

Infinite Reflections: Kaleidoscope Magic & Wonder

By D. Suchy

It is a magical mixture of art and science, of light waves and color. It is an optical phenomenon. A delicate balance of left- and right-brain, of simple mathematics and complex formulas. It is a child's toy, an artist's inspiration, and a collector's passion. It is a timeless source of spiritual renewal and a calming focus for the senses. It is, quite simply, the kaleidoscope.

It was 1816 when Scottish scientist and inventor Sir David Brewster created the first kaleidoscope while mastering the mathematics of light polarization and optics. Then only 35 years old, Brewster already had a wealth of accolades to his credit. Among his scientific accomplishments were the poly-zonal lens – the predecessor to what we now know as a lighthouse lens, and “Brewster's Angle” – a polarization calculation central to the adjustment of radio signals, molecular microscopes, fiber optics, lasers, and meteorology.

From all of his study in the world of optics, Brewster then identified a method of creating repetitive images of color and shape by setting reflective surfaces at specific angles, and thus the kaleidoscope was born. In 1817, he submitted a patent for his new “Optical Instrument called the Kaleidoscope for Exhibiting and Treating Beautiful Forms and Patterns”. Brewster's new kaleidoscope received immediate acclaim for its scientific achievement, and throughout Europe, thousands were sold to the masses that were mesmerized by the objects' beauty.

The earliest American made kaleidoscope can be traced back to 1818, but it wasn't until Charles G. Bush's 1873 patent for improvements to the kaleidoscope's object chamber that the fervor progressed. Bush made a series of significant improvements including hermetically sealed liquid-filled and interchangeable object cells, incorporated light sources for better viewing, as well as a patented wooden stand for display. He began producing his scopes by the thousands in the 1870's, and his early scopes set the tone for many future styles. Victorian homes often displayed a lovely Parlor kaleidoscope as art and a source of entertainment for family and friends.

The kaleidoscope's popularity as an art form remained strong for the next 70 years, but sales decreased as the electronic age of television grew. The scopes of the mid-1900's were primarily limited to the production of toys. The Steven Manufacturing Company, a toy business started in 1946, created hundreds of children's kaleidoscope designs fashioned with popular emblems and icons. Their clever marketing of these delightful toys featured Campbell's Soup kids, Mickey Mouse, and even Uncle Sam. The Steven toys are largely credited for inspiring the collectibility of the kaleidoscope in its modern day form, as hundreds of thousands were sold to a generation that remembers them with great nostalgic admiration. The kaleidoscope was often the first piece of art that a child owned, and adults frequently speak of their youth when viewing the artful interior of a kaleidoscope. It is a magical time transport back to the pleasures of childhood.

As discovered by both Brewster and Bush, the key to any great kaleidoscope lies within the body of its design. The optical phenomenon of a scope's interior image is created by two or more mirrors set against each other at specific angles – typically in the form of a triangle. The most common types of arrangements are the “2-mirror” and “3-mirror” systems. The 2-mirror system, combined with a third black or solid surface, creates a central contained image much like that of a cathedral window. The 3-mirror system gives the viewer an endless stretch of repetitive image in all directions. As all three sides of the inner triangle are made of reflective surfaces, the image bounces repeatedly to infinity.

A few artists have taken these more common mirror set ups to new heights. The Sea Parrot's "Time Machine" features a 4-mirrored interior, which creates the effect of two separate images interlinked together like the spokes of a wheel. Artist Debra Davis uses 4 mirrors in her "Geometry Class" series. In "Trapezoid", the mirrors are tapered in size from large to small, thereby creating the illusion of a fully dimensional sphere. "Rectangle" features 4 mirrors, each set at a 90-degree angle to each other, resulting in a series of optical, overlapping rectangles within the image. Even more daring, internationally acclaimed kaleidoscope artist Corki Weeks uses a 6-mirrored interior for her limited edition "Dichrorama" scope. The effect is that of falling through an endless stretch of space, deep into an ever-shrinking reflection of the repeated image.

In addition to the numbers of mirrors used, a kaleidoscope's image is determined by the angles of the "V" made by those mirrors. In the classic triangle formation, the more acute the angle, the greater the reflection of the image, and therefore the more sections or repetition of the interior image will appear. A simple 60-degree angle within a 2-mirrored scope will create the appearance of a 6-point star image, whereas a very acute 15-degree angle will result in a 24-point star – an image remarkably complex and intensely artful. By adding the third mirror to the existing triangle, the image develops into a series of shapes within shapes. The art is largely dependant on the mathematics.

The final factor in designing interior images lies in the contents of a scope's "object chamber" or "object cell". These cells may consist of liquid-filled ampules, dry or loose-filled chambers, wheels, or marbles. Liquid-filled cells give the greatest diversity of imagery, as they are propelled by motion and gravity and never fall into the same pattern twice – infinite reflections abound. Many scopes are designed with interchangeable chambers, again giving the viewer a variety of interior images. A "teleidoscope" utilizes a spherical lens rather than an object chamber. This unique combination of mirrors and lens allows the user to turn anything viewed into a kaleidoscopic image – little brother, the family dog or your favorite vegetable become instant art.

Today, the kaleidoscope has re-entered the world of art in a wide variety of forms and mediums. Most contemporary kaleidoscope makers are artists rather than scientists, and their focus is expanded to the whole of the object, as well as its interior image. Exterior construction includes materials such as stained, fused, and blown glass; brass and chrome; ceramics, hand-turned wood and dried gourds. There are trains, planes, and automobile scopes, elegant double-chambered dichroic glass scopes, and even sterling silver jewelry scopes. If you prefer your art to be functional, consider Will Smith's kaleidoscope fountain or R.C. Anderson's Garden Scope – a 6' high outdoor teleidoscope in which you may plant and view your favorite flowers.

Within the beauty of the kaleidoscope's science lies the power to heal. Studies in Japan have linked the use of kaleidoscopes to better health and longevity, and their calming ability has proven useful in meditation and therapy. Because a scope's visual stimulus is so intense, the viewer is hard-pressed to focus on other mental stimuli. Doctors and attorneys have been known to keep kaleidoscopes in their offices to relieve a client's anxiety. Hospice organizations use kaleidoscopes to relieve stress and bring beauty to home bound patients. The art of the symmetry promotes balance and harmony.

Little did Sir David Brewster know that his ornamental invention would become one of the most commonly owned and intensely loved pieces of art known throughout the world. Like music, the art of the kaleidoscope speaks an international language knowing no boundaries and limited only by the imagination and emotion. From needlepoint to quilting, inlaid wood design to pop-culture art to poetry, his creation of beautiful forms and patterns has linked symmetry in art in a multitude of mediums across nearly two centuries of time.

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