Dear Students:

In this packet, you will be reviewing the topic of Evolution in a creative way. First, you will answer some questions about a photo, then you will read an article on one aspect of human evolution, and lastly, you'll be prompted to write about your understanding of the article.

**ACTIVITY 1: Activate Your Thinking**

1. What message is this woman trying to communicate through her facial expression?

2. If you were unable to move any of the muscles in your face, how would this affect your life?

**ACTIVITY 2: Annotate the Article & Answer Questions**

*Directions:* As you read the article, highlight or circle words you don’t understand, underline important concepts that stand out, and add comments or write any thoughts that pop-up in your head. For full credit, there must be evidence that you’ve annotated the article. Answer the questions after the article.

*Raising Eyebrows: How Evolution Gave Us Expressive Faces*

*By The Guardian*

Modern humans might never have raised a quizzical eyebrow had *Homo sapiens* not lost the thick, bony brows of their ancient ancestors, a new study suggests. Instead, they took on
smoother facial features.

Researchers at the University of York in England believe early humans bore large brow ridges that showed physical dominance. Then the human face evolved to become smaller and flatter, allowing eyebrows to reveal more emotion.

"We traded dominance or aggression for a wider palette of expression," said Paul O'Higgins, a professor of anatomy and lead author on the study. "As the face became smaller and the forehead flattened, the muscles in the face could move the eyebrows up and down and we could express all these subtler feelings."

The Evolution Of The Eyebrow

The York team stresses their conclusions are speculative, but if they are right, the evolution of smaller, flatter faces may have unleashed the social power of the eyebrow. This allowed humans to communicate at a distance in more complex ways.

"We moved from a position where we wanted to compete, where looking more intimidating was an advantage, to one where it was better to get on with people, to recognize each other from afar with an eyebrow flash, and to sympathize and so on," said Penny Spikins, a palaeolithic archaeologist at York. She is a co-author on the study. It was published in Nature Ecology & Evolution.

The scientists set out to investigate why ancient humans had such prominent brow ridges in the first place. Over the years, researchers have put forward a range of hypotheses. One idea states that the ridge simply filled the gap that would otherwise exist between the protruding face and the braincase. Another argues that a prominent brow served as structural reinforcement, ensuring the face could take the stress of powerful chewing.

Scientific Work Done On Ancient Skull
Working with their colleague Ricardo Godinho, the researchers obtained a 3-D X-ray scan of an ancient skull. It belonged to a human ancestor called *Homo heidelbergensis* that lived in what is now Zambia between 300,000 and 125,000 years ago. The skull displayed a thick brow ridge that was even more prominent than the ones seen on Neanderthals.

Using computer models, the scientists performed a series of experiments on the virtual skull. First, they looked at how much brow bone was needed if its purpose was to plug the gap between the face and the braincase. "We shaved away the bone to get the minimum needed to fill the gap and found we could reduce its size dramatically," O'Higgins said. "The skull has far more bone than is needed to fill the gap."

Next, the researchers looked at how the stress of chewing spread over the face with and without the brow ridge, and, again, it seemed to make little difference. "We fully expected serious consequences for the face, but nothing happened. It's clear that this is not about resisting bending in the face," O'Higgins said. "What we are left with is the plausibility of a social explanation."

**Important Part Of Human Communication**

It is unclear what factors led the human face to become smaller over time and lose its thick brow ridges, but a flatter face may have made communication easier. With that would come the greater collaboration that emerged with *Homo sapiens*. In *Homo heidelbergensis* and other ancestors, the thick brow signified physical strength at the apparent expense of eyebrow gymnastics. In those early humans, the muscles that moved the eyebrows simply pulled them back and forth over their brows.

Eyebrows are important in human communication. So it is not clear why other primates do not use them more, said Robin Dunbar, professor of evolutionary psychology at Oxford University in England. "It is plausible to suggest that it has something to do with increased need for more complex communication in the larger social groups that evolved late during the
course of human evolution," he said.

Rachael Jack, who studies human social interaction at the University of Glasgow in Scotland, said the expressive value of eyebrows made them "strong candidates for evolution to pick them up as social signallers." But she added: "The human face has many more muscles though, which are likely to have contributed substantially to the development of socially sophisticated communication, group cohesiveness and functioning, and therefore survival and progress. So I'm not totally convinced that eyebrows are the missing part of the puzzle."

1. Is the author of the article suggesting that ancient humans needed a prominent brow ridge to help with the stress of chewing? Which selection from the text BEST supports your answer?

   A. Yes, ancient humans did need prominent brow ridges to help with the stress of chewing; Another argues that a prominent brow served as structural reinforcement, ensuring the face could take the stress of powerful chewing.

   B. No, ancient humans did not need prominent brow ridges to help with the stress of chewing; "We shaved away the bone to get the minimum needed to fill the gap and found we could reduce its size dramatically," O'Higgins said.

   C. Yes, ancient humans did need prominent brow ridges to help with the stress of chewing; Next, the researchers looked at how the stress of chewing spread over the face with and without the brow ridge, and, again, it seemed to make little difference.

   D. No, ancient humans did not need prominent brow ridges to help with the stress of chewing; "We fully expected serious consequences for the face, but nothing happened. It's clear that this is not about resisting bending in the face," O'Higgins said.

2. Read the paragraph below from the section "Important Part Of Human Communication."

   It is unclear what factors led the human face to become smaller over time and lose its thick brow ridges, but a flatter face may have made communication easier. With that would come the greater collaboration that emerged with Homo sapiens. In Homo heidelbergensis and other ancestors, the thick brow signified physical strength at the apparent expense of eyebrow gymnastics. In those early humans, the muscles that moved the eyebrows simply pulled them back and forth over their brows.

Which conclusion is BEST supported by the paragraph?

   A. It is likely that early human ancestors such as Homo heidelbergensis communicated their emotions with their eyebrows.

   B. Homo heidelbergensis and other early human ancestors did a better job of communicating with
their eyebrows than Homo sapiens do.
C. Homo sapiens were able to communicate physical strength by moving the muscles back and forth over their eyebrows.
D. The flatter face of Homo sapiens likely made it easier for them to communicate emotions that facilitated collaboration.

3. How do the first and final paragraphs of the article relate to one another?

A. They both refer to the expressive value of eyebrows.
B. They both explain how the human face became smoother over time.
C. They both demonstrate problems with the York team’s conclusions.
D. They both illustrate that large brow ridges mean physical dominance.

4. Read the details below from the sections “The Evolution Of The Eyebrow” and “Important Part Of Communication.”

“We moved from a position where we wanted to compete, where looking more intimidating was an advantage, to one where it was better to get on with people, to recognize each other from afar with an eyebrow flash, and to sympathize and so on,” said Penny Spikins, a palaeolithic archaeologist at York. She is a co-author on the study.

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How do these details help develop the main idea of the article?

A. Both sentences help explain how evolution resulted in eyebrow movement that had a social function.
B. Both sentences help explain how eyebrows were first used to express a desire to compete and then later signaled a desire to be social.
C. The first sentence describes the many different steps that occurred in the evolution of eyebrow movement, and the second sentence describes the final step.
D. The first sentence describes a variety of emotions that eyebrows can communicate, and the second sentence describes how bigger brows showed dominance.

ACTIVITY 3: Identify the Main Idea

Write a paragraph that explains the central idea of the article. Use at least two details from the article to support your response.