Art of Infinity

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Abstract

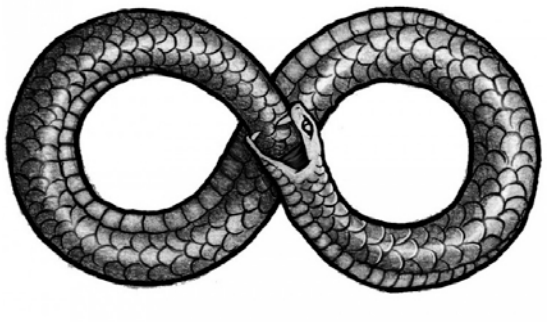
Infinity has been the subject of paintings, sculptures and other visual art forms, as well as works of poetry and fiction. Several of these creations combining artistic, scientific and mathematical ideas of infinity are discussed here. A new sculpture in this genre designed by the author and his collaborator Randy Rhine is also presented.

Introduction

Mathematicians, scientists and philosophers have explored ideas of the infinite for as long as there have been records of human activity. Artists, poets and many others have also weighed in on the subject from their own perspectives. Much has been written about infinity from the broad perspective of mathematics [1, 2], less so from the artistic viewpoint. We start with a few remarks about the origins of visual representations of infinity to see how they have evolved in more recent artistic expressions of the subject.

Origins of Visual Representations of the Infinite

In 1655, English mathematician John Wallis devised the now familiar mathematical symbol for infinity (essentially the number 8 on its side) for its current purpose, though the image itself dates back at least two millennia (Fig. 1a). Sometimes the image of the snake Ouroboros swallowing its own tail plays a related role concerning eternity (Fig. 1b). In some ways artists have embraced infinity more than scientists. For example, regarding Einstein's aversion to the reality of infinity in science, Sir Arthur Stanley Eddington wrote in his book *Pathways in Science*: "That queer quantity 'infinity' is the very mischief, and no rational physicist should have anything to do with it. Perhaps that is why mathematicians represent it by a sign like a love knot." The early use of the symbol to represent the infinite may be one of the reasons why the Möbius band, whose 2D projection has a similar appearance, also became a symbol of the infinite [3].



Figures 1*: (a) Roman Mosaic (Stara Zagora, Bulgaria), 100 AD; (b) Unknown, "Ouroboros Dragon".*

Art of The Mobius Band

The Möbius band (or strip) was discovered/invented/devised in the year 1858 almost simultaneously by German mathematicians August Ferdinand Möbius and Johann Benedict Listing [3]. Though Listing (who coined the word "topology") discovered it first, history has given the credit to Möbius. With its continuous single edge and single surface, it is often used to symbolize concepts of infinity. It is ironic that this is the case, given that Listing's PhD advisor, Carl Friedrich Gauss, had expressed doubt about the legitimacy of the very concept of infinity then prevailing within mathematics.

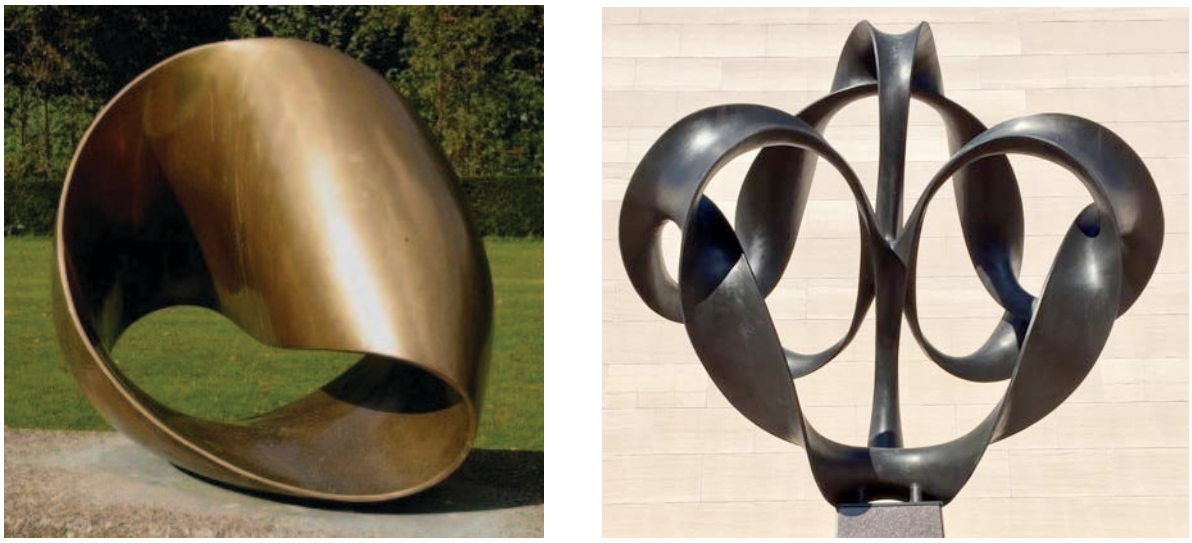


Figure 2*: (a) M. Bill, "Endless Ribbon, bronze, 1953;*
(b) C. O. Perry, "Continuum", bronze, painted black, 1976.

Many sculptors have created variations on the Möbius band in their own explorations of the infinite. Swiss artist Max Bill is possibly best known for his many sculptures based on the shape. He has written that he discovered the Möbius band for himself in 1935. One of his many Möbius sculptures is shown in Fig. 2a above. American artist Charles O. Perry explored topology in many sculptures during his long career, including a variety of variations on the Möbius surface. Perhaps his most visited one is called "Continuum" (Fig. 2b). It sits in front of the Air and Space Museum in Washington, DC. According to the artist himself, "Continuum began as an exploration of the Möbius strip…The center of the bronze sculpture symbolizes a black hole, while the edge shows the flow of matter through the center from positive to negative space and back again in a continuum." Möbius band or knot? You decide.

Sculptors of Infinity: Richard X. Zawitz and John Safer

Two American sculptors have explored ideas of infinity working with quite different topological objects. John Safer created three similar sculptures with the title "Limits of Infinity". Version III (Fig. 3a) resides on the campus of George Washington University in Washington, DC, though it is presently enshrouded in a wooden box, ironically making its name a reality! Richard X. Zawitz is an American artist/sculptor, a modern day renaissance man. Around 1975, he created a sculptural object he called the "Tangle" [4]. He has produced it in many forms, from 3' objects in plastic, to small hand held manipulable versions, to16' tall fixed stainless steel sculptures (Fig. 3b). The one shown below is entitled "Infinite Man". Zawitz says, "Infinity is not some grand mathematical formula that can fill up rooms of information. Infinity is we, the human species residing on planet earth. Only we humans can conceive of such a vast concept". Given the current fascination in the particle physics community with strings to represent the ultimate nature of all matter, he would like to see his "Tangle" replace the Möbius band as the visual symbol of infinity.

Figure 3*: (a) J. Safer, "Limits of Infinity III", brass, 1979; (b) R. X. Zawitz, "Infinite Man", steel, 2012.*

Mirroring Infinity

Who has not looked at himself or herself in a bathroom mirror that happens to have a mirror on the opposite wall and wondered, "How far can I see?" Elevator cars, restaurants and many other enclosed spaces have mirrors similarly placed. Several artists have raised this mirror configuration to the level of art. Perhaps the first to consciously do this was the American artist Lucas Samaras. Upon entering his 1966 "Mirrored Room" (Fig. 4a) at the Albright-Knox Art Gallery in Buffalo, New York one feels a dizzying sense of dislocation in space. The Japanese artist Yayoi Kusama has created similar rooms.

Figure 4: *(a) L. Samaras, "Mirrored Room", 1965;*
(b) J. McElehney, "Mirrored and Reflected Infinity", 2004.

Possibly the most marvelous variation on this theme has been created by Josiah McElheny, an American glass artist and MacArthur ("genius") Fellow. Some of his works employ a half-silvered mirror facing the viewer and a reflecting mirror on the opposite surface of a space through which a seemingly endless array of aluminized glass objects stretches to infinity (Fig. 4b). Of course, the finite reflectivity of the materials used restricts the actual number of images, but the artwork entices the viewer to contemplate the infinite nonetheless.

The invention of the kaleidoscope in 1816 by Sir David Brewster started the exploration of a world of multiple mirror devices, including the interior mirrored objects called "holoscopes" by American artist Gary Alison (Fig. 5a and b) and "Cumos" cubes by Japanese artist Minori Yamazaki (Fig. 5c). Alison has created versions of his holoscopes that employ many geometrical shapes, including all of the Platonic solids. Images are created by light entering from all the vertices. Yamazaki's name "Cumos" comes from the combination of cosmos and cube and represents his attempt to combine the "mystery of the finite and the infinite" by placing the "universe in a box". Seen through a single corner opening, the seemingly infinite array of images arises from the painted mirror walls. Each of these objects provides nice hand-held versions of the mirrored rooms and, much as Richard Zawitz's hand held "Tangles" allow the individual to manipulate infinity in ones hands, they allow the viewer to immerse himself in the infinite.

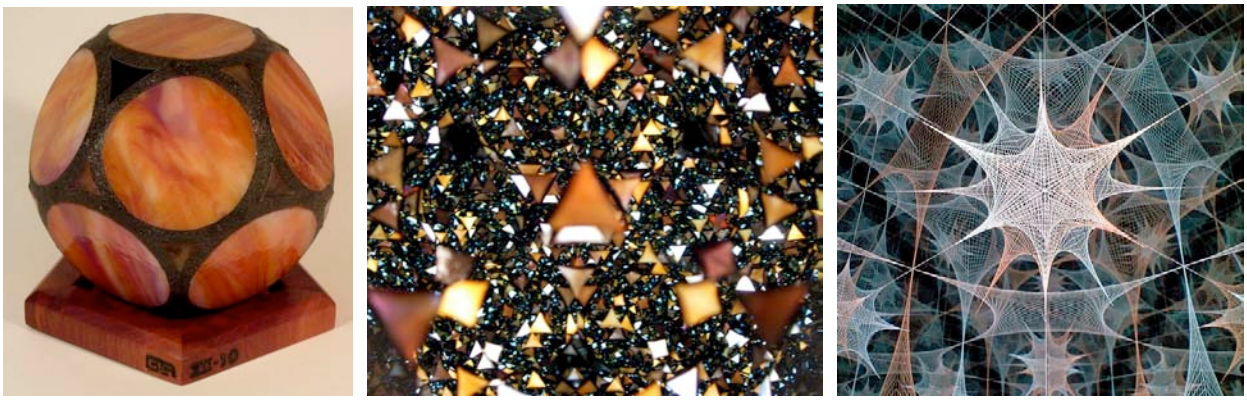


Figure 5: *(a) G. Alison, "Cosmos" exterior, stained glass 2010; (b) G. Alison "Cosmos", interior view; (c) M. Yamazaki, interior view of a "Cumos Cube", plastic box with mirror, 1985.*

William Blake and Richard Anuszkiewicz

Many poets, novelists and other writers have explored ideas of infinity and eternity. The visionary artist-poet William Blake (1757 - 1827) is singular among them by having had both the artistic and literary temperament, interest and ability to explore the possibilities of unending space and time in multiple media and literary works. In his portrayal of Sir Isaac Newton (Fig. 6a), Blake shows Newton concentrating on a mathematical construction, with his back to a seemingly chaotic material world. As the inventor of the calculus, Newton was faced with the daunting task of coming to grips with the infinitesimal, the inverse of the infinite. Maybe this is what Blake had in mind in writing "If the doors of perception were cleansed everything would appear to man as it is, infinite."

Arguably Blake's most famous poetic lines about the infinite appear in his poem "Auguries of Innocence": "To see a World in a Grain of Sand, and a Heaven in a Wild Flower, Hold Infinity in the palm of your hand, and Eternity in an hour…" In 1970, the American artist Richard Anuszkiewicz created 10 serigraphic prints in response to ten of Blake's most suggestive poetic lines. These prints are contained in an elephantine artist's book, each print enveloped by a three-fold cover with the associated lines from Blake. The one shown here is Anuszkiewicz response to the Auguries verse.

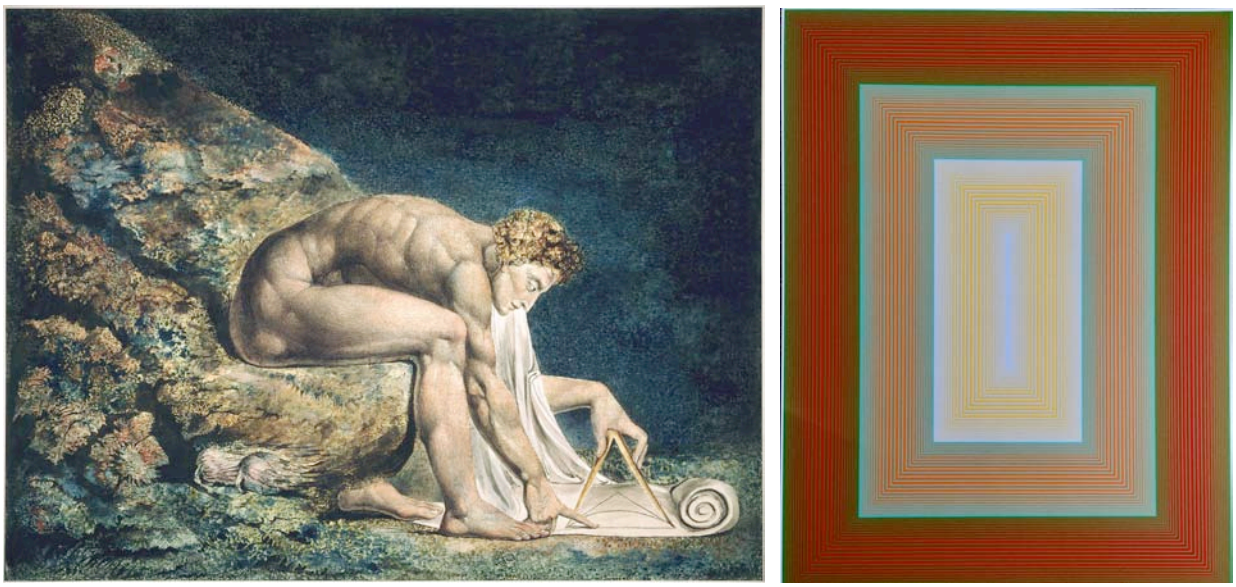


Figure 6*: (a) W. Blake, "Newton", 1805 color print based on 1795 monotype; (b) R. Anuszkiewicz, serigraph from the "Inward Eye" portfolio.*

Borges Infinities

"The Universe (which others call the Library) is composed of an indefinite, perhaps infinite number of hexagonal galleries." So begins Jorge Luis Borges' evocative short story *The Library of Babel* that incorporates an imaginary library containing all possible variations on a book of a particular type. This short story, originally published in Spanish in his 1941 collection *The Garden of the Forking Paths,* has inspired a number of artists to convey Borges works visually. French master engraver Erik Desmazieres (surely the living incarnation of Piranesi) has reinterpreted the story visually (Fig. 7a) by creating a suite of eleven large engravings for a wonderful portfolio. These images, along with the text of the story have been reprinted in a small version [6] in 2000. American photographer Sean Kernan is both a master photographer and an author of books about and including his and others' photographic images. His book *The Secret Books* [7] presents imaginative visual explorations (Fig. 7b) of Borges' writings about the infinite, in particular about *The Library of Babel*.

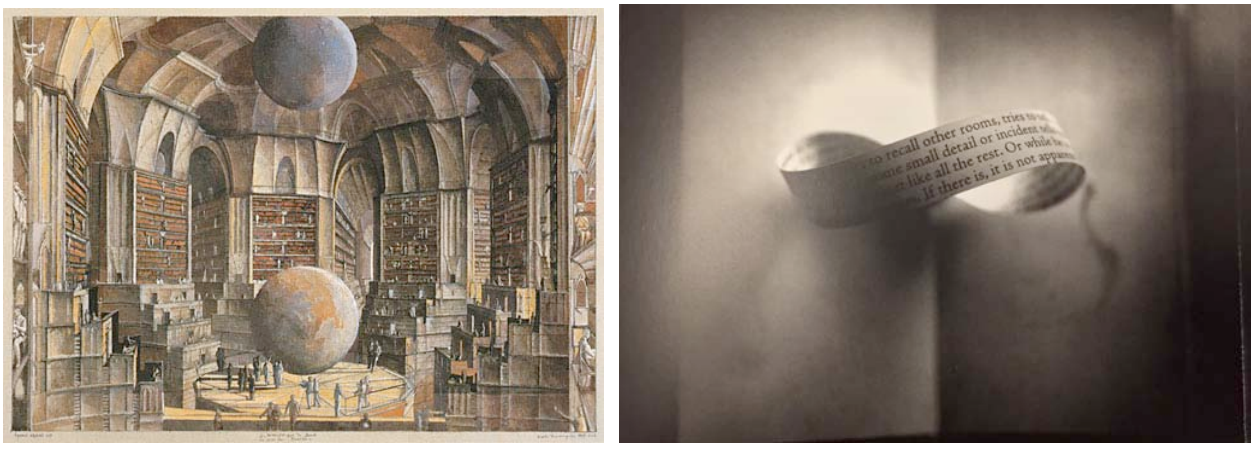


Figure 7*: (a) E. Desmazieres, colored engraving, 2000; (b) S. Kernan, photograph, 1999.*

Mathematicians' Eternal Flame

Figure 8: *"Mathematicians' Eternal Flame", K. Brecher and R. Rhine, wood sculpture, 2015.*

The sculptural object above intertwines a Mobius band around a tetrahedron, with a Penrose Triangle in its base. Randy Rhine and I leave to others their own interpretations of our sculpture for all eternity.

Acknowledgments

I thank Richard X. Zawitz for sharing his views about the artistic, scientific and philosophical nature of infinity; Charles O. Perry for some reflections on his sculptures; and Jorge Luis Borges for personally sharing with me some of his thoughts about time and the future. And many thanks to Randy Rhine, my collaborator on several artistic/mathematical projects, including the "Mathematicians' Eternal Flame".

References

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