciduous forest, fresh water springs, abundant good quality flint, rich supply of potential food, likely 'home-base' *(PR2006)*

	Elveden, UK Tilehurst, UK Bowman's Lodge, UK Round Green, UK Gaddesden Row, UK OIS 11, c. 400 ka *(WM2000; AN1998; BD1989)*	Acheulian, 'twisted ovate' tradition', // Swanscombe Upper Loam, (RD1981); Elveden, even has a 'twisted cordiform'; Round Green also with limande and ficron; Gaddesden Row, with more rounded ovates; Re-examination of 13 *Porosphaera globularis* fossil sponges with natural perforations proposed as 'beads' from 9 sites in UK and France, only a few provenanced and with microchipping around holes only on 1 specimen Biddenham, France and 2 from Bedford, but could be excavation damaged, excepting Bedford (W. Smith 1884: 375), states he found them personally and not damaged by workmen, so "may indeed be ancient (beads)" *(RS2009)*	1 handaxe from Bedford "which had the butt-end when first found wrapped round with herbaceous stems, probably rushes, as if for protection of the hand" (Keeley 1980: 164 citing W.G. Smith 1894: 222). The purpose of the stems is unknown. In the replication experiment in meatcutting at Boxgrove, the butcher who used ovates and said they were the perfect butchering tool did his work without any need for protecting his hand.
	Schöningen, Germany Schöningen II: Reinsdorf interglacial *(WM2000);* (fauna) OIS 11, c. 400 ka *(SC2002)*	Schöningen II: spears with perfect javelin shape	Fauna: *Trogontherium cuvieri, Equus ferus; U. spelaeus, S. kirchbergensis (SC2002)*
	Kärlich-Seeufer, Rhineland, Germany Unit G (geo- and biostratigraphy, normal polarity, Jaramillo, Ar/Ar **396±20 ka**) OIS9 or, likely **OIS11** *(GS1996)*	Acheulian, on site manufacture (refits), high degree of cortex, dorsal scars rarely exceed 3, 50 retouched artifacts (scrapers, bifacial cores, 3 bifaces, 4 cleavers), 60 unmodified flakes; mixed artifact and bone assemblage palimpsest, no cutmarks or fractures; *(GS1996)*	Rhine-Rhone W. European Rift System; Lacustrine, Fauna, dominated by *Palaeoloxodon antiquus; Sus scrofa, Rangifer* sp., *Cervus elaphus, Equus* sp., *Panthera leo* sp., *Bos* or *Bison (GS1996)*

	Bilzingsleben, Germany, Bilzingsleben II: (U-series, travertine; ESR, rhino tooth) OIS9 or 11 (Schwarcz et al 1988) (fauna) Bilzingsleben I: OIS11c Bilzingsleben II: **OIS11a [~400 ka]** *(SC2002)* OIS11 *(SC2002; MD1988; SL1999)*	Micro-CCC or 'pebble tool tradition': bipolar technique, microlithic core and flake tools 1-3cm. in size, notches, denticulates, microlithic choppers and choppingtools; less frequent heavy-duty choppers, polyhedrons *(SJ1987)*; flaked bone, including bone flaked like a cordiform handaxe verging on an ovate, 18.5 cm. long *(MD1999: fig. 8.3)*; spear; 3 circular hut structures, 3.5 m. dia., with fire places, stone paved area with bison skull (possibly 'dancing floor'), elephant skull anvils, anvil workshop areas *(MD1988);* Incised artifacts *(see next page)*	Fauna: *Trogontherium cuvieri, S. kirchbergensis, S. hemitoechus, U. spelaeus, Dama dama clactoniana; Macaca sylvanus*; *Equus ferus*; micromammals = OIS 11 // Swanscombe *(SC2002) Homo erectus / Heidelbergensis* Microlithic tool tradition at Bilzingsleben, Vértesszöllös and Arago not due to raw material constraints but represents positive selection, thus may infer transmission over generations of defined set of behavioral norms *(GI2009)*

	(continued) Bilzingsleben, Germany Bilzingsleben II: OIS11a, ~400 ka	#208.33 (= #1): one group of 7 incised parallel or sub-parallel stroke marks, a second group of 14 marks, and a missing third section (possibly a group of 7 marks, and if so reconstructed total of 28 marks *(MD1988)*; proved by laser scanning microscope *(SL1999)*; 'Divergent Line Motif (DLM)' and/or 'lunar count' *(JBH)*; #219.34 (= #2): flat rib bone, large mammal, incised with 7 stroke marks, parallel or sub-parallel *(MD1988)*; laser *(SL1999)*; 'Iterative Stroke Motif' *(JBH)*; #260.55 (= #3): one group of 5 or possibly 7 apparently convergent stroke marks, second group of three parallel stroke marks *(MD1988)*; laser *(SL1999)*; 1st group apparently up to over 20 stroke marks *(BR1995; BR1988)*; 'Convergent Line Motif (CLM)' *(JBH)*; #182.32 (= #4): 7 marks (1st and 7th more than twice as long as the others) and composed of two lines crossing at an acute angle *(MD1988)*; laser *(SL1999)*; 'Iterative Stroke Motif' *(JBH)*; (#5) ivory point, pair of parallel arcs, visual *(MD1988; BR1995)*; 'Arc Motif' *(JBH)*; (#6) elephant tarsal bone, incised with two nested rectangles, with stroke, V's incised between them; visual *(MD1988; BR1995)*; 'Shape/Lattice of Space Motif' *(JBH)*; (#7) quartzite slab, ('D-shape'), visual *(BR1995)*; 'Shape of Space Motif' *(JBH)*;	"these marks document a response to geometric aspects of the object" as they appear to mirror the overall shape of the artifact itself *(BR1988)*; Artifact #2, 5 of its lines are a 'radial motif' that has an invisible source point away from the artifact (also implying earliest evidence of 'straight edge' measuring) and the marks on bone are analyzable into three identical 'golden (Phi) ratio' (1.618) rectangles. Artifact #1 also appears constructed by 3 golden rectangles with 7 stroke marks in each. The two rectangles on Artifact #6 show the golden ratio. and this ratio also serves as a template for handaxe design, and this suggests that Phi "was not only a centralizing element in general Acheulian culture but due to its intrinsic analogical quality played a defining role in the actual development of human cognition" *(FJ2008)* Artifact #1 has a plan shape like an Acheulian pick which in the Later Acheulian context may be interpreted as a female symbol; groups of 7 marks also suggest possibly a lunar cycle count *(JBH)* For comprehensive, global review of Later Acheulian marking motifs and attempted decoding of differential features and semantics see *(HJ2007; HJ2004)*

	Boukoul, Netherlands OIS 11or 13, 400-500 ka other Boukoulian sites: Helden Meyel Roggel	Micro-CCC/Acheulian or 'Boukoulian' type site, primary technique L-shaped workbench anvil, also 'egg-in-cup' in anvil with direct percussion, abrasion against anvil, rare Clacton (not bipolar or buffer), microlithic core choppers and choppingtools, bifacial and unifacial cleavers and rare handaxes (of thick triangular, cordiform or ovate aspect), scrapers, borers, points and retouched flakes; flake tools 1-3cm. in size, 95% < 2cm., largest only 5 cm.; *(VEJ1989; DT1990)*; zoomorphic, anthropomorphic, geometric and polymorphic representational sculptures *(VEJ1989; DT1990);* but all CCC artifacts are pseudo (de Warrimont, J.P. 1990. *Archeologie in Limburg* 45)	Worked flints interpreted as figurative, representations, categories identified: 'elephant', 'mammoth', 'hippo', 'seal', 'bison', 'horse', 'deer', ('moose' or Megaloceros'), 'bear', 'hare', 'bird, flying bird', 'falcon', 'owl', 'lion', 'dog-like Canid' '*Homo* face/portrait', 'female' figures, 'skull', 'mask', 'one-eye open/one eye closed', polymorphic combinations, e.g.,: 'elephant+face', 'elephant/mammoth+female (vulva)+egg/sun with or without bird and w/without +lion', '3 elephants+2 lions (kill)+birthing+vulva', 'bear+lion', 'kissing couple' 'decorated biface (handaxe)' *(collector, interpreter, Jan van Es, personal communication 2009-2010)*
	Helden, Netherlands (higher level than Boukoulian at Boukoul) Iegelpoel, Netherlands n.d.	Micro-CCC/Acheulian, zoomorphic, anthropomorphic, geometric and polymorphic representational sculptures; *(MJE1981: fig. 8; MJE1980)*	
	Eygalières, Alpilles, Petite Crau, Provence, France n.d.	Micro-Acheulian, with some bifaces and choppers in the 1 cm. range—it might be called 'micro-micro-Acheulian' possible anthropomorphic sculptures *(MJE1981: fig. 8; MJE1980)*	

	Steinheim, Germany (fauna): Holsteinian OIS11 *(SC2002)*		Fauna: elephant *antiquus, S. kirchbergensis, S. hemitoechus, U. spelaeus, Equus ferus, M. giganteus,* water buffalo *Bubalus murrensi*s; OIS 11 *(SC2002)*; 1 MNI, Late *Heidelbergensis / pre-Neanderthal*
	Montmaurin, France 400 ka *(MA2009)*		*Homo erectus/Heidelbergensis* (Billy and Valois 1977) *(MA2009)*
	Azykh Cave, Azerbaijan (fauna // Bilzingsleben II, Torre in Pietra) *(BG2002)* thus OIS11	Layer 6: Old Acheulian Layer 5: Middle Acheulian, bifaces, flake cleavers, Levallois *(PM1998)* Layer 4: sterile Layer 3: Mousterian Layer 2: Neolithic Layer 1: Bronze Fire: ash in all 5 Acheulian levels (LV2000)	Layer 5: Mandible fragment, *Homo heidelbergensis;* Layer 5: Fauna: *Mammuthus trogontherii, Steph. kirchbergensis, Equus cf. mosbachensis, Equus hydruntinus, Bison schoetensacki Sus scrofa, Megaloceros, Dama mesopot., Saiga sp. Capra aegagrus, Felis chaus, Canis aureus (?)* (// Bilzingsleben II, Torre in Pietra) *(BG2002)*

	Ambrona, Spain Lower Member Complex: Levels AS1-AS6 (geostratig, fauna) OIS 12 = 470-430 ka (Howell et al 1995); (Th/U) >350 ka = OIS 11 (Perez-Gonzalez et al 1999) *(PJ2001; VP1990)* (ESR/U-series**) min. ~350 ka, end of OIS 11** *(FC2006)*	AS1: Acheulian, predominantly flake tools and core choppers, 16% bifaces (5 bifaces, 2 flake cleavers, 1 trihedral pick); large shelter, 8 x 4 m, internal hearth and workspaces; *(SM2001; FL1975);* red ochre *(RW1988)*; no bone tools, contra Freeman *(VP2005);* AS4: predominantly flakes, flake fragments, flake tools, cores, 1 biface, 0 cleaver *(SM2001)* AS3: elephant bone assemblage, subject to natural processes; not associated with stone artifacts; elephant cranium 567 undisputable cutmark; 3 femoral specimens and 2 distal shafts have spiral, V-shaped fractures diagnosed as man-made (for marrow); cutmarks only found on elephant bones, no other species; for other species, spiral breakage on 12 of 31 long bones or shaft fragments may indicate breakage for marrow; all other breaks post-depositional or indet.; AS4: 2? cutmarks on elephant bones, 1 cutmark on bovid rib 959; limited large mammal butchery, but no evidence either hunted or scavenged (contra Binford and Freedom, stones and fossils not associated) *(VP2005, VP1990)*	AS1-AS4 fauna: *Elaphas* (*Palaeoloxodon) antiquus* 28-38% all levels; *Bos primigenius*, rhino *S. hemitoechus; Equus caballus torralbae* (prior 4 confirm Mid-Pleistocene age) ;*Dama* cf. *dama* sp.; few remains of red deer *Cervus elaphus*; roe deer *Capreolus* sp.; *Oryctolagus* sp.*;* 1-3% *Canis lupus, Panthera* sp.; no hyena evidence (confirms not carnivore accumulation); an elephant natural burial ground *(SE2001)* Factor analysis of tool and faunal associations suggests that choppers, chopping tools, and scrapers were used for coarse butchery; utilized and unretouched flakes were used for fine slicing and disarticulation of joints; and perforators, notches and denticulates to break open and scrape out skulls. Large bifaces found did not have significant association with faunal remains, and by implication were not tools used for butchery and were clearly unnecessary for butchery tasks *(FL1978, 1975)*

	Aridos, Spain Aridos 1 Units B, C, and D = date for Aridos 2 *(YJ2010)* Aridos 2 (microfauna) OIS 9 or 11 *(SM2001b)*; (Arganda Fluvial Sequence Unit I) (AAR) 379±45 ka; (ESR) 384±77 ka average **380 ka = end of OIS11** *(YJ2010)*	Aridos 1: 331 stone artifacts, flint and quartzite, mostly flint flakes, natural or lightly retouched edges (incl. Levallois flakes), a few quartzite choppers, 3 percussors, 2 biface tips; 18% (high) refit rate, mint condition, refit links overlap bone distribution, fresh edges of artifacts prove site in primary context = single event of elephant butchery by small group of hominids (Santoja et al 1980); but no cutmarks *(YJ2010);* Aridos 2: 34 lithics, including 1 biface and 1 cleaver; Aridos 2 more disturbed than 1 *(SM2001b; VP2005;* VP1990*)*; SEM cutmarks on scapula and rib indicate bulk flesh and viscerae extraction; cutmark may evidence made by handaxe *(YJ2010)*	Aridos 1: *Elephas antiquus* in association with lithic artifacts; 2 MNI bovidae indet.; Aridos 2: *Elephas antiquus,* also in association with lithic artifacts *(SM2001b; VP1990; YJ2010)* 'Aridos 2 small tools do not exclusively represent resharpening of the bifaces, as Jones (1980) suggests, but were produced by independent strategies' *(VP1990)*

	Trinchera Galería, Cueva Mayor, Atapuerca, Spain Galería: Units 1-6: ~200 to slightly >350 ka Unit GII: (U/Th) **~350 ka** *(CE2003)* = OIS10 (fauna) *Canis lupus, Lynx pardina spelaea* = post-Cromerian (OIS12), but *Ursus spelaeus* limits age at least to Middle Pleistocene transition deningeri to spelaeus *(GN1998)*	Galería II-III: Acheulian, 1500 lithics; flint, quartzite, quartz, limestone; for most part similar to SH lithics, though larger flakes at upper levels; large tools 39% cleavers, 24% bifaces; also choppers, pics, large scrapers, denticulates GII: amygdaloid biface, 685g, 155mm long, finely flaked and retouched red-brown quartzite, possible "symbolic behavior', mortuary ritual offering *(CE2003)*	Galería: 7000 fossils macrofauna, including carnivores: *Cuon alpinus europaeus, Canis lupus, Vulpes vulpes, Panthera leo, Lynx pardina spelaea, Felis silvestris, Ursus spelaeus, Meles meles and Mustela* sp.; GII and GIII similar rodents, so time difference not great *(GN1998)*; 2 MNI *Homo erectus/Heidelbergensis (CE2003)*
	Pech de l'Azé II, France, Layer 9, OIS 9, ~300 ka	'Middle' Acheulian, handaxes and cleavers; hearths on areas paved with stone *(BF1972)*	
	Cagny-l' Épinette, Somme River, France Épinette Form. (20-21 m) (ESR quartz and teeth) 231±35, 291±44, 296±53, 318±48, **OIS 9**, ~300 ka (Bahain et al 2001, Laurent et al 1994) *(AP2004)*	Level II: Acheulian, 480 artifacts: 16 cores, 226 unretouched flakes; 51 tools and 24 tool fragments (scrapers, notches, denticulates, and UP types: burins, backed knives, 1 truncated faceted piece), 19 bifaces: lanceolates and amygdaloids with some cordiforms and limandes; possible living floor (Tuffreau et al 1995, 1988, 1986), not a living floor *(DH1997);*	'retouched gelifract' *(DH1997: fig 3a)* [*JBH:* possible polymorph sculpture, face, etc.?]

	Port-Launay en Ecouflant, Maine-et-Loire, France OIS 9, ~300 ka	Acheulian Bone incised with pairs of stroke marks (visual inspection) *(DH1976)*	
	Terra Amata, near Nice, France C1a Beach site (geology) OIS 11 (de Lumley 1976); (TL burnt flint) 214 and 244 ka (Wintle & Aitken 1977) ESR 380±80 ka (Falguères et al 1991) C1b Dune site (later) C1 (fauna) **OIS 9, ~300 ka** *(VP2001)*	'Clactonian-like' flake tool industry with Tayac and Quinson points; stones interpreted as hutfloors or windbreaks for 20-30 people *(DH1979; DH1975; DH1966);* or mixed assemblages of different time periods (Villa 1983); 75 bits of colored pigment, yellow, brown, red, purple, most with traces of artificial abrasion, manuported into site *(BP1997)*	CI fauna: *Elephas antiquus, Bos primigenius, Hemitragus bonali, Sus scrofa, Cervus elaphus, Stephanorhinus hemitoechus, Ursus* sp., *Oryctolagus cuniculus* (Mourer-Chauviré & Renault-Miskovsky 1980; Serre 1991; El Guennouni 2001) // Orgnac 3 OIS 9 *(VP2001)*
	La Polledrara, Campagna Romana, Italy OIS 9, ~300 ka *(AA2001)*	Lithic industry, 8 artifacts, including scrapers and denticulates, made from small siliceous pebbles, in association with faunal bones; tools made from fragments of long bones of elephant *(AA2001)*	>9000 remains, predominantly *Elaphas antiquus, Bos primigenius, 1 Canis lupus (AA2001); (JBH:* fig. 1 bone fragment tool has possible figuration 'elephant'?)

	Wolvercote, UK OIS 9, ~300 ka *(WF2004; WM2000; AN1998; BD1989)*	'Middle' Acheulian, 'plano-convex handaxe tradition', pointed cordiforms and pointed ovates *(RD1981);* finely made large plano-convex handaxes, likely nonutilitarian *(WJ1982: 103)*;	[interpreted as 'decorated biface' with two portraits on L and R bottom ?*(JBH)*
	Furze Platt, UK Baker's Farm, UK Cuxton, UK Stoke Newington. UK Lynch Hill basal gravel: OIS 8-10 or 9, ~300 ka *(WF2004; WM2000; AN1998; BD1989)*	'Middle' Acheulian, 'cleaver tradition', primarily pointed cordiforms (with ficrons verging on lanceolate shapes) cleavers and a few ovates, rounded or pointed; // Saint-Acheul *(RD1981);* giant handaxe, 7.5 lbs, likely nonutilitarian *(WJ1982: 103)*	
	Shrub Hill, UK OIS 9, ~300 ka	giant handaxe, length 29cm (12 in.), likely nonutilitarian *(WJ1982: 103)*	

	Ohle Pit, Groß Pampau, suburb of Hamburg, Germany, (geostratig.) artifacts dredged from Elster / Mindel moraine strata, which remained 'open' during interglacials, Holsteinian/Hoxnian OIS11 (~400 ka), OIS9, and OIS7 prior to arrival of Saale III (H-J. Lierl 1985); the moraine itself likely consists of some artifacts from the Cromerian OIS13, ~470 ka or older; most dating to Holsteinian; a few artifacts evidencing reworking perhaps dating to Holsteinian or later interglacials; collection may contain some younger material eroding during dredging *(BU personal communication)*; thus min. OIS7 ~230 ka to max. OIS13 ~470 ka (fauna) *Macaca sylvanus* not extant after OIS9 *(SC2002)* hence, artifacts appear to be predominantly OIS 9, ~300 ka to Holsteinian/Hoxnian OIS11, ~400 ka *[JBH]*	Mixed tool industries, CCC, Acheulian, micro, regular and macro sizes; some handaxes of heavy Abbevillian- Fordwich (ca. OIS12-13) type; flint, chert, quartzite, limestone granite, quartz, etc.; stone artifacts appear to be zoomorphic, anthropomorphic, geometric and polymorphic representational sculptures; *(BU1990);* marking motifs: 3 stones, each with crosshatch (net) pattern *(VEJ2001)*	*(BU1990: 27)* identifies categories of depictions; which are similar to those of Hamburg-Wittenbergen (see below) with addition of following motifs: Zoomorph: Elephant & mammoth Hippopotamus Deer Horse Birds: owl; waterbirds, frequently preening or head bent back tucked under feathers; birds of prey, pelican Primates: *Macaca* but also Baboon Fish Land and water turtles Anthropomorph: Female figurines—rare, e.g., mother and child Polymorph: Man+woman; animal+human; animal+animal, e.g. horsehead+bison Geometrics: tetrahedron, hexagon, disc, cone; Figures may be naturalistic, stylized, or abstract; microlithic, small or large forms in same standardized shape; made to stand without support, be held in the hand, or pendant *(BU1990);* *For up-to-date art inventory, see http://www.schafftwissen.de/*

	Jabeek, Netherlands c. 200-500 ka // Bilzingsleben, Vértesszöllös, Arago, possibly OIS9-11 *(PH1988)* type site, also at: Ede II Banholt Neer Latham Terlinden Bemelen Drouwen Heerlen	'Chopper-Choppingtool Complex (CCC)' or 'Jabeekian'; bipolar (contracoup), buffer (breaking tabular stone), double ('sprung') buffer, etc. techniques; great variety of tool types: core chopper, chopping tool, denticulate, notch, billhook, burin, bec, Tayac point, scraper; crescents, disks, triangles and rhomboid, rhomboid anvil; 'protobiface' including flake cleaver, handaxe and trihedral pick' // Vértesszöllös, Bilzingsleben, Arago *(WA1981)*; but all CCC artifacts are pseudo (de Warrimont, J.P. 1990. *Archeologie in Limburg* 45)	
	Beegden and Asselt, Netherlands ~400,000 BP (VEJ2001)	*CCC, zoomorphic, anthropomorphic, geometric and polymorphic representational sculptures; marking motifs: crosshatch* (VEJ2001);	Worked flints interpreted as figurative, representations, categories identified: 'elephant', 'mammoth', 'bear', 'boar', 'horse' 'saiga antelope', 'roe deer', 'ibex', 'chamois', 'moose', 'fish', 'red deer', 'megaloceros', 'bird'; 'lion', 'wolf'; '*Homo* face/portrait', polymorphic combinations: 'elephant+face', 'elephant/mammoth+female (vulva)+egg/sun with or without bird and w/without +lion', 'boar+lion', 'lion+man', '3 elephants+saiga'; 'decorated biface (handaxe)' *(collector, interpreter, Jan van Es, personal communication 2009-2010)*
	St. Martin-de-Crau, Bouches-du-Rhone, France n.d.	CCC, pebble tools, 1.5-6cm size, average 3cm *(MJ1981)*	

	Rue de Cagny, Somme River, France 'Atelier Commont' OIS 8, ~250 ka (Antoine 1990) *(GC1999)*	Rue de Cagny: Acheulian, 271 of 300 handaxes are limandes, often with twisted edges; rare Levallois *(BF1968)*	
	Maastricht-Bélvèdere, River Maas, Netherlands 3rd Lowest Terrace (Quarry) Site C: OIS 7 or 9 *(WM2000)*	Site C: Acheulian, with Levallois *(WM2000)*; 14 concentrates of red pigment, probable red ochre (C. Arp, x-ray diffraction) *(RW1988);* Site K: possible red ochre (De Loecker 2006)*;* re-analysis of both specimens pending *(RW student thesis due 2011, online)*	

	UK general	'Upper' Acheulian, Levallois prepared core technique appears in Acheulian assemblages in late OIS 8 to early OIS 7 *(RD1981);*	OIS 7 = Stanton Harcourt fauna: mammoth *(BC1996)*
	Cuxton, Kent, UK Medway Valley fluvial sediments (OSL-SAR protocol) X2561 232.64±13.75 ka X2563 197.54±17.09 ka **c. 230 ka = OIS7** *(SJ2009; WF2009; WF2004)*	Rectory: 'Upper' Acheulian, 200+ handaxes, predominantly pointed, including several ficrons, 11 cleavers, 50+ flake tools, dominated by scrapers (Tester 1965); Rochester Road Lower: flakes, cores, flake tools; Rochester Road Upper: mostly handaxes, fewer cores and flake tools; similar to Rectory assemblage (Cruse et al 1987); giant ficron, 307mm (2nd longest in UK after Furze Platt), 1418g, 'exquisite workmanship' "almost flamboyant", 2 tranchet blows make point edge, and giant cleaver, 179 mm long, 134 mm wide, transverse cutting blade, 110 mm, both tranchet blow, cleaver edge by 2 "immaculate opposing tranchet blows, one from each edge", "workmanship is again extraordinary", no step fractures, cross-sections perfectly symmetrical; 1210g, like the ficron, "too large and heavy for this modern human to wield" *(WF2004)*	"The greatly contrasting shapes of the two handaxes are so far removed from application of a generalized bifacial construct that it is hard to view them… as accidental. They show specific technical and shaping traits that can only be explained by the prior intentions of the knapper to create the form we find today as a finished form Above all, the use of diverse approaches to tranchet-sharpening in each of these contrasting types of handaxe is inconceivable other than as a finishing touch to deliberately create a much sharper cutting edge than would result from continuing the more natural bifacial knapping pattern orthogonal to the central axis of each tool" *(WF2004: 17)*

	West Tofts, Norfolk, UK dating not secure, perhaps OIS7	Acheulian, handaxe with fossil scallop shell at its plan face center (//Swanscombe handaxe with sea urchin); these reflect the emergence of "art as human behaviour" and "higher thought" *(OK1973; OK1981)* fan-shaped shell shows remarkable degree of centering in biface; fact that the fossil bivalve is itself a creature of bilateral symmetry suggests it was intentionally used as "an iconic image framed by a human being" *(FJ1998; 2006)* = 'Divergent Line Motif'	
	Pontnewydd Cave, Wales, UK (U-series ,TL, biostratig.), **OIS 7**, 195-251 ka, but maybe younger wash material Mousterian of Acheulian Tradition *(PP2002/1)*		*Homo archaic* with *Neanderthal*-like features, MNI 5, max 15, mostly teeth, maxilla and mandible fragments, males under age 20; or child, 8 years, and near-adult or young adult *(GH1981);* likely mortuary cave deposition (caching) (Aldhouse-Green 2001 in *PP2002/1*) *[JBH – consensus? = cave deposition/caching?]*

	Hamburg-Wittenbergen, Germany Treene interglacial, (geostratigraphy) **OIS 7, ~230 ka** *(MW1963, 1964, 1964/1965, 1966, 1969, 1970)*	Non-handaxe industry described as 'Clacton-like', also called 'Heidelbergian'; [or 'CCC / Jabeekian']; some stone artifacts appear to be zoomorphic, anthropomorphic, geometric (crescent, disks, triangles, rhomboids) and polymorphic representational sculptures; *(MW1963, 1964, 1964/1965, 1966, 1969, 1970)*	(MW1969; MW1964/65; MW1964) photographs show following categories of motifs and species (numbers are rough count of distinct sculpture photos in these articles) Zoomorph: Bear – 8 Feline – 3 Bison or Calf – 2 Rhino – 1 Birds (perching, sitting, flying) – 6 Species indet. -3 Anthropomorph: Human head / profile / skull – 10 Mask: One-eye-open / one-eye-closed or one-eyed – 6 Face, two–eyes – 1 Grotesque masks – 1 Animal mask, species indet. – 1 Polymorph ('combi') combining motifs above: 1 female/male portrait head; 1 feline/human face or mask; Geometrics, often symmetric, e.g, crescent, disc, triangle, rhomboid, etc. (mentioned only) *(MW1964/65: 7)*
	Weimar-Ehringsdorf, River Ilm, Thüringia, Germany Lower Travertine (F) (U-series) 225±28 ka (Blackwell & Schwarcz 1985) (fauna) OIS7 *(SC2002)* Upper Travertine (fauna) late OIS7 *(SC2002);* but both W-E and Taubach Eemian (Speleers 2000) *(WM2000)*		Fauna: LT: *P. antiquus, S. kirchbergensis* UT: *M. primigenius, S. hemitoechus, Coelodonta antiquitatis* = late OIS7 *(SC2002)* LT-Unit F: *Homo erectus/Heidelbergensis* (McCurdy 1915) *(MA2009)*

OIS 7 ~230 ka OIS 6 ~130-186 ka	Repolusthöle, Styria, n. of Peggau, Austria Layer gray sands, above culture layer: OIS 6-7 ~ >130 (Tyrberg 2008) Layer rust sediments: fauna, lithics) **~200-220** ka [**OIS7**] (Fuchs et al 1999; Fladerer & Fuchs online 2010) Layer basal, loam and clay (Th/U) 230+13=12 (Fürnholzer 1997) *(DD2008)*	2,000 artifacts (Mottl 1951; Fuchs & Ringer 1996) Upper layers: Late MP // Taubachian (find level not in review) 1 long bone fragment with perforation near edge; and 1 perforated wolf incisor, which might have been used as bead for pendant or necklace, and also may have had a symbolic value (Mottl 1951) *(BR1997; BR 2000);* But incisor has yet to be examined *(DF1997)*	flora and fauna interglacial: Lower rust-colored phosphate-rich sediment: *Elephantidae* indet., *S. scrofa, Cervus elaphus, Megaloceros giganteus, C. capreolus, Rangifer tarandus, Bison priscus, R. rupicapra, C. ibex, Lepus* sp., *M. martes, M. meles, Mustela nivalis, Putorius* sp., *Marmota marmota, Hystrix* cf. *vinogradovi, Ursus deningeri, U. arctos, Felix silvestris*, *Lynx lynx, P. pardus, Panthera leo spelaea, C. lupus, Canis mosbachensis, V. vulpes, Cuon alpinus* sp. (Rabeder and Temmel, 1997) *(DD2008)*; *Aegypius monachus; Aquila* sp., *Tetrao tetrix* (Tyrberg 2008);
	Pech de l'Azé II, France, Layer 8, OIS 8, ~250 ka	'Upper' Acheulian, lanceolate and amygdaloid; hearths on areas paved with stone *(BF1972)*	
	Orgnac III, France OIS 7, ~230 ka	'Upper' Acheulian, amygdaloid bifaces and cleavers; hearths on areas paved with stone *(WJ1982)*	
	Le Lazaret Cave, Nice, France OIS 7, ~230 ka	'Upper' Acheulian, predominantly lanceolate; hutfloor, 11x3.5 m., 2 hearths and workspaces with areas of possible bedding material consisting of seaweed and pelts of wolf, lynx, fox, and panther *(WJ1982)*	

	Ede II, Lunteran-Goudsberg, Netherlands prior to Riss III or Treene Interglacial or older, thus ≥ OIS 7, ~230 ka; comparable to industry at Hamburg-Wittenbergen of similar dating *(PH1988)*	'Heidelbergian facies of CCC', bipolar and buffer techniques; primarily core tools with some flake tools, few protobifaces and true bifaces (including a thick pentagonal 'grand biface' 19.3 cm, possibly a 'female figurine'), also microlithic tools; flake cleaver, trihedral pick, core choppers, some microchoppers, rhomboid, Tayac point, billhooks, notch, denticulate, and bec; colored pigment (red and yellow ochre, manganese, and white chalk or kaolin) on some plaques and anvils *(FC1983, FC1980)*	

	Torralba, Spain (fauna; geologic or radiometric dating not possible) c. 250 BP = OIS 7-9 *(PJ2001)*	'Upper' Acheulian, // Ambrona, predominantly flake tools (notches, denticulates, scrapers), cores, choppers, some bifaces mostly cleavers, handaxes are thick lanceolates, small ovates, small picks, and chisel-ended cordiforms, 'cleavers and cordiforms suggesting African influence'; wood artifact, interpreted as pine wood spear tip *(SM2001a; FL1975);* bone tools, likely *(VP2005)*	Elephant *(VP1990)* Factor analysis of tool and faunal associations suggests that choppers, chopping tools, and scrapers were used for coarse butchery; utilized and unretouched flakes were used for fine slicing and disarticulation of joints; and perforators, notches and denticulates to break open and scrape out skulls. Large bifaces found did not have significant association with faunal remains, and by implication were not tools used for butchery and were clearly unnecessary for butchery tasks; similar for Ambrona *(FL1978, 1975)*. But Torralba site is disturbed and its archaeology too problematic to draw any conclusions about tool and faunal associations *(VP1990)*
	Vértesszöllös, Hungary dating ambiguous: Th/U and faunal c. 400,000 BP, but U-series c. 185-225,000BP; OIS 7 *(VL1965)*	Micro-CCC or 'pebble tool tradition': bipolar technique, microlithic core and flake tools 1-3cm. in size, notches, denticulates, microlithic choppers and choppingtools; less frequent heavy-duty choppers, polyhedrons *(SJ1987; VL1965)*; hearth; some artifacts interpreted as zoomorphic, anthropomorphic, representational sculptures *(DT1990)*	2 MNI, V2 'Samu man', adult occipital, late *Homo erectus/Heidelbergensis*; V1 2 teeth, child, ~age 7; bison, rhinoceros, smaller mammals *(VL1965)* Occipital shows artificial modification, hence disarticulation, defleshing *(UH1995; UH1979b)* *[JBH – consensus? = defleshing but not cannibalism?]*

	La Grotte de l'Observatoire, Monaco Rissian [OIS6-8] *(DH1976)*	Flint biface, with tree-like natural marks, vertical with cross lines, centered *(DH1976)*; visual inspection shows natural inclusion eroded away *(R. Bednarik personal communication);* 'Lattice Motif' (JBH)	
	La Baume Bonne Rissian, OIS 6, 8 or 10. C. 150-350 ka La Grotte d'Aldène	CCC/Acheulian, 'Tayacian'; large % scrapers, many Tayac and Quinson points, notches, core-choppers, rare but beautifully worked handaxes; stone floor of packed pebbles *(DH1976)*; La Grotte d'Aldène, stone floor of flat slabs *(DH1976)*;	
	Grotte de Sainte-Anne 1, Polignac, Haute-Loire, France Level J1: OIS 6	Acheulian, basalt, phonolite, flint, quartz; not tephrafacts (Raynal, Magoga & Bindon 1995); J2: incised (horse?) bone, 11 subparallel stroke marks of variable length, probably defleshing marks *(RJ1986)*	Wolf, fox, brown bear, dear, *Megaceros*, reindeer, ibex, bison, aurochs, horse *(RJ1986)*
	Dastadem-3, Armenia No date, LA by tool typology *(KE2009)*	2,464 Late Acheulian artifacts, mostly hyalo-dacite; 81 cores, 262 tools, including 49 handaxes, 8 Levallois points, 21 scrapers, 13 endscrapers, 52 backed knives, 66 beak-like pieces, 17 notched pieces *(KE2009)*	No organic remains

Final Acheulian (~150-300 ka) Interglacials: OIS 5 = ~120 ka	General technology (Africa/SW Asia): multiple reduction strategies, Acheulian bifaces, sometimes made on Levallois flakes, Levallois and disc cores; variable presence of handaxes, cleavers as well as points, blades; termed 'Final Acheulian' or 'Intermediate' with regional variants; blades in African Kapthurin and Fauresmith and Levantine Mugharan Tradition; *archaic Homo sapiens* or *erectus* transitional to *H. sapiens*		
	UK OIS 5 and thereafter	Mousterian of Acheulian Tradition, predominates with distinctive '*bout coupé*' handaxes *(RD1981);*	
	Lehringen, Germany 120,000 BP	Spear;	
	Cys-la-Commune, Aisne, France ~ OIS5e	Final Acheulian, Finely flaked handaxe with reddish mineral inclusion at top and center of gravity, interpreted as 'decorated handaxe', indicating 'head/face' and 'womb' of 'female birthgiver' *(collection J. Harrod courtesy Jan Evert Musch)*	

Early Middle Paleolithic (Africa ~150 to 300 ka)	General technology (Africa /Southwest Asia): elongated or large, relatively thick, blades and point blanks flaked from radial, single or opposed platform cores, recurrent and some or no Levallois, with minimal preparation of striking platform; elongated blanks, retouched points, prismatic blades, endscrapers, burins; no backed microliths; evidence of hafting points and blades (tangs, grooves, mastic); use of color pigments; *archaic Homo sapiens/Homo helmei*		
OIS 7 ~230 ka OIS 6 ~130-186 ka	La Cotte de Saint-Brelade, Jersey Basal occupation: OIS8 or even late 9 Lower (layers D-A and 3-6): (layers D-C, OX-TL222 TL on burned flints) **238±35** ka = OIS7, occupation until c. 190 ka Upper: OIS5e *(CP1988)*	Lower: MP Mousterian, Levallois technique, flakes, rare handaxes; fire; large pile of mammoth and of rhino bones, cutmarked, 'deliberate arrangement' *(CP1988)*; evidence of game drives off cliffs (Scott 1980)	Lower (layers D-6): *Mammuthus primigenius, Coelodonta antiquitatis* (woolly rhino); Lower (layers C-A): reindeer *(CP1988);* 2 MNI *Homo neanderthalis (CP1988)*
	Bečov, Czech Republic Bečov I PK IV/layer A-III-6 t: OIS 7a-c interglacial, **~200-220 ka** PK III: artifacts, OIS 5 artifacts OIS4 PK I-II: Settlement features: OIS2 and OIS3 *(SF2008)*	PK IV: 50,000 pieces, Early Mousterian or proto-Charentian, amorphous cores, flake cores, flakes; Quinson, Tayac points, notches, awls, choppers, few burins, few blades; low % Levallois; hut settlement features; • 4 polished quartzite tablets / anvils, one over 0.5 m, which served as pallets for mixing pigments, along with large quantities of porcellanite in diverse shades (yellow, orange, red), with traces of heat treatment (to soften the stone), replication experiments indicate purposeful grinding for pigments; (Fridrich 1976) *(SF2008);* red ochre, use striations *(WE1985)*; striated on 2 faces, marks of abrasion, occupation floor stained with ochre in same area, flat rubbing stone *(AM1981)* • polished, round sandstone object (6.85x5.56x4.5cm), interpreted as human head with neck parts of shoulders (Fridrich 1976) *(SF2008);*	

	Petralona, Italy (ESR) 350-700 ka or 200 ka (1970's, 1980's); (ESR, U-series, speleothems bracketing cranium): **150-250 ka** *(GR1996)*		Hominid cranium
OIS 6 ~130-186 ka	l'Abri Suard, La Chaise-de-Vauthon, Charente, France Riss III, OIS 6 ~150,000 BP *(CH1996; CM1996)* (U/Th) entire sequence: 50-200 ka (Blackwell et al 1983) (U/Th) L53: 185±30 ka (Schwarcz & Debenath 1979) (TL) L51: 126±15 (Schvoerer et al 1979)	V: Denticulate Mousterian VIII: MTA Mousterian; 15 pieces of bone of horse and reindeer, incised with stroke marks, mostly parallel, some paired, some notching the bone (Debénath and Duport 1971 (*CM1996)*	1 mandible, several teeth, infant, *Neanderthalensis* (Genet-Varcin & Tillier 1980); fragment occipital, probably *Neand.* (Hublin 1980) S15: frontal, age 3-6, *Neanderthalensis*; possible pathology *(CH1996)*

MID-Middle Paleolithic (~60-150 ka)	General technology (African, SW Asia): continuation of Early MP/MSA production of blanks by multiple reduction methods (single, double, multiple platforms, radial disc cores, Kombewa), sometimes ovoid and large flakes, regional variants of specialized prepared core techniques (e.g., Levallois, Nubian) and specialized point, blade or scraper styles (e.g., African Nazlet Khater, Aterian, Pre-Aurignacian, North African Mousterian, Ethiopian MSA, Kenya Rift MSA, Mumba Industry, Final Lupemban, Katanda MSA, Bambatan, Pietersburg, MSA-IV, Howiesons Poort, Stillbay; Levantine Nahr Ibrahim, Denticulate or 'Typical' Mousterian, Mousterian of Acheulian Tradition, Tabun C); (Australia) horsehoof bipolar cores; and general increased frequency and variety of symbolic behavior, palaeoart, 'burials'; (Central Asia/Siberia): denticulates, scrapers, Levallois blade and other end products, subprismatic blades, crested blades, bladelets; *Homo sapiens sapiens*		
OIS 6 ~130-186 ka OIS 5e ~117-125 ka OIS 5d ~ 110-115 ka cold OIS 5c ~ 98-110 (Brørup) w OIS 5b ~ 90-98 c OIS 5a ~ 75-85 ka w OIS 4 ~ 59-74 ka OIS 3 ~ 24-58 ka	Krapina, Croatia Unit 8, Level 9 (youngest) 'Unit 9': (Th/U hominid tooth) 113±10 ka and (ESR) 87±7 ka Units 1-8 (similar) mean **130±10** (Rink et al 1995) *(DD2008)* Unit 1, Level 1 (oldest)	Secondary burial. Bone breakage due to rock fall and sediment pressure; some 'cutmarks' excavation damage; some long bones show carnivore gnawing; cutmark frequency and patterns like bones defleshed for secondary burial at Michigan Late Woodlands ossuary, but different from Mousterian Combe-Grenal butchery marks on reindeer *(RM1987a, 1987b)*; or only evidence for dismemberment of corpses *(CJ1991)*; or cannibalism, since ethnographic examples of defleshing mortuary rites take care not to break bones *(DD1993; WT2001, GA1997);* high number MNI suggests funerary caching *(PP2002);* however re-examination shows breakage due to sediment damage or rockfall, no evidence of human activity; some carnivore toothmarks; Cranium 3 shows possible cutmarks on frontal bone, which might indicate skinning, removal of scalp, or ritual activity, but position/size of marks fails to prove such activity *(OJ2009);* *[JBH – no consensus? Or possible defleshing, caching?]*	Unit 1, Level 1 and Unit 4, Levels 5-6 and Unit 6 Levels 7-8 and Unit 8, Level 9: MNI 20 *Neanderthal*; ~900 fragments, mostly teeth, skull fragments, hand bones, some with cutmarks; bones highly fragmented and disassociated; in one layer remains of hearth in which found human skulls, broken and burnt; long bones broken, possibly split; 'cannibalism evidenced by extremely fragmented, scattered among animal bones, cutmarked, and burned bones *(GD1906; UH1978)* 'Not cannibalism, fragmentation post-depositional; long bone splitting due to sediment pressure; no marrow extraction hammer blows; burning incidental; cutmarks not patterned like ethnographic animal butchery marks; however not rock fall damage, bones were rapidly buried, either by natural sediments or intentional burial' *(TE1985)*
	Saccopastore, near Rome, Italy most probably OIS5e ~120 ka *(BE2008)*		Saccopastore 1 cranium (found 1929), 'early' Neanderthal *(BE2008)*

OIS 5e ~117-125 ka OIS 5d ~ 110-115 ka cold OIS 5c ~ 98-110 (Brørup) w	Oldisleben 1, Germany **OIS5**, ~120 ka *(BR2006)*	Eastern Micoquian; • Incised bone #1: 2 sets (8 and 13) = 21 stroke marks, each set with parallel strokes; 'no reason to assume different tools used in any of the grooves; short subsidiary markings seem to indicate the maker hesitated or spaced the markings before choosing precise course of each groove; definitely not random lines lacking meaning or purpose'; • Incised bone # 2: 5 strokes join in 'arrow' shape, 2 vague curved lines and pit, might be 'head', but this is speculation; • Incised bone # 3: 8 grooves, with six re-inscribed with a second stroke; suggests drawn from left to right, top to bottom, in one sitting; 'not just a set of sub-parallel grooves, but each made carefully, deliberately and with an overall outcome in mind, with increasing confidence'; all three objects 'deliberately and purposefully 'decorated'; and #2, 'no question that such a deliberate construction had a symbolic meaning, that is stood for something other than itself'; this refutes the long-held view that iconicity is absent prior to the UP *(BR2006)*	

	Wallertheim, Wiesbach/Rhine Valley, Germany (TL, geo-and biostratig.) Levels A, B: **OIS5e** Level C: OIS5d Levels D, E, F: OIS5c *(AD2003)*	Levels A-F Middle Paleolithic, Level A: predominantly tuffaceous rhyolite, rare red rhyolite, quartz, quartzite, andesite, agate; refits; reduction not maximized, rare retouch, many unused blanks; hearth, burned bones (probably fallow deer); 7 large limestone blocks, manuports (<50m away), no residue or usewear, possibly anvils, or anchor weights for some sort of structure	Occupation: repeated seasonal use; LA: 282 bone specimens, 95 identifiable: MNI 4 *Bos aurochs/Bison*; MNI 5 fallow deer *Dama dama*; MNI 1 *Equus ferus*; MNI 1 *Cervus elaphus*, MNI 3 *Canis lupus*, MNI 1 *Castor fiber*; cutmarks and impact scars, bovid, fallow deer; LD: dominated by horse
	Bocksteinschmiede, Germany c. 110 ka	Micoquian, human-perforated wolf vertebrae and wolf metapodium plus naturally perforated bone fragments (Narr 1951; confirmed *AM1991*; but disputed *DF1997* as partially digested bones regurgitated by hyenas)	
	Le Grand Abri aux Puces, southern France OIS 5e ~117-127 ka	Mousterian, Abundant charcoals, twigs with pith and bark *(SL2010)*	
	Dartford, Kent, UK (OSL) **~110 ka**	MP tools (proves Neanderthals right after Eemian water levels lowered 115 ka, no delay to 60 ka) (Wenban-Smith 2010 *news*)	

OIS 5e ~117-125 ka OIS 5d ~ 110-115 ka cold OIS 5c ~ 98-110 (Brorup) w OIS 5b ~ 90-98 c	Moula-Guercy, France Level XV: **100-120 ka** *(DD1999)*	Ferrassie Mousterian *(DD1999)* *[JBH – consensus? = disarticulation, defleshing, cannibalism, fragmentation, discard?]*	MNI 6 *Neanderthal*; 78 fragments) bones highly fragmented, cutmarks, percussion, peeling, post-discard polish; no evidence of burning or roasting; 3 hearths, stone wall, tools on same level; human and animal bones cutmarked, disarticulated, discarded in similar way; percussion and breakage for marrow and brains, therefore cannibalism *(DD1999)*
	Prolom II, Crimea, Ukraine levels from 60 to 135 ka *(EJ2000)* 4 levels MP ~100 ka [5c] *(BR1995)*	Micoquian; 4 engraved bone objects: • Saiga phalange engraved with set of 7 'fan-like' Divergent radial stroke marks; • horse canine, polished, with 5 deeply engraved subparallel strokes from one end; • triangular bone fragment, with 2 strokes radiating from point; • fragment of bone with two parallel but not adjacent strokes *(SV1993) (BR1995)*; disputed: locations of stone tool cutmarks on bones suggest they are typical disarticulation cut marks *(EJ2000)*	Fauna: 3500 specimens by MNI: *Saiga tatarica, Equus hydruntinus, Equus latipes, Mammuthus primigenius, Ursus spelaea, Crocuta spelaea, Vulpes corsac*; lower % *Bison priscus, Rhinoceros antiquitatis*, *Cervus elaphus,* rare *Ovis, Megaceros, Sus scrofa, Lepus*, high % carnivores, esp. hyena suggests much of faunal material accumulated by them (also arctic fox, wolf); stone tool cutmarks on only 6 specimens of saiga; thus ephemeral butchering station; primarily carnivore den *(EJ2000*; contra *SV1993*)
	Tata, Hungary At first dated to Brørup by 14C and fauna; (U-series) 70±2 ka and 116±1.6 ka; probably Brorup or end of OIS 5 (Schwarcz & Skoflek 1982)*(MM2001)* [5a or 5c = 75-85 or 98-110 ka]	> 20,000 artifacts, Quina Mousterian; • 'cross' on both sides of circular silicified fossil nummulite disk, a natural crack crossed at right angle by engraved line (Vértes 1964) *(MA1991);* • beveled, polished and ochred mammoth molar 'plaque' (VL1964) confirmed (MA1976)	Open-air travertine site; Fauna, dominant young *Mammuthus primigenius;* also *Ursus arctos (MM2001; MM2000)*

OIS 5e ~117-125 ka OIS 5d ~ 110-115 ka cold OIS 5c ~ 98-110 (Brørup) w OIS 5b ~ 90-98 c OIS 5a ~ 75-85 ka w OIS 4 ~ 59-74 ka	Kůlna, Moravian Karst, Czech Republic 14 Layers Level 11a-d: MP (geo- and biostratig.) **OIS 5c ~ 98-110 ka** *(MM2001)* Levels 9-10: end Eemian	Level 11: > 10,000 artifacts, Taubachian: small pebbles, quartz, orthoquartzite, few silicites; microlithic, non-Levallois, unipolar, centripetal and crossed technique; sidescrapers, denticulates, notches, micro-choppers, retouched cores; bones show retouch (Valoch 1995, 1988, 1984); also cutmarks (Valoch 1988) // other Eemian sites Tata, Weimar, Taubach, Gánovce, Bojnice III, Ondrej-Skalka, Pontian; why this industry, not explained by environment, site location or raw materials *(MM2000)*; possibly faunal remains indicate scavenging, but hunting possible // young rhino prey with bison at Taubach and Gavnoce with *Elephas* and *Dicerhorhino (MM2001);*	Open-air travertine site; (typically associated with hot water springs); Level 11: temperate, forest and step fauna: *Equus taubachensis, Alces alces, Cervus elaphus*, *Bos, Coelodonta antiquitatis* (Zelinková 1998); why big animals, not fat need in temperate times, possibly carcasses found near water (Valoch) *(MM2000);* and *Rangifer tarandus, Elephas antiquus,Ursus spelaeus (MM2001)*
	Pech de l'Azé IV, France Layer 6AB, 5 AB 4 ABC 3 AB 2 IABC Layer 8: (TL) **99.9±5.4 ka OIS5c** Bedrock: *(DH2009)*	L8: Mousterian, Levallois; scrapers predominate retouched tools; complete reduction sequences; unambiguous use of fire/hearth, burned bones *(DH2009)* Over 9 MP archaeological horizons: 26 pieces of colorants mostly manganese dioxide (black), 15 clearly utilized, striations, polish, etc., some blocks of red and yellow ochre, but none bear clear traces of use; source local *(SM2007b)*	L8: predominantly MNI 7 *Cervus elaphus*, MNI 2 *Capreolus capreolus,* MNI 2 *Sus scrofa,* MNI 1 for *Equus ferus*, *Rangifer tarandus, Rhino* indet., *Castor fiber, Lepus* sp. and a medium-size raptor *(DH2009)*

OIS 5e ~117-125 ka OIS 5d ~ 110-115 ka cold OIS 5c ~ 98-110 (Brørup) w OIS 5b ~ 90-98 c OIS 5a ~ 75-85 ka w OIS 4 ~ 59-74 ka	Le Régourdou, Dordogne, France (fauna) temperate, either OIS 5e ~115-135 ka OIS 5c ~ 98-110 (Brørup) w or OIS 5a ~ 75-85 ka (*JJ2010)*	Quina and Ferrassie Mousterian 'burials' (IVA, IVB, IVC) *(BE1965; BE1965; VB1976a; WJ1992);* bear ceremonial rites and/or bear shamanism // Bruniquel *(BM1996; WJ1992);* no proof of inhumation; all features explainable as rock fall and transport down chimney due to slope movement, water and other sedimentation, hence not burials *(GRH1989)* the Neanderthal skeleton -- if found as displayed at Regourdou museum—has human humerus substituted with bear humerus and symmetrical shield-like stone object between its legs, apparently a cache deposition good, both suggesting possible role as bear shaman *(JBH personal observation 2001)*	Feature IVA: 1 MNI, *Neanderthal* adult male, almost complete skeleton beneath cairn of boulders on pavement of stones with bear humerus and flint tools (nucleus, scraper, flakes) and additional bear bones and a deer bone mixed in cairn with sand and ashes of a fire; 'burial' *(JJ2010)*; Feature IVB: separated from IVA by boulder wall, 'coffer' with bear bones with cutmarks; next to Feature IVC: complete skeleton of bear between stone blocks, a 'pierced stone' and covered by 850 kg stone slab, with bones disarticulated. Other bear bones in heaps elsewhere in cave. Also 20 bear skulls in rectangular pit lined with stones and red ocher, covered with stone slab *(BE1965; BE1965)* *[JBH – consensus? = some features, perhaps IVB and IVC due to rock fall, or IVB residue of bear hunting, but IVA and the pit of bear skulls appear due to human activity;* *IVA apparently a secondary deposition or burial of nearly intact skeleton]*
	Rece Cave, Bihor Mountains, w. Romania (14C on nearby bear skull) ~40 ka; but (U/Th on calcite encasing the 4 skulls) ca. 75-95 ka	• 4 skulls *Ursus spelaeus* back to back (apparently in 4 directions with one knocked out of place), encased in calcite; 'cult of bears' (Lascu 1999; *LC1996*) *(CM2010)*	

OIS 5a ~ 75-85 ka w OIS 4 ~ 59-74 ka OIS 3 ~ 24-58 ka	Combe-Grenal, Dordogne, France (ESR) **71-87 ka [OIS 5a]** Layer 50 (TL) **62±7 ka [OIS 4]**	Final Acheulian, 1 fossil *Rhynochonellidae teraebratulina* (exotic) (F. Bordes) *(CM2010)* Quina and Ferrassie Mousterian 1 fossil *Zeillerinae terebratulina* (exotic) (F. Bordes) *(CM2010)* Layer 50: Typical Mousterian	2 *Neanderthal*, 1 adult cranium and post-cranials; child, mandible, age 2, in shallow mound with stones placed over it (Bordes 1972 found 'empty funeral pit' in layer 50 Typical Mousterian; 'burial' *(VB1976a; WJ1992)*; cutmarks are present, hence defleshing *(LF1989); [JBH – consensus? defleshing and deposition in natural mound with stones over it?]*
	Roc de Marsal, Dordogne, France Early OIS 4 (precedes Quina sequence) **~70 ka** *(JJ2010)*	Typical Mousterian	Level prior to Quina sequence: 1 *Neanderthal* child, age 3, skeleton almost complete, shallow pit; 'burial' *(BF1962 HJ1976; WJ1992) (JJ2010)*; disputed - pit was depression filled with sediment breakdown; not a burial; hyena mandible in fill suggests level also hyena activity *(GR1989);* burial *(PP2002) [JBH – consensus burial?]*
	Kůlna, Moravian Karst, Czech Republic Level 9b: (ESR Bos and Equus teeth) **69±8 ka** (Rink et al 1996)**,** near OIS 5a/4 boundary Levels 6a, 7a-c: MP (ESR) 50±5 ka in agreement with uncalibr. 14C 45 ka and interstadial fauna) = **~45 ka** *(RW1996)* Levels: UP Magdalenian *(MM2000)*	Level 9b: Micoquian Level 6-7: Micoquian, 80% silicites (Valoch 1995)	Level 9b: *S. kirchbergensis*; *M. primigenius, Equus taubach,, B. primigenius, Bovidae, C. antiquitatis, C. elaphus, A. alces, Rangifer tarandus, Lepus sp., Aves, U. spelaeus, U. arctos (Ursus taubachensis), Panthera leo spelaea, C. lupus, Crocuta crocuta spelaea* (Valoch et al 1969) *(DD2008)* Level 6-7: *Homo neanderthalensis (RW1996);* many *Rangifer* bones *(MM2000)*

OIS 5a ~ 75-85 ka w OIS 4 ~ 59-74 ka OIS 3 ~ 24-58 ka	Cioarei-Borosteni Cave, Carpathian Mountains, Romania Level E 14C dates at limit of method, bio-stratigraphy **suggest > 80 ka (OIS5a)** (14C) LE: **51.9+5.3-3.2;** 50.9+4.4-2.8; >49; >47 ka LG: 49.5+3.2-1.1 ka LH: 48.0+1.8-1.5 ka LJ: 48.9+2.1-1.7; 43+1.3-1.1; >46 ka LL, LM, LN: 37.750±0,95 ka *(CM2002; CM2010)*	Levels E, F, G, H, J: Mousterian, 801 lithic artifacts; flake tools rare, mostly blanks, discoidal, pebbles; • 55 elements of ochre residues (red and yellow-red), majority in LE and LF; • Levels E and F: 8 'containers' (6 from level E) made of stalagmite fragments with hollows with traces of ochre and scraping marks (Carciumaru et al 1995); 'the lithic débitage does not suggest labor intensive tasks such as hide tanning, so some sort of ritual/artistic activity should be considered' *(CM2002)*; • 1 spherical fossil cast, with tiny pit (exotic) *(CM2010)*; LG: traces of fire; • 1 skull *Ursus spelaeus* framed by 3 Mousterian Typical characteristic tools: a superb quartzite point, a quartzite scraper, and a diorite nucleus; LH: • 2 skulls of *Ursus spelaeus* placed back to back, almost joined, oriented E-W, under a ledge; *(CM2010)*;	MP fauna: 85% bear remains, *Ursus arctos and Ursus spelaeus, Capreolus capreolus, Cervus elaphus, Bos primigenius, Capra ibex, Dicerorhinus kirchbergensis, Sus scrofa, Canis lupus, Vulpes vulpes* (Terzea 1987); a few bones of deer, boar and ibex bear cutmarks, and at level G Bos and Equus *(CM2002)*
	Grotte Bordul Mare de Ohaba Ponor, Romania ca. 37 to 45 ka	Mousterian, Fossil bivalve (exotic) *(CM2010)*	

	Grotta Guattari, Monte Circeo, Italy c. 50-100 ka		*Neanderthal*, cranium 1; crania 2 and 3 no hominid modification; 'cannibalism' *(BA1939);* carnivore damage; no cutmarks, scraping marks or other hominid modifications *(WT1991*); Hyena-den *(DF1991)*
	Chez Pourré-Chez Comte, Corrèze, France LI LII LIII a and b	Upper: Châtelperronian, LIII: Mousterian of Acheulian Tradition, flint and quartz; LII: quartz industry LI: Mousterian Charentian, flint and quartz; • manuported fossil bivalve *Glyptoactis Baluchicardia* sp. (exotics) • 4 pebbles, incised with stroke marks; Champlost area (1990): • 1 cortical flake incised with criss-crossing stroke marks *(LV1993; CM2010)* [almost like rectangle(s)]	

Late MP **(~30-60 ka)** **OIS 3 ~ 24-57/9 ka** OIS 2 ~ 10-24 ka	General technology: (African) continuous Levallois for production of blades as in UP and thin flakes, light-duty flake tools, or single, double platform or radial cores for flakes and blades; high % denticulates; notches, Tayac point, end- and sidescrapers; but no LSA geometrics; no backed pieces like Howiesons Poort and no bifacial points like Stillbay *(KR2004)*; (Levant Tabun B) return to triangular blanks removed from mainly unipolar convergent Levallois cores, broad-based Levallois points; short thin flakes and some blades; also radially prepared cores in upper contexts of Tabun B *(BO1995)*; (Sahul): waisted, grooved, ungrooved ground axes, ground edge tools; *Homo sapiens sapiens* and *Neanderthal*		
Europe Late MP (~40-60 ka)	Kiik-Koba, Crimea, Russia perhaps c. 60 ka (?)	Eastern Mousterian	2 *Neanderthal*, adult male and child, nearly complete skeletons (KK1, fibula, patella, tibia, hands, and feet), in shallow pits in bedrock; 'burial ' *(BG1940 MA1961; VE1973; WJ1992);* not graves, but solution cavities like others nearby, acting as sediment traps (GRH1989); burial? (SC1993); pit for adult 'artificially widened natural hollow' (Stepanchuk 1998 in *PP2002*); *[JBH – consensus? Burial?]*
	L'Hortus, France Würm II c. 60 ka	Typical Mousterian Possible cannibalism *(DH1976)* Deposition or cannibalism? *(WJ1992)* Cavern used by lynx, leopard and cave bear *(SC1993);* especially high no. MNI 20 suggests funerary caching *(PP2002);* *[JBH – consensus, deposition/caching?]*	Multiple levels: *Neanderthal*, MNI 20, max NI 36, most on one level, MNI 6, max 9; mostly maxilla, mandible and hand bone fragments, mostly young and elderly, human bones mixed with animal bones, long bones broken in similar manner; stone tools, hearth, indicating seasonal occupation

	Pech de l'Azé II, France Layer 2-4: 54-87 ka *(VH2003)*	Typical Mousterian,	
	Combe-Capelle Bas, France Levels I-1D, I-1E, I-2B: (TL burnt flints) 37 to 57 ka, with 6 of 7 flints: between 50-60 ka; **mean age 51.8±3.0 ka or first part of OIS3** *(VH2003)*	Typical Mousterian, rich in notches and denticulates; (contra Quina Mousterian of Mellars versus Peyrony & Bourgon, from Quina to Ferrassie Mousterian) *(VH2003)*	
	Starosele, Crimea MP: 40-80 ka (*HB2001)*	Micoquian, points hafted for projectile or thrusting use, high force impact striations, with starchy plant residue (probably due to binding or mastic) and feather (raptor); scrapers primarily used on starchy plant material, also hair and feather (waterfowl) residues; and broadly similar to tool functions at EUP site of Buran Kaya III (*HB2001)*	1 *Homo* child, 1-2 years old, skull and partial skeleton, 'burial with grave goods' 'and occupational debris' *(MA1961; WH1992),* probable *Neanderthal* (Marks, Demidenko et al 1997) or modern *Homo sapiens sapiens* (Tillier comment, *RSJ2001*); *[JBH – consensus? burial with grave goods?]*

	La Ferrassie, Dordogne, France (ESR bovid teeth) **55±2 ka to 61±5 ka** correlates well with late **OIS4** or earliest **OIS3** *(BB2007)* but *(JJ2010)* says the burials are at Levallois Mousterian level preceding Q-F M and thus OIS5	Quina and Ferrassie Mousterian; • 18 cupules on underside of a roughly triangular rock slab over burial F6, Neanderthal child; all except two cupules are arranged in pairs; all cupules of similar size, except of two unpaired, which are significantly larger; • engraved iterative long, parallel lines crossing stone from a burial of another child (Capitan & Peyrony 1921) *(MA1991: fig. 209)* Examination of cupules on stone slab over F6 burial indicates that they are intentionally human-made cupules (Lorblanchet 1999) <u>Interpretations</u>: F1 and F2, no evidence of 'burial' but intentionally placed; F3-6 in excavated pits (Capitan & Peyrony 1909; etc., 1934; *WJ1992; VB1967a; HJ1976)* Contra: F1 not 'tightly' flexed, preserved by location near back wall; F3 & F4 pits natural; F5's 'pit' likely slow natural burial in natural depression, while 'covering' mound and other 8 'empty' mounds natural permafrost feature; F6 natural depression with sediment, no proof of inhumation; artifacts due to natural sedimentation *(GRH1989);* no evidence of burial (Stringer 1993); the report says 'mixed' which means a new stratum (Bricker 1989). Contra Gargett, inhumations *(RSJ2001)*; Pro Gargett 'mounds' are dubious; F5 and F6 may be in natural depressions, but F1 and F2 not 'natural' and F3, F4, F4a in 'deliberately excavated'; pro and con fail to take into account inference of 'non-burial' mortuary caching *(PP2002/1)* [JBH – consensus? = FI, F2 and F5, F6 deposition (caching), possibly with grave goods (tools, blocks, cupule slab), though possibly some natural in-filling; F3, F4, F4a intentional pit and deposition?]	9 *Neanderthal*, 6 on one level. F1 Adult male, skeleton complete and F2 female, skeleton almost complete, found head to head on sediment near back wall; male with 3 scrapers over the body in same orientation, quartz hammerstone, 3 flat limestone blocks around (or over) head, both flexed; no evidence of scavengers. In two 'hemispheric dug pits of mixed soils', F4 humerus and femur of a fetus, F4a, neonate skeleton. F5 fetus, 7-8 months, under small mound of soil, with 2 fine scrapers and point. F6, age 3-5, in natural pit, skeleton complete except skull missing, partly covered by limestone slab with 18 cupules on side facing F6, 14 or 16 of which appear to be in pairs; 7 small mounds and 3 rectangular pits containing animal bones and worked flints. Lower Stratum, in small pit, 1 child, 1 newborn, and 2nd fetus. (Capitan & Peyrony 1909; 1912; etc., 1934)

	Temnata Cave, Bulgaria, TD-I, bed 6 (TL) **67±11 ka** TD-1, bed 4 (TL) **46±8 and 45±7** ka (AMS) 31.9±1.6, 38.2±1.5, 38.8±1.7, 38.3±1.8 CI ash fall layer **~40 ka** TD-1 Gravettian (no dates) TD-II, bed 6 probably **50**±3or4 ka TD-V Early Aurignacian (AMS) 33±0.9, 36.9±1.3, 39.1±1.8 ka CI ash fall layer **~40 ka** TD-V, Early Aurignacian *(FF2008)*	TD-1, bed 6: Mousterian TD-1, bed 4: Early Aurignacian CI ash fall layer TD-1, bed 3 Gravettian TD-II, bed 6: Mousterian, schist block incised with two rows of 21 parallel stroke marks per row, with end section possibly broken off *(CM1995)*; accepted (D'Errico and Villa 1997); TD-V, Mousterian TD-V, Early Aurignacian CI ash fall layer TD-V, Evolved Aurignacian *(FF2008)*	
	Bruniquel Cave, France >47.6 ka	13 x 16 foot stone container, with burnt bear humerus inside; possibly bear cults, sacrifices or ceremonials *(BM1996)*	
	Drachenloch Cave, Switzerland, ~49 ka	Mousterian tools, two hearths, stone cyst with 7 bear skulls and charcoal, 6 skulls in niche, long bone through bear skull lying on two long bones of two different bears, piles of sorted long bones along walls of cave, 'bear cult' (excavated 1917 to 1923 by Dr. Emil Bächler)	*Ursus spelaeus,* Not ritual behavior but result of geomorphological processes (Tillet); or cave bear natural deaths and trampling (Koby)
	Bear caves, possibly bear cults, sacrifices or ceremonials *(after WJ1992):* • Petershohle Cave, Bavaria, Germany, 10 bear skulls on a natural platform • Wldenmannlisloch, Germany, 310 canine teeth of bears • Les Furtins, France, 6 bear skulls on limestone slabs, 2 others nearby, bundle of long bones on a slab against the wall • Veternica, Yugoslavia, some bear bones in a crevice before blocking it with stones • Isturitz, France, regular alignments of bear bones • Many caves inhabited by hunters of Eastern Mousterian industry have very large numbers of bear bones		

	Salzgitter-Lebenstedt, Germany Unit 1 and 2: (biostratig.) either OIS5c ~100 ka or OIS 4 Oerel Interstadial 54-58 ka or Glinde Interstadial **48-51 ka;** Unit 1: (5 14C dates, lowest standard deviation) 48.70±0.26 ka Unit 2: (14C) 48.5±2 and 55.6±0.9 ka [but Unit 2 stratified above Unit 1]	Unit 2: MP Unit 1: MP N=28 bone tools [mostly pointed], including bone point, mammoth ribs and fibulae, raw material probably intentionally selected and working intentional *(SG1999)*	*Homo* sp. MNI 2, *Rangifer tarandus* MNI 86, *Mammuthus primigenius* MNI 17, *Equus* sp. MNI 8, *Bison priscus* MNI 3, *Coelodonta antiquitatis* MNI 1, *Canis lupus* MNI 1 *(SG1999)*
	Lurgrotte-Peggau, Styria, n. of Peggau, Austria Upper, cultural layers: (AMS the reindeer bone) **52.4±3.1/-2.2 ka** (1st stratified 14C date for prey species in eastern Alps) [**early OIS3**] (F. Fladerer in M. B. Hart 2000; Fladerer & Fuchs online 2010)	Upper: 17 quartz artifacts; 1 reindeer distal humerus 2 impact notches indicate cracking for marrow, evidence for at least one hunting episode (Fladerer & Fuchs online 2010); // Taubachian (Fuchs & Ringer 1996)	*Rangifer tarandus*
	Tunnelhöhle, Styria, n. of Peggau, Austria		
	Marillac, Charente, France Würm II, c. 50-70 ka	Mousterian, incised bone (Duport 1973) *(DF1997)*	*Neanderthal*, cranial and dental remains; scattered remains *(VB1976b; BC2002)* cutmarks, suggest defleshing or cannibalism *(LF1987; LF1988) [JBH – no consensus?]*

	Cueva de los Aviones, Cartagena, SE Spain Level VI: OIS3-OIS-4 Level IV (14C on shells) ~42.5 ka calibr. (problematic); Level II and III: **OIS3**; (14C) **~45-48 ka calibr.** (= cold Heinrich Event 5) *(ZJ2010)*	Abundant lithics, mostly quartz, suggesting flint non-local; Levallois method used to produce blanks in both materials; absence of flint cores and high sidescraper index suggests long-distance transport and curation of the finer raw-materials; LII: 'Perforated and pigment-stained marines shells; 3 umbo-perforated valves of *Acanthocardia* and *Glycymeris* were found alongside lumps of yellow and red colorants, and residues preserved inside a Spondylus shell consist of a red lepidocrocite base mixed with ground, dark red-to-black fragments of hematite and pyrite'; (+ white calcite; carbon black); density of shell finds similar to those at African MP/MSA sites with Nassarius beads *(ZJ2010)*	Abundant mammal bones, horse, red deer, ibex, rabbit, tortoise *(ZJ2010)* 'Comparable early modern human-associated material from Africa and the Near East is widely accepted as evidence for body ornamentation, implying behavioral modernity. The Iberian finds show that European Neanderthals were no different from coeval Africans in this regard, countering genetic/cognitive explanations for the emergence of symbolism and strengthening demographic/social ones' *(ZJ2010)*

OIS 5d ~ 110-115 ka cold OIS 5c ~ 98-110 (Brørup) w OIS 5b ~ 90-98 c OIS 5a ~ 75-85 ka w OIS 4 ~ 59-74 ka OIS 3 ~ 24-58 ka	La Chapelle-aux-Saints, Corrèze. France **47-56 ka**	Mousterian prior Q-F M (burial) *(JJ2010)* Quina-Ferrassie Mousterian 'burial' *(BA1909; HJ1976a; WJ1992);* problematic *(VB1976a);* natural depression acting as sediment trap *(GRH1989)* rectangular straight-walled flat-bottomed pit not natural, therefore burial *(FD1989);* concur *(PP2002)* *[JBH – consensus burial?]*	1 *Neanderthal*, adult male, skeleton almost complete, in a pit, with bovid metatarsals, phalanges, red ochre; jaw shows dental disease and arthritis and likely required special care *(BA1909; HJ1976a; WJ1992);*
	La Quina, Charente, France mid-OIS3, c. 45 ka *(PP2002);* Level aval.: (14C) calibr. 41.39-42.78 ka *(ZJ2005)*	Mousterian (prior to Q-F M): the *Neanderthal* 'burial' *(JJ2010)* Quina and Ferrassie Mousterian; large circular stone disk (Henri-Martin 1947; *MA1991);* partly-perforated fox canine (Martin 1907-1910, confirmed *MA1991*); 2 pieces of bone with parallel iterative lines and stroke marks (Henri-Martin 1910); 'non-symbolic, probably for leather thong making' *(MA1991);* Crémades 1996); human skull fragment scraped and utilized as retoucher (Verna & d'Errico 2009)	MNI 3 *Neanderthal*, Q5 adult female, partial skeleton, Q9 adult mandible, Q18 skull of child, age 6; MNI 22 *(PP2002)*; 'burial' *(MH1923; VB1976b; WJ1992; JJ2010);* Q5 not a burial, found in sandy clay fluvial environment *(GRH1989);* high MNI probably funerary caching *(PP2002)* *[JBH – consensus? Deposition/cache?]*
	Bacho-Kiro, Bulgaria, >43,000 BP	Mousterian (Bachokirian); 1 perforated wolf canine and 1 bear incisor (confirmed *AM1991;* 'earliest Europe 'beads' list (*VM2005)*; 'zigzag' (and/or multiple 'chevrons') on bone fragment (Marshack 1976, in Kozlowski et al 1982; Marshack 1982; Kozlowski 1992) *(CM1995)*	

	Warlingham, Surrey, North Downs, UK Sites: HW, Pit Dip, OSO, Gate Dip, Gate Corner; Pipe, Plateau, CCC; all near vista panorama to Thames (London): MTA, Mesolithic, Neolithic *(WR1987)* Sites: Hawk, Sline's Oak: Upper Paleolithic (dating not secure, surface sites; by tool typology and comparison to *(FD1990)* Slines Oaks and Worms Heath excavations just W and N of collected sites): MTA, Mesolithic, Neolithic; Typically MTA and its *bout coupe* handaxes are dated 35-60 ka [But Wenban-Smith 2010 – MP in Dartford, Kent as early as 110 ka]	Slines Oak and Worms Heath: 1500 objects, mostly Mesolithic or Neolithic flake and blade cores, flakes, blades and core tools *(FD1990)*; they illustrate some seventy core tools, primarily Mesolithic or Neolithic axes, adzes and preforms. They do acknowledge one biface (handaxe) (#75), "'a remnant of an earlier epoch' with no further elaboration. They seem to have overlooked among the core tools illustrated what appear to be a typical MTA *bout coup* biface (#16) and two other bifaces (#33, #54) *[JBH]*	Worked flints interpreted as figurative representations, categories identified: 'horsehead', 'bear' 'mammoth', 'flying bird' 'bison, 'vulva' 'Neanderthal head/portrait', 'portrait/head', 'female birth giver', 'female in triangular shape'; polymorphs: 'horse+ bear+female', 'female+skull+womb', 'pure geometric triangles', 'decorated handaxe', 'egg-cup anvil/biface', 'sliced pebble'; Hawk & Sline's Oak: (UP motifs): 'Venus' figurines, 'mammoth', 'flying bird', 'hawk', 'female with backpack/child', 'portrait/head', 'dog', 'hippo' or 'crocodile' *(WR1987) (collector, interpreter, Ron Williams, personal communication 2005-2010)*
	Molodova, Dniester Valley, Ukraine Molodova I: >44 ka Molodova V: **~43-45 ka** Molodova V (UP level) 28-29 ka	Typical Mousterian, Levallois or transitional to Levallois; points, side scrapers, retouched blades; hut of mammoth bones and wood, 15 internal hearths; carved wood and bone; • ochre at center of oval arrangement of mammoth bones;	

	Jonzac, Charente-Maritime, France ~40-55 ka *(RM2008)*	Mousterian of Acheulian Tradition *(RM2008)*	Neanderthal, (collagen) diet: main protein sources were large herbivores, particularly bovids and horses, with the hyena having different niche consuming mainly reindeer; this is first ever study of MTA Neanderthal diet *(RM2008)*
	Gorham's Cave, Vanguard Cave, Gibraltar VC Levels (14C) from OIS5-OIS3 Unit A **>41.8 ka** GC LIV (latest MP) (14C) 30-32 ka LIII: UP ~30 ka *(SC2008)*	Mousterian	VC: Marine fauna (monk seal, dolphin, fish, molluscs) exploited (cutmarks, etc.), as well as red deer, ibex, boar, rhino; also wolf, hyena, cat, lion, polar bear; GC: LIV: red deer, ibex, horse, *phocids* and other marine species, birds LIII: seal, rabbits (human gnaw marks) *(SC2008)*
	Fontmaure, France > 40 ka	Mousterian of Acheulian Tradition; jasper in multiple colorations (Pradel); a natural geofact 'vaguely spherical' quartzite 'figure-stone' ('face, 2 eyes, mouth line') with added artificial pecking of left 'eye' to accord with right 'eye' *(PL1971)* perforated circular fossilized sponges (*Coscinospora* sp.?), some holes natural, some artificial and/or natural but artificially enlarged *(VH2002)*	Worked artifacts, interpreted as figurative, identifications: 'female figurine', 'portrait head', 'grotesque maks' and animal figurines: 'mammoth, bison, feline, bear, horse, bird, fish') (collector, interpreter Tedde Toet http://www.neanderthalerart.com/about.html); 'Female figurine in geometric triangle shape' (collector, interpreter, Jan Evert Musch)

OIS 3 ~ 24-57/9 ka OIS 2 ~ 10-24 ka	Pech de l'Azé I, France, Layer 7: (ESR) 42.2±8 (EU), 49±7 (LU) (ESR + U-series) 41-58 ka Layer 6: (ESR) 39±2 (EU) 47±4 (LU) (ESR, U-series) 37-51 ka; (AMS 14C, bone top of layer 6) 41.7-43.6 ka calibr. (with geostratig.) thus **41-51 ka** Layer 5: (ESR) 49±6 (EU) 51±7 (LU) Layer 4: (14C) 42.2±1.3 = >42 ka Layer 3: *(SM2007; SM2004)*	30,000 artifacts Layer 3: MTA-A Layer 4: MTA-A, 30 km manuported brachiopods (exotics) *(SM2007)* Layer 5: MTA-A/B Layer 6: MTA-B Layer 7: MTA-B (MTA-B typically has high frequency UP type tools: elongated blanks and blades), entire reduction sequence completed on site *(SM2005; SM2007)*; MTA Levels: 250 specimens of pigments (F. Bordes), 103 blocks of manganese dioxide, majority bear modifications and scrape mark use traces and 67 rounding from use on a soft substrate; some appear intentionally shaped into pointed crayons; microscopic analysis suggests used to produce linear designs; 2 pieces bear engraved abstract pattern; black pigment use // African MSA use *(DF2002; SM2007b);* 'MTA-B manganese pigment almost nonexistent' *(SM2004)*	Layer 6: skull, mandible, juvenile, *Homo neanderthalensis*; Fauna L6: dominated by *Bos/Bison*, *Cervus elaphus*, least by horses, goats, reindeer (Peyrony) *(SM2007)*
	La Rochette, France Layer MTA-A ≥ Layer 7 Layer 7: (AMS) **52.5±3.4 ka** (Soressi 2002, after Valladas, unpublished) *(SM2004)*	Above layer: MTA-A Layer 7, MTA-B, entire reduction sequence completed on site *(SM2005; SM2004)*	

	Le Moustier, Dordogne, France LG: (TL flint) 50.3±5.5, 55.8±5.0; (ESR) 43±2.3, 47±2.5 LH: (TL flint) 42.5±2.0, 46.3±3.0; (ESR) 39.7±2.4, 41.0±2.6 (Valladas et al 1987; Mellars & Grün 1991) *(SM2004)*	Layers G: MTA-A, Layers H: MTA-B, G-H biface workshops *(SM2005)* Typical Mousterian; rock crystals in implements; Site report rather indicates sedimentation in natural pit *(GRH1989);* 'burials' *(WJ1992);* no evidence of grave goods, possibly discard as rubbish? Adult reburied and re-excavated several times *(SC1993);* suspect excavation *(PP2002)*; *[JBH – no consensus?]*	3 *Neanderthal*, male 15-18 years, skull and incomplete skeleton, with charred ox skull and worked flints, red ochre; adult skull cap, teeth; oval pit with infant, 1 m. from larger oval pit with flint tools and broken animal bones, covered by 3 stone blocks; 'possibly a burial' *(HO1909)*; 'burial (infant)' (Peyrony 1914 etc.); possibly the larger pit used for funeral feast *(BF1972),* larger pit might have had infant so young all remains disintegrated; several associated pits also at Le Ferrassie and Chapelle *(HJ1976a);*
	La Roche-Cotard II, Langeais, Indre-et-Loire, France Level 7c: (bone) > 32 ka *(MJ2003)*	Mousterian of Acheulian Tradition; piece of flat flint shaped into the upper part of a face; "combined work of nature and art;" percussion flaking and retouch, gives overall piece a regular shape and a certain symmetry; a splinter of bone pushed through a natural tubular hole in the stone represents its eyes; two little flint plaquettes were inserted into the hole to block the bone in place; resembles "a human face or animal mask" *(MJ2003; LM1999)*	

Final Middle Paleolithic (FMP) "transitional" industries (Szeletian, Uluzzian, Châtelperronian, leaf-point industries) were made by Neandertals and date predominantly to between ca. **38 ka** and **41 ka** 14C BP, but not younger than 35/34 ka 14C BP *(JO2008)*			
Campanian Ignimbrite (CI) eruption, southern Italy, (Ar/Ar) **39,395±51 ka BP** (GISP2) **40,012** // Heinrich Event 4, and Laschamp excursion, yielded sudden and at least hemispheric climactic deterioration, a 'volcanic winter' *(FF2008);* (Ar/Ar and various stratig. methods) **~39 ka cal BP** *(HJ2008)*	Kostenki14, Russia (bio- and geostratig., palaeomag., tephra, IRSL) Layers 5, 4, 3 = **OIS3 43-46 ka** (Levokovskaya, Anikovich and Popov 2009) L5b: (AMS) **32.6±0.3 to 37.2±0.4 ka** L4a: (AMS) 32.1-33.5 ka) but L Aurignacian at CI **~40 ka** *(FF2008)*	Layers 5b: Streletzkaya, 1 Mediterranean shell with 2 holes, 'beads' list *(VM2005)* Layer 4: Spitzenskaya Level: Aurignacian	L5 and L4: dominated by *Cervus elaphus*, and later *Mammuthus*; L3: *Rangifer* (Levokovskaya, Anikovich and Popov 2009)
34 to 40 ka	Grotte des Fées, Châtelperron, France (AMS) Levels B1-B3: between 34.55±0.5 and 36.34±0.32 a span = ~34.5 to 36 ka (GISP2 correlation) = **~40 to 41 ka** B4: 35.54±0.28 and 39.78±0.39 ka (GISP2 correlation) = **~41 to 42 ka** B5 (the basal Châtelp.): 39.15±0.6 and 40.65±0.6 = ~39-40 ka (GISP2 correlation) = ~42-43 ka *(GB2005)*; calibr. **42.38 to 45.09 ka** *(ZJ2006)*	Levels: MTA, 3 cordiform bifaces (Delporte) Levels B1-5: >750 artifacts, Châtelperronian type-site, large concentration of mammoth tusks (up to 2m in length) associated with series of hearths // mammoth tusk 'hut' in Chatelperronian levels of Grotte du Renne *(GB2005)*; perforated fox canine, 'bead' (White 2000) 'beads' list *(VM2005)* Levels esp. B4 interstratified with Aurignacian; dating confirms co-existence of Neanderthals and Aurignacians *(GB2005)*	

	Roc de Combe, Lot, France Level 8: (14C) 39.54±0.97 and 40±1.3, calibr. **42.1 to 45.45 ka** *(ZJ2005)*	Châtelperronian, 1 carnivore canine (lynx) (Sonneville-Bordes 2002), 'beads' list *(VM2005)* Aurignacian	No dietary difference Châtelperronian versus Aurignacian (Grayson & Delpech 2008)
	Bryndzeny, Moldavia (Szeltian ca. 35-38 ka)	Szeletian, 1 perforated fish-tail ivory pendant (Ketraru 1989, Kozlowski 2000) 'beads' list (VM2005)	

	Saint-Césaire, France (TL) 36.3±2.7 ka	Châtelperronian tools, ornaments *(LF1980);* *Dentalium* sp. shells (Lévêque in d'Errico et al 1998), 'beads' list *(VM2005)*	*Neanderthal*, with tools, ornaments; no evidence of pit; maxilla, mandible, tibia, fibula, hand bones, highly fragmented, some articulated, some not; no cutmarks *(LF1980);* no evidence of burial? *(SC1993)* in rock fall sediment; not a burial *(GRH1999)*
	Grotte Tournal à Bize-Minervois, Narbonne, southern France L1 (Level of Bears): Mousterian; end Würm II L2 base (H): Mousterian Denticulate (14C) 33.65±0.45 ka (U-series) 33.0±8/±4 ka (ESR) 37±8 ka = **35±7 ka** L2 top: Aurignacian (14C) >34.2 ka, >29 ka and >35.8 ka L3: Würm III L4: Early Magdalenian (14C) 14.25±0.45 L5: Würm IV L6: Final Magdalenian (14C) 13.7±0.4, 12.85±0.32 and 12.55±0.21 ka *(YY1987)*	L1 Mousterian L2 base (H): Mousterian Denticulate Mousterian; • black and red pigments; • several incised stones and bone; • flaked and pecked quartzite and flint and bone 'sculptures', intentional artwork, 'elephant, horse, bear, hyena, feline, bird and human heads, in profile, ¾ and rarely face; *(HP1963) (MW1969)*	L1-L2 base (Mousterian): horse exploitation; L2 top (Aurignacian): equally horse, bovids, reindeer, thus more diversified (Patou-Mathis 1994)

	Klisoura I Cave, Greece V: (14C) 40.0±0.7 ka, calibr. **42.57-44.69** ka (*ZJ2006)*	Uluzzian, *Dentalium* sp. shells (Koumouzelis et al 2001) 'beads' list *(VM2005)*	
	Grotta del Cavallo, s. Italy	Uluzzian, *Dentalium* sp., *Natica* sp., *Trochus* sp. and Glycymeris sp. shells (Palma di Cesnola 1993) 'beads' list *(VM2005)*	
	Castelcivita, s. Italy	Uluzzian, *Pecten* sp. shell (Palma di Cesnola 1993) 'beads' list *(VM2005)*	

	Quinçay Cave, France	Châtelperronian, Perforated wolf, fox and red deer canines (Granger & Lévêque 1998) 'beads' list *(VM2005)*	
	Roche au Loup, France	Contemporaneous, bovid incisors and an ivory ring (White 2000), 'beads' list *(VM2005)*	
	Cauna de Belvis Cave L7: (14C) 35.425±0.45, calibr. **38.48-42.92 ka** *(ZJ2006)*	1 Turitella sp. shell (Taborin 1993), 'beads' list *(VM2005)*	
	Cueva Antón, central Spain **OIS3**	Final Mousterian, perforated *Pecten* shell, painted on its external, white side with an orange mix of goethite and hematite, was abandoned after breakage *(ZJ2010)*	

	Vindija, Croatia Unit D: Unit E: (cave bear) 18.5±0.3 ka Unit F: (C14 charcoal) 24±3, 27±0.6 and 29.7±2 ka Unit G1: (AMS cave bear) 18.3, 33.0 and 46.9±2 ka); (*Neandertal*): 29.1±0.4 ka and 28.0±0.36 ka, thus Podhradem interstadial, ca. **28-33 ka** Unit G3: U/Th (bear) 41±1 ka; (AMS *Neandertal*) >42 ka, thus Lower Würm stadial, **ca. 38-46 ka** Unit H: (AMS, bear) 33.4±2 ka Unit I: (AMS, bear) 37.0±0.6 ka (Brørup) Unit J: (AMS, bear) 34.7±0.5 ka; but (Th/U bear) range **156±2 to 196+20-15 ka** Unit K: (U/Th) **150+16-13 to 212+17-13 ka (**Wild et al 2001) (DD2008) *(AMS dates in AJ2004)*	Unit F: Aurignacian-like industry associated with *Neanderthal* (10 specimens) *(AJ2004)* Unit G1: both Mousterian and UP lithics and EUP Mladeč bone points *(AJ2004)*; a post-depositionally disturbed palimpsest, as evident by diverse dates on bear bones; Neanderthal likely Szeletian associated (Zilhão in M. Camps & P. Chauhan 2009) Unit G3: Late Mousterian with UP features *(AJ2004)*	Unit D: *H. s. s.* Units G-I: *Neanderthal*; GI *Neanderthals*, latest Neanderthals known; G3 *Neanderthal*s claimed intermediate between Neanderthal and early modern *H.s.s.* (Wolpoff et al 1992, 1981, Wolpoff 1999; Frayer et al 1993) *(AJ2004)* [GI ?] cutmarks, disarticulation, breakage, dumped on cave floor; 'cannibalism; pattern similar to Mancos and Krapina' *(WT2001, GA1997)*; *[JBH – consensus: disarticulation, defleshing, cannibalism, fragmentation, discard?]*

	Orneau Cave, Spy, Belgium Level 1: (AMS cutmark faunal bone with ochre traces) 26.4 ka (= Gravettian time period) Level 2 (red breccia) (AMS bone spear-point, no level, but Aurign. type) 32.6-33 ka; (AMS fauna with ochre) ~34.5 ka Level 3 (Neanderthal layer) (AMS on SPY I and 2 bones) range **~36 ka**; (faunal bones, no level >42 ka (Semel 2009)	L1: Gravettian; Creswell-Tjongérien; Magdalenian L2: Aurignacian; Transitional industry with foliate points on blades; Evolved Mousterian L3: Charentian; MTA (Ulrix-Closset 1975; Otte 1979; Dewez 1981) rock crystals in implements	2 *Neanderthal,* SPY 1, female, SPY 2 male, shallow graves, no goods; no burial (Fraipont & Lohest 1887; De Puydt & Lohest 1887); 'burial' *(TF1958)* (A. Thoma 1975) *WJ1992);* concur *(PP2002)* SPY VI, child, 1.5-2 yrs, discovered 2005; *[JBH – consensus burials?]*

	Arcy-sur-Cure, France Grotte du Renne (GR) 34-35 ka (14C dates by level) IV: Solutrean VI, V: Gravettian VII: Aurignacian, 30.8 ka X (33.4 ka), IX (33.8 ka), VIII (33.0 ka): **[33.4 ka]** Châtelperronian XII, XI: Denticulate Mousterian XIII: Mousterian transitional XIV: Typical Mousterian XV: (F. Bordes) *(DdF2001);* Grotte de l'Hyene (GH) ~ 45 ka *(BP1998)* Grotte de Trilobite (GT)	GRX-VIII: Châtelperronian, artifacts show features deriving from MAT, well before arrival of Aurignac.; 142 worked bone objects, some decorated or incised with sequences of regularly spaced notches; 36 personal ornaments, pierced teeth, ivory rings, perforated ivory and bone beads; possibly reflecting communicative codes, social roles (d'Errico, Zilhão et al 1998; *AM1991*) (Hublin, Spoor et al 1996; *BP1998) (DdF2001);* 23 kg pigments (red, yellow, black) with use wear traces, polishing and rubbing, probably from hide working as well as powder preparation, associated with hearths, *(fig. 4)* black with a 'cupule'; recovered from Renne (20 LX red, brown, yellow, black; 1 LVIII red; 2 V-VI Gravettian red, brown-yellow), Bison (1 red) and Lagoped Caves *(CC1991)* Grotte de l'Hyene, bed 15, Mousterian: 2 agglomerated spheres of iron pyrite; and 2 fossils, globular polyp and spiral gastropod; spheroid piles ('rather numerous bolas') *(LA1961; LA1961; ES1978)*	GR Xb: temporal bone, 1 yr old, *Homo neanderthalensis*, youngest known specimen with Zafarraya (Hublin, Spoor et al 1996) *(BP1998)*; Fauna: reindeer, horse, mammoth, bovine, bear, wolf, martin, hare *(DdF2001);* GR: 'beads', include 8 fox canines, 4 bovid incisors, 3 reindeer incisors, 2 bear incisors, 2 marmot incisors, 1 red deer canine, 5 bone pendants, 3 ivory beads and 2 fossil belemnites (Leroi-Gourhan & Leroi-Gourhan 1965; d'Errico et al 1999; White 2000), 'beads' list *(VM2005)* GT: 1 bear incisor, 1 *Pecten* sp. shell (Taborin 1993), 'beads' list *(VM2005)*

	Hamburg-Sülldorf A, Germany Hamburg-Wittenbergen LT2 (dating not secure, surface sites; by tool typology) MP (MW1963, 1964/1965, 1969)	Mousterian tools; worked flint, intentional artworks, continue themes from Hamburg-Wittenbergen Acheulian; categories: H-S: 'mammoth', 'face/mask one-eye open / one-eye closed', 'fish', 'bird'; H-W LT2: 'mammoth', 'fish' *(MW1963, 1964/1965, 1969)*	

	Les Merveilles	rock crystals in implements	
	Engis Cave, Liège, Belgium	Mousterian Cranium has incised striations, but no evidence of defleshing or normal circumferential scalping; might be hemispheric scalping *(RM1986)*; preparation damage, not cutmarks *(WT1989)* *[JBH – consensus: preparation damage]*	*Neanderthal*; Engis 2, under 6 years of age, skullcap, maxilla, teeth; with tools (Schmerling 1833 cited in *(RM1986)*
	Cueva Morin, Spain Mousterian occupation levels, from OIS5b [~90-98 ka] (Butzer 1981) L1: Azilian L2: Magdalenian L3: Solutrian L4: Gravettian L5a: evolved Aurignac. L5b: Gravettian L6-7: Aurignacian L8-9: early Aurignac. (AMS) **36.59±0.77 ka** (// El Castillo C14 38-40 ka) L10: Chatelperronian (14C 28 and 40 ka) L11-12: Final Mousterian 11 AMS **39.77±0.73**) (Fernández et al 2001) L13-17: Mousterian [hence >40 ka ≤98 ka] compare (ESR) El Castillo Mousterian L20: 42.7±3.5 ka (Liberda, Thompson et al 2010) and L21-22 ~69-70 ka, post-Acheulian level (Rink et al 1997)	Mousterian; three sets of paired lines on rib fragment (Freeman and Gonzales Echegaray 1983) *(BR1995);* Level 17, Mousterian, 'macaroni' meander marks on 11 bones, • some natural vascular grooves amplified and extended by deliberate engraving, V-shaped grooves, with other natural causes ruled out; • one bone has widely spaced parallel sets of meanders; • another totally covered with macaroni meanders *(FL1978b);* the last instance disputed *(MA1991)*; vascular grooves *(DF1997: fig. 2; DF1998)*	

	Abri Lartet, Montgaudier, France	>3000 artifacts, Mousterian Charentian Ferrrassie (Debénath in Dibble 1992) Mousterian or Aurignacian; 2 engraved bone objects, • one with three 'chevrons'; • one with two sets of paired strokes plus one single stroke (Debénath and Duport 1971; Crémades 1996) *(BR1995)*; mentioned but not examined (*DF1997*)	
	Srbsko, Bohemia, Czech Republic	Proto-Aurignacian, sculpted mammal bone, suggesting human body (MJ2003)	

Upper Paleolithic (~5-60 ka) (LGM = ~ 18 kya; 24,000 cal yr BP)	***The literature for the European Upper Paleolithic is voluminous; except for a few sites, I leave it to others to review it.***		
Early or Initial UP—30-50 ka	General (SW Asia defined): hardhammer single platform reduction strategy for blade blanks, slender elongated interior blades, for points and retouched blade and bladelet blanks, not yet differentiation into distinct reduction strategies for blades versus bladelets; dominated by UP tool forms (endscrapers, burins, truncations) on blades though may be made on Levallois blanks, but may include MP forms (sidescrapers and denticulates) // Bohunician central Europe (36-43ka) and Kara Bom, Altai, Siberia (43 ka) *(KS1999); Homo sapiens sapiens*		
IUP/EUP (Bachokirian, Bohunician, Protoaurignacian, Kostenki 14) date between ca. **35 ka to 38/39 ka** 14C BP and document appearance of AMH in Europe *(JO2008)*	Brno-Bohunice, Czech Republic (OSL, IRSL, TL and 14C) (quartz from overlying loess: OSL) 30.9±3.1 ka; underlying loess 104.3±10.6 ka (paleosol OSL) 58.7±5.8 ka; (TL heated flint ave.) 48.2±1.9 ka (14C from 2002 excavations, Hulu calibrated) **35-44 ka** *(RD2009)*	Bohunician	
Campanian Ignimbrite (CI) // Heinrich Event 4 (Ar/Ar and various stratig. methods) **~39 ka cal BP** *(HJ2008)*	Mamontovaya Kurya, Usa River, Urals, Komi Republic, Russia **35-40,000 BP** Unit 1: 21 14C (tusk) 14C 36,630+1310-1130 AMS 2x, mean **34,655±570 BP** (uncal, add 2k) (mammal bones) mean **35,000 BP** (uncal, add 2k) Unit 1: 9 OSL 34,000±2000 BP 41,000±3000 BP 48,000±3000 BP Overlying deposits, 8 AMS 31,400-23,800 BP; Unit II OSL 27,000±2000 BP Unit III OSL 19,800±2100 BP *(SJ2003)*	Unit 1: Few stone artifacts, 1 scraper, 1 slate bifacial tool interpreted as knife, unmodified flakes; resembles eastern Europe MP Mousterian and UP, so not diagnostic; Mammoth tusk with human made incision marks made by chopper but appear not accidental to chopping, but organized in rows in regular and repeatable pattern, thus infer "made intentionally with artistic or symbolic meaning" *(SJ2003)*	123 mammal bones, primarily *Mammuthus primigenius*; but also *Rangifer tarandus, Canis Lupus, Equus caballus*; no unambiguous cutmarks; no hominid fossils, so unknown if *H. s. s*. or Neanderthal *(SJ2003)*

	Kostenki-Borschevo, Middle Don, Russia EUP layers above CI tephra correlated with warm intervals that preceded the CI and HE4; Greenland Interstadial: GI12–GI9) ca. **41–45 cal BP** *(HJ2008)* UP (GI 8–GI 5) 30–38 ka cal BP	EUP, an industry not currently recognized in other parts of Europe. UP Aurignacian, *(HJ2008)*	UP: *Homo sapiens sapiens*
	Ortvale Klde Rockshelter, Republic of Georgia Layers 2–3 (EUP) Layer 4a–d (EUP) **~34-38 ka 14C BP (39-42 ka** cal BP Hulu) *(AD2008)*	L2–3 (EUP) L4a–d (EUP) L5 (LMP) L6 and L7 (LMP) L8 (sterile) L9–10 (LMP) *(AD2008)*	'suggests an initial expansion of AMH into the southern Caucasus followed by expansion along the Black Sea coast and into the northern Caucasus' and 'rapid demise of Neandertals *(AD2008)*
	Buran Kaya III, Crimea, Ukraine Level C: (C14, range from) 32,200±650 to 36,700±1500 Level (above): Kiik-Koba Micoquian: ~28,600 BP (*HB2001)*	Level C: EUP, Early Streletskayan, bifacial foliate points, endscrapers, bifacial geometric microliths, ringed and snapped bone tubes, handles made from hare wand wolf long bones; points hafted for projectile or thrusting use, high force impact striations, with starchy plant residue (probably due to binding or mastic), feather and hair; 2 scrapers, wood residue, evidence 1 was hafted; trapezoids, 1 of 4 hafted but not projectile/thrusting, evidence of plant and unknown residues; and tool functions broadly similar to tool functions at EMP site of Starosele (*HB2001)*	(possibly Neanderthal based on similar IUP levels in central and western Europe) (*HB2001)*

Middle UP **30-40 ka**	General technology (SW Asia defined Aurignacian): multiple reduction strategies (opposed platform for large blades; single platform for bladelets); flake strategy; soft-hammer for 'classic' microblade and bladelet products; retouched bladelets; blanks into burins and endscrapers; small microlithic tools; bone tools, soft hammer, more art; in Japan, grindstones by 30 ka		
Earliest Aurignacian (I) appears throughout Europe quasi simultaneously at ca. **35 ka** 14C BP *(JO2008*			
	Byzovaya, Pechora River, Komi Republic, Russia 13 14C dates: range 26-29,000 BP, **mean 28,000** BP *(SJ2003)*	EUP, 400 artifacts; similar to Sungir and 'eastern Szeletian with Aurignacian Traits' *(PP2001)*	4000 animal bones, mainly mammoth; similar to Sungir *Homo s. s.* with UP ≥28k, Kostenki IV H. s. s. 30k *(PP2001)*

Late UP **~15-30 ka**	General technology: microblade/bladelet traditions. In Europe, laminar microliths/bladelets occur with Gravettian (22-28 ka).		

Epi-Paleolithic / Mesolithic 10-13 ka	General:		

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