



Neuroscience of the Golden Ratio



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Background

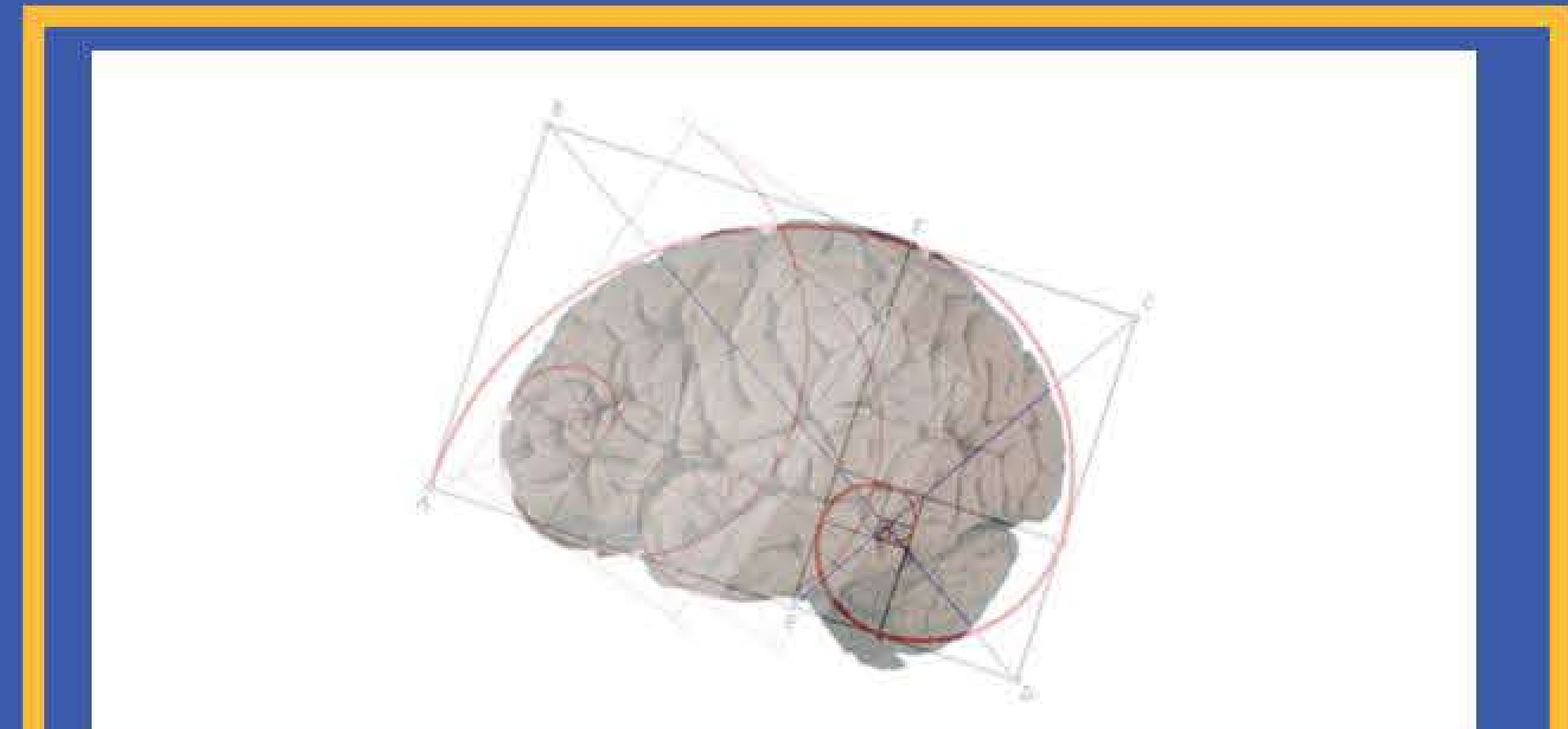
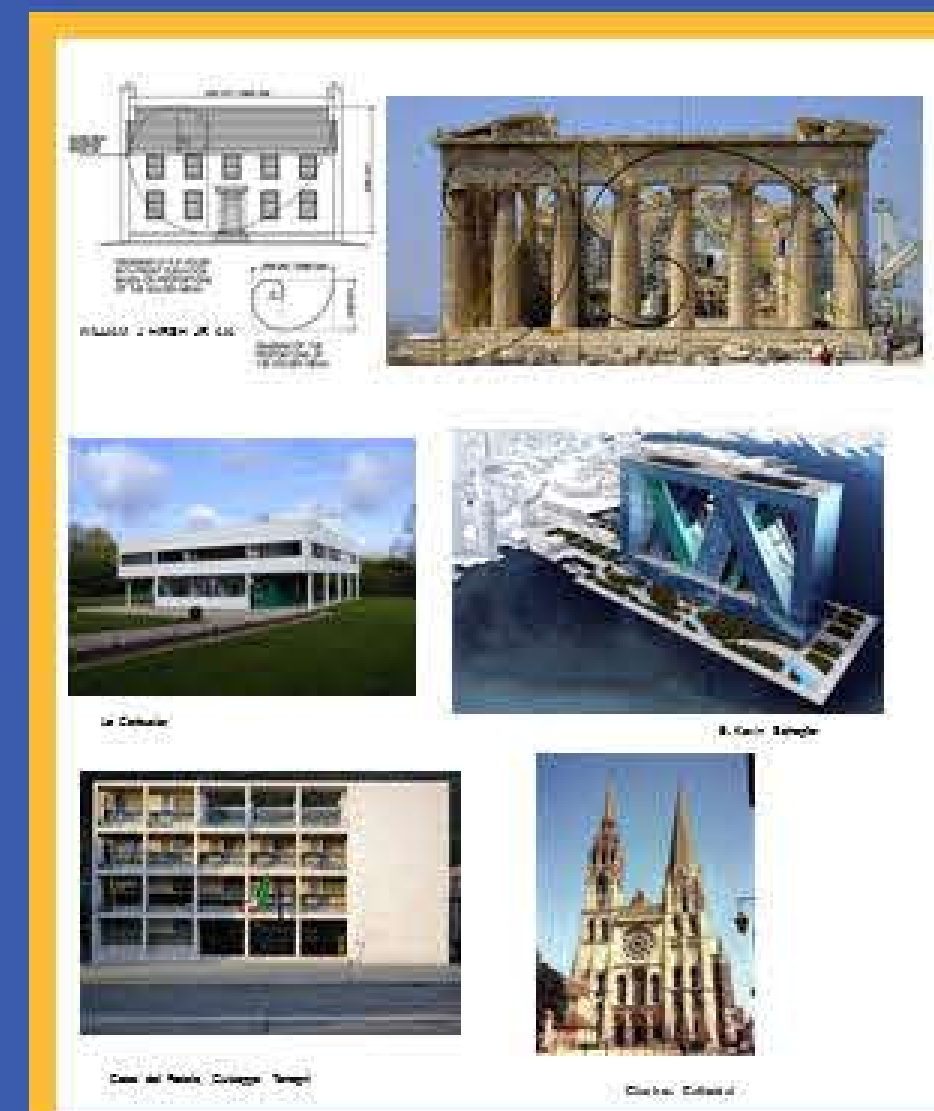
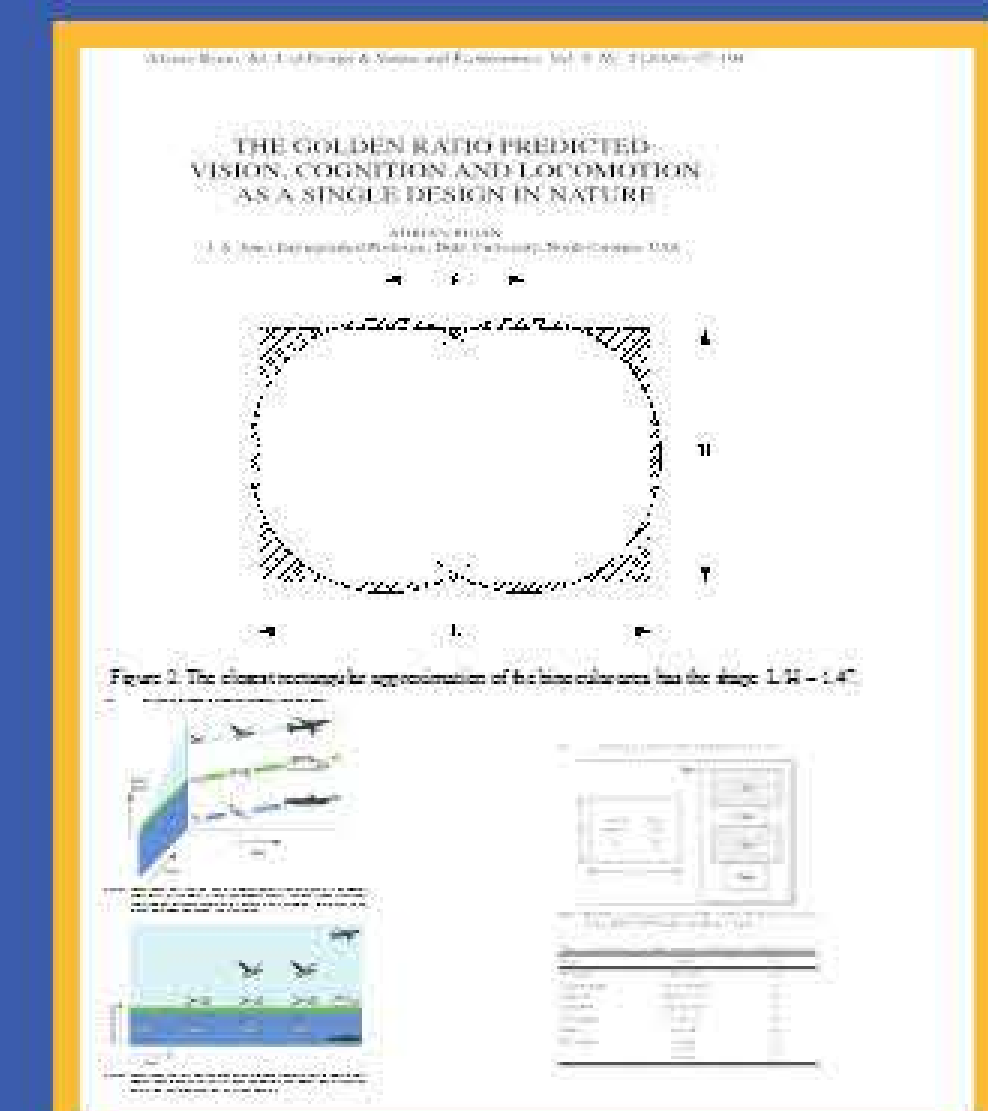
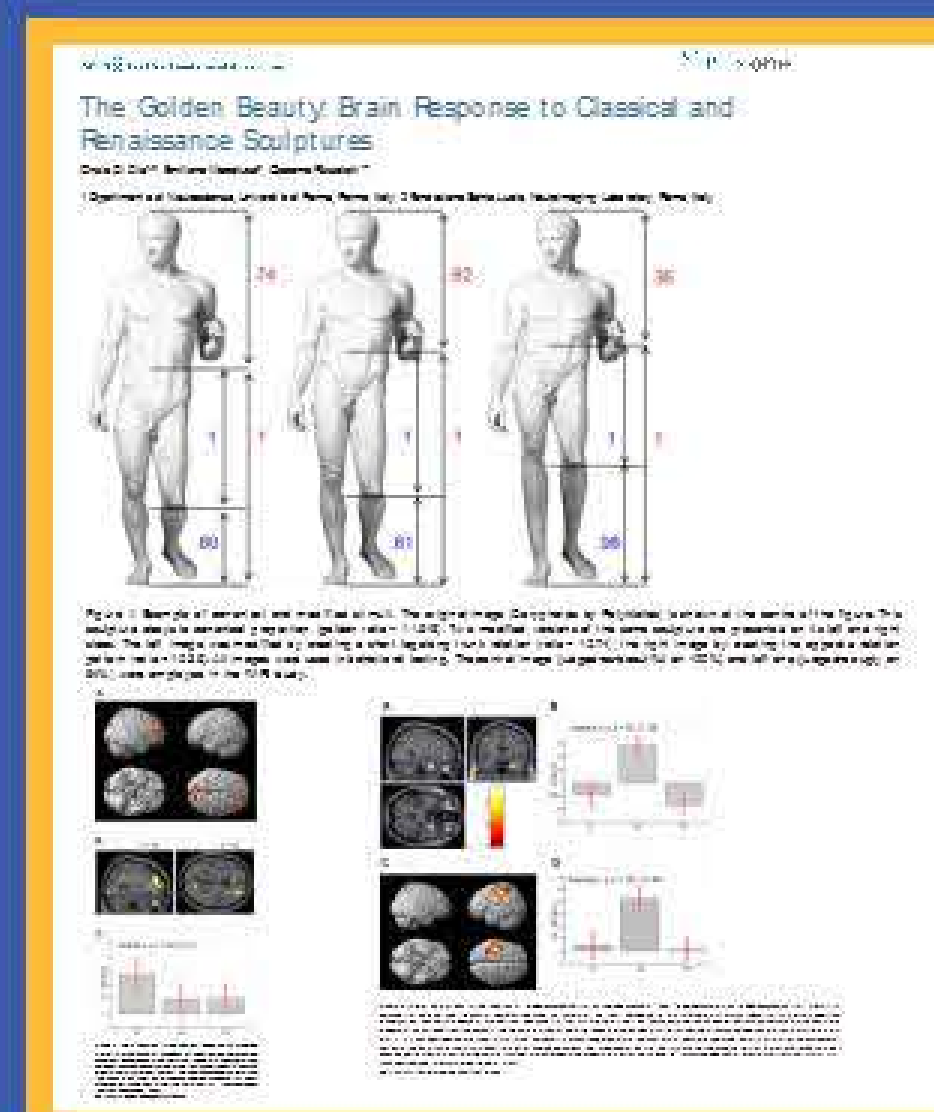
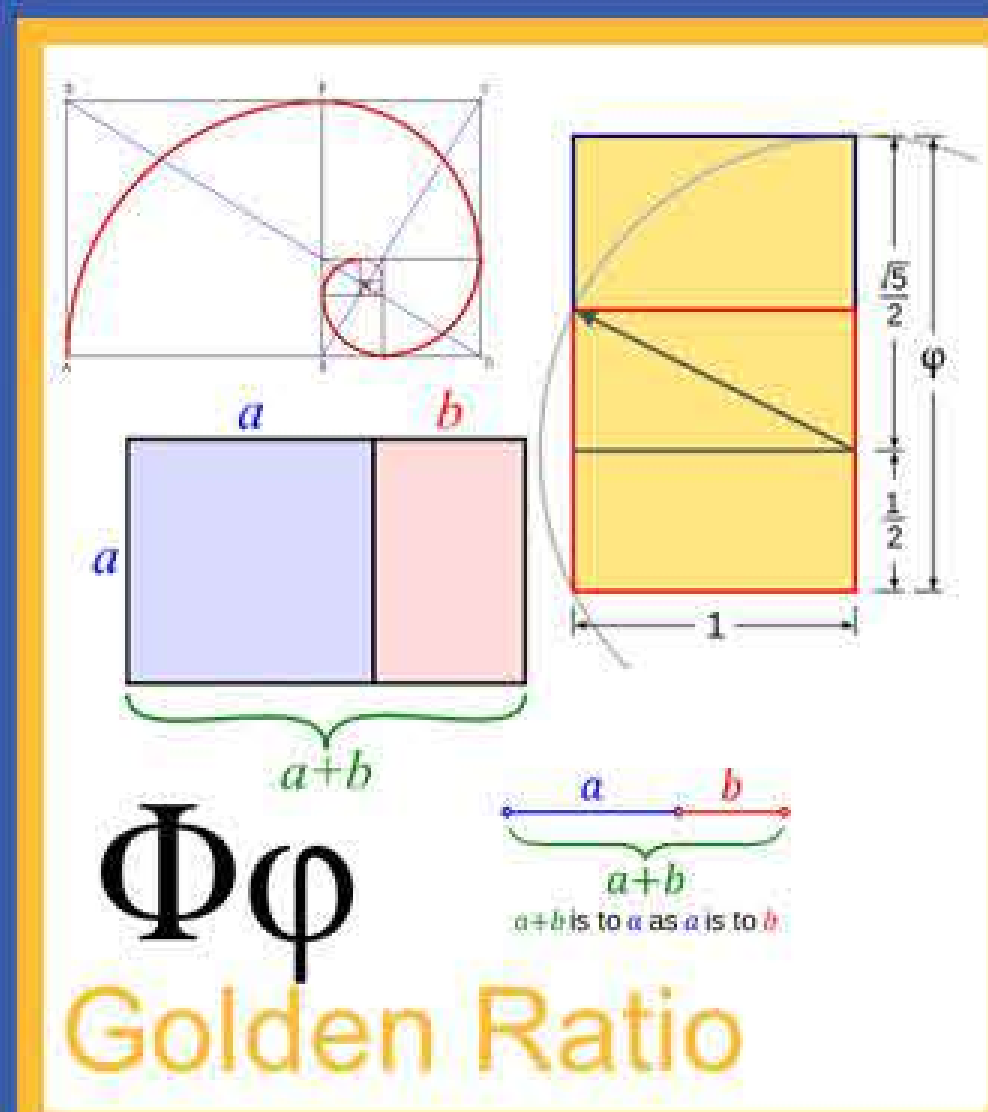
The golden ratio was first defined by Euclid (c. 300 BC), a mathematician, but was likely utilized earlier by Phidias (430-495 BC), a sculptor, in his statues and sculptures. Some feel that the designers of the Great Pyramids may have used this ratio well before either of them. Although, controversial, the golden ratio continues to permeate into multiple disciplines even today.

Golden Ratio Descriptions in nature many including the nautilus shell, romanesque cauliflower, etc. It is unclear if there is a natural selection for these proportions or if it provides some form of evolutionary advantage. It is also important to note that these examples are approximations to the golden ratio. Also, it is prudent to remind ourselves that although it has a mathematical basis for existing, it is also a human creation or observation.

It is these observations that have been used to describe objects in nature and of human creation. Utilized by artists and mathematicians, it was not until centuries later that scientists and architect used it to create and describe their works.

The Golden Ratios popularity is a matter of debate. Some feel it is a self-fulfilling prophecy; where creating objects to the Golden Ratio proportions is popular, possibly because it is familiar. But is this a familiarity to other human made objects or to naturally occurring objects or beings.

Looking beyond why these proportions exist or why they continue to be used, is if these proportions provide a sense of satiety that can used to create satisfying environments. This will involve an interface between architecture and neuroscience.



Wishful Thinking?

Discussion

It appears that aesthetic qualities can be monitored neurologically and radiographically

Using visual input of classical sculptures, a map of what one thinks is beautiful to ugly can be created.

This may be due to an inherent preference for viewing the horizon as a 3/2 rectangle (close to 1/1.618)

Binocular vision approximates 3/2 rectangle and many of our artificial inputs (TV, monitors, gauges, etc) use these proportions, adding to this concept familiarity or aesthetic of the Golden Ratio.

Does this pattern of familiarity perpetuate to the neuroanatomic or neurophysiologic level?

Is the familiarity or aesthetic actually an efficiency of neuronal processing?

Can this aesthetic signal be replicated or duplicated to generate familiarity without redundancy?

Architecture may provide a tool to determine the threshold between familiarity and redundancy. While neuroscience may provide insight into whether the golden ratio approximations truly reveal a familiar aesthetic.

Questions that remain to be answered include:

Does the use of the golden ratio in architecture improve the aesthetic satisfaction or likeability of a design?

Can individuals have changes in mood when entering or exiting a room/building with golden ratio proportions?

Is can the aesthetic be dulled with repetition or is the golden ratio a sustained positive aesthetic?

Can we use neuroimaging techniques in a practical sense to design neuroaesthetically pleasing environments? Is this design somewhat universal or variable from person to person?

Conclusions and Future Directions

There continues to be controversy regarding the aesthetic of the golden ratio. However, neuroscience including neuroimaging, may provide additional insight into why the Golden Ratio is aesthetically pleasing, familiar, or coincidental. Architecture may provide a satisfactory medium to analyze this phenomenon.