

Michelangelo's Presentations in the Sistine Chapel: Brain Evolution and the Relationship of the Brain to Specific Cognitive Functions

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J. Wesson Ashford¹  and Sue Binkley Tatem²

Abstract

Michelangelo Buonarroti (1475–1564) presented some of the most spectacular artworks of all times in frescos on the ceiling and behind the altar of the Sistine Chapel. While Michelangelo's presentations depict events described in the Bible, there is broad consensus that Michelangelo was conveying his knowledge and theoretical ideas gleaned from his experiences with anatomic dissection. Michelangelo appears to have communicated several ideas about the brain in the images of the *Days of Creation* and the *Last Judgment*. Taking the *Days of Creation* and the *Last Judgment* together, Michelangelo appears to be symbolizing that God is in the brain, specifically the brainstem, and the brain performs mental functions. The five images on the ceiling of the chapel showing *Days of Creation* may be interpreted as reflecting the course of vertebrate brain evolution. There are further suggestions about brain function, including perceiving light and complex images and giving spirit to Adam. Furthermore, on the front wall of the Sistine Chapel behind the altar, within the work titled the *Last Judgment*, the central ellipse, in which Jesus is sitting, appears to represent a midcoronal cross section of a human brain, suggesting that it is the brain that renders judgments about good and evil.

Keywords

Renaissance, Michelangelo, art, decision, executive function, brainstem, God

Michelangelo Buonarroti (1475–1564) was an extremely erudite scholar of the Renaissance and led many intellectual and architectural developments. Michelangelo's frescoes on the Sistine Chapel ceiling, applied from 1508 to 1512, and behind the altar as the *Last Judgment*, from 1525 to 1541, are widely considered as being among the most spectacular artworks of all time. Michelangelo had experiences with anatomic dissection, and he and other Renaissance artists are widely believed to have used this knowledge in their art (De Bonis and others 2019). The penchant of Michelangelo to use anatomy in his art has been described (Ashford and Tatem 2020; Keshelava 2022; Savastano and others 2022; Tatem 2013).

One focus of Michelangelo was the use of the brain and his apparent concepts regarding the role of the brain. There is a convincing view that Michelangelo was utilizing definite brain structures to convey deep conjectures about brain development and function. The breakthrough in viewing the Sistine Chapel frescos as anatomic representations of the brain was initiated by the startling report of Meshberger in 1990 comparing God in the *Creation of Adam* to a human brain. By using the brain theme, there were elaborations of the concept that Michelangelo was depicting human brain structures in other parts of the

Days of Creation masterpiece (Savastano and others 2022; Suk and Tamargo 2010). Moreover, Michelangelo's contemporary, Leonardo da Vinci, was applying anatomic principles in his artwork, including the brain, during the time that Michelangelo was working on the Sistine Chapel ceiling (Keshelava 2022). Support for such utilization of diverse information and disguising ideas in an artistic rendition is now thought to have been a common practice during that era (de Campos and others 2016).

One interpretation of a part of the Sistine Chapel ceiling fresco is that the sequential depiction of the *Days of Creation* is a thesis about the progressive development of the brain (though unclear if evolutionary was intended;

¹Department of Psychiatry and Behavioral Sciences, Stanford University, Palo Alto, CA, USA

²Biology Department, Temple University, Philadelphia, PA, USA

*J. Wesson Ashford is also affiliated to War Related Illness & Injury Study Center (WRIISC), VA Palo Alto HCS, Palo Alto, CA, USA

Corresponding Author:

J. Wesson Ashford, Department of Psychiatry and Behavioral Sciences, Stanford University, VA Palo Alto Health Care System, 3801 Miranda Ave, 151Y, Palo Alto, CA 94304, USA.
Email: ashford@stanford.edu

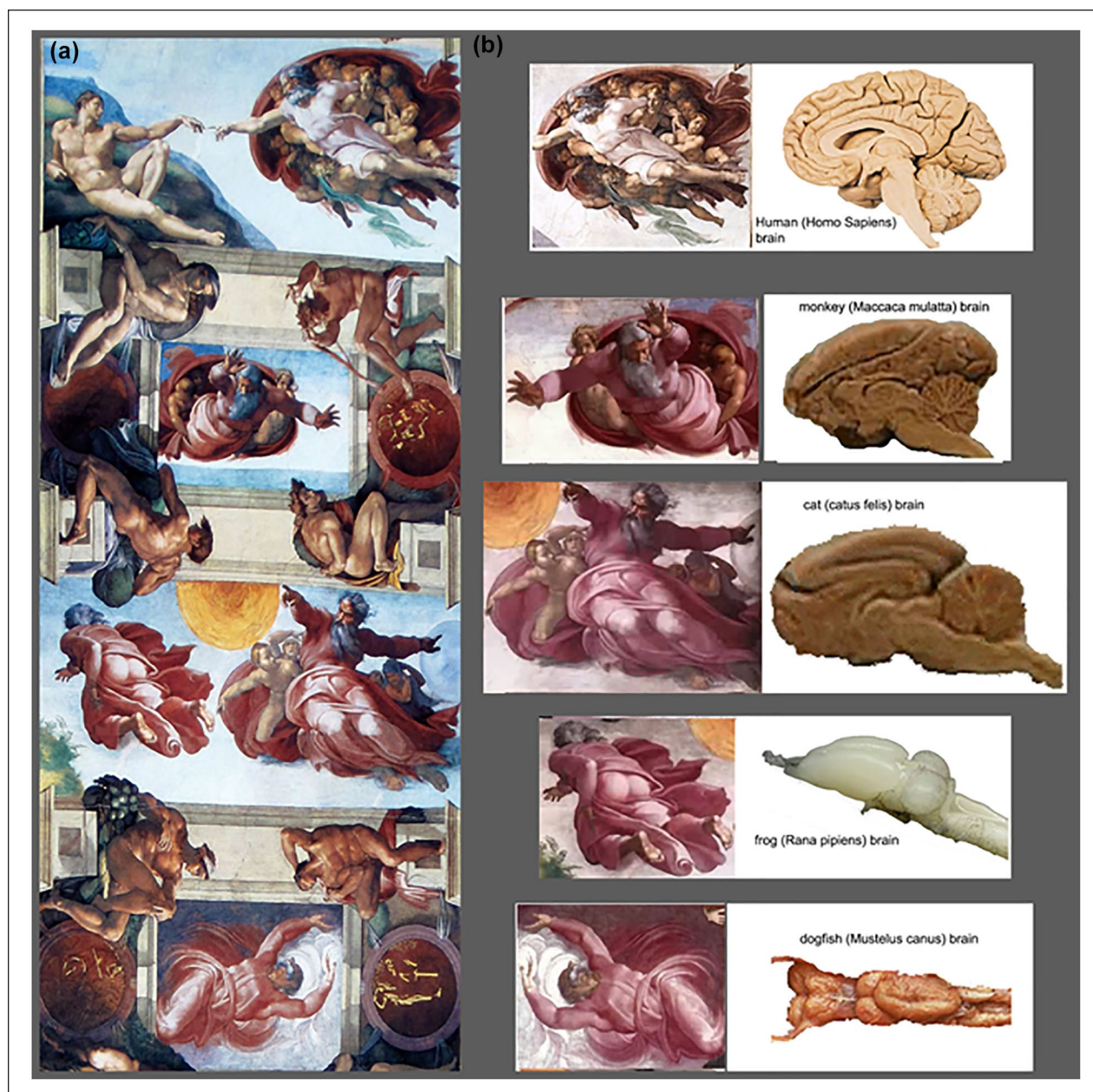


Figure 1. (a) Portion of Sistine Chapel ceiling portraying the Days of Creation: Creation of Adam (day 6, top), Creation of Living Creatures (day 5, no creatures shown), Creation of Sun and Moon and Creation of Plants (days 3 and 4), and Separation of Light and Darkness (day 1, bottom). (b) The specific days on the left, side by side with analogous brains on the right: Creation of Adam, midsagittal section of the human brain; Creation of Living Creatures, monkey brain; Creation of Sun and Moon, cat brain; Creation of Plants, frog brain; Separation of Light and Darkness, dogfish brain. Images have been adjusted to show the rostral aspects of the brain to the left and the caudal aspects to the right.

Ashford and Tatem 2020). A comparison of the images from this section of the Sistine Chapel portrays God embedded (hidden) in a range of animal brains and provides a very modern interpretation: that each day of creation is associated with the brain of an increasingly “higher” level of species development (Figure 1). This perception across the full range of components of this region of the Sistine Chapel ceiling leads to the view that

the composition represents the progression of the evolution of the brain (Ashford and Tatem 2020).

On the first day of Creation, God said, “Let there be light,” and Michelangelo has a clear image of God creating light with his outstretched arms. God’s body has the shape of a fish brain, and His outstretched arms are in the position of the olfactory bulbs of a fish. Figure 1, lower right, compares this image to that of a dogfish brain.

Note that an earlier interpretation compared this image and other images in the creation series with the human brainstem (Suk and Tamargo 2010), though the fish brain comparison is a better match and fits this proposed theme.

There is no identifiable rendition of the second day of creation: the separation of water and sky.

On the third day, God said, “Let the land produce vegetation.” In this panel, Michelangelo shows God with his buttocks fully exposed, a picture clearly in need of supporting justification. The rendition can be easily interpreted as representing an amphibian brain, known for its prominent optic tectum, thus justifying this representation (exposure). As an aside, a classic study in neurophysiology is the responsivity of neurons in the frog optic tectum to the movement of a fly (Maturana and others 1960), affirming the anatomic interest in this structure. The corresponding panel in Figure 1 provides the image of a frog brain for comparison, showing the optic tectum. God’s single outstretched hand is in a position comparable to the olfactory bulbs.

On the fourth day, “God made two great lights” in the sky. Savastano and others (2022) make the point that the sun on the right and the moon on the left represent the eyes; thus, Michelangelo is showing the role of vision in the brain. Indeed, God is arising from what can be interpreted as the visual regions of the brainstem. Figure 1, middle panel, shows the similarity of this image to a cat brain. God’s right and left knees are in the positions of the superior and inferior colliculi, respectively. Moreover, this is the first panel in which angels appear, three of them, consistent with angels representing the cerebral cortex in mammals and with angels representing the rise of the cerebral cortex, a theme in the subsequent depictions.

On the fifth day, God said, “Let the land produce living creatures.” Again, the image of God can be interpreted as a more evolutionarily advanced brain, this time taking the shape of a monkey brain (Figure 1, second panel) and showing God surrounded by four angels, possibly representing the divisions of the primate neocortex.

On the sixth day, God created man, shown as giving Adam his spirit and using the shape of a human brain, which is exquisitely described in detail by Meshberger (1990). Meshberger convincingly shows numerous structures of the human brain and their probable representation. Figure 1 shows at least 10 angels in this drawing, in the position of cortical gyri. Eve is under God’s left arm, and her knee appears to be in the location of the pineal gland (Tatem 2013).

Another important theme for consideration is that Michelangelo’s depictions of God use the brainstem for His body. Given the complex (even modern) concepts that Michelangelo was forming in his drawing, it is possible that he was presenting a view that the foundational aspect of the brain is the brainstem. Furthermore, these images



Figure 2. Michelangelo’s the *Last Judgment* fresco behind the altar in the Sistine Chapel.

seem to portray the development of the cortex, using the angel theme to represent the notion that the cerebral cortex is positioned for the storage of supporting information and functions to serve the brainstem. This view is consistent with the discussion by Carl Sagan in his 1977 book *The Dragons of Eden* that the brainstem is the most basic brain mechanism and has this role throughout the vertebrate kingdom. The view that the brainstem manages basic human functions, including energy metabolism, sleep, pain, emotions, memory, and thinking, while the cortex functions as a supercomputer acting at the behest of the brainstem is developing as a new and important approach to understand brain function and pathology (Ashford 2019; Zhang and others 2020; Zhang and others 2021).

Another suggestion is that the color of the brains selected by Michelangelo, a slight dark red, might reflect the use of red wine as a fixative for the brains that he dissected (Brenner 2014; Keshelava 2022). The coverings of the brain, also in this color, likely portray the meninges.

At a later date (1525–1541), after considerable discussions with the Pope, Michelangelo composed the portrayal of the *Last Judgment* behind the altar of the Sistine Chapel. Again, Michelangelo uses the brain motif, this time representing a coronal section of a human brain (Figure 2). Indeed, careful comparison of many components of the composition with a coronal section shows

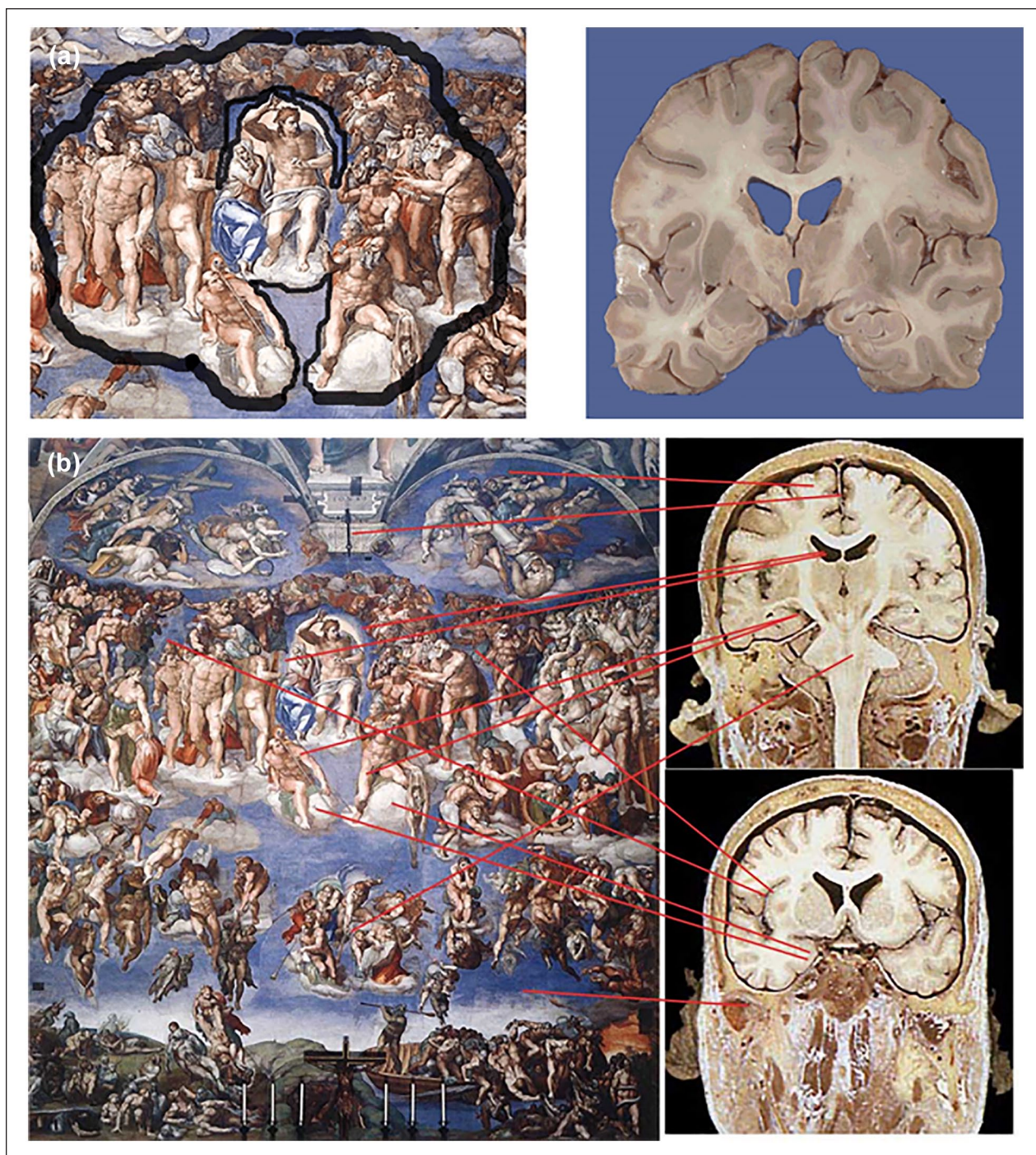


Figure 3. The central ellipse (a; upper left, outlined) from the *Last Judgment*. A midcoronal cross section of the brain (a; upper right) shows the location of lateral and third ventricles. Lines in the lower images (b) suggest relationships between specific parts of the fresco and coronal neuroanatomic cross sections.

the accuracy of drawings for representing a human brain's coronal section (Figure 3). As this composition represents a time in the Bible much later chronologically, the brain and its components are much more complex

evolutionarily. The obvious conclusion is that Michelangelo is conveying the concept that the brain is the organ that makes judgments. Consistent with the themes of the *Days of Creation*, Jesus is sitting in the

position of the brainstem, with his mother, Mary. Jesus's upstretched right arm is similarly portrayed in a later painting by an artist who had worked for Michelangelo, Sebastiano Fillipi, in which neuroanatomic features appear (De Bonis and others 2019). The numerous individuals crowded around Jesus, apparently representing angels and people in Jesus's life, may also be interpreted as cortical structures storing memories and recollections and guiding His judgment. There are also characters/angels outside the brain to provide more input and assistance.

These interpretations of the frescoes of the Sistine Chapel as having relationships to neuroanatomic features are consistent with numerous findings throughout Michelangelo's work (de Campos and others 2016; Meshberger 1990; Savastano and others 2022; Suk and Tamargo 2010; Tatem 2013) and the work of other Renaissance figures (De Bonis and others 2019; Keshelava 2022). While such comparisons could relate to the phenomena of apophenia (the tendency to perceive meaningful relationships between unrelated things) or pareidolia (perceiving images in random stimuli), once viewed, the relationships are difficult to deny. This view is most evident in the initial modern interpretation of the *Creation of Adam* by Meshberger in 1990: once individuals with any knowledge of neuroanatomy see that image, they always see the brain.

The numerous interpretations of neuroanatomic structures in the Sistine Chapel do not necessarily imply any lack of faith or belief in God on the part of Michelangelo. Rather these interpretations may be seen as Michelangelo's attempts to provide greater insight into the creations of God, based on his extensive studies of human neuroanatomy and comparative anatomic studies by his known associates. In the Sistine Chapel frescoes, Michelangelo may have communicated basic stages of brain development (*Days of Creation*), that the brain generates man's spirit (*Creation of Adam*), and the brain as an instrument for rendering moral decisions (*Last Judgment*).

A final caveat is that Michelangelo's apparent demonstration of stages of evolution of the brain in relationship to the *Days of Creation* does not suggest that he was presenting the modern principles of evolution over eons of time, such as origins of species and phylogenetic structures, including principles such as survival of the fittest, described by Darwin and Wallace. However, this interpretation does suggest that there were many important concepts developing during the Renaissance that were unrecognized but likely had important influences on later thinking.

Authors' Note

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ORCID iD

J. Wesson Ashford  <https://orcid.org/0000-0001-9600-6471>

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