

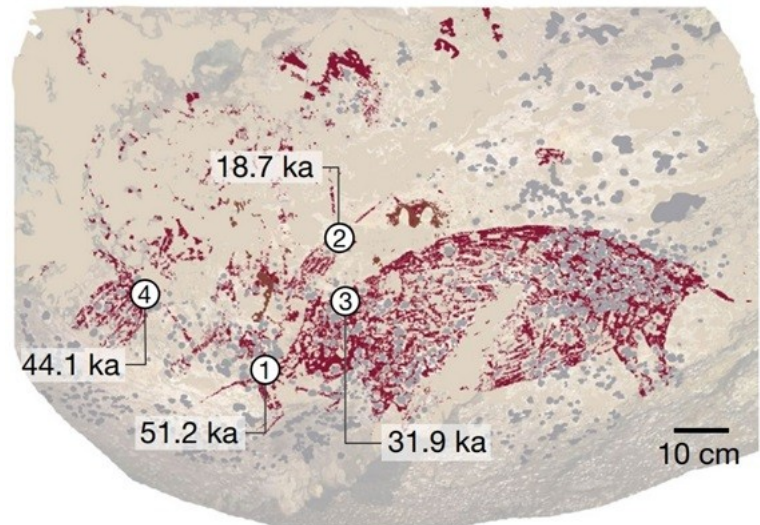
## Oktaviana AA, et al. 2024 Narrative cave art in Indonesia by 51,200 years ago

Previous dating research indicated that the Indonesian island of Sulawesi is host to some of the oldest known rock art. That work was based on solution uranium-series (U-series) analysis of calcite deposits overlying rock art in the limestone caves of Maros-Pangkep, South Sulawesi.

Here we use a novel application of this approach—laser-ablation U-series imaging—to re-date some of the earliest cave art in this karst area and to determine the age of stylistically similar motifs at other Maros-Pangkep sites. This method provides enhanced spatial accuracy, resulting in older minimum ages for previously dated art.

We show that a hunting scene from Leang Bulu' Sipong 4, which was originally dated using the previous approach to a minimum of 43,900 years ago (43.9 ka), has a minimum age of  $50.2 \pm 2.2$  ka, and so is at least 4,040 years older than thought.

Using the imaging approach, we also assign a minimum age of  $53.5 \pm 2.3$  ka to a newly described cave art scene at Leang Karampuang. Painted at least 51,200 years ago, this narrative composition, which depicts human-like figures interacting with a pig, is now the earliest known surviving example of representational art, and visual storytelling, in the world.



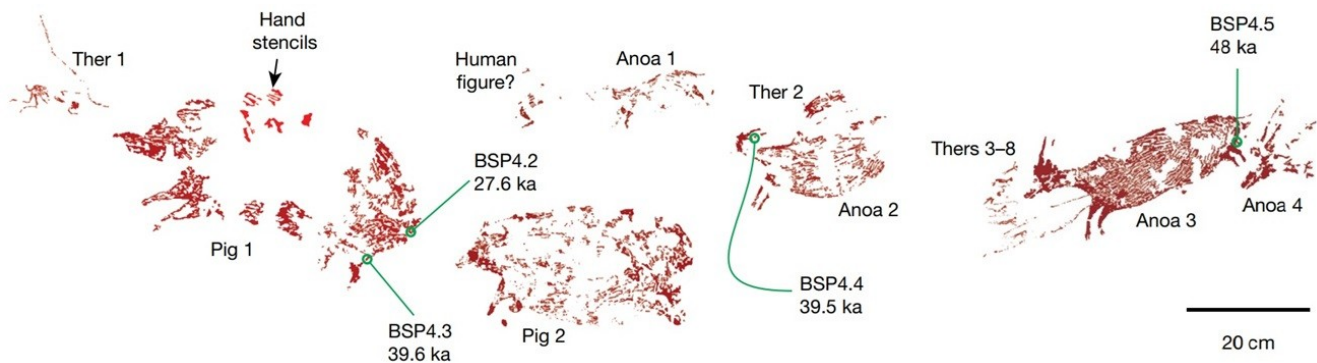
Our findings show that figurative portrayals of anthropomorphic figures and animals have a deeper origin in the history of modern human (*Homo sapiens*) image-making than recognized to date, as does their representation in composed scenes.

To demonstrate the efficiency and reliability of this technique, we re-dated what was previously the oldest known surviving pictorial narrative, a rock art scene at Leang Bulu' Sipong 4, which we had already dated to a minimum of 43.9 ka.

At this cave site, a 4.5-m-wide panel on the rear wall comprises several figurative paintings of human-like figures interacting with Sulawesi warty pigs and dwarf bovids (anoas, *Bubalus* sp.). The former are depicted with material culture objects (spears and/or ropes) and some display what can be construed as attributes of non-human animals. These figures are interpreted as representations of therianthropes (composite human–animal beings).



This enigmatic scene may represent a hunting narrative, while the prominent portrayal of therianthrope figures implies that the artwork reflects imaginative storytelling (for example, a myth).



We originally dated a total of four coralloid speleothems overlying animal figures on this panel to a minimum of 35.1 ka ( $35.7 \pm 0.6$  ka; sample BSP4.2), 43.9 ka ( $44.4 \pm 0.5$  ka; BSP4.3), 40.9 ka ( $41.1 \pm 0.2$  ka; BSP4.4) and 41 ka ( $41.3 \pm 0.4$  ka; BSP4.5). Using our LA-U-series method, those same speleothems and the associated artwork are now dated to a minimum of 27.6 ka ( $28.3 \pm 0.6$  ka; sample BSP4.2), 39.6 ka ( $43.2 \pm 3.6$  ka; sample BSP4.3), 39.5 ka ( $40.4 \pm 0.9$  ka; sample BSP4.4) and 48 ka ( $51.2 \pm 2.2$  ka; sample BSP4.5).

Our LA-U-series approach provides either similar ages within error or older ages when compared with previous dates for the same samples.

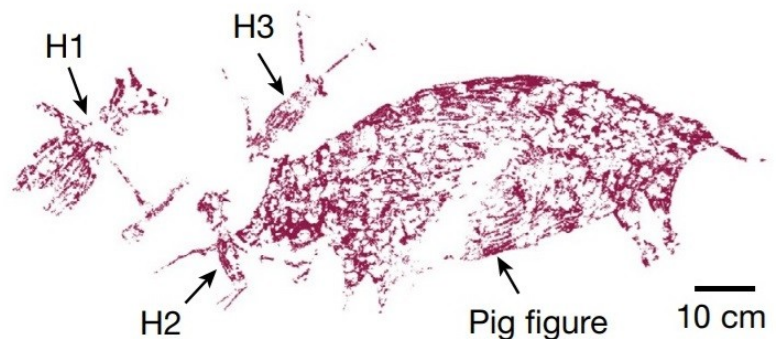
Dating results for Leang Karampuang rock art Using the LA-U-series method, we also dated another rock art scene in Maros-Pangkep—one that again portrays human-like figures interacting with an animal. This ceiling panel was discovered in 2017 at the

limestone cave of Leang Karampuang. It is in a poor state of preservation owing to extensive exfoliation of the limestone rock surface, a process that has erased much of the art. The presence of abundant overlying coralloid growths (and other types of speleothems) further obscures the imagery.

The visible elements of the scene are dominated by a large (92 × 38 cm) naturalistic red painting of a suid (most probably *S. celebensis*). This animal figure is represented as a pictorial outline shown in side (profile) view with an infill pattern consisting of painted strokes or lines. It is therefore consistent in style with the visual convention used to represent pigs and other animals in the dated Late Pleistocene rock art of South Sulawesi, including at Leang Bulu' Sipong 4.

Other pig motifs (n = 5) are present at Leang Karampuang, but do not seem to be associated with the dated panel. In the latter, the pig is standing in a static position with its mouth partly open. At least three human-like figures (denoted H1 to H3) were depicted in close association with the pig as part of a single composition. The former were portrayed using the same red-hued pigment and broadly the same stylistic convention as the pig, although they are smaller in size. At least two are arrayed in dynamic action poses near the head and face of the animal and seem to be engaged in some kind of close interaction with it.

The largest human-like figure (H1, 42 × 27 cm) is represented with both arms extended; it has no legs, and it appears to be holding an item of material culture in its left hand, a rod-like object with a protuberance at both ends.



The second human-like figure (H2, 28 × 25 cm) is positioned immediately in front of the pig with its head next to the snout. It also seems to have both arms extended and is holding a stick-like object of indeterminate form in its left hand, one end of which may be in contact with the pig's throat area.

The last human-like figure (H3, 35 × 5 cm) is depicted in an upside-down position with its legs facing up and splayed outwards. It also has its arms extended, with one hand reaching towards and seemingly touching the pig's head. Pigment traces between H1 and H3 suggest that another figure may have originally been part of the scene.

At least two hand stencils visible on the panel seem to be contemporary with the scene;

another hand stencil, made using a darker pigment, is overlaid by the pig and was therefore produced earlier in time.

The actions taking place among the figures in this scene are difficult to interpret. In contrast to the dated artwork at Leang Bulu' Sipong 4, this composition involving human-like figures and an animal does not seem to explicitly depict hunting activity, nor are therianthropes obviously represented, although we cannot rule out either.

We collected four coralloid speleothems, one over each of the human-like figures and one over the closely associated pig motif. Samples LK1, LK2 and LK4 directly overlay H2, H3 and H1, respectively, while LK3 directly overlays the pig image. The results of LA-U-series dating of LK1 provided a minimum age of 51.2 ka ( $53.5 \pm 2.3$  ka), whereas the same method applied to LK2, LK3 and LK4 yielded minimum ages of 18.7 ka ( $19.2 \pm 0.5$  ka), 31.9 ka ( $34.1 \pm 2.2$  ka) and 44 ka ( $45.9 \pm 1.9$  ka), respectively.

Thus, we can demonstrate that this rock art scene was present at Leang Karampuang at least 51.2 ka, when the oldest dated coralloid (LK1) began to form on top of figure H2. Implications for the early history of art At Leang Bulu' Sipong 4, our LA-U-series dating work shows that the panel with the figurative art and composed scene is at least several thousand years older than previously established, with a new minimum age of 48 ka.

Furthermore, our use of the same method at Leang Karampuang shows that both forms of artistic expression (naturalism and narrative) date to at least 51.2 ka in the Maros-Pangkep karsts.

It is evident from these findings that the use of figurative depiction has a particularly deep antiquity in the history of early human visual culture.

Of the three oldest dated cave art panels now known from Sulawesi, Leang Karampuang (minimum age, 51.2 ka), Leang Bulu' Sipong 4 (minimum age, 48 ka) and Leang Tedongnge (minimum age, 45.5 ka) all involve figures that are grouped together in such a way as to allow an observer to infer actions taking place among them.

It is possible that the Leang Tedongnge art is older; however, we were unable to re-date it using the new approach, as there was no calcium carbonate material remaining (the previous method involved the use of the entire sample).

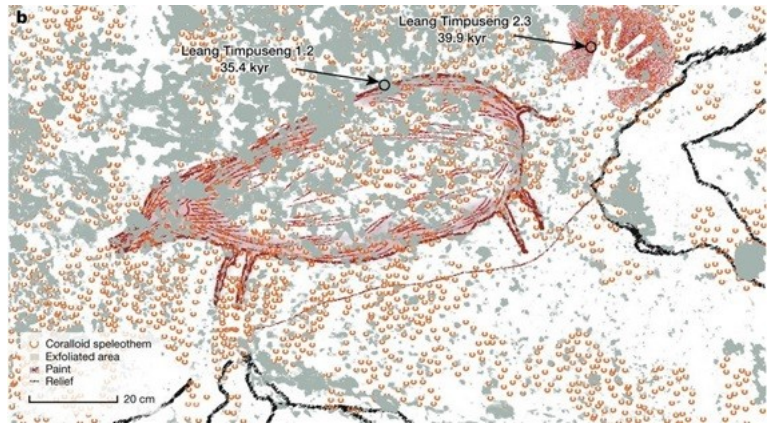


Leang Tedongnge art



Two panels seem to comprise pictorial representations of human–animal relationships (Leang Karampuang and Leang Bulu’ Sipong 4), while the third depicts animals (S. celebensis) that are apparently interacting with each other.

Moreover, the panel at Leang Timpuseng (minimum age, 35.3 ka) portrays a pig standing on a painted line representing the land surface, another convention used in scenic depiction.



The use of composed scenes in cave art may have enhanced the communicative potential of this

visual medium. In contrast to single-figure depictions, the agency of the juxtaposed figures constituting a narrative scene allows a story to be told through images in a manner that does not require the producer of the art to be present to convey the narrative to an audience.

Scene-making has therefore been linked to an increase in the potential for images that persisted on rock surfaces to transmit particular narratives (such as myths) over long periods of time, especially when combined with oral traditions.

On the basis of our dating work, it now seems that depictions of anthropomorphic figures (including therianthropes) interacting with animals appear in the Late Pleistocene cave art of Sulawesi at a frequency not seen elsewhere until tens of millennia later in Europe. This implies that a rich culture of storytelling developed at an early period in the long history of *H. sapiens* in this region — in particular, the use of scenic representation to tell visual stories about human–animal relationships.