

Report

□ **Seen/Unseen: Michelangelo master of camouflage and deception**

Anatomy lessons hidden in the Sistine Chapel?

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COVER IMAGE: "The Creation of Adam"

TECHNIQUE: Fresco (480 x 230 cm)

DATE: circa 1511, restored between 1980 and 1999

PAINTER: Michelangelo Buonarroti

LOCATION: Sistine Chapel, Vatican City, Rome (Italy)

Michelangelo's artistic creations, no less his sculpture than his paintings, reflect his neo-platonic culture, representing not only physical but also spiritual beauty and divine love. Michelangelo saw the artist's task not to imitate nature, nor to idealise it, at least not in the widely understood sense of selecting and exalting the best specimens it could offer. Instead, his works are expressions of a different, very personal ideal. Take, for example, his contorted but beguiling nudes of "The Last Judgement".

To acquire knowledge of the human form, he began to study it very early on. As his two biographers, Vasari and Condivi, tell us, by the age of 18 Michelangelo had begun to perform his own dissections. The Church permitted dissection of the cadavers of condemned criminals, and from 1492 onwards, Michelangelo did most of his dissections at the Florentine Monastery of Santo Spirito. This experience is documented in Lives of the Artists, written by his contemporary, Giorgio Vasari⁽¹⁷⁾: "For the Church of Santo Spirito in Florence Michelangelo made a crucifix of wood, which was placed above the lunette of the high altar, where it still is. He made this to please the prior, who placed rooms at his disposal, where Michelangelo very often used to flay dead bodies in order to discover the secrets of anatomy."

Michelangelo continued to study the human body throughout his life, and for a long period aspired to publish a book on

anatomy in collaboration with the great Paduan anatomist Realmo Colombo.

Although no trace of systematic research to this end survives - presumably Michelangelo destroyed almost all his anatomical sketches and drawings - his accurate knowledge of anatomy can nevertheless be discerned from his artworks. In contrast to Leonardo's research, which dealt with the internal articulation of bones, organs and muscles, Michelangelo appears to have preferred direct observation of whole bodies to glean anatomical knowledge, giving this clear priority over dissection. This is evident from his emphasis on depicting the body actively engaged with the world. The work of Michelangelo is an affirmation of the radical reality of the living body⁽⁵⁾.

Michelangelo's extraordinary mastery of the human figure essentially came from two sources: direct dissection and analytical study of human musculature, and careful scrutiny of ancient sculpture. He had the chance to show off his knowledge of the human form when commissioned to paint the Sistine Chapel, named after Pope Sixtus IV. The chapel was completed in 1481, but before long cracks began to appear in the masonry, and it had to be restored and the ceiling repainted. In 1508, Michelangelo was duly commissioned to carry out the latter task by Pope Julius II. The artist was not exactly overjoyed with this request, since saw himself as a sculptor of marble and not as a painter. A difference of opinion also arose when the subject of the painting was discussed - Julius II wanted the Twelve Apostles but Michelangelo had something more ambitious in mind - he wanted to deliver a work that would surpass anything that had been done before. He continued to harry the Pope until the latter gave in and told him to do exactly as he pleased.

Four years later, in 1512, at the age of 37 Michelangelo

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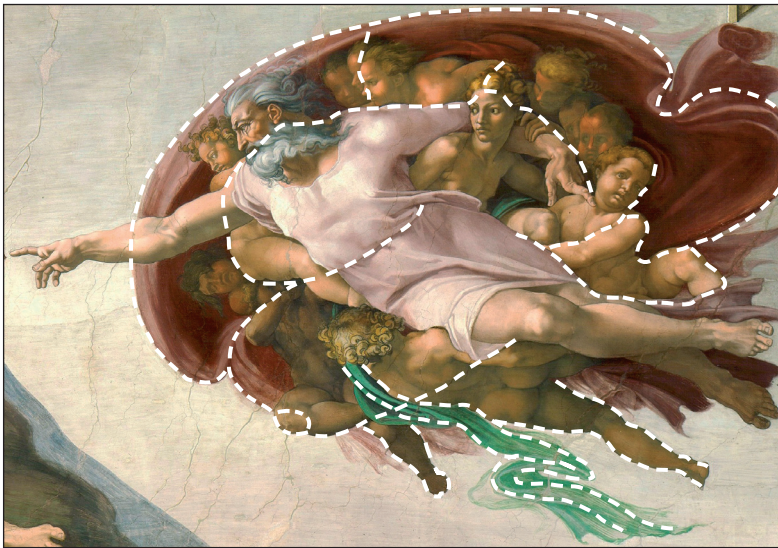


Figure 1. In *The Creation of Adam*, according to Meshberger, an anatomically accurate image of the human brain is portrayed behind God. On close examination, the borders in the painting correlate with sulci in the inner and outer surfaces of the brain, as well as the brain stem, the basilar artery, the pituitary gland and the optic chiasm (modified from Meshberger⁽¹¹⁾).

It is not only these hidden messages that can be discerned in Michelangelo's 500-year-old paintings, however - to those of a neuroanatomical bent, something else entirely also appears to have been camouflaged. Indeed, astonishingly, in 1990, Frank Lynn Meshberger⁽¹¹⁾ reported that Michelangelo had apparently concealed an image of the brain in *The Creation of Adam* (Figure 1). This fresco seems to contain a remarkably accurate representation of the anatomical features of the midsagittal and lateral surfaces of the brain. The theory is that Michelangelo was seeking to convey that God was endowing Adam not only with life, but also with a supreme and unique human intelligence. Intriguingly, the gesture Michelangelo used to symbolize this transmission of divine power from God to Adam, the touch of their fingertips, can also be interpreted neuroscientifically - the two hands don't actually touch each other; instead life is being transmitted across a synaptic cleft like a neurotransmitter (which were not, however, discovered until Loewi's pioneering works in 1921). This seems to indicate that Michelangelo did indeed have a profound understanding of the anatomy of the brain.

In 2010 Ian Suk and Rafael Tamargo, from the Department of Neurosurgery at the Johns Hopkins University School of Medicine, reported⁽¹⁶⁾ that Michelangelo also appears to have hidden an image of the brainstem and spinal cord in a depiction of God in the final panel of the series, *The Separation of Light From Darkness*, one of the last Sistine Chapel frescoes painted by Michelangelo. It depicts the first act performed by God in the creation of the universe (Genesis 1: 3-5), and this final panel has a special location in the Sistine Chapel, being situated directly above the altar. In this panel, God's neck presents evident anatomical irregularities and discordant areas of light and shade. Suk and Tamargo propose that this disfigured

completed one of the most incredible artworks known to man, covering nearly 1,000 square metres of vaulted ceiling with more than 340 figures, a feat he achieved while painting on his back by candlelight. In the words of Goethe: "Until you have seen the Sistine Chapel, you can have no adequate conception of what man is capable of accomplishing".

At first glance, the frescoes depict familiar stories from the Old Testament, and in the collective consciousness, have become the definitive versions. Even if people have never set foot in the chapel, they will imagine these characters exactly as Michelangelo painted them. Studying the frescoes a little more closely, however, it becomes clear that Michelangelo embedded messages of tolerance, ecumenical brotherhood and freethinking, probably in defiance of the dogmatic Catholic Church of his time. Several publications analysing this camouflaged ideology are available for those who wish to know more⁽²⁾.

neck of God, described by another Author as "goiter-neck"⁽³⁾ rather than being a mistake, is, in fact a hidden message. The overall light source illuminating God emanates obliquely from the lower left of the frame, but God's neck is illuminated mainly head on and slightly from the right (Figure 2 A). This notable irregularity is not consistent with Michelangelo's otherwise masterful depiction of light on form, and is unlikely to be accidental. It therefore appears that Michelangelo intentionally used the additional light source to highlight his depiction of the ventral brainstem.

For those sceptics among you, it is important to remember that in Michelangelo's works anatomical drawing is always functional to the sense of the artwork. Even in his *David* (1501-1504) we find certain anatomical imperfections: the right hand is bigger than the left, and the abductor digiti minimi is enlarged. This has been suggested as a device to draw attention to the stone as a symbol of David's courage and physical power, indicating that the artist was confident enough in anatomy to be able to manipulate it for his own symbolic ends. So is it feasible that Michelangelo unknowingly provided such accurate representations of human brain features?

According to Suk and Tamargo, comparative views of brainstem landmarks in *The Separation of Light From Darkness* shows the specific midbrain structures that correspond to the unusual features in God's neck as depicted by Michelangelo. Thus, these Authors propose that Michelangelo incorporated into God's neck a ventral view of the brainstem (Figure 2 B), as well as the perisellar and chiasmatic regions.

Astonishingly the anatomical description is so accurate that the dark areas in God's neck correspond precisely to the anatomy of the basal cisterns (Figure 2 C). Another hidden neuro-anatomical detail discovered by these Authors is a ventral

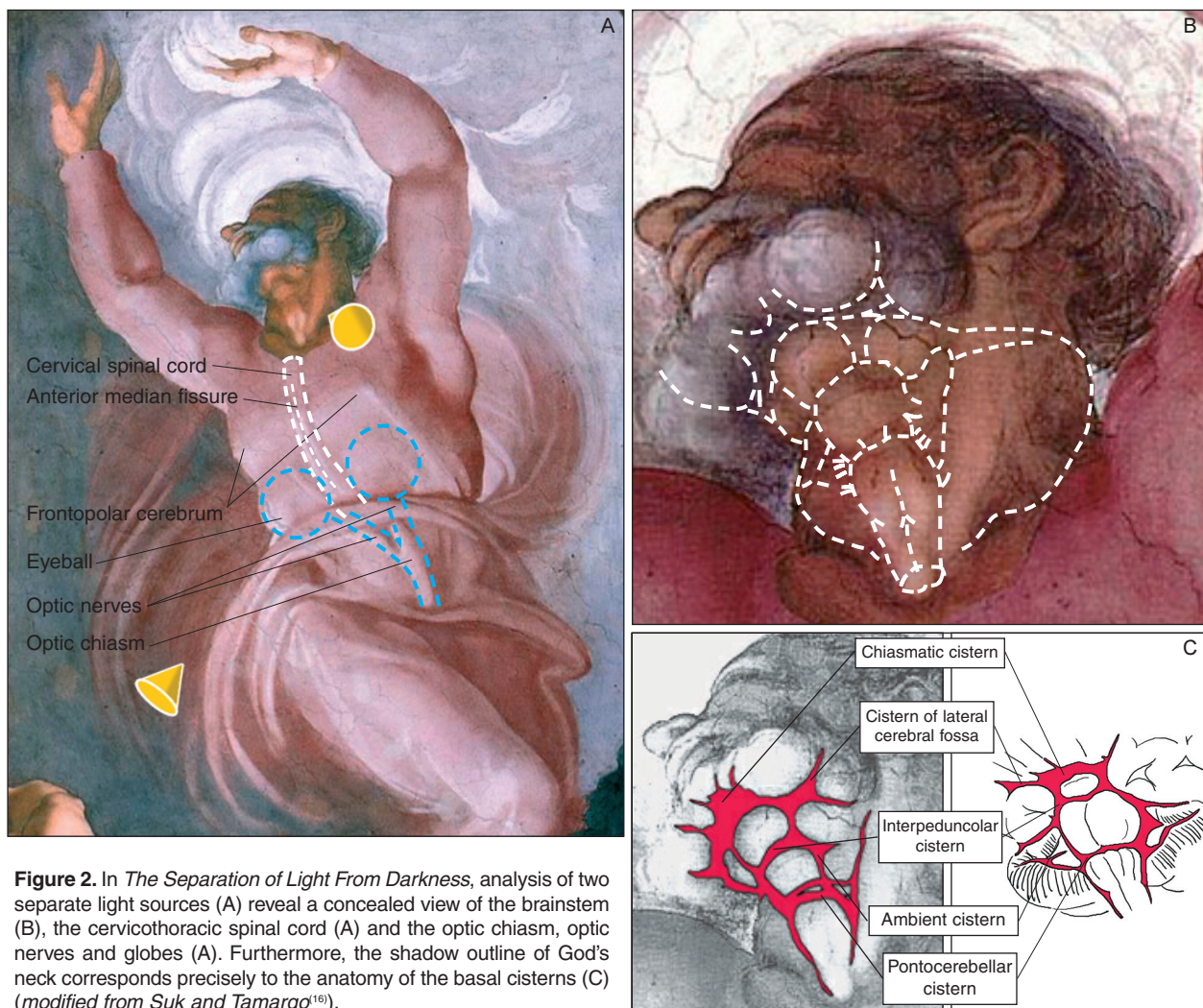


Figure 2. In *The Separation of Light From Darkness*, analysis of two separate light sources (A) reveal a concealed view of the brainstem (B), the cervicothoracic spinal cord (A) and the optic chiasm, optic nerves and globes (A). Furthermore, the shadow outline of God's neck corresponds precisely to the anatomy of the basal cisterns (C) (modified from Suk and Tamargo⁽¹⁰⁾).

view of the cervicothoracic section of the spinal cord, which is depicted as an offset continuation of the inferior medulla in God's neck. Finally, Suk and Tamargo find an allusion, albeit less convincing, to the optic chiasm and the optic nerves below God's waist (Figure 2 A).

It is important to understand that the last four panels along the longitudinal axis of the Sistine Chapel vault, namely *The Creation of Adam* (Genesis 1: 26-27), *The Separation of the Earth from the Waters* (Genesis 1: 9-10), *The Creation of the Sun and Moon* (Genesis 1: 14-19), and *The Separation of Light From Darkness* (Genesis 1: 3-5), are clearly stylistically different from the first five, and not only neurologists have noted their underlying anatomical motif. Indeed, in *The Separation of the Earth from the Waters*, Garabed Eknayan⁽⁴⁾, a nephrologist, noted that computer-assisted removal of the figure of God and the cherubim reveals the tunic to be in the shape of the bisected right renal pelvis, from which the figure of God emerges "in a turbulent spiral movement," where the renal pyramids are located (Figure 3 A-B). Interestingly, it is known that Michelangelo had a personal interest in kidney and

urinary function, as he suffered from nephrolithiasis for most of his life. Is it possible that he depicted the source of his woes in his artwork? Eknayan seems to think so, showing that, in addition to the shroud enveloping God, this panel also features, above the *Persian Sybil*, a naked figure (*ignudo*) whose back is turned to the observer; he appears to be flanked by two embedded images of the kidneys (Figure 3 C).

Looking at the same subject, in 2004 Brazilian Authors Gilson Barreto and Marcelo G. de Oliveira⁽¹⁾ published an entire book about anatomical findings in Michelangelo's masterpieces, and it is interesting to observe that in the same figure of God painted in *The Separation of Light From Darkness* panel in the Sistine Chapel, they recognize the image of a hyoid bone, God's elevated arms mirroring its U-shaped form (Figure 4). According to Barreto and de Oliveira⁽¹⁾, in the *Libyan Sibyl* painting, when the vestment that covers the Sybil is inverted, there is a great resemblance between the shoulder articulation with the glenoid cavity (a) and the head of the humerus (b) (Figure 5).

What is more, in *Judith and Holofernes* (Figure 6), the

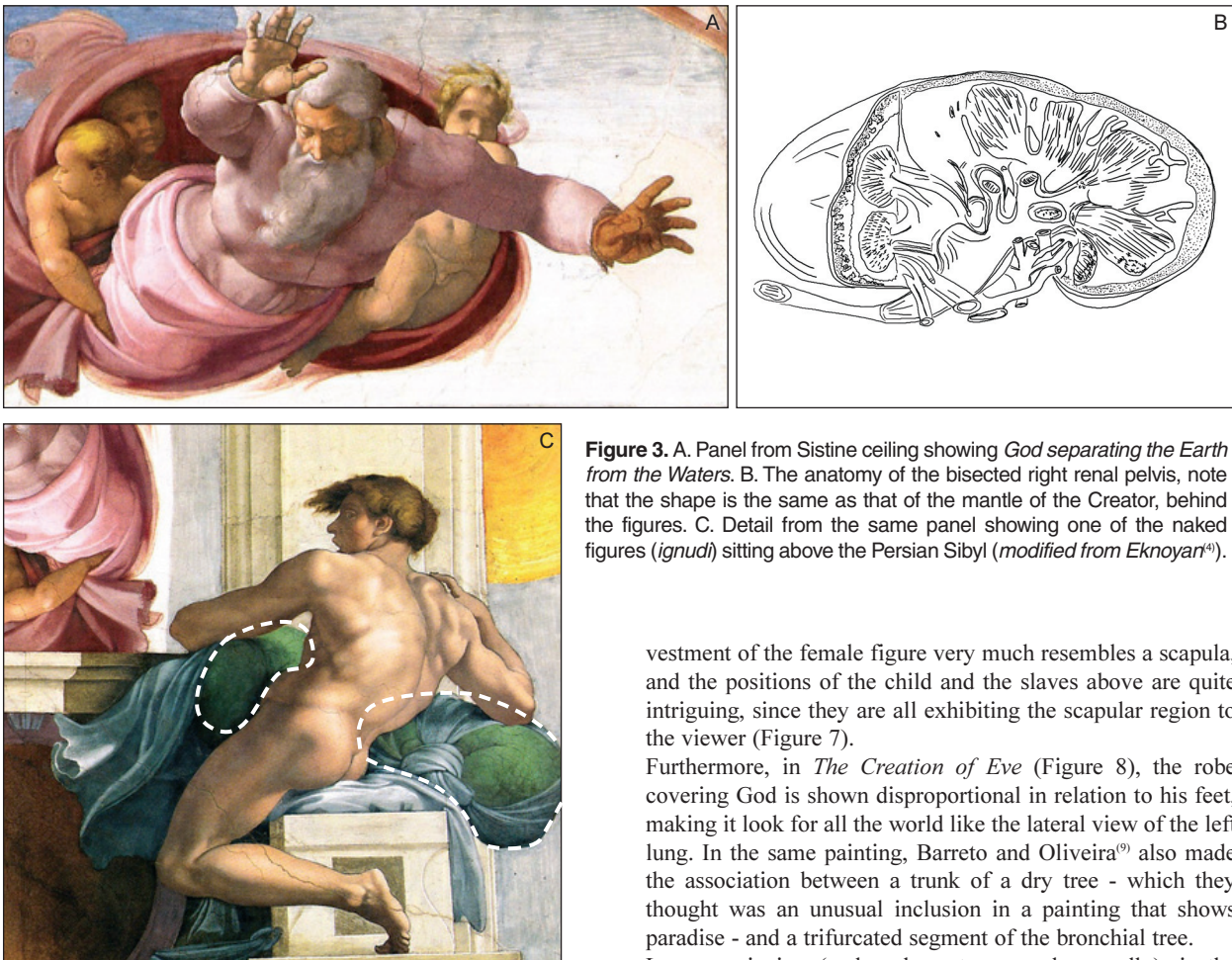


Figure 3. A. Panel from Sistine ceiling showing *God separating the Earth from the Waters*. B. The anatomy of the bisected right renal pelvis, note that the shape is the same as that of the mantle of the Creator, behind the figures. C. Detail from the same panel showing one of the naked figures (*ignudi*) sitting above the Persian Sibyl (modified from Eknoyan⁽⁶⁾).

position of Holofernes' body is compatible with the shape of the second vertebrae, also called the axis or epistropheus. A clue that Michelangelo fully intended to represent this vertebra is given by the slaves nearby, who are quite obviously pointing to their necks.

In *Salman, Booz and Obeth*, it is possible to note that the

vestment of the female figure very much resembles a scapula, and the positions of the child and the slaves above are quite intriguing, since they are all exhibiting the scapular region to the viewer (Figure 7).

Furthermore, in *The Creation of Eve* (Figure 8), the robe covering God is shown disproportional in relation to his feet, making it look for all the world like the lateral view of the left lung. In the same painting, Barreto and Oliveira⁽⁹⁾ also made the association between a trunk of a dry tree - which they thought was an unusual inclusion in a painting that shows paradise - and a trifurcated segment of the bronchial tree.

Less convincing (and perhaps to some less godly), is the identification in a comparative analysis performed by a urologist, Leonardo Oliveira Reis⁽¹³⁾, of a similarity between the representation of the mouth of the fish, which rests on Jonah's left thigh, with a cross section of the penis (Figure 9).

This wealth of apparent anatomical structures and details in Michelangelo's art works has given rise to considerable debate as to their presence and meanings⁽⁶⁾. As Douglas Field says⁽⁸⁾, "The mystery is whether these neuroanatomical features are hidden messages, or whether the Sistine Chapel a Rorschach test upon which anyone can extract an image that is meaningful to themselves. The Authors of the paper are, after all, neuroanatomists".

Indeed, one of the functions of the brain is to instil meaning into this world from the signals that it receives. This is

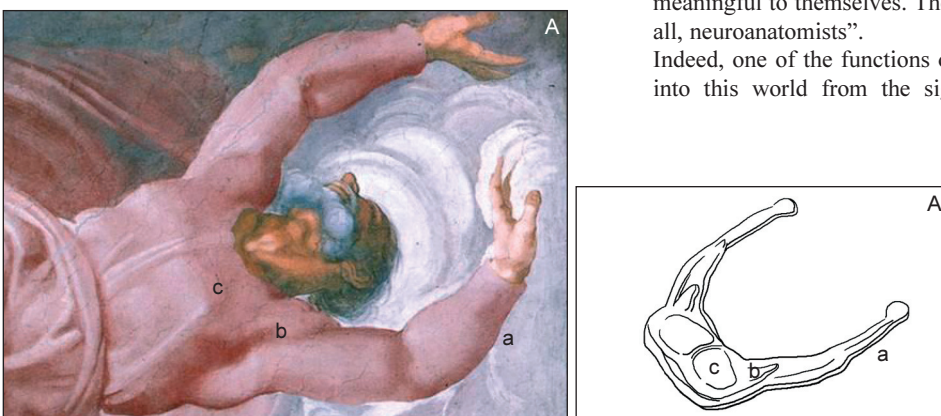
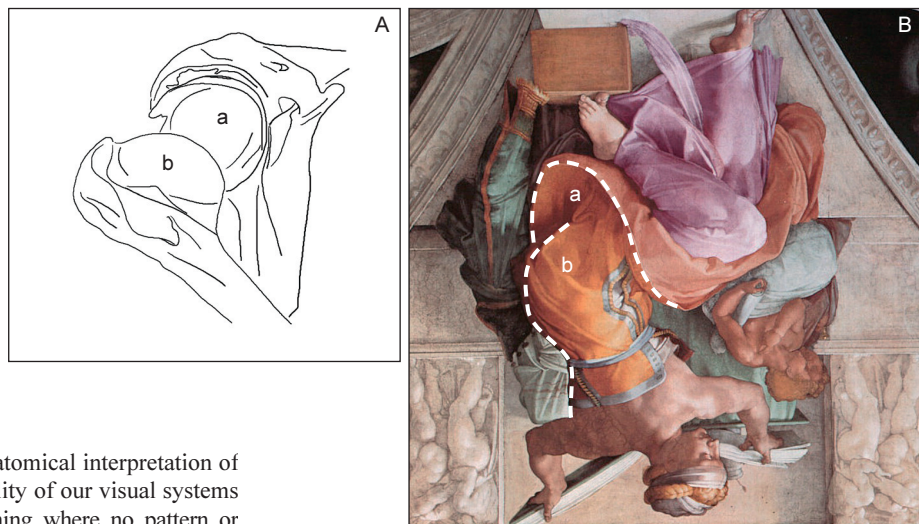


Figure 4. It is possible to associate the position of the Creator in *The Separation of Light from Darkness* (A) with the greater cornu (a), lesser cornu (b) and the body (c) of the hyoid bone (B) (modified from Barreto and de Oliveira⁽¹¹⁾).

Figure 5. A. The shoulder joint. B. In an inverted position, the Libyan Sibyl's garment corresponds to the glenoid cavity (a) and to the head of the humerus (b) (modified from Barreto and de Oliveira⁽¹⁾).



precisely the problem with an anatomical interpretation of Michelangelo's frescoes - the ability of our visual systems to fill in details and create meaning where no pattern or meaning may have been intended, and the neurophysiological tendency of the brain to fill in or complete partial visual information to enable us to make sense of the world⁽¹⁵⁾. Our brain is often confronted with situations or views that are open to more than one interpretation. In fact, the brain is not a passive observer of external events; rather, it is an active participant in constructing what we see. The brain can complete this task in different ways, furnishing different outcomes, each one of which is as plausible as the others. This is possibly due to the role of higher cognitive factors, including memory, learning and experience.

The brain's facility in finding patterns is related to its gift for metaphorical association: nephrologists tend to see kidneys in the Sistine Chapel paintings, whereas neuroscientists tend to see brains. In the literature there are several papers written by neuroscientists in collaboration with artists analysing the problem in this interplay of Art and Science. Visual indeterminacy occurs when subjects view apparently detailed and vivid images that resist object

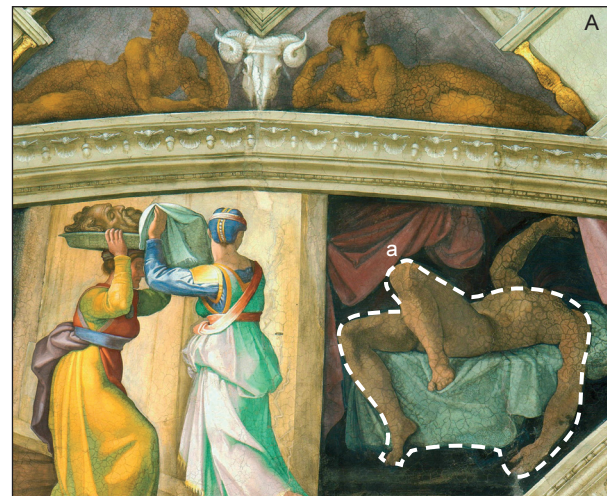


Figure 6. A. *Judith and Holofernes*. Above the panel note the two slaves pointing to the neck. B. The axis vertebra. In both frames the letter "a" shows the shape associated with the odontoid process (modified from Barreto and de Oliveira⁽¹⁾).

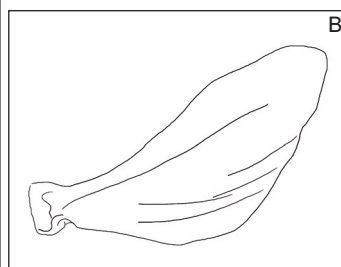
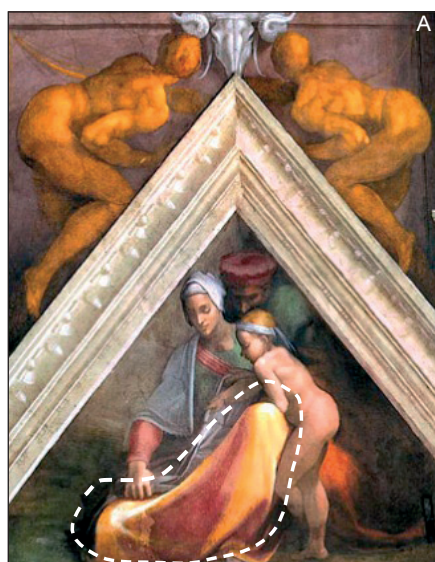


Figure 7. A. *Salmon, Booz and Obeth*. Note that the both the child in the spandrel (presumably Salmon, as Booz and Obeth have been identified in the lunette below) and the two slaves above seem to be exhibiting their scapular regions, whose shape also appears to be evident in the garment worn by the female figure (thought to be Salmon's mother). B. The human scapula (modified from Barreto and de Oliveira⁽¹⁾).

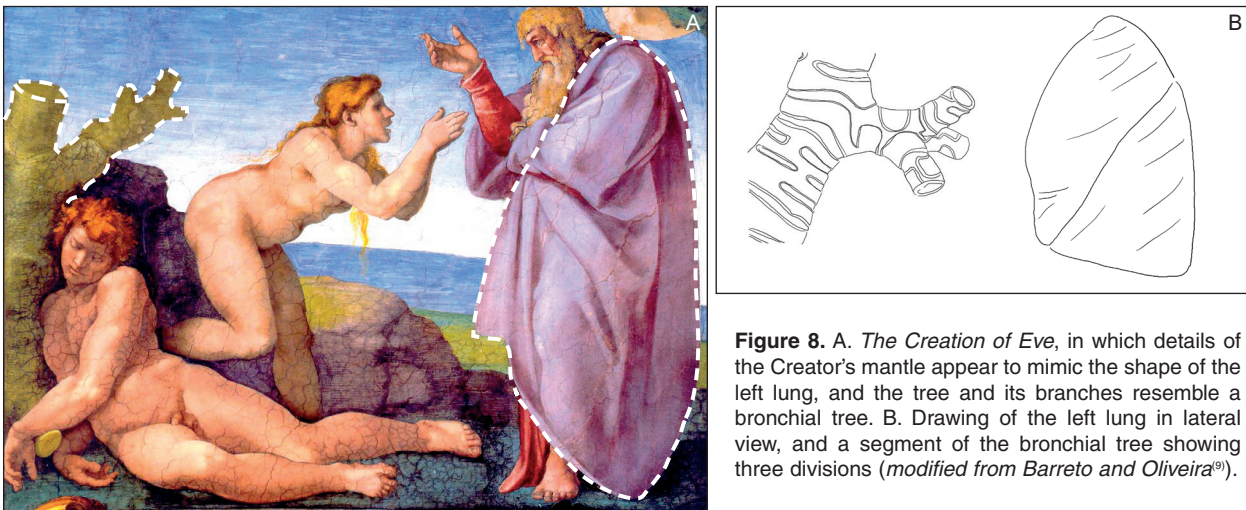


Figure 8. A. *The Creation of Eve*, in which details of the Creator's mantle appear to mimic the shape of the left lung, and the tree and its branches resemble a bronchial tree. B. Drawing of the left lung in lateral view, and a segment of the bronchial tree showing three divisions (modified from Barreto and Oliveira⁽⁹⁾).

recognition. Robert Pepperell designed some paintings and drawings⁽¹²⁾, defined as “indeterminate art”, to induce a disrupted perceptual condition: instead of a recognizable depiction, the viewer is presented with a ‘potential image’, that is a complex multiplicity of possible images, none of which ever finally resolves (Figure 10). These images are highly suggestive of forms but not explicitly descriptive of them.

In a functional magnetic resonance imaging study, Fairhall and Ishai⁽⁷⁾ demonstrated that representational paintings with meaningful content evoked stronger neural activation than abstract and indeterminate paintings. This increased activity was recorded in the fusiform gyrus, a region that responds to assorted common objects, including faces, houses, animals and tools. In contrast, the scrambled paintings evoked enhanced activation in the precuneus and the medial frontal gyrus, regions of the “imagery network,” which mediate the generation and maintenance of mental images from long-term memory, helping us determine whether the images contain any familiar objects. To decide whether the indeterminate paintings,

which were rich with suggestive objects, contained any recognizable objects, subjects relied on visual similarity and visual associations.

Indeed, recognition memory⁽¹⁸⁾ is mediated by activation in a cortical network that includes several regions: the visual cortex, where stimulus-specific representations are stored; attention-related areas, the intraparietal sulcus and superior parietal lobule, where visual similarity to familiar prototypes is detected; and memory-related areas, the caudate, insula and anterior cingulate cortex, precuneus, superior temporal gyrus, and inferior and superior temporal gyrus, where new items are classified as a match or a mismatch based on their similarity to familiar prototypes.

In summary, recognition memory is modulated by visual similarity. So, we must always remember that the eye of the beholder (and of the artist) is not innocent. With “innocence of the eye” John Ruskin means: “a sort of childish perception of these flat stains of colour, merely as such, without consciousness of what they signify - as a blind man would see them if

suddenly gifted with sight”⁽¹⁴⁾. But “the innocent eye is a myth”⁽⁹⁾, because the viewer is cognitively active, not passive. Gerhard Richter, one of the most important contemporary artists, says: “Pictures which are interpretable, and which contain a meaning, are bad pictures.” A good picture, on the other hand, “demonstrates the endless multiplicity of aspects, it takes away our certainty, because it deprives a thing of its meaning and its name. It shows us the thing in all the manifold significance and infinite variety that preclude the emergence of any single meaning or view.”

Both artists and scientists have faced the challenge of representing the world in visual form; as the great

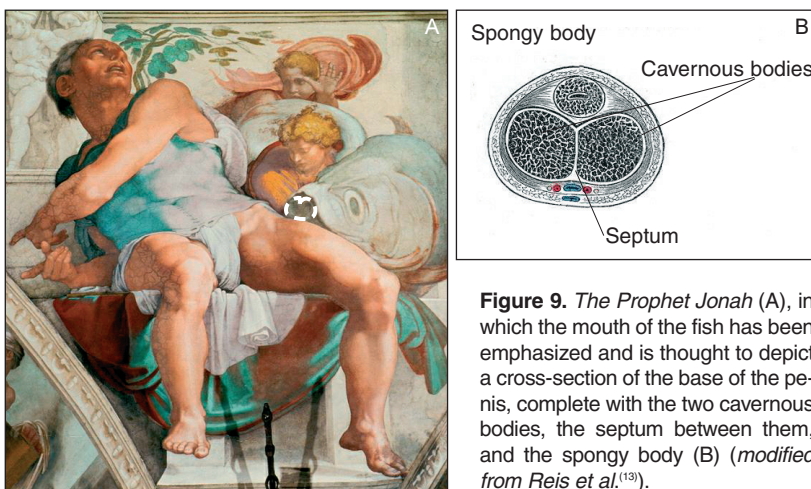


Figure 9. *The Prophet Jonah* (A), in which the mouth of the fish has been emphasized and is thought to depict a cross-section of the base of the penis, complete with the two cavernous bodies, the septum between them, and the spongy body (B) (modified from Reis et al.⁽¹³⁾).

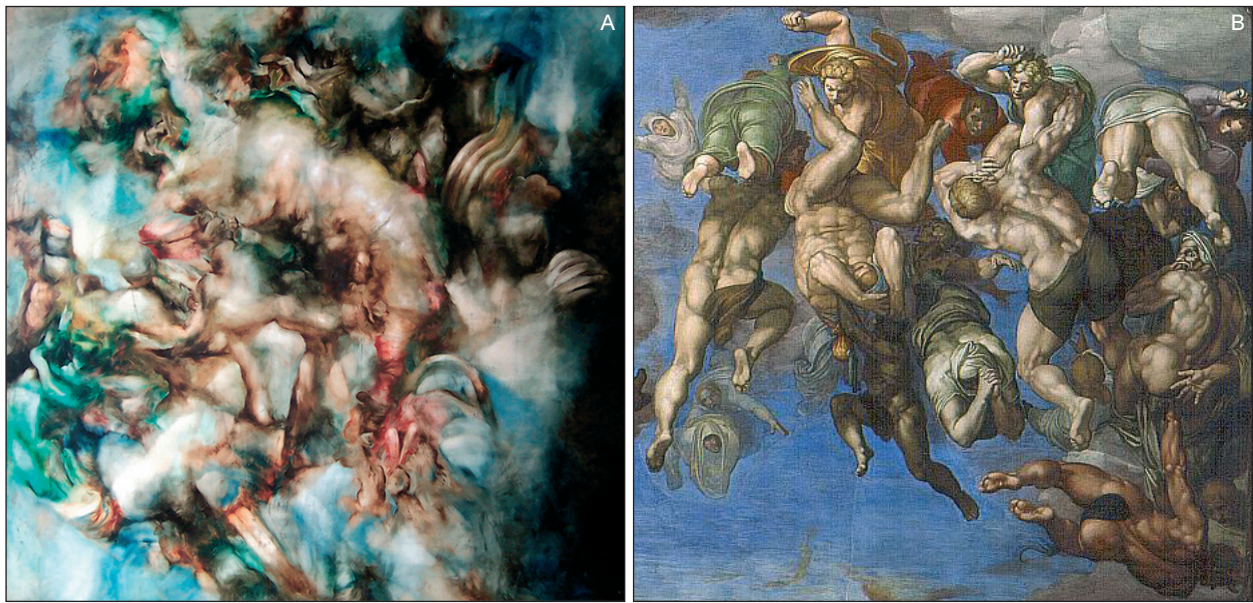


Figure 10. A. The painting *Succulus* by Robert Pepperell (oil on canvas, 123 cm x 123 cm, 2005) B. A detail from *The Last Judgement* by Michelangelo. Although both images have a similar visual structure and colouring, the second image is full of recognizable objects, while the first is not (modified from Pepperell⁽¹²⁾).

Abstract Expressionist Willem de Kooning has said, there is no picture so abstract that it does not contain a resemblance to something the mind already knows. From this point of view, the optical unconscious is not only a modernist question⁽¹⁰⁾. However, Michelangelo's modernity persists, perhaps, in his exploration of how certain kinds of images engage the visual system and how we make sense of the world.

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