

SYNOPSIS OF THE PALEOLITHIC AUSTRALIA and SE ASIA

Period	Sites	Tools/ <i>Hominids</i> / Symbolic Behavior	Fauna
‘Oldowan’ (Lower or Early Paleolithic)		General: pebble core-flake tools	
	no sites yet		

‘Early Acheulian’			
	Perning, Solo River, Java (Ar/Ar) 1.81±0.04 MYA and (paleomag) normal = Olduvai = 1.78-1.96 MYA (SC1994)(DVJ1994) but 20 m above this (HO2006) (Paleomag) = Jaramillo 1.1 MYA (HM2002, 1993)	Mojokerto 1 : juvenile calavaria: <i>Homo erectus</i> (SC1994)	
	Sangiran, Solo River, Java (Ar/Ar) 1.66±0.04 MYA (SC1994)(DVJ1994) Bapang Formation hominids (Ar/Ar) 1.51±0.08 to 1.02±0.06 MYA (LR2001) (Paleomag) = Jaramillo 1.1 MYA (HM2002, 1993)	S27, S31: <i>Homo erectus</i> (SC1994) but not linked to strata (LR2001) S1996.04 occipetal in Sangirin Formation > 1.51±0.08 (LR2001). Shell tools cutmark bones (KC2007) 220 small flake tools, mostly chalcedony at ca. 1.6 MYA (WH2006, SR2006))	

'Middle Acheulian'			
	Ola Bula, Soa, Flores (ZFT) Boa Lesa 840±70 Mata Menge (above top artifact) 800±70 ka and (below lowest artifacts) 880±70 ka (matching biostrat., palaeomag. tektites)(MM1998)	Chert, silcrete, basalt mostly unifacial and bifacial radial cores, perforators, utilized and some retouched flakes with plant polish and residue; // Liang Bua implied watercraft; (MM1998,1999)(BA2006)	SE Asian fauna, <i>Stegodon</i> , crocodile, giant rat (MM1998)
	Lampang and Phrae River, northern Thailand Ban Mae Tha Ban Don Mun (paleo) 600±20 to 800±30 (Pope et al 1986, Sorensen 1985) (DF2004)	Chopper-core industry Pebble tools (WJ1982)	
	Fingnoi Valley, Bhan- Koa, Thailand	Pebble tools (WJ1982)	
'Later Acheulian'			
	Upper Irrawaddy Terraces, Myanmar (geol.) ca. 500 ka (WJ1982)	Choppers, flakes, proto- bifaces, scrapers (WJ1982)	Middle to Late Pleistocene (WJ1982)
	Cagayan River Basin, Luzon, Philippines (fauna) 250 ka or 750 to 900 ka	Quartzite, sandstone pebble core tools, unifacial retouch; unretouched flakes (PA2005)	<i>Elaphas</i> , <i>stegodon</i> , rhino, giant tortoise, bovids ~250 ka (Coppens) (PA2005)
	Tham Khuyen Cave, Long Son, northern Vietnam Units S1-S3 (Useries and ESR) 475±125 ka (Cuong 1971, Kha & Cuong 1975) (CR1996)	teeth <i>Homo erectus</i> // Zhoukoudian teeth; faunal remains result of scavengers? (Kha & Cuong 1975) (CR1996)	' <i>Stegodon-Ailuropoda</i> ' fauna = Early to Middle Pleistocene; <i>Gigantopithecus blacki</i> , <i>Pongo pygmaeus</i> (CR1996)

<p>‘Final Acheulian’ (~150-300 ka)</p>	<p>General (African-SW Asia definition): 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 (<i>CJI1965</i>); blades in Kapthurin and Fauresmith as in Levantine Mugharan Tradition (<i>AS2002</i>)</p>		
	<p>Tham Wiman Nakin Cave, northern Thailand (U-series capping layer) 130±18 to 169±15 ka (Esposito et al 1998) (<i>DF2004</i>)</p>	<p>Tooth, ‘<i>Homo sp.</i> between <i>H. erectus</i> and <i>H. sapiens sapiens</i>’. (<i>TJI1998</i>) [= <i>archaic</i>]</p>	<p>Late Middle Pleistocene fauna</p>
	<p>Tham Om Cave, Nghe An, central Vietnam 140-250 ka (Kha 1975) (<i>DF2005</i>)</p>	<p>teeth <i>Homo sapiens</i> (Kha 1975, 1976, 1977) (<i>DF2004</i>)</p>	

Middle Paleolithic			
	Pajitan/Pacitan, Baksoka Valley, Java ~ 130 ka (BP1997)	Silicified tuff, limestone, fossil wood: large chopper cores, worked flakes, proto-handaxes, 'apparent handaxes' (WJ1982)	
	Kampung Gelok and Kampung Temelong, Bukit Jawa, Lenggong Valley, Perak, Malaysia 200 ka or 50-100 ka (MM2007/1 VD2001)	'MP stone tools' (Strait Times April 25, 2001); 3 open-air 'lithic workshops' (MM2007)	
	Hang Hum, Long Son, northern Vietnam 80-140 ka (Cuong 1971, Kha 1975) (DF2005)	teeth <i>Homo sapiens</i> (Kha & Bao 1967) (DF2004)	
	Ma U'Oi Cave, Hoa Binh, northern Vietnam (biostr.) ca. 60-250 ka (DF2004, 2005)	Teeth MU18, MU57, <i>H. sapiens archaic</i> , fragment occipital MU88 = ? (DF2004) (DF2005)	' <i>Stegodon-Ailuropoda</i> ' fauna = Late Middle Pleistocene to Late Pleistocene (DF2004)
	Liang Bua Cave, Flores Sector VII: (ABOX AMS calibr.) 18 ka and (TL and IRSL bracket) 35±4 and 14±2 ka Sector IV: tooth at lower level (TIMS Useries) 37.7±0.2 ka; Layer 9 'Pulse C': (ESR+Useries) 74+14/-12 ka Back cave: (Useries on overlying flowstone above chopper) 102.4±0.6 ka (MM2004; MM2007)	Sector IV and VII/XI: 9 MNI <i>H. floresiensis</i> associated with tools (BP2004, MM2005); tuff and chert single, bifacial and multi-platform radial cores, flakes reduced to cores, flakes (<i>façonnage</i> , bipolar reduction of edge common) at Pulse C and other loci dated from ca. 95-74 ka to 12 ka tools associated with juvenile <i>Stegodon</i> , other 'big game': points , perforators, blades , burin core and microblades; Back cave: large chopper (MM2007, MM2004, BA2006)	dwarf <i>Stegodon</i> , Komodo dragon, remainder small animals, some bones burned (MM2004) <i>Homo sapiens sapiens</i> at 10.5 ka, with new tool types: grinding stones, edge-glossed flakes, and beads, pigment, burial of dead (BA2006)
	Cabenge and Berru, South Sulawesi (fauna) Upper Pleistocene, 'seems earlier than Leang Burung or perhaps variant' (BG1991)	Chert, andesite, quartzite limestone 'Cabenge industry': core and flake, unifacial, bifacial pebble & cobble artifacts, 'hand adzes'/'hand axes', flakes possibly used as scrapers // Java Pajitanian of <i>H. sapiens</i> (BG1991) jasper chalcedony, thick flakes, some points (WJ1982)	<i>Archidiskodon</i> , giant tortoise (BG1991)

	Arubo 1, Luzon, Philippines	Chert bipolar cores (horsehoofs) // Javanese Pajitanian and 'Australian Core-Tool and Scraper Tradition', pebble and core tools, bifacial core tools (proto-handaxe with use wear and 'temporal curation'), cleaver fragment, Levallois-like point, modified, and unmodified flakes (PA2005)	
	Lang Rongrien, Krabi, SW Thailand (14C) > 43 ka (Anderson 1990, 1997) (OJ2004)		
	Ogan River Basin, South Sumatra (n. d.)	Surface survey: 'a classic Acheulian of "giant hand axes", cleavers, large retouched flakes, massive plano-pyramidal cores, some choppers and chopping-tools, etc.' (ST2006) Pajitanian core tools: chopper-chopping tools, cleavers, big scrapers and flakes on chert, chalcedony, jasper, andesite, and basalt (DD2006)	
	Sambungmacan, Solo River, Java 27±3 to 53±4 ka (SC1996) (GR1997)	Sambungmacan: Sm1 calvarium (1035cc) Sm2 tibia = 'late <i>erectus</i> ' (SC1996). Sm3 calvarium (918 cc) = late <i>H. erectus</i> or evolved <i>erectus</i> or different <i>H. sp.</i> (MS 2001) with some <i>H.s.s.</i> traits (DE2002). Sm4 calvarium (1006cc) like Sm1 transitional between Sangirin Trinal and Ngandong (BH2003)	
	Ngandong, Solo River, Java Unit 2: (ESR and Useries) 27±3 to 46±4 ka (SC1996) (GR1997)	Ngandong: 14 calvaria and partial calvaria, 2 tibiae, pelvic fragments (SC1996). Affinity between WLH-50 and Ngandong and not <i>erectus</i> (WM2001) [thus = ? indigenous <i>H. s. archaic</i> ?]	Late Pleistocene (SC1996)

<p><i>Homo sapiens sapiens</i> with MP technology</p>			
<p>Begin Australia</p>	<p>Malakunanja II, Kakadu, Northern Territory, Australia ‘Pit feature’ with artifacts at 232 cm. (overlain by TL 230-236 cm) 45±9 and (at 241-54 cm.) 52±11 ka (RR1990) and confirmed by (OSLs) 45.7±4.1 and 44.2±4.7 (Roberts et al 1998) (OJ2004) [average =46 ka] Lowest occupation level starting at 260 cm (TL just above it at 254-259 cm.) 61±13 but can’t exclude artifacts at lowest level trodden in older sediments by first occupants (RR1990); (OSL) 60.7±7.5 and 55.5±8.2 ka confirms TL (Roberts et al 1998); but (BM2000) shows ABOX below 146 cm implies alteration of charcoal; (OJ2004) accepts occupied at ca 45 ka to < 50 ka</p>	<p>Lowest occupation level: > 1,500 artifacts; silcrete, quartzite, quartz; flakes, ground hematite, red and yellow ochres, grindstone, amorphous artifacts; (RR1990), bipolar horsehoof cores (FJ1990) At M-II and N-I sites: pieces of hematite, red and yellow ochre ‘crayons’ with wear facets; scraped large lumps of hematite (FJ1990) At 18 ka level: 3 grooved ground-edge grindstones by hammerstone pecking technique, one with face impregnated with red and white ochre (FJ1990)</p>	<p>‘Humans reached northern Australia about 60,000 years ago’ (RR1990) but (GR2002) believes 45ka best average of Malakunanja II, Nauwalabila I, Devil’s Lair, Mungo and Carpenter’s Gap sites; as does (OJ2004) (BR2001) accepts artifacts at lowest occupation level as 53 ka. [TL at 241-54 cm., which is 6 to 19 cm above lowest occupation level (hence allows some settling of artifacts per RR1990), 52±11 supported by OSL, 55.5±8.2 and 60.7±7.5, averaging lowest and highest range plus central = 54.9 ka, comparable to Bednarik’s 53 ka – JBH]</p>
	<p>Nauwalabila I, Kakadu, Northern Territory, Australia (OSL 234 cm.) 53±5.4 (290 cm.) 60.3±6.7 ka brackets Lower Level peak density (RR1990) = but below ~130 cm charcoal alteration makes ABOX unreliable but confirms no strata disturbance and OSL dates may be older (BM2000); (OJ2004) still questions integrity; accepts only dates up to (OSL) 30 ka</p>	<p>> 30,200 artifacts, peak densities at ~ 40 cm., mostly quartzite; 90 cm., mostly chert; 150 cm, mostly quartz. Lowest level peak 240 cm, mostly quartzite (BM2000); bipolar horsehoof cores (FJ1990); Lowest level: ‘1 kg piece of hematite bearing ground facets and striations—clear signs of scraping to produce powder paint’ (FJ1990)</p>	

	<p>Devil's Lair, SW Western Australia Layer 28 (highest artifact density) (ABOX) 41.46±1.4/-1.19 or (OSL) 43.4±2.2 and 44.4±2.1 Layer 30 Lower (ABOX) 45.47±1.42/-1.21 Layer 39 below artifacts (ABOX) 48.13±2.59/-1.96 (OSL) 51.1±2.6 (OJ2004) (calibr.) 50 ka, thus < 50 GR2002) (TC2001) or 'range 41-46 ka' (OJ2004)</p>	<p>Layers 19-27 55 artifacts; Layer 28: 34; 29:14; 30 Upper: 8; Layers 30 Lower to 38: sparse (Dortch & Dortch 1996; Turney 2001) (OJ2004). Quartz and chert: flakes, scrapers, possibly adzes for hafting; notches, denticulates; split pointed bones, bone points, awls?; resin on stone tools; bird bone pendant, 3 bone beads, 1 naturally perforated flat marl pebble with 4 wear grooves, possibly as pendant, [6 limestone plaques thought engraved with straight lines are naturally marked]; burned bone, 4 hearths (L27-L30) (FJ1990; BR2003; BR1997; OJ2004)</p>	<p>Emu eggshell fragments (MJ1999)</p>
	<p>Huon Peninsula, Papua New Guinea artifacts between Layer IIIb (uncalib. U/Th tephra) 44.5±0.7 ka Layer IIIa (tephra) 61.4±0.6 ka (Chappell 2002); (previous TL) min. 40 ka , later recalculated to ca. 47 ka (Roberts 1997) (GL1986, OJ2004)</p>	<p><i>In situ</i> core, flakes, waisted axes, at least one grooved and > 100 waisted axes without grooves, cores, flakes, other axes (GL1986)</p>	
	<p>Niah Caves, Miri, Sarawak/Borneo (ABOX/AMS) 42±0.67 (Barker 2002) (OJ2004) (14C) 39,820±1012 (Oakley 1975) (BP)</p>	<p>Core tool and scraper tradition; ground-edge tool; 'early modern' <i>H. sapiens sapiens</i>(FJ1990)</p>	

	<p>Lake Mungo, Willandra Lakes, NSW Australia Lower Mungo artifacts (OSL) between 50.1±2.4 & 45.7±2.3; LM3 in sands dated 42±3, overlain 38±2, ergo buried 40±2 ka; Upper Mungo maximum density occupation (OSL) between 43 and 45 ka (BJ2003)(GR2006 agrees) (OSL on stored grave infill blocks) 41±4 ka confirms previous study (OJ2006); ca. 43 ka or less (OJ2004)</p> <p>LM3 (TL) 43±4, 41±7 (U/Th on bone) 50,7±0.9-69.8±2.1 ka (U/Th on calcite on bones) 81±21 ka (ESR tooth) EU 63±6, LU 78±7 ka combined U and ESR est. 62±6 ka agrees with (OSL burial stratum) 61±2 ka (TAI999)</p>	<p>Mostly silcrete, 41 bipolar cores (25 horsehoofs), 74 scrapers, 12 other retouched flakes; 103 unworked flakes, typical of ‘Australian Core Tool and Scraper Tradition’, (BJ1970) (MJ1999)</p> <p><i>Homo sapiens sapiens</i>: LM1 female, cremation, hearths, burnt animal (in situ kangaroo, wallaby, wombat, cat) and fish bones, emu egg fragments, mussel shells; (BJ1970) (MJ1999)</p> <p>LM3 male, ochre burial, no tools (MJ1999, FJ1990)</p> <p>‘complete colonization of Australia soon after 50K’ (BJ2003)</p>	<p><i>in situ</i> kangaroo, wallaby, wombat, cat) and fish bones, emu egg fragments, mussel shells; surface, thylacine (BJ1970)</p>
	<p>Carpenter’s Gap, Kimberley, Western Australia (AMS 14C on charcoal) 39,700±1,000 BP 39,220±870 BP (8” below that) (O’Connor 1995)(FJ1997) (ABOX AMS uncalib.) 40.6±0.8 (Fifield et al 2001) (OJ2004) (calibr. AMS) max. 44 ka (GR2002)</p>	<p>Exfoliated fragment with red pigment painted on it in layer with ochre, burnt bone; charcoal; stone tools. Dates = only minimum age for painted fragment (FJ1997)</p>	
	<p>Allen’s Cave, Nullarbor Plain, Australia 14C 18,000 (hearth bone) but new (14C, TL, and OSL) 39.8±3.1 ka (Roberts et al 1996) (GR2002)</p>	<p>Stone tools – silcrete flakes; hearth with burnt bone (MJ1999); negligible stratigraphic disturbance confirmed (TCB2001)</p>	

	Ngarrabullgan Cave, Queensland, Australia (calibr. AMS 18 dates) Level 3: 36±2 ka (GR2002) (AMS, OSL) 34.9±2.1 (David et al 1997) (ABOX) 35.28±0.67 ka (Turney & Bird 2002) (OJ2004)	Occupation occurred from > 37,170 and ceasing ~32,500 ka; the site was not reoccupied until (Level 2 and 1) 5,410±60 ka and intensively occupied until abandonment to 930±50 bp. (FR1997)	Use wear and residue analysis Level 3: processing starchy grains and fibers; resin hafted woodworking; possible skin-working; Level 2 same plus processing animal tissue (FR1997)
	Matenkupkum; Balof 2; Panakiwuk, New Ireland (14C calibr.) 36±2 ka (GR2002)		
	Puritjarra, Cleland Hills, Australia Lowest occupation level (ABOX AMS) 31.14±0.47 ka (Smith et al 2001) (14C AMS, TL, OSL) 34.6±1.6 (Smith et al 1997) (OJ2004)	Artifacts, 'first occupation of central Australia' (GR2002)	
	Lachitu Rock Shelters, New Guinea (14C) 35.36±1.4 ka (GP1991, BS1997)		
	Lene Hara, Timor Early Phase (shells 14C calibr.) 34.65±0.63 ka (GR2002, OS2002) Late Phase ~1.0 ka	Chert, flake-based industry, lacking ground axes (OS2002)	
	Sandy Creek I, Cape York, Australia Lower occupations (14C) 31.9+0.7/-0.6 ka (calibr.) 34.4 ka ; some even lower flakes and red pigment; Middle occupations ~18 ka to ~9 ka; layer containing exfoliated engraving (14C at 162 cm.) 12.62±0.27 (calibr.) 14.4 ka ; Upper occupations (calibr.) ~ 3.6-1.2 ka (MJa1995)	Lowest: clear or milky quartz, split pebble core reduction, 1 ground-edge axe, waisted and grooved, 11 pieces red pigment; Middle: 14 pieces red pigment, partially buried panel: 'pecked lines, curves, bird tracks' (buried by upper occupation and height indicates pecked from middle occupation), exfoliated pecked engraving confirms panel dating; Upper: grindstones, burren adze slugs (MJa1995); cupules on wall (BR2006)	= regional variant of Panaramitee tradition (FJ1997)

land bridge 60k to 10k	Fraser Cave; Bluff Cave; ORS7, Tasmania (14C calibr.) 34 ka (GR2002) Warreen Cave (ABOX AMS) 33.175±0.67/-0.62 ka 34.79±0.51 (OJ2004)		
	Golo Cave, Gebe Island, Maluku Islands (14C calibr.) 32.21±0.32, 31.03±0.4 ka (BP1998) but misread? 35.57±0.48 (OJ2004)	Chert-like and volcanics, flake tools, burnt shellfish, cookstones (BP1998)	Shellfish
	Mandu Mandu Creek Shelter, Pilbara, Western Australia (AMS layer between) 30.9±0.8 to 35.2±1 ka (MK1993)	22 perforated <i>Conus sp.</i> shells and modified fragments (MK1993)	Shellfish, fish, crabs (Morse 1988)(MK1993)
	Leang Burung 2, Maros, South Sulawesi (14C on 5 shells calibr.) Layer V: 22.649±0.14 Layer IV-V: 27.646±0.2 Layer II: 30.848±0.33 Layer I: undated, possibly 40 ka or earlier (separate loci) Layer IIIa: 19.405±0.25 highest intensity artifacts Layers V and II (GI1981; OJ2004)	Chert, flaked stone all levels: bipolar/scalar (often of quartz), bifacial disc cores, 1 blade core (Layer II) and minor use of Levallois technique, scrapers, knife, blades with phytolith edge gloss, perhaps for basketry or matting, a few 'classic' Levallois points, unretouched (no such cores other levels) and utilized flakes (Layers II, III V); bone and shellfish food remains, carbonized seeds, hearths; Layer I: 1 bipolar/scalar core, utilized and waste flakes and bones; hematite fragments all levels, 3 abraded (1 ochre pellet with cross-cutting striation, as if used for pigment) (GI1981)	
	Kota Tampan, Bukit Bunuh, Lenggong Valley, Perak, Malaysia (14C uncal.) ~ 31 ka (Zuriana & Tjia 1988) (OJ2004)	Quartzite, chert, quartz pebble choppers, chopping tools, proto-bifaces, cores, flakes (knives) (WJ1982)	

	<p>Tabon Cave, Palawan, Philippines from IB (14C) 9.25±0.25 to III: 23.2±1 ka to level IV: >30.1±1.1, above deepest artifact level V; hominid (U/Th) 16.5±2 ka (DEF2002)</p>	<p>Level III: hammerstones, cores, flakes, 10% used or retouched into scrapers, some denticulate; few choppers (Fox); 2 mandibles and cranium, <i>Homo sapiens sapiens</i> but robust or <i>Pongidae</i> features(?) (DEF2002)</p>	<p>Pig, deer (DEF2002)</p>
	<p>Malangine Cave and Koongine Cave, Mount Gambier, South Australia (Useries speleothem covering Karake engraved ceiling) minimum 28 ka (BR1999); (14C) 9.710±0.18 or 5.5±0.55 ka on calcite under Style III (FJ1997)</p>	<p>3 styles (Bednarik): I: Digital fluting, II: Karake Style: CLMs, 'x tracks'. (maybe 9-10 ka III: Circles, lattice (<5,550 BP) (FJ1997; but see redating BR1999)</p>	
	<p>Karlie-ngoinpool Cave, and other Mount Gambier Caves, South Australia</p>	<p>3 styles in sequence I: Digital fluting (possibly pits and grooves) II: Karake; circle, barred, concentric circles, CLMs of 2-5 lines; !maze, dots, parallel stroke marks; arcs, !stars, multiple wavy lines, xtracks, enclosures III: shallow lines (FJ1997)</p>	
	<p>Mushroom Rock West, Cape York, Australia But TL/14C discrepancy: Lower: (TL 3.8 m) 28.7±3.5 ka; (TL 2.96 m) 26.7±4 k; (14C sedim. rate extrapolated ~15 ka) Middle: (TL 2.3m) 20.7±3 ka (TL 1.4m) 9.5±1.9 ka (14C) 7.7 ka Upper : (14C calib. 1.2m) 4.5 ka (TL 0.75m) 8.6 ka; (TL 4.0 m but 12 m out) 37.4±3.9 ka (MJc1995)</p>	<p>Quartz, quartzite, silcrete, chert; L: bipolar, single and multi-platform cores, flakes, blades, core tools; M: L tools plus blade and burin cores, scrapers, adze ca. 10-15 ka; U: L+M cores, 1 point, backed micro-blades, elourae, adzes; ground-edge tools all levels; used pigment for painting all levels; cupules on buried sandstone slab unprovenanced, but also on shelf (MJc1995; MJa1995)</p>	

	<p>Sandy Creek II, Cape York, Australia (AMS on oxalate crust over 3 superimposed hematite pigment layers on rock wall) 24.6±0.22 (calibr.) ~27 ka; 15-16 ka; (calibr.) 7.499 k (CN1995) Lower: (no 14C, TL); Lower Middle: (sediment) ~15 ka or (artifact density) ~12 to ~15 ka; Upper Middle: (calibr. 14C) ~8.6; (TL) 7.7±2.1; 10.3±1.7 ka; Upper: (calibr. 14C) 4.232 to 1.992 ka; (TL) 5.4±0.7; 4.4±0.2 (MJa1995)</p>	<p>Lower 3 levels: bipolar reduction quartz, single platform quartzite cores; flakes, blades, ground-edge axe fragments (1 from Lower Level); At ~4 ka: 'more consistent blade production', burren adze slugs, 3 backed tools: 1 geometric microlith, 1 Bondi point, 1 eloura; 60 pieces of pigment all levels (red, orange, purple, white), utilized; red pigmented paintings since at least ~27 ka (MJa1995)</p>	
	<p>Kosipe, New Guinea (14C) occupations from 15.0 ka to 26.45±0.88 ka (FJ1990, MJ1999)</p>	<p>Edge ground waisted axes (White) (FJ1990)</p>	
	<p>Malangangerr Shelter, Arnhem Land, Australia Earliest occupation (uncal. 14C) 22.9±1.0, 22.7±0.7 and 19.6±0.55 (~19-24 ka) (FJ1990) but (TL) 32.9±7.0 (Roberts et al 1994) (OJ2004)</p>	<p>Ground-edge axes some with hafting grooves (FJ1990)</p>	
	<p>Woodstock 65B, Pilbara, Western Australia (microwane analysis on 2 circle petroglyphs) 19.376+7.219/-3.419 ka, 26.753+11.545/-3.349 or in range of ~16 to ~38 ka (BR2001)</p>	<p>Petroglyphs: circles, anthropomorphs (BR2001)</p>	
	<p>New Guinea II, Snowy River Unit 4: 20" above lowest tools (14C) 21+0.9/-0.8 reoccupied ~13-16 ka, 9-9.5 ka; 4.5 ka; 1-2 ka (OP1995 FJ1997)</p>	<p>Unit 4: 9 mostly cores and larger flakes, few scrapers; Units 3-1 cores and smaller flakes, more retouch, blade cores for microliths; Units 4-1 bone points; digital fluting, diagonal crossing lines, circles // Koonalda style (OP1995, FJ1997, 1990)</p>	

	<p>Kow Swamp, southern Australia (sing. aliq. OSL) ~19-22 ka interred in silt 19-22 ka and supported by palaeoenv. reconstruction (ST2003) versus (calibr. 14C) 9.5-15 ka</p>	<p>> 40 burials, oldest KS1, 5, 9 & 14; 1 and 5 complete crania; 'robust' type' with <i>erectus</i> features from Java (Alan Thorne) (MJ1999); <i>H. sapiens archaic</i> (Rhys Jones); grave goods: ochre, shells, marsupial teeth, cranial deformation? (FJ1990). Sparks site (burial area, infill, association?) quartz, retouched and unworked flakes and debris; nearby excavations, similar plus 'fabricators' (WR1975) = bipolar core fragments (MF1976)</p>	
	<p>Koonalda Cave, Nullarbor Plain, Australia Gallus (14C uncalibr.) (GaK-510) 'top fire' 13.7±0.27 ka; Wright (ANU-70) 15.85±0.32 ka; Gallus (V-82) 'bottom fire' 31.0±1.65 ka; Wright (V-96) 19.3±0.72 (ANU-245) 21.9±0.54 ka; charcoal in red silt (ANU-148) 19.4±0.45 ka and (ANU-244) 23.7±0.85 ka; Squeeze (V92) 19.9±2 ka; Gallus (ANU-1201) 'lowest floor, mining' 29.4+11.6/-4.6 ka hence >20 ka up to 30 ka (WR1971, FJ1997) (14C calibr.) 16-27 ka (GR2002)</p>	<p>Flint quarry, squeeze passageway to shaft with water below. 'MP cores, burins, knives, scrapers, flake axes, choppers, points' (Gallus) or 'cores and 96% unworked flakes (blanks)' (WR1971). Extensive digital fluting meanders, crisscross lines, lattices, herringbone; Squeeze entrance: SW side 2 sets of 4 concentric circles; lattice grids above entry. (WR1971). Standing stones & stones with zoomorphic and anthropomorphic shape (Gallus). Pre-Panaramitee tradition (FJ1997)</p>	<p>From red layer: <i>Macropus rufus</i>, <i>Sarcophilus</i>, <i>Dasyercus</i>, <i>Dasyurinus</i>, <i>Sminthopsis</i>, various rodents, reptiles, owl pellets (Thorne in WR1971)</p>
	<p>Kalate Egeanda Cave, Tari, Papua New Guinea (based on dating of other sites in region) possibly ~15-20 ka (FJ1997)</p>	<p>Digital fluting petroglyphs (FJ1997)</p>	
	<p>Dong Can, Vietnam ~16 ka (Cuong 1986) (DF2005)</p>	<p>Hoabinhian tools; teeth <i>H. sapiens sapiens</i></p>	

	Early Man Shelter, Cape York, Australia (minimum age of frieze) (14C calibr.) 14.4 ka and (14C uncalibr.) clean sand base of occupation 18.2±0.45 ka = max. age (CN1995)	Buried engraved frieze: 'cupules, xbird tracks, tridents, circles, mazes'; 1 buried engraved slab, 'xbird track' (calibr.) 4.536 ka ; 'typical of petroglyphs 5 ka to present' (CN1995)	
	Willandra Lakes, NSW Australia WLH-50 (Useries) ~ 14 ka (Simpson & Grün 1998) vs. ESR on bone 29 ka (Caddie 1987) (GR2006)	WLH50, robust' type contemporary with <i>H.s.s.</i> burial (GR2); 1300cc hence two groups, a relict <i>H. s. archaic</i> and <i>H. s. s.</i> who probably interbred (Rhys Jones) (FJ1990)	
	Keilor Terrace, Victoria, Australia (14C on H. bone) ~13 ka (14C) Douffa ~15 ka (14C) Galla Silt ~ 18 ka (GE1966, FJ1990) Green Gully, Keilor Ter.: (14C burial) 8.155±0.13 (BJ1967); (14C) flake industry 15.35±0.7 ka (GE1966, WJ1982)	KT cranium, partial femur <i>H. sapiens sapiens</i> , 'gracile' type; GG partial skeleton, shallow burial, possibly secondary; associated nearby quartz flakes, scrapers, 1 delicately trimmed 'thumbnail' scraper, 'fabricators' (BJ1967, FJ1990) = bipolar core fragments (MF1976)	
	Bukit Kepala Gajah, Lenggong Valley, Perak ~10-11 ka (VD2001)	<i>H. sapiens sapiens</i> (VD2001)	
	Song Terus (Song Keplek, Song Tritis, Goa Braholo) Southern Java ~10 ka (Simanjuntak 2003) (LA2004)	Burial, mandible <i>Homo sapiens sapiens</i> (LA2004)	
	Sturts Meadows, NSW (14C on carbonate overlying varnish) thus > 10.25±0.17, 10.41±0.17 k (Dragovich) (FJ1997)	Panaramitee style rock art (FJ1997)	
	Mai Da Dieu and Mai Da Nuoc, Hoà Binh, Vietnam 8.2 ka (Cuong 1986) (DF2004)	teeth <i>H. sapiens sapiens</i> Hoabinhian tools	
	Panaramitee North, Olary region, South Australia 'cation-ratio' dating (Dorn, Nobbs) ranging 3.5 ka to >43 ka (FJ1997) generally not accepted dating technique	Type site for Panaramitee style: pit, groove, circle, arc, track (macropod and bird), star, maze, parallel strokes, vulva, human footprint (FJ1997)	

	<p>Gum Tree Valley, Dampier, Western Australia (14 C on imported trumpet shell, associated with engravings?) 18.51±0.26 ka and between 3.67 ka and 1.51 ka (LM1992)</p>	<p>Both GTV and Skew V (below) Horsehoof and Small Tool Tradition; former surface finds more associated with Group 1; rock art by patina Group 1: cupules, circles, concentric circles, lines, ovals, ithyphallic figures; 2: triangles, mazes of lines, bi-lobed, ithyphallic, hands, kangaroo-men; 3 (fresh) boomerangs, bird-men, snakes, humans with exaggerated hands and feet; All 3 patinae: stick figures, female & ghost-like humans, copulating couples, turtle, kangaroo, fish, bird, bird track, arcs, eggs (LM1992)</p>	
	<p>Lake Nitchie, NSW, Australia (14C) 6.5-7.0 ka (FJ1983)</p>	<p>‘robust’ or <i>archaic H. sapiens</i>; burial with ochre pellets, necklace of 178 pierced Tasmanian devil teeth (from MNI 47), missing 2 central upper incisors // male initiation rite (FJ1983)</p>	
	<p>Ingaladdi Shelter, Victoria River, Northern Territory, Australia Oldest level (14C) 6.8±0.27 ka and 4.92±0.1 ka brackets art (FJ1990)</p>	<p>Engravings: ‘xbird tracks’ and abraded grooves on buried sandstone slab (FJ1997, 1990). Flake scrapers at all levels; lancet shaped flake preforms for unifacial and bifacial points appear at about 2.8 ka (CC2002, MJ1999)</p>	
	<p>Mt Yengo Shelter, New South Wales, Australia Lowest level (14C) 5.98±0.29; also at 4.59±0.3; 2.84±0.24 ka (FJ1997)</p>	<p>Partially buried engravings, Panaramitee style: ‘circles, dots, tracks’ associated to 5 to 6 ka dates (FJ1997)</p>	

	Lang Cuom, Vietnam 6.44±0.5 ka (Demeter 2000) (DF2005)	Hoabinhian tools; teeth <i>H. sapiens sapiens</i>	
	Lang Guo, Vietnam (Colani 1927) (DF2005)	teeth <i>H. sapiens sapiens</i>	
	Roonka, South Australia (14C) ~ 4.0 ka (FJ1983)	2 skeletons, <i>H. sapiens sapiens</i> , adult and small child, 'most elaborate status burial yet found', skin cloak with bone pins, paws of animal pelts, bird bones suggest fringe of bird feathers, child bore bird skull pendant, necklace of reptile vertebrae, feet stained with ochre (FJ1983)	
	Skew Valley, Dampier Western Australia (14C in midden) Layer I: 2.77-4.15 ka Layer II: 6.28-6.96±1 ka (LM1992)	'Core Tool and Scraper Tradition'; engraved rocks in midden Layer I: 2 with stick figures, 1 human figures, 1 spiral + funnel ('snake') (LM1992)	

Notes.

“It now seems probable that an extended Sahul continent existed not only at LGM but also throughout most of Marine Isotope Stage 3 (MIS3, 30–70 ka). Sea level fluctuated during MIS3 with decreasing amplitude in a range of about 60 ± 20 meters below present (Chappell et al. 1996b). Following LGM, sea level rose rapidly to reach a range similar to that in MIS3 by about 14 ka, shortly before Tasmania and New Guinea became isolated from Australia.” (Gillespie)

O’Connell and Allen (2003) argue that dates $> 45,000$ not well supported; continent probably occupied 42-45,000 BP.

“Archaeological criticism of 14 C and luminescence chronologies for the first occupation of Australia (e.g. Allen and Holdaway 1995; O’Connell and Allen 1998) appears to be based on concern that: the 14 C chronology extends only to about 40,000 BP, some TL/OSL dates are older than any 14 C results, U/Th/ESR dates for the Mungo 3 skeleton at >60 ka are older still, and Sahul dates >50 ka are earlier than 14 C dates from Europe and therefore a major revision of world prehistory is required to accommodate them.” [This is due to fact that 14C dating at its dating limit.] CONCLUSION “There are currently four widely separated regions of Australia with human occupation layers dated at **45 ± 3 ka** by some combination of overlapping 14 C, TL, OSL, and ESR results: Devil’s Lair in the southwest, Carpenter’s Gap and Riwi in the northwest, Malakunanja in the north, and Mungo in the southeast. According to the most recent TL, OSL, and U/Th results, many species of megafauna from all climatic zones became extinct at about the same time as people spread across the continent. Age resolution is not yet good enough in this period to precisely define when the first boat people arrived or the last big animal died, and the possible existence of older archaeology or younger mega-fauna will require further archaeological and stratigraphic confirmation.” (Gillespie)

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