

# 24 Anthropomorphic and Geometric Aesthetics

Wednesday, April 5, 2017

## Today:

Announcements  
Sketching horizontal cylinders  
Anthropomorphic Effects  
    Uncanny Valley  
    Top down lighting bias  
Geometric Aesthetics (if there's time)  
    Symmetry  
    Area Alignment  
    Rule of Thirds  
    Fibonacci  
    Golden Ratio

## Consider displaying your projects at an Expo:

Subject	Class projects to ATLAS Expo - due 4/7
From	Stephanie Wanek
To	
Sent	Wednesday, April 03, 2019 11:38 AM

I believe there are likely students in your class with projects heading to ATLAS Expo. Please note that we are requesting applications due by Sun 4/7 so we can curate and select. Interested students should be encouraged to apply soon!!

### The EXPO cometh

- **ATLAS Expo** comes on Thurs 4/25 but the work starts now! Expo is a showcase of **astounding** and **outstanding** student projects – like yours.
- **Apply by 4/7** to have your work be considered for Expo. Students can [submit works here](#).
- **Project Curation** [Annie Bruns](#) will be the faculty project curator and can help you refine your projects.
- **How to Expo like a Pro** Annie's offering 2 workshops to help you present your work, including at Expo. Reach out to [Annie](#) and sign up for her workshops [here](#).

Stephanie

Stephanie Wanek  
ATLAS Assn't Director, Operations  
Roser ATLAS Bldg, Rm 215  
303-735-0797



<http://atlas.colorado.edu/>

Explore our world of creative technology, computing & design



University of Colorado **Boulder**

Subject	Spring 2019 Expo Registration
From	Christina Marie Oerter
To	geen1400-instructors@lists.colorado.edu
Sent	Wednesday, April 03, 2019 4:10 PM

Hi all,

The Expo registration form is up. The link is <https://itll.link/expo> The deadline for teams to register is Friday, April 12th. Please have one student from each team fill out the registration. We highly recommend you look over the registration form before they submit it, to ensure the

ITLL Expo

The Expo registration form is up. The link is <https://itll.link/expo> The deadline for teams to register is Friday, April 12th. Please have one student from each team fill out the registration. We highly recommend you look over the registration form before they submit it, to ensure the students have included all the pertinent information. If you want me to come in and talk to your class about registration, let me know. Please let me know if you have any questions or I can help with anything. Cheers,  
~Christina

Academic Program Associate  
ITL and Engineering Plus Programs  
College of Engineering and Applied Science  
University of Colorado Boulder | ITLL 1B40  
Christina.Oerter@colorado.edu  
T: 303 492 2172

**Friday, April 26**

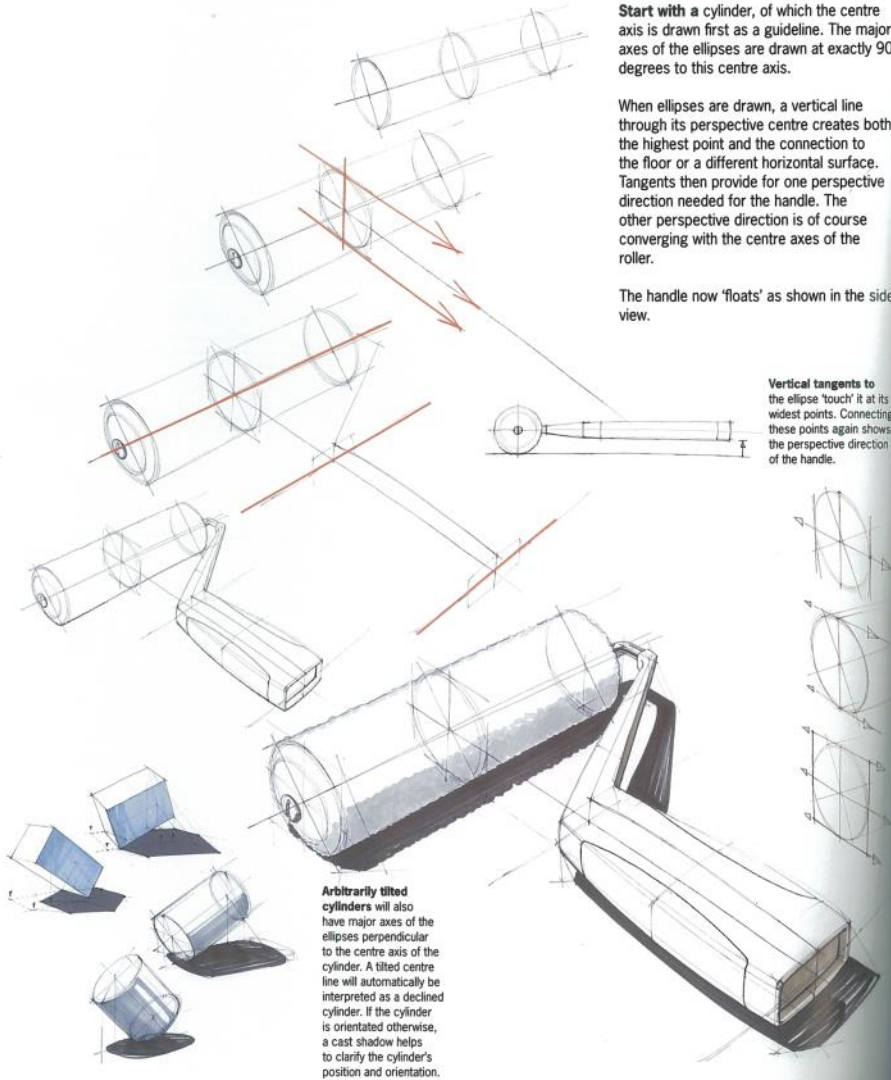
Student Networking Event: 2 to 3:30 p.m.  
**Open to Public: 2 to 4:45 p.m.**  
Awards to follow

**Indoor Practice Facility**  
Corner of Folsom Street and Stadium Drive, Boulder

[colorado.edu/engineering/expo](https://colorado.edu/engineering/expo)

Sketching

## 2.5 HORIZONTAL CYLINDERS



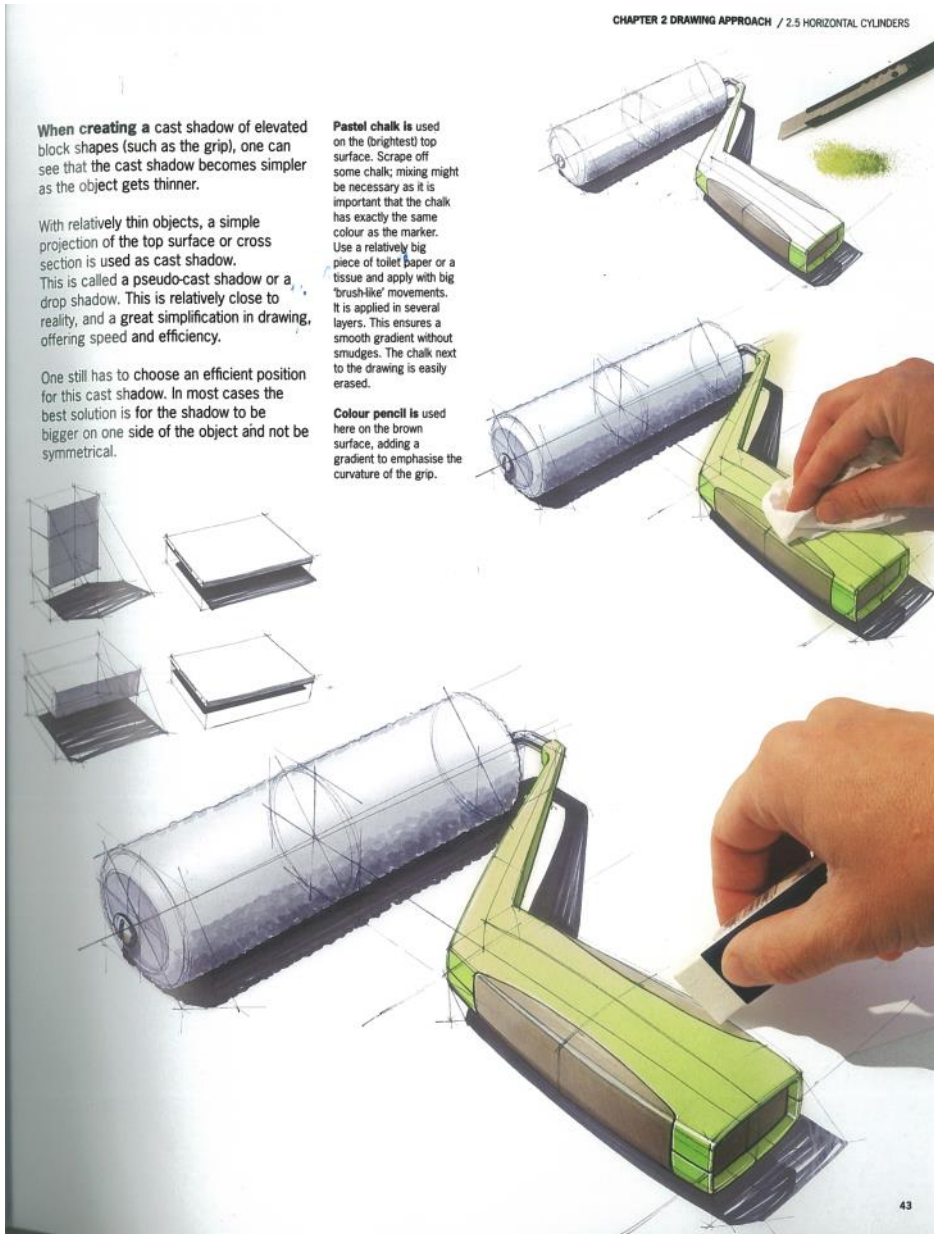
When creating a cast shadow of elevated block shapes (such as the grip), one can see that the cast shadow becomes simpler as the object gets thinner.

With relatively thin objects, a simple projection of the top surface or cross section is used as cast shadow. This is called a pseudo-cast shadow or a drop shadow. This is relatively close to reality, and a great simplification in drawing, offering speed and efficiency.

One still has to choose an efficient position for this cast shadow. In most cases the best solution is for the shadow to be bigger on one side of the object and not be symmetrical.

Pastel chalk is used on the (brightest) top surface. Scrape off some chalk; mixing might be necessary as it is important that the chalk has exactly the same colour as the marker. Use a relatively big piece of toilet paper or a tissue and apply with big brush-like movements. It is applied in several layers. This ensures a smooth gradient without smudges. The chalk next to the drawing is easily erased.

Colour pencil is used here on the brown surface, adding a gradient to emphasise the curvature of the grip.



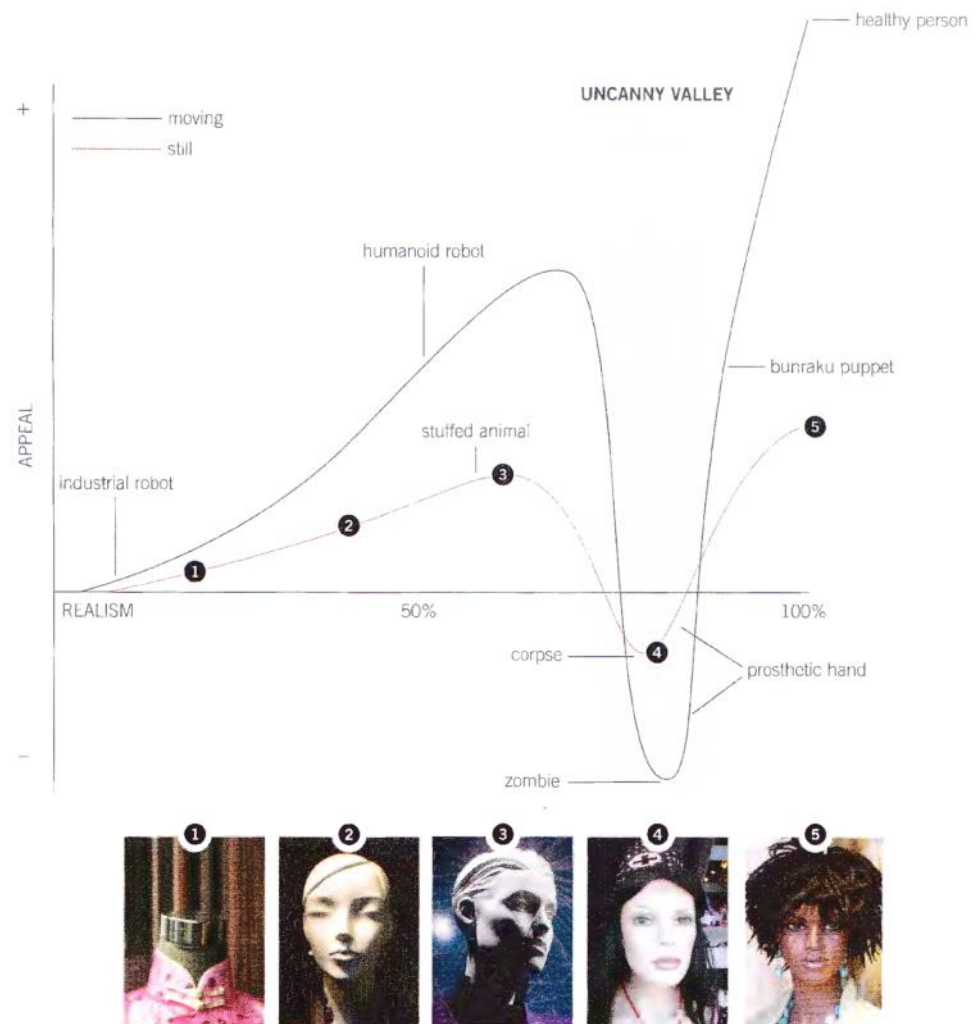
## Anthropomorphic Aesthetics

26 Anthropomorphic Form *last time*

34 Baby-Face Bias (video) <https://www.lynda.com/Higher-Education-tutorials/Baby-face-bias/193717/478055-4.html>

242 Uncanny Valley

240 Top-Down Lighting Bias (video) <https://www.lynda.com/Higher-Education-tutorials/Top-Down-Lighting-Bias/193717/426774-4.html>



Masahiro Mori's classic graph plots familiarity or appeal of an anthropomorphic form against its degree of realism. The uncanny valley resides to the right of the continuum, dipping sharply just before the likeness of a

genuine healthy person. The mannequin images illustrate the benefits of abstraction and total realism in depicting human likenesses, as well as the perils of the uncanny valley.

<https://www.polygon.com/2017/4/6/15207502/mass-effect-andromeda-patch-eyes-comparison>



# Uncanny Valley

Anthropomorphic forms are appealing when they are dissimilar or identical to humans, but unappealing when they are very similar to humans.

Applies to other natural forms; flowers, plants etc.

Anthropomorphic forms are generally appealing to humans. However, when a form is very close but not identical to a healthy human—as with a mannequin or computer-generated renderings of people—the form tends to become distinctly unappealing. This sharp decline in appeal is called the “uncanny valley,” a reference to the large valley or dip in the now classic graph presented by Masahiro Mori in 1970.<sup>1</sup> Though some have disputed the existence of the effect altogether, attributing any negative affective response to a simple lack of familiarity with artificial and rendered likenesses, more recent empirical research suggests the uncanny valley is a real phenomenon. The cause likely regards innate, subconscious mechanisms evolved for pathogen avoidance—that is, detecting and avoiding people who are sick or dead.<sup>2</sup>

Although a full understanding of the variables required to take an anthropomorphic likeness into the uncanny valley has not yet been realized, some conditions have been identified. The strength of the negative reaction seems to correspond to the fidelity of the likeness—a highly realistic likeness that is identifiable as artificial will evoke a stronger negative reaction than a less realistic likeness. Abnormally proportioned or positioned facial features, asymmetry of facial features, subtleties of eye movement, and unnatural skin complexions are all sufficient conditions to trigger uncanny valley effects.

Although the uncanny valley is generally observed by animators and roboticists, there are plenty of examples where the caveats of the principle are not abided. For example, director Robert Zemeckis decided to depict computer-generated characters with a high degree of realism for the movie *The Polar Express*. The resulting effect was both impressively realistic and eerie. The movie raised awareness of what is called “dead eye syndrome,” where the lack of eye movements called saccades made the characters look zombie-like, taking the Polar Express straight through the uncanny valley. Another example is found in retail contexts. There is a general perception among retailers that the effectiveness of mannequins is a function of their realism. However, barring a mannequin that is indistinguishable from a real person, the uncanny valley suggests that retailers would be better served by more abstract versus highly realistic mannequins.

Consider the uncanny valley when representing and animating anthropomorphic forms. Opt for more abstract versus realistic anthropomorphic forms to achieve maximum acceptance. Negative reaction is more sensitive to motion than appearance, so be particularly cognizant of jerky or unnatural movements when animating anthropomorphic bodies and faces.

See also Anthropomorphic Form, Threat Detection, and Top-Down Lighting Bias.

<sup>1</sup> The seminal work on the uncanny valley is “Bukimi No Tani [The Uncanny Valley]” by Masahiro Mori, *Energy*, 1970, vol. 7(4), p. 33–35.

<sup>2</sup> See, for example, “Too Real for Comfort? Uncanny Responses to Computer Generated Faces” by Karl MacDorman, Robert Greera, Chin-Chang Hoa, et al., *Computers in Human Behavior*, May 2009, vol. 25(3), p. 695–710; and “The Uncanny Valley: Effect of Realism on the Impression of Artificial Human Faces” by Jun'ichiro Seyama and Ruth Nagayama, *Presence*, Aug. 2007, vol. 16(4), p. 337–351.

strandbeest  
[https://en.wikipedia.org/wiki/Janse\\_n's\\_linkage](https://en.wikipedia.org/wiki/Janse_n's_linkage)

[https://www.youtube.com/watch?v=LewVEF2B\\_pM](https://www.youtube.com/watch?v=LewVEF2B_pM)

# Geometric Aesthetics

## Classical Composition

Much comes from classical painting composition, dating far back. These rules are made to be broken. Rules are empirical, not supported by science.

[https://en.wikipedia.org/wiki/Composition\\_%28visual\\_arts%29](https://en.wikipedia.org/wiki/Composition_%28visual_arts%29)

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Modern implementation in 2D graphic design, part of **Human-Computer Interface (HCI)** research  
Ware, Colin. *Visual Thinking For Design*. Morgan Kaufmann, 2010. Whole pdf in our AesDes Zotero  
library

Table of contents: [http://www.amazon.com/Visual-Thinking-Kaufmann-Interactive-Technologies/dp/0123708966#reader\\_0123708966](http://www.amazon.com/Visual-Thinking-Kaufmann-Interactive-Technologies/dp/0123708966#reader_0123708966)

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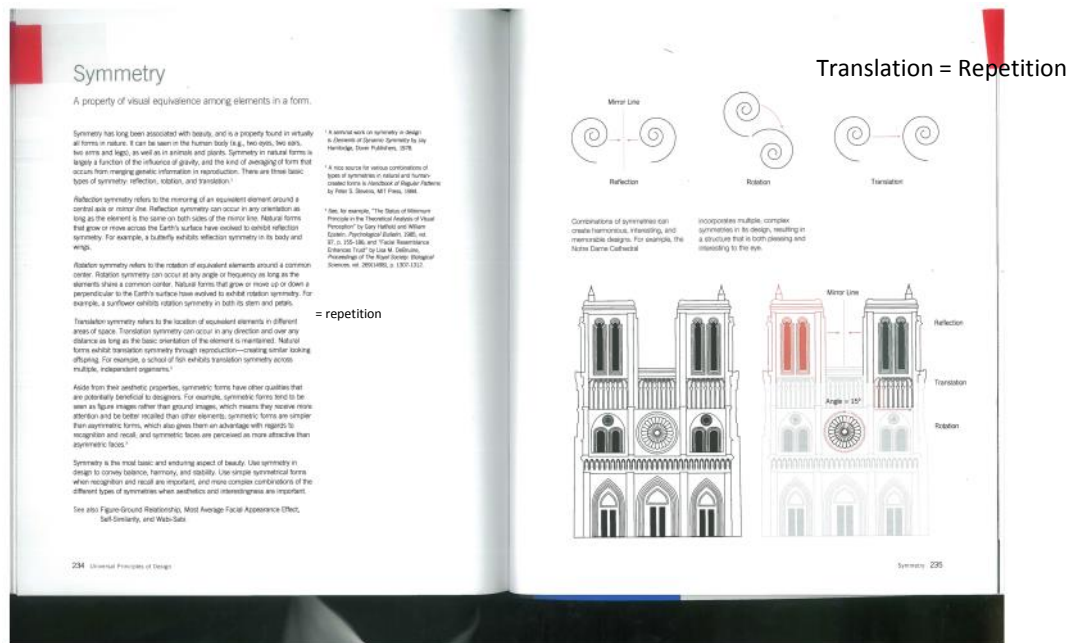
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## Universal Principles of Design topics



Good symmetry works. Asymmetry works. Broken symmetry is tricky.

## Area Alignment

Alignment based on the area of elements versus the edges of elements.

With the advent of professional design and engineering software, elements in a design can be aligned with exacting precision. However, the alignment supported by software is based on the edges of elements—excluding center alignment, which calculates a center based on the edges. This method works well when elements are relatively uniform and symmetrical, but less well when the elements are irregular and asymmetrical. In these latter cases, it is preferable to align based on the visual weight or area of the elements, a technique that must be performed using the designer's eye and judgment. Using edge alignment when area alignment is called for is one of the most common errors in graphic design.

A satisfactory area alignment can be achieved by positioning an object along the axis of alignment such that an equal amount of area or visual weight hangs on either side—if the object has mass, it would be balanced on the axis. Unlike the straight edge achieved by left- or right-aligning similar elements based on their edges, alignment based on area invariably creates a ragged edge. This occurs if two parts of elements hang in the gutter or overlap when aligned with strongly nonlinear elements, but it represents the strongest possible perceived alignment that can be achieved for nonhomogeneously dissimilar elements.

The principle applies to text as well as pictorial elements. For example, the horizontal center of a left-aligned text chunk with a right ragged edge, based on its area, would be to the left of a horizontal center based on its width—area alignment calculates the horizontal center in consideration of the reduced area of the ragged right edge, moving the horizontal center to the left, whereas edge alignment simply calculates the horizontal center through the text chunk where a rectangle, with the right edge determined by the ragged character. Other common text examples include pull quotes, which should be aligned based on the last edge and not on the quotation marks, and numbered or bulleted items, which should be aligned based on the text edge and not on the numbers and bullets, unless the specific intent is to subordinate the bulleted items.

Consider area alignment when incorporating dissimilar elements into a composition. When objects are simple and symmetrical, align based on their edges; otherwise, align based on their areas. Unless there is some extraordinary overriding consideration, always bring pull quotes, long numbers and bullets, when listing items, except when the items are meant to be subordinate.

See also Alignment, Good Continuity, and Uniform Connectedness.

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The left column is center-aligned based on the edges of the objects. The right column is center-aligned based on the areas of the objects. Note the improvement achieved by using area alignment.



Area Alignment 31

## Rule of Thirds

A technique of composition in which a medium is divided into thirds, creating aesthetic positions for the primary elements of a design.<sup>1</sup>

The rule of thirds is a technique derived from the use of early grid systems in composition. It is applied by dividing a medium into thirds both vertically and horizontally, creating an invisible grid of nine rectangles and four intersections. The primary element within a design is then positioned on an intersection of the grid. The asymmetry of the resulting composition is interesting to look at, and generally agreed to be aesthetic.

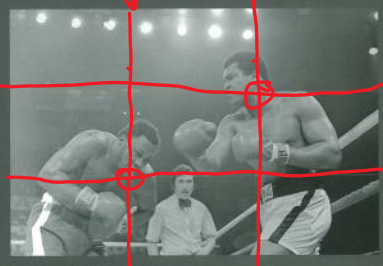
The technique has a long following in design circles due to its use by the Renaissance masters and its rough relationship to the golden ratio. Although dividing a design into thirds yields a ratio different from the golden ratio (i.e., the 2/3 section is 0.667 versus golden ratio = 0.618), the users of the technique may have decided that this simplicity of its application compensated for its rough approximation.

The rule of thirds generally works well, is easy to apply, and should be considered when composing elements of a design. When the primary element is so strong as to invigorate the composition, consider confining the element rather than using the rule of thirds—especially when the strength of the primary element is reinforced by the surrounding elements or space. If the surrounding elements or space do not reinforce the primary element, use the rule of thirds and add a secondary element below as a counterpart to the opposing intersection of the primary element to bring the composition to balance. In designs where there is a strong vertical or horizontal element, it is common practice to align the element along one of the grid lines of corresponding orientation.<sup>2</sup>

See also Alignment, Golden Ratio, and Symmetry.

<sup>1</sup> Also known as golden grid rule.

<sup>2</sup> A close association to conceptualized concepts is Design and Composition by Herbert Lubliner, Prentice Hall, 1987.



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Rule of Thirds 209



[https://en.wikipedia.org/wiki/Rule\\_of\\_thirds#/media/File:RuleOfThirds-SideBySide.gif](https://en.wikipedia.org/wiki/Rule_of_thirds#/media/File:RuleOfThirds-SideBySide.gif)

The rule of thirds was first written down by John Thomas Smith in 1797.

## Fibonacci Sequence

A sequence of numbers in which each number is the sum of the preceding two

A Fibonacci sequence is a sequence of numbers in which each number is the sum of the two preceding numbers (e.g., 1, 1, 2, 3, 5, 8, 13). Patterns exhibiting the sequence are commonly found in natural forms, such as the petals of flowers, spirals of galaxies, and bones in the human hand. The ubiquity of the sequence in nature has led many to conclude that patterns based on the Fibonacci sequence are intrinsically aesthetic and, therefore, worthy of consideration in design.<sup>1</sup>

Fibonacci patterns are found in many classic works, including classic poetry, art, music, and architecture. For example, it has been argued that Virgil used Fibonacci sequences to structure the poetry in the Aeneid.<sup>2</sup> Fibonacci sequences are found in the musical compositions of Mozart's sonatas and Beethoven's Fifth Symphony.<sup>3</sup> Le Corbusier relied very much on the measures of the human body and Fibonacci sequences to develop the Modulor, a classic system of architectural proportions and measurements to aid designers in achieving practical and harmonious designs.<sup>4</sup>

Fibonacci sequences are generally used in concert with the golden ratio, a principle to which it is closely related. For example, the division of any two adjacent numbers in a Fibonacci sequence yields an approximation of the golden ratio. Approximations are sought for many numbers in the sequence but interestingly accurate as the sequence progresses. As with the golden ratio, debate continues as to the aesthetic value of Fibonacci patterns. Are such patterns considered aesthetic because people find them to be more aesthetic or because people have been taught to believe they are aesthetic? Research on the aesthetics of the golden ratio tends to favor the former, but the empirical research exists on the aesthetics of non-golden Fibonacci patterns.<sup>5</sup>

The Fibonacci sequence continues to be one of the most influential patterns in mathematics and design. Consider Fibonacci sequences when developing interesting compositions, geometric patterns, and organic motifs and controls, especially when they involve rhythms and harmonies using multiple elements. Do not confine designs to incorporate Fibonacci sequences, but also do not forgo opportunities to explore Fibonacci relationships when other aspects of the design are not compromised.

See also Aesthetic Usability Effect, Golden Ratio, and Most-Average Facial Appearance Effect.


<sup>1</sup> The earliest work on the Fibonacci sequence is "Liber Abaci" (Book of the Abacus) by Leonardo of Pisa, 1202. Contemporary works include "The Geometry of Art and Life" by Martin Gropius, Dover Publications, 1978 (1964); "Elements of Dynamic Symmetry" by Johannes Itten, Dover Publications, 1978 (1925).

<sup>2</sup> See, for example, "Structural Patterns and Proportions in Virgil's Aeneid" by George Edgar Schuchert, University of Michigan Press, 1962; and "Did Mozart Use the Golden Section?" by John Shaw, *American Scientist*, March/April 1996, and Le Corbusier by Le Corbusier, Birkbeck, 2002 (1946).

<sup>3</sup> "On That Golden: A Review of Psychological Research on the Aesthetics of the Golden Section" by Christopher D. Green, *Perceptual*, 2005, vol. 34, p. 807-846.

<sup>4</sup> See "The Golden Ratio" by Mark Padellaro, *Journal of Architecture*, 2005, vol. 10, no. 4, p. 607-616.

<sup>5</sup> See "The Aesthetics of the Golden Ratio" by Mark Padellaro, *Journal of Architecture*, 2005, vol. 10, no. 4, p. 607-616.



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Illustration: Robert R. R. R.

<https://www.youtube.com/watch?v=RjM8AaNsJhA&index=1&list=PLC1VCzU4q6ohKrlZAscdjylx-gjmPul2x> How to draw a Fibonacci spiral

## Golden Ratio

A ratio within the elements of a form, such as height to width, approximating 0.618.

The golden ratio is the ratio between two segments such that the smaller (BD) segment is to the larger segment (AB) as the larger segment (AB) is to the sum of the two segments (AC), or AC:AB = AB:BC.

The golden ratio is found throughout nature, art, and architecture. Phidias, Leonardo da Vinci, and many others incorporated the golden ratio into their designs. The Parthenon, the Great Pyramid of Giza, Stonehenge, and the Colosseum all exhibit the golden ratio.

While many manifestations of the golden ratio in early art and architecture were likely caused by processes not involving knowledge of the golden ratio, it may be that these manifestations result from a more fundamental, subconscious preference for the aesthetic resulting from the ratio. A substantial body of research concerning individual preferences for rectangles of various proportions supports a preference based on the golden ratio. However, these findings have been challenged on the theory that preferences for the ratio in past generations resulted from experiential bias, methodological flaws, or other external factors.

Whether the golden ratio taps into some inherent aesthetic preference or is merely an early design technique turned tradition, there is no question as to its past and continued influence on design. Consider the golden ratio when it is not combined to create golden ratios, but golden ratios should be explored when other aspects of the design are not compromised.

See also: Aesthetic-Likability Effect, Form Follows Function, Rule of Thirds, and Repeat-to-Rate.

## Education-tutorials/Golden-ratio/193717/497816-4.html

### 1/1.618=0.618

Also known as golden mean, golden number, golden section, golden proportion, divine proportion, and sectio aurea.

The golden ratio is a irrational (never ending decimal) and can be compared with the equivalent 1:1.618, adding 1 to the golden ratio yields 2.618, whereas 1 subtracted from 1 yields 0.618.

The ratios are used most frequently to define the golden ratio, as they represent the same basic geometric relationship. Numerous shapes derived from the golden ratio include golden rectangles, golden polygons, and golden triangles.

The earliest work on the golden ratio is due to the Hellenic mathematician Euclid. His system of the golden section is by "Division of a Line into the Golden Section" (c. 300 BC). A modern reference is "The Golden Ratio" by Martin Gardner, 1991, and "The Golden Ratio: A Source of Psychological Research on the Aesthetics of the Golden Section" by Christopher D. Green, 1995.

The "Cut of the Golden Ratio" is a mathematical representation of the golden ratio that uses the "Cut of the Golden Ratio" or "Mean Ratio" and "Fibonacci" to form a golden rectangle.

The page contains the text "The golden ratio is a irrational (never ending decimal) and can be compared with the equivalent 1:1.618, adding 1 to the golden ratio yields 2.618, whereas 1 subtracted from 1 yields 0.618." The text is repeated twice.

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