Inquiry: Identifying a Fossil from its Morphology

1: Assessment of the Condition of the Fossil

The mystery fossil preserves a little more than a quarter of the cranial vault. This includes the frontal, right temporal, and zygomatic bone. However, the entire left side of the skull is not present. The right parietal bone is missing a big chunk of itself. Additionally, the occipital bone is missing on the right side. The right frontal bone is also missing a small chunk. What is preserved of this skull, however, does not appear to have any distortion.

2: Comparison to Six Hominin Species/Populations

2a. Australopithecus Africanus

(1) Neither the mystery fossil or the *Au. Africanus* fossil have a sagittal crest.
(2) The mystery fossil has a much taller face than *Au. Africanus*.
(3) The mystery fossil has less subnasal prognathism *Au. Africanus*.
(4) The mystery fossil has larger premolars than *Au. Africanus*.
(5) The mystery fossil is bigger than *Au. Africanus* in cranial vault size, suggesting a larger brain
(6) The mystery fossil has a less prominent brow ridge than *Au. Africanus*.

Out of the features I compared, the skull is different from *Au. Africanus* in 5 out of the 6 features and similar in 1.

2b. Paranthropus Robustus

(1) The mystery fossil does not have a sagittal crest, but the *Paranthropus Robustus* skull does.
(2) The mystery fossil has a taller face than *Pa. Robustus.*
(3) The mystery fossil has less subnasal prognathism than *Pa. Robustus.*
(4) The mystery fossil has equal size premolars to *Pa. Robustus.*
(5) The mystery fossil is bigger than *Pa. Robustus* in cranial vault size, suggesting a larger brain.
(6) The mystery fossil has a less prominent brow ridge than *Pa. Robustus.*

Out of the features I compared, the skull is different from *Pa. Robustus* in all of the features but one.

2c. Paranthropus Boisei

(1) The mystery fossil does not have a sagittal crest, but the *Paranthropus Boisei* skull does.
(2) The mystery fossil has a taller face than *Pa. Boisei*
(3) The mystery fossil has less subnasal prognathism than *Pa. Boisei.*
(4) The mystery fossil has equal size premolars to *Pa. Boisei.*
(5) The mystery fossil is bigger than *Pa. Boisei* in cranial vault size, suggesting a larger brain.
(6) The mystery fossil has a less prominent brow ridge than *Pa. Boisei.*

Out of the features I compared, the skull is different from *Pa. Boisei* in all of the features but one.

2d. Homo Habilis

(1) The mystery fossil and the *Homo Habilis* skull do not have a sagittal crest.
(2) The mystery fossil has an equal size face to *Homo Habilis*
(3) The mystery fossil has equal subnasal prognathism to *Homo Habilis.*
(4) The mystery fossil has lesser size premolars than *Homo Habilis.*
(5) The mystery fossil is bigger than *Homo Habilis*, suggesting a bigger size brain.
(6) The mystery fossil has a less prominent brow ridge than *Homo Habilis*.

Out of the features I compared, the skull is the same as *Homo Habilis* in 3 out of the 6 features.

2e. Homo Erectus

(1) The mystery fossil and the *Homo Erectus* skull do not have a sagittal crest.
(2) The mystery fossil has an equal size face to *Homo Erectus*.
(3) The mystery fossil has equal subnasal prognathism to *Homo Erectus*.
(4) The mystery fossil has equal size premolars to *Homo Erectus*.
(5) The mystery fossil is equal to *Homo Erectus*, suggesting an equal size brain.
(6) The mystery fossil has a lesser size brow ridge to *Homo Erectus*.

Out of all the features I compared, the skull is the same as *Homo Erectus* in 5 out of the 6 features.

2e. Neanderthals

(1) The mystery fossil and the *Neanderthal* skull do not have a sagittal crest.
(2) The mystery fossil has an equal size face to *Neanderthal*.
(3) The mystery fossil has equal subnasal prognathism to *Neanderthal*.
(4) The mystery fossil has smaller premolars than *Neanderthal*.
(5) The mystery fossil's cranial vault is smaller than *Neanderthal*, suggesting a smaller size brain.

(6) The mystery fossil's brow ridge is smaller than *Neanderthal*.

Out of all the features I compared, the skull is the same as *Neanderthal* in 3 out of the 6 features.

3: Assessment of the Best Match for the Mystery Skull

The mystery fossil is very different from *Au. africanus*, *P. robustus*, and *P. boisei*. It appears to have a larger brain size than all of these species judging from the size of its cranial vault and has a larger face than all of these species. Unlike *Au. Africanus*, it does not have any prognathism and the face seems vertically oriented. Additionally, it does not have the sagittal crest that *Paranthropus* does. It seems most similar to species within the *Homo* genus. The fossil has a smaller cranial vault than *Neanderthal* skulls, which means out of the choices, it is most likely to be either *Homo Erectus* or *Homo Habilis*. I could not figure out for certain which of these species the mystery fossil was from due to the fact that the mystery fossil showed only a small cross-section of the skull – to be sure, we would need more of the skull to observe the characteristics of the jaw and the full cranial vault. My guess is that the fossil is most likely a *Homo Erectus* skull, based on the fact that the mystery fossil appears to have a larger cranial capacity and has a more modern-looking, non-ape-like skull, including a less prominent brow ridge.

However, it is very possible that the mystery fossil belongs to a species that I do not know of. For all I know, this could be a fossil of an early *Homo Sapiens* since it looks quite similar to a modern human skull. Dating the fossil would help in knowing if this fossil was of a modern human or of some other species, since *Homo Sapiens* are a relatively recent species in human development.