Early human symbolic behavior in the Late Pleistocene of Wallacea

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Wallacea, the zone of oceanic islands separating the continental regions of Southeast Asia and Australia, has yielded sparse evidence for the symbolic culture of early modern humans. Here we report evidence for symbolic activity 30,000–22,000 y ago at Leang Bulu Bettue, a cave and rock-shelter site on the Wallacean island of Sulawesi. We describe hitherto undocumented practices of personal ornamentation and portable art, alongside evidence for pigment processing and use in deposits that are the same age as dated rock art in the surrounding karst region. Previously, assemblages of multiple and diverse types of Pleistocene "symbolic" artifacts were entirely unknown from this region. The Leang Bulu Bettue assemblage provides insight into the complexity and diversification of modern human culture during a key period in the global dispersal of our species. It also shows that early inhabitants of Sulawesi fashioned ornaments from body parts of endemic animals, suggesting modern humans integrated exotic faunas and other novel resources into their symbolic world as they colonized the biogeographically unique regions southeast of continental Eurasia.

Pleistocene art | Pleistocene symbolism | cognition | personal ornamentation | Wallacea

Anatomically modern humans (AMHs) had reached the edge of continental Eurasia (Sunda) and crossed eastwards into "Wallacea," the ∼1,700-km-wide zone of oceanic islands separating Sunda from the Pleistocene low sea-level landmass of Sahul (Australia/Papua) (1), by 47 ka (2), and possibly several millennia earlier (3). Wallacea lies in the east of Island Southeast Asia (ISEA) and straddles the equator between 4° N and 10° S. The islands comprising this archipelago have never been connected to adjacent continents, even at –120 m sea level during the Last Glacial Maximum (LGM, 22–19 ka). Wallacea is therefore regarded as a transitional zone between the biogeographical regions of Sunda and Sahul (1). How AMHs colonized Wallacea, with its abrupt discontinuities in terrestrial faunal distributions, rich biodiversity, and high species endemism (1, 4), is important for comprehending cultural behavior associated with the global expansion of Late Pleistocene *Homo sapiens*, as well as the initial peopling of the evolutionarily unique region of Sahul (5–7).

Compared with findings elsewhere, however, evidence for cultural complexity in Pleistocene Wallacea—and ISEA and Sahul generally—is markedly sparse (8–12). Some scholars argue that this pattern is an accurate reflection of past human behaviors and capabilities: According to this view, the region encompassing Pleistocene Sunda, Wallacea, and Sahul was fundamentally out of step with the pace of development in symbol use and advanced social behaviors recorded for the Paleolithic Old World (13, 14). However, the notion that the first AMHs to enter Wallacea were less "advanced" than Pleistocene peoples elsewhere is poorly supported. For instance, the patchy evidence for early symbolic behavior in Sahul is likely due, in part, to inadequate sampling and differential preservation (11). A case can also be made that the colonization of remote Sahul is itself demonstrative of cultural complexity (5, 7, 15) and that the slender evidence for symbol use at this period reflects the lack of intensive research in the region (6, 10–12).

The combined land area of Sunda–Wallacea–Sahul exposed by present sea levels—Malaysia, Indonesia excluding West Papua, Brunei, Timor-Leste, and the Philippines plus Australia and Papua = 10,626,408 km^2—is comparable in size to that of Europe (10,180,000 km^2). Despite this fact, fewer than 272 sites dating to between 50 ka and 10 ka (11, 16) have been discovered in ISEA/Wallacea ($n = 49$) and Sahul ($n = 223$). In contrast, over twice this number of sites ($n = 542$) with occupation from ∼39.5–11.5 ka has been excavated in a single sedimentary basin (∼50,000 km^2) in France's Dordogne region, an area 99.5% smaller (17). ISEA, in

Significance

We present evidence from the Late Pleistocene of Sulawesi, Indonesia, where an unusually rich and unique symbolic complex was excavated from archaeological deposits spanning 30,000 to 22,000 y ago. Including previously unknown practices of self-ornamentation, used ochre, pigmented artifacts, and portable art, these findings advance our knowledge of the cultural repertoires of modern humans in Pleistocene Wallacea, including the nonparietal artworks and symbolic material culture of some of the world's earliest known "cave artists."

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particular, remains woefully underexplored: Borneo, for instance, despite being 15.5% larger than France, has yielded only a single site from the period of AMH colonization (Niah Cave, Sarawak) (18), whereas reliable data for Pleistocene occupation by *H. sapiens* are available for only seven of the ∼2,000 islands in Wallacea (4).

Although none of these factors fully explains why evidence for symbolic behavior in Pleistocene Wallacea is so meager, it is clearly unsound to invoke a process of cultural degeneration. In our view, long-cherished ideas about the significance of Upper Paleolithic (UP) European "cave art" for the emergence of modern human culture have also bolstered arguments that Late Pleistocene human societies in Wallacea (and adjacent regions) were "simple." However, it is now known that early hunter-gatherers in Sulawesi were marking caves with hand stencils and figurative images of animals that are of comparable antiquity (40–35 ka) (19) to the oldest dated parietal motifs from Europe (20). Moreover, almost all of the rock art known from the European UP is confined to karst areas in the districts bordering France and Spain (21). Thus, our understanding of the symbolic worlds of UP Europeans is more validly based on the thousands of personal ornaments (22–24), portable artworks (25, 26), and other material symbols largely recovered from archaeological sites located within restricted regions (21, 24).

In ISEA, although we now have dated Pleistocene rock art from the large Wallacean islands of Sulawesi (19) and Timor (27, 28), we still have extremely limited knowledge of the wider symbolic culture and nonparietal art used by early AMHs in this region. Hence, any new empirical data recovered from dated archaeological sites using modern standards of excavation are vital for chronicling the nature and diversity of AMH cultures in this poorly understood part of the Paleolithic world. Moreover, in cases where excavated artifacts can be directly correlated with dated evidence for Pleistocene rock art in Wallacea—or anywhere else—the insight furnished into the spectrum of symbolic activities at play within these communities, owing to its rarity, has particular importance.

Here we describe evidence for Late Pleistocene art and symbol use on Sulawesi, the largest island (∼175,000 km^2) in Wallacea. We present our analysis and interpretation of a perforated bone ornament, disk-shaped bead blanks, stone artifacts incised with geometric patterns, and intensive use of mineral pigments, the latter most likely associated with rock art production but also including direct and indirect evidence for the pigmentation and coating of artifacts. These findings were excavated from deposits that we have dated to 30–22 ka (29). While postdating the first appearance of AMHs in ISEA by several thousand years (30), the context and age of these findings greatly expand our knowledge of the art and symbolic material culture of early AMHs in Wallacea. The new

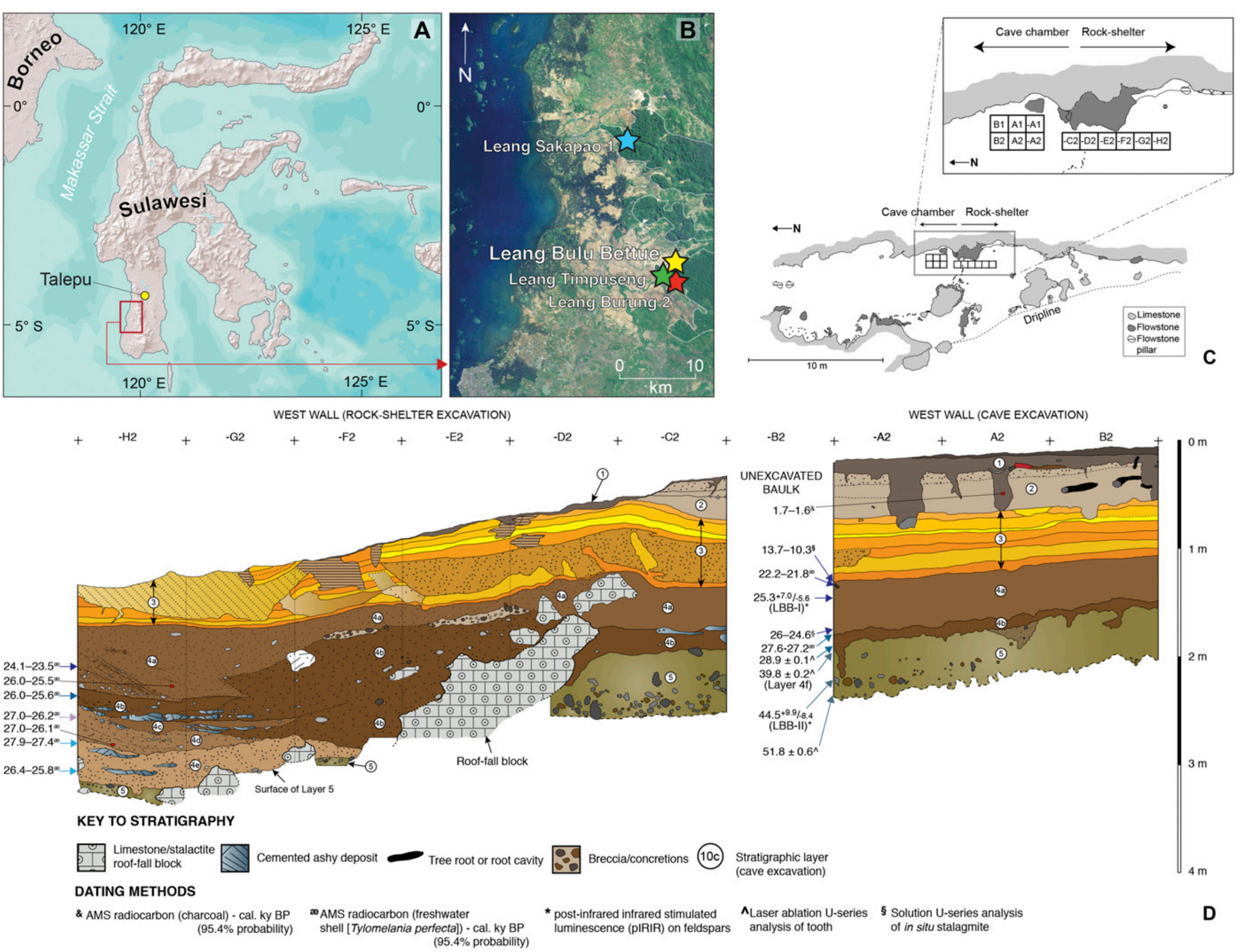

Fig. 1. LBB, (*A* and *B*) location, (*C*) site plan, and (*D*) excavation profiles. In *B*, dotted white lines highlight the main karst areas. Also shown are the locations of nearby sites with Late Pleistocene human occupation: Leang Burung 2, Leang Timpuseng, and Leang Sakapao 1.

artifacts also offer evidence that the colonization of Wallacea was achieved through a symbolic negotiation with the dramatically new faunal communities encountered east of the Sunda Shelf.

Archaeological Background

Before the current research, only two sites from Sulawesi with excavated Late Pleistocene deposits had been reported (Leang Burung 2 and Leang Sakapao 1; see refs. 31 and 32, respectively), both of which are located in the karst border plains of Maros-Pangkep in the island's southwestern peninsula (Fig. 1). The objects described here come from Leang Bulu Bettue (LBB), a prehistoric rock art site (19) situated in a cave and rock-shelter complex at the foot of a limestone tower in this ~450 km^2 karst area (Fig. 1 and *SI Appendix*).

Our 2013–15 investigations at LBB involved the excavation of a large trench (12 m^2) that extended from the cave mouth to the central floor of the adjacent shelter. Below the topmost Neolithic level, dated to 1.7–1.6 ka cal (calibrated) B.P., are cemented layers of flowstone with a total thickness of 108 cm. This culturally sterile, capping flowstone unit sealed the lower strata and is underlain by three distinct Pleistocene cultural deposits: a 1.5 m-thick sequence of silty clays (layers 4a–e) spanning 29.5–22.3 ka; an underlying 50 cm-thick sandy clay (layer 4f) preserved near the eastern wall of the cave spanning 40–30 ka; and below this, a 50 cm-thick sandy clay (layer 5) with an estimated age of 50–40 ka (29) (*SI Appendix*, Table S1). Findings occur sporadically below layer 5; however, investigation of these deposits is ongoing, and we have not yet exposed bedrock.

Recent excavations at Talepu, an open site situated 80 km north of LBB (Fig. 1), recovered in situ stone tools in deposits dated to 194–118 ka (33), and it has been proposed that these artifacts relate to occupation by archaic hominins of presently unknown identity (33). As yet, there are no Pleistocene fossils of hominins known from Sulawesi. We assume that *H. sapiens* occupied LBB by at least 40 ka, which is the minimum age of the oldest dated rock art motif from Maros-Pangkep (19).

Pleistocene Symbolic Behavior at LBB

We describe artifacts (n = 7) recovered from layers 4a–e (30–22 ka). Three of the objects are animal products modified into ornaments, and four are stone artifacts bearing incised lines. We also examine other excavated evidence for symbolic activity at LBB, including used red ochre pieces and ochre-stained chert tools, as well as a painted rock and a pigmented bone tube (*SI Appendix*).

Disk-Shaped Bead Manufacture. From layer 4d (~29.5 ka cal B.P.), we recovered two refitting artifacts that document a method of producing standardized disk-shaped beads (Fig. 2 and *SI Appendix*, Table S2). These items, Bead Blank A (BBA) and Bead Blank B (BBB), were both made on the same lower incisor of a babirusa "pig-deer" (*Babyrousa* sp.), an archaic suid endemic to Sulawesi that has subcylindrical incisors lacking enamel (34). Attributes preserved on the artifacts (*SI Appendix*) suggest that the tooth shaft was sectioned using a punch-like tool, followed by flexion to separate the pieces, creating the smooth/splintered surfaces. These objects feature a natural perforation consisting of the pulp cavity of the tooth, while the edges retain the aesthetically pleasing, natural tooth surface. The side opposite the conjoining face of detached blank BBA presents the same stigmata/traces of manufacture observed on the conjoining faces, indicating that the same process was executed on this edge. Neither specimen exhibits traces of use, suggesting these specimens may be manufacturing rejects or simply unused blanks.

This method of producing beads of similar diameter, color, texture, and perforation, with the thickness of the disks controlled by the placement of the punch, is—as far as we are aware—unique among Pleistocene modern human beadworking traditions. Furthermore, these artifacts provide the only Pleistocene evidence

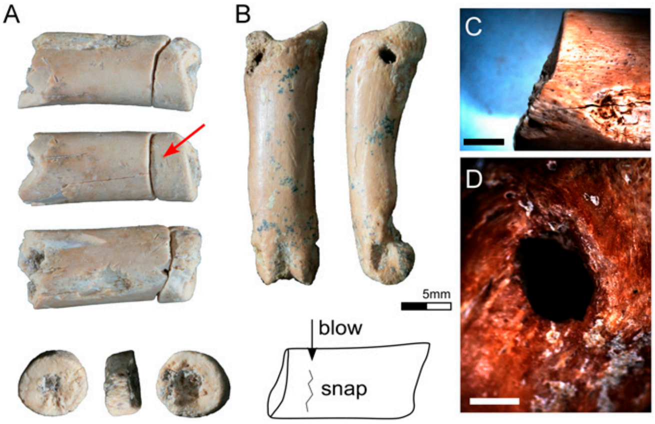

Fig. 2. Personal ornaments from LBB. (*A*) Disk-shaped bead blanks on *Babyrousa* sp. lower incisor: Red arrow indicates notch created by the use of a tool edge in directing the force of a blow through the tooth during sectioning. Detail of the fractured edge shown in *C* and both faces of BBA are shown at bottom left. The natural perforation consisting of the pulp cavity is in-filled with sediment. (*B*) Perforated *A. ursinus* phalanx: *D* provides detail of the intact perforation with attack point (top) and polish and smoothing of perforation wall visible. (Scale bar, 1 mm.)

east of India for standardized disk-bead manufacture (13, 14). Importantly, skeletal and dental elements attributable to babirusas are extremely rare in layers 4a–f at LBB (*SI Appendix*). In contrast, remains of suids (*Sus celebensis*) are second only to those of the endemic bear cuscus (*Ailurops ursinus*). The only babirusa remains appear to have been introduced for symbolic, rather than subsistence, purposes. At a nearby site, Leang Timpuseng (Fig. 1), a babirusa painting has a minimum Uranium series age of 35.4 ka (19). Evidence from LBB suggests these animals were rarely hunted in the Maros-Pangkep karsts by this time (see also ref. 35), and it remains unclear whether this situation relates to their ecological rarity or a cultural proscription.

Perforated Bone Pendant. Layer 4a (26–22.3 ka) yielded a bear cuscus phalange with a medial–lateral perforation at its proximal end (the "base") (Fig. 2) (*SI Appendix*, Table S3). The remnants of a notch used to constrain a point for drilling (i.e., an "attack point") (23) were identified. Protuberances on the head and base on the posterior surface exhibit polish, which we interpret as evidence for smoothing of the bone surface and the addition of greases from skin, leather, or the bone itself being lightly ground together (i.e., as a form of use wear). Evidence for the beginnings of a notch being worn into a corner of the perforation owing to threading ("key-holing") is apparent on the distal edge of the perforation. The distribution of polish suggests that the perforated bone was strung as a pendant and suspended with the posterior face resting, and repeatedly rubbing, against a soft surface (e.g., skin or clothing).

The use of whole small animal bones as personal ornaments is presently unrecorded elsewhere in Pleistocene ISEA or Sahul at an equivalent, or earlier, time period. Bear cuscuses appear to have been the dominant prey item at LBB. Weighing ~5–10 kg, *A. ursinus* is the largest and most primitive of the Phalangeridae (36). The discovery that the pre-LGM inhabitants of LBB used ornaments fashioned from *A. ursinus* bones implies these economically important marsupials may also have acquired symbolic meaning for early human communities on Sulawesi.

Portable Art. Five stone artifacts with incised lines, V-shaped in section, were recovered from layers 4a and 4d (Fig. 3 and *SI Appendix*, Table S4). Artifact 153 (layer 4a) is a used, truncated (37) chert flake with traces of red ochre (Fig. 3*A*). The truncated

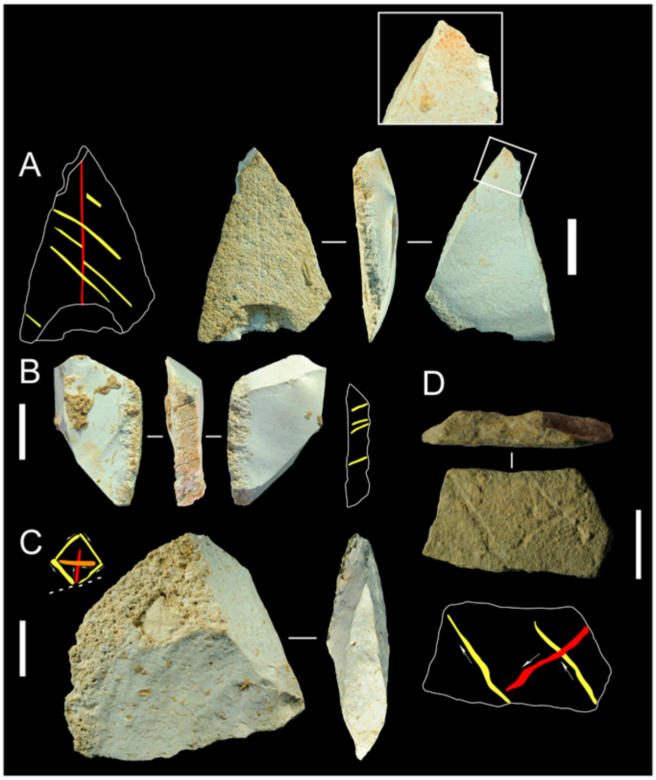

Fig. 3. Incised stone artifacts from LBB. (*A*) Artifact 153 (layer 4a), a used truncated flake with traces of red ochre at the tip (shown magnified in *Inset*). The cortical surface of the artifact was lightly incised with a leaf-like motif. (*B*) Artifact 443 (layer 4a), a flake struck down a steep cortical ridge on the core and truncated. The cortical back is lightly incised with four lines oriented at right angles to the ventral surface. (*C*) Artifact 2344 (layer 4d), an unmodified flake with a cross incised into a sunken square on the cortex. (*D*) Artifact 10 (layer 4a), a thin fragment of tabular limestone lightly incised with a cross-hatched pattern. (Scale bar, 10 mm.)

edges are oriented obliquely to each other, creating a robust pointed projection, modified by the removal of a small flake. The cortical surface of the artifact was lightly incised with a central line extending from the center of this retouch to the tip of the projection, dividing the triangular artifact into more-or-less equivalent halves. Three equally spaced lines, 5 mm apart, extend obliquely from the central line at ~40°, running to the tool's edge. Two of the lines appear to cross the central line, and up to six other lines, parallel to the oblique lines, are visible under magnification. The resultant geometric pattern is leaf-like in form.

Artifact 443 (layer 4a) is a truncated chert flake struck down a steep cortical ridge on the core, resulting in a cortical "back" (Fig. 3*B*). The cortical back was lightly incised with four lines oriented at right angles to the ventral surface. Artifact 2344 (layer 4d) is an unmodified chert flake with a cross incised into a sunken square on the cortex (Fig. 3*C*). Artifact 10 (layer 4a) is a small, thin fragment of tabular limestone that was lightly incised with two parallel lines, 6.6 mm apart, and a third line oriented at a right angle to the first two, forming a simple cross-hatched pattern (Fig. 3*D*). The engraved face is relatively smooth, and the opposite face is rough and resulted from exfoliation from a larger, decorated piece. Artifact 1878 (layer 4d) is a used chert flake with an area of dorsal cortex incised by a single, shallow 22-mm-long line.

These incised stone artifacts provide evidence from Wallacea and the wider region for a tradition of creating nonrepresentational imagery on mobile rock surfaces using a distinct artistic technique (incising with lithic tools), resulting in geometric motifs that are presently undocumented in the dated Pleistocene rock art of Sulawesi and more distant parts of ISEA (19). The practice of incising abstract patterns on stones either before the knapping process or afterward is rare worldwide (38, 39) and, to our knowledge, unique within ISEA (and Sahul)—the closest examples in Asia being a stone core engraved with crossed and parallel lines, which dates to 30 ka in China (40), and five incised stones from Xom Trai Cave in Vietnam (22–19 ka) (41). Similar objects occur in UP France (42) and at Clovis sites (39).

In layer 4d, we also identified a loose slab of flowstone (300 × 230 × 70 mm) that had been marked on one surface with a ~75-mm-long finger-width line of black, mineral carbon-based paint (*SI Appendix*, Fig. S5)—a possible example of portable art (21).

Pigment. Layers 4a–f contained extensive amounts of red- and mulberry-colored ochre fragments. We also recovered four ochre nodules (av wt = 22.9 g)—three from layer 4a and one from layer 4b—all of which exhibit signs of utilization (including primary traces from scraping and grinding and secondary traces from rubbing on a soft surface such as animal hide or skin) (Fig. 4 *A–D*). In addition, we identified an ochre "plaquette" (layer 4b) and three unmodified ochre nodules (two from layer 4a and one from layer 4b) that were brought to the site. Other evidence for pigment processing includes ochre residues on 30 chert artifacts (25 from layer 4a, three from layer 4b, and two from layer 4f) (Fig. 4 *E–I*), including the incised implement described above. The ochre residues reflect use of lithic edges for two different activities: scraping ochre, presumably to generate powdered pigment, and scraping or working the surfaces of already-painted objects. Preliminary compositional analysis using portable X-ray fluorescence (pXRF) indicates that mineral pigments used to create dated Pleistocene rock art at nearby sites (19), and the red ochres recovered in layers 4a–e at LBB, have consistently elevated abundances of iron with associated ochre matrix elements (Si and K). In layer 4b, we also found a small section of an *A. ursinus* long bone with traces of red and black pigment (Fig. 4*J*; see *SI Appendix*). The hollow, tube-like morphology of the bone, and the distribution of colorants on it, is consistent with those few bone items identified as "blow-pipes" or "airbrushes" from UP Europe, which were apparently used for creating hand stencils and other rock art (43, 44).

The only archaeological evidence for Pleistocene pigment use documented previously on Sulawesi includes two used red ochre pieces excavated from nearby Leang Burung 2 (associated with a ^{14}C age of 25,561 ± 235 y cal B.P.) (31) and a chert flake with ochre residues from Leang Sakapao 1 (~30–20 ka) (32). The earliest indications of pigment at LBB, two ochre-stained chert tools from layer 4f, are consistent in age with the oldest known parietal art motif in Maros-Pangkep (~39.9 ka) (19). Layer 4a contains abundant evidence for pigment, and the age of this unit (26–22 ka) fits well with that of the latest dated hand stencil in the Maros-Pangkep karsts, which has age brackets of 27.2 ka and 22.9 ka (19). Thus, both the oldest and youngest evidence for pigment use at LBB conform to the known time span of the pigment-based rock art tradition on Pleistocene Sulawesi.

Discussion and Conclusion

Current evidence for the artistic traditions and/or symbolic material culture repertoires used by AMHs during the pre-LGM period is available from two Wallacean regions: Maros-Pangkep and the easternmost tip of Timor-Leste. Empirical data from these karst areas, separated by an ocean gap of ~900 km, include parietal art on Sulawesi, with a ~40-ky-old stenciling tradition and figurative art at about 35 ka (19), and a contrasting region of parietal art on Timor-Leste dating between 29.3–24 ka (27) and 12.5–10.2 ka (28). Further research on Timor-Leste has uncovered drilled and painted marine shell (*Nautilus* sp.) ornaments dating from 42 to 38 ka cal B.P. (45) and marine shell (*Oliva* sp.) beads from ~37 ka cal B.P. (12). In the latter region, there is also evidence for pelagic fishing, probably using fishhooks, by ~42 ka cal B.P. (46), and

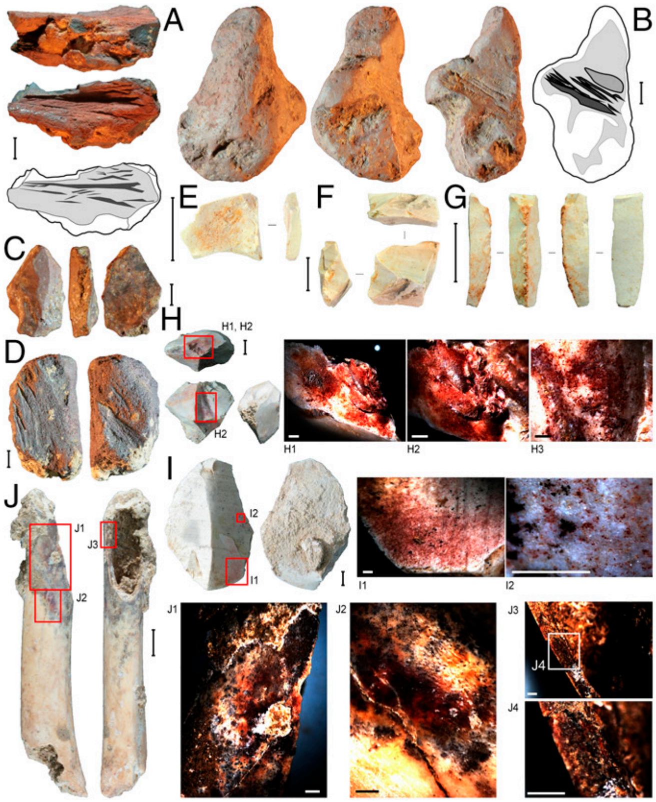

Fig. 4. Evidence for pigment use at LBB. (*A*) Used ochre nodule (layer 4a). On the accompanying illustration, striations from scraping are depicted in dark gray. (*B*) Use-worn ochre piece (layer 4a); light gray, ground area; dark gray, scraped area; midgray, scraped area partially worn away by abrasion. (*C*) Ochre nodule with flake scars at the proximal extremity suggesting it was detached from a larger nodule (layer 4b)—a central (dorsal) facet reaches 14.8 mm from the distal edge and, along with a single facet located on both the left and right sides of this central one, displays evidence for rubbing against a soft surface. (*D*) Use-worn ochre piece (layer 4a). (*E–G*) Chert artifacts with red ochre residues from layer 4a. (*H*) Chert flake with ochre residues (layer 4f). (*I*) Chert flake with ochre residues (layer 4f). (*J*) Possible pigment blow-pipe made on a bear cuscus long bone (layer 4b). [Scale bar, (*A–J*) 10 mm and (*H1–3*, *I1* and *I2*, and *J1–4*) 1 mm.]

highly elaborate artifacts have been recovered, including a complex bone point with bilateral notching (35 ka cal B.P.) (47). The total number of individual instances of Pleistocene symbolic behavior from Wallacea is still very small; however, new finds are emerging at a rapid pace with the onset of intensive fieldwork programs in Maros-Pangkep and Timor-Leste. Maros-Pangkep is also now possibly the only region outside Western Europe to have yielded a dated pre-LGM assemblage of ornaments, portable artworks, and other examples of material symbolism that can be explicitly linked to the same Pleistocene societies responsible for the creation of parietal art in the local landscape.

Both in Wallacea and Sahul, rare body adornments recovered from Late Pleistocene contexts are manufactured almost exclusively on marine resources, with marine shells predominating (12, 45, 48), but also including a perforated shark's tooth pendant (39.5–28 ka) (49). In all cases, used materials were available less than ~3–5 km from sites. Although debate continues over whether the first AMH colonizers dispersed across the Sunda landmass along coastal routes or an interior "savannah corridor" (50), the above data support the view that the initial colonization wave of *H. sapiens* moved rapidly through Wallacea, exploiting long familiar aquatic foods (5, 45). Importantly, shells of endemic marine gastropods (*Nautilus* sp.) were used for ornament production in Timor (45), suggesting the integration of hitherto unfamiliar species into existing symbolic cultures.

In the case of LBB, the pre-LGM occupants were at most ~60 km from the coast; however, there is no marine or estuarine shell in the deposit and no other signs of contact with coastal environments. Thus, by at least 10–20 millennia after initial landfall in Sulawesi, some groups of AMHs appear to have been living more or less permanently away from the coast. They also seem to have developed cultural traditions that were particular to their way of life in interior lowland habitats. Indeed, taken together, the dated parietal art, the presence of two discrete types of personal ornaments, a unique approach to creating portable art, and diverse pigment use are suggestive of a distinct and flourishing symbolic culture in the lowland karsts of pre-LGM southern Sulawesi. We expect to find that pigment use traditions in Maros-Pangkep originated at the periphery of the Sunda Shelf, as suggested by the presence of stylistically similar rock art in Borneo (19). As yet, however, there is no evidence for ornaments or portable artworks in a comparable Late Pleistocene context in the interior of Borneo (Niah) (18, 30, 51), raising the possibility the LBB practices represent in situ developments.

At LBB, personal ornaments and portable art first appear 30–22 ka during a period of climatic stress on Sulawesi (52). It is unclear whether a major spike in human occupation intensity at this time is owing to more regular use of the site, the growing presence of people in the surrounding karsts, or a combination of both. One possibility, however, is that glacially induced changes to shoreline morphology disrupted AMH settlement patterns in the region (*SI Appendix*), displacing formerly coastal-dwelling groups inland and causing "demographic packing" (e.g., see ref. 5). Evidence for ornaments/portable artworks spanning 50–30 ka might therefore be expected in as-yet-unexplored coastal areas west of Maros-Pangkep. Alternatively, social pressures triggered by increasing population sizes in the karsts 30–22 ka may have driven the innovation of novel signaling technologies.

Finally, it is possible that the distinctive ecology of Sulawesi gave rise to conceptual changes in human symbolic culture. Sulawesi's mammal community has an extremely high rate of endemism (92%, excluding bats) (34, 53). Hence, the first people to reach this island from the Sunda Shelf would have discovered a highly insular animal world that differed markedly in character and composition from continental Eurasian faunas—as exemplified by the absence of Asian apex predators. Most Sulawesian species would have been new and exotic to AMH colonizers; in fact, it was probably on Sulawesi that *H. sapiens* first encountered marsupials. They also would have recognized few of the flowering plants (54). The Maros-Pangkep record suggests that Pleistocene hunter–gatherers ascribed symbolism and meaning to two of Sulawesi's most characteristic endemics, babirusas and bear cuscuses, depicting the former in their art and wearing parts of both animals as ornaments. These data show that the AMHs who crossed to Sulawesi had the wherewithal to identify new resources and use them from both economic and sociosymbolic perspectives. This capacity would have been fundamental to the colonization of the Wallacean archipelago, and Sahul in particular—indeed, it is noteworthy that the oldest bone implement from Sahul is a modified kangaroo fibula apparently used as a "nose-bone" (46 cal ky B.P.) (55), suggesting an early application of symbolic values to macropods. It follows that when AMHs ventured into Wallacea they may have begun to develop traditions of creative expression that essentially were as diverse and novel as the endemic organisms inhabiting this region. If so, we may expect to find that the regional pattern of Pleistocene symbol use was more distinct, complex, and variable than is generally assumed.

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