

# Symmetry

A property of visual equivalence among elements in a form.

Symmetry has long been associated with beauty, and is a property found in virtually all forms in nature. It can be seen in the human body (e.g., two eyes, two ears, two arms and legs), as well as in animals and plants. Symmetry in natural forms is largely a function of the influence of gravity, and the kind of *averaging* of form that occurs from merging genetic information in reproduction. There are three basic types of symmetry: reflection, rotation, and translation.<sup>1</sup>

*Reflection* symmetry refers to the mirroring of an equivalent element around a central axis or *mirror line*. Reflection symmetry can occur in any orientation as long as the element is the same on both sides of the mirror line. Natural forms that grow or move across the Earth's surface have evolved to exhibit reflection symmetry. For example, a butterfly exhibits reflection symmetry in its body and wings.

*Rotation* symmetry refers to the rotation of equivalent elements around a common center. Rotation symmetry can occur at any angle or frequency as long as the elements share a common center. Natural forms that grow or move up or down a perpendicular to the Earth's surface have evolved to exhibit rotation symmetry. For example, a sunflower exhibits rotation symmetry in both its stem and petals.

*Translation* symmetry refers to the location of equivalent elements in different areas of space. Translation symmetry can occur in any direction and over any distance as long as the basic orientation of the element is maintained. Natural forms exhibit translation symmetry through reproduction—creating similar looking offspring. For example, a school of fish exhibits translation symmetry across multiple, independent organisms.<sup>2</sup>

Aside from their aesthetic properties, symmetric forms have other qualities that are potentially beneficial to designers. For example, symmetric forms tend to be seen as figure images rather than ground images, which means they receive more attention and be better recalled than other elements; symmetric forms are simpler than asymmetric forms, which also gives them an advantage with regards to recognition and recall; and symmetric faces are perceived as more attractive than asymmetric faces.<sup>3</sup>

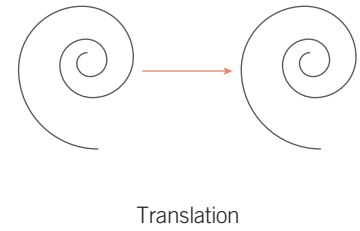
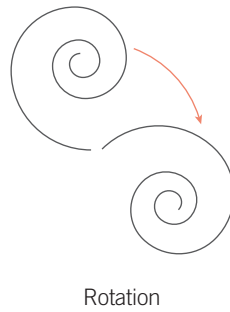
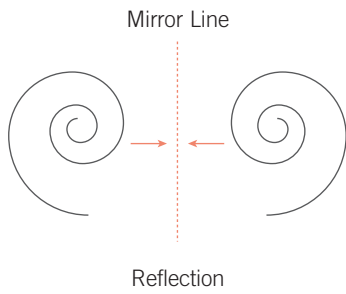
Symmetry is the most basic and enduring aspect of beauty. Use symmetry in design to convey balance, harmony, and stability. Use simple symmetrical forms when recognition and recall are important, and more complex combinations of the different types of symmetries when aesthetics and interestingness are important.

See also Figure-Ground Relationship, Most Average Facial Appearance Effect, Self-Similarity, and Wabi-Sabi.

<sup>1</sup> A seminal work on symmetry in design is *Elements of Dynamic Symmetry* by Jay Hambidge, Dover Publishers, 1978.

<sup>2</sup> A nice source for various combinations of types of symmetries in natural and human-created forms is *Handbook of Regular Patterns* by Peter S. Stevens, MIT Press, 1984.

<sup>3</sup> See, for example, "The Status of Minimum Principle in the Theoretical Analysis of Visual Perception" by Gary Hatfield and William Epstein, *Psychological Bulletin*, 1985, vol. 97, p. 155–186; and "Facial Resemblance Enhances Trust" by Lisa M. DeBruine, *Proceedings of The Royal Society: Biological Sciences*, vol. 269(1498), p. 1307-1312.



Combinations of symmetries can create harmonious, interesting, and memorable designs. For example, the Notre Dame Cathedral

incorporates multiple, complex symmetries in its design, resulting in a structure that is both pleasing and interesting to the eye.

