

# Symmetry: Breaking Through the Looking Glass

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## Abstract

For thousands of years artists have been inspired by symmetry in the natural world. Their work, directly or indirectly, led to the science of symmetry: the symbols and codes enabling the analysis and expansion of this phenomenon as a visual language. Presently, symmetry is a vibrant topic led by research in Mathematics, Biology and Physics. But what has happened to this theme in the arts? Since M.C. Escher's works last century, there doesn't appear to be much interest in symmetry.

Symmetry is broken today, but in a good way. As in Lewis Carol's masterpiece, when Alice falls through the looking glass she find an enchanting and mysterious world, far more curious and engrossing then her winter ensconced Victorian drawing room. The same pageantry is exemplified in the various fields of art: although a powerful starting point, *breaking* symmetry yields greater complexity in subsequent manifestations. When integrated with other techniques and concepts, the resulting artworks are sophisticated, intricate and at times awe-inspiring.

## Introduction

The mathematical proofs for the 17 plane symmetry groups (or wallpaper groups) were first established in the late 19<sup>th</sup> century. [1] But the practical, intuitive use of these systems was developed by the artisanal vernacular of the ancient world: Egyptian, Greek, Roman and numerous others. [2] Most celebrated for the extensive and creative evolution of these wallpaper groups were the traditional Islamic Artists spanning the 12<sup>th</sup> to 16<sup>th</sup> centuries. Their tiled architecture not only utilize all 17 groups, they exhibit a profound mastery of the subject – choreographed compositions in form, pattern, colour and cultural context. [1]

The visual splendour of these works can still be witnessed today at many popular sites such as in Granada, Spain. The Alhambra was transformative in guiding M.C. Escher towards a career featuring his famous tessellation artworks. Symmetry in the Western contemporary fine art world does not pay much homage to these ancient artisans or the popular graphic work of Escher, who is largely viewed in this field as kitschy. [3]

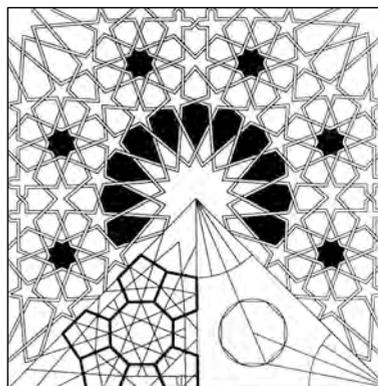


Fig 1. An Islamic Art construction of wallpaper group p6m  
©World Scientific Publishing Co. Pte. Ltd. [1]

## Computer World

The conditional rubrics used by the minimalists and conceptual artists of the 60's found a receptive serendipity with the development of the computer. This lineage has followed through to this day. UCLA's Programming Media II course examines programmes written by artists and musicians going back to John Cage in 1958. [4] At Victoria University of Wellington, design students are introduced to the works of Sol Le Witt, Vera Molnar and Edward Zajec in their 1<sup>st</sup> year. [5] Examples of such conditionally driven artworks are important for understanding how the computer can be used as a powerful tool for working with all modes of rule-based visuals, including symmetry: the artists who adorned the Alhambra had the compass and straight edge, today we have the personal computer. Zajec, in particular, not only crafts new masterworks meditating on symmetry, he also brings the topic into time-based media (see Fig. 2).



Fig 2. *Composition in Red and Green*, 1989, Edward Zajec, Digital Video.

### Worldbuilding

Early theoretical works on the nature of artificial life also reinforce symmetry's creative fecundity. Dating back to Conway's Game of Life (CGL), the computer is established as the tour de force for simulation, beckoning analogy to other cyberspaces while creating new terminology like cyberspace and virtual reality. Created in 1970, CGL features very simple rules along with initial random pixel assignment. After a few generations, astonishing patterns (virtual organisms), typically exhibiting at least some initial symmetry, take hold and thrive in this black and white world. [6]



Fig 3. *Conways Game of Life*, Image from Javi Agenjo <http://www.tamats.com/blog/?p=409>.

Symmetry acts as scaffolding, pre-eminent in the cauldron of life, yet at the same time, a stifling homogeneity, threatening to bind this wellspring within a crystalline prison. It is at the higher levels of organization where we see chirality (the "left-handed" corkscrew shape of all living DNA) [7] and approximate symmetry take shape (animals, after all, are not precisely bisymmetrical). Such staged evolution is neatly delineated in Valentino Braitenberg's treatise on synthetic psychology, *Vehicles*. [8] The book is based around thought-experiments where simple robots are fitted with a means to sense and move around a hypothetical environment.

The first conceptual vehicle proposed by Braitenberg is composed of one sensor and one motor, only able to change course within its world through external forces and frictions, but perhaps exhibiting life-like qualities by speeding up or slowing down based on the hot/cold fluctuations in the terrain. Vehicle 2 presents two sensors and two motors and multiple wiring strategies (see Fig. 4). Already we have an impressive set of behaviours on display, but by the time the book advances to vehicle 14, we have witnessed a dizzying, yet convincingly logical, array of neurological upgrades where the original simple symmetrical forms are buried deep within the hypothetical organism.

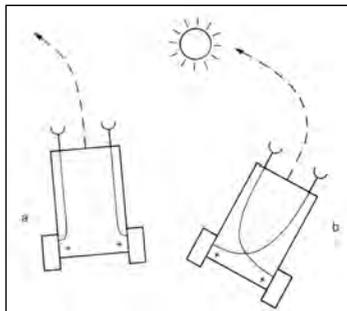


Fig 4. Vehicle 2a (coward) and 2b (aggressor). [8]

Graphic designers and computer artists often start with basic structures (or initial rules) supplied through software. Creative software programs feature customizable rulers and grids (grids happen to be a wallpaper group known as P1). [9] As useful as a grid may be for a starting point, in most cases artists understand there is something problematic if the work is not able to develop a visual logic that manoeuvres from this starting point. This is one of the most essential lessons in a basic design course. [10] So even though M.C. Escher's work was inventive and meticulous, its reliance on inherent structure is perhaps what has kept his work from connecting with a more erudite audience of museum collections and fine art research. While Islamic Art is even more reductive in terms of content than Escher's, the relationship to architecture, balance with materials and accessory ornaments, and most importantly, religious and cultural contexts, immediately places these works in a more refined and solemn place of reverence. One doesn't look at the Alhambra and start to decode its tricks or clever devices – it is one and part of a greater visual and conceptual totality.

### Conceptual Symmetry

Symmetry is relied upon in a wide range of sensory modes. In the creative arts, it has been noted as a useful

strategy in music, dance and film. While M.C. Escher turned down an offer to work with Stanley Kubrick, the latter obviously possessed his own fascination with symmetry. [11] *The Shining* and 2001 are prime examples of how measured shots of radial and bisymmetrical views communicate unusual moods – a sedate meditation as a spurious backdrop for a more unsettling and discordant *Weltanschauung* (see Fig. 4). Yet again, another student of symmetry, Wes Anderson, employs similarly framed shots achieving a completely different psychology of anodyne frivolous romps driving his films.



Fig 4. *The Shining*, 1980, Stanley Kubrick, ©Warner Bros..

In the fine art world, we see symmetry deployed across a far more convoluted pathway of translations. Most notable would be a conceptual use of symmetry – playing with juxtaposed roles and social tropes in order to illuminate multivariate perspectives. For instance, one could consider Stelarc's self-bioengineering experiments as a rebel cry for transhumanism, striking out against biology's most ancient and ubiquitous heredity: bisymmetry. Ears assume a position high atop the bisymmetrical frame of humans – Stelarc's third ear transgresses nature, planting a flag in his own asymmetrical agenda.



Fig 5. Stelarc, *Ear on Arm*. 2008. Photo by Nina Sellars.

Before computer screens, sheets of paper contained regular segmentation for organizing and unifying thoughts, love letters and government edicts. In SWAMP's 2010 work *Notepad*, perhaps one of the most radical leaps from the starting point of pre-structured media is taken. At first glance, no leap is taken at all, as the content is not visible with the naked eye: all the

audience sees are blank sheets of legal pad paper – thin cobalt-blue lines breaking up the rectangle field of canary yellow. But as the artwork explains: *in* the medium is the message. Magnifying the blue lines reveals that they are actually microtext of the names of Iraqi civilians who were killed during the US led war in Iraq. The paper further served as a prop for a performance artwork and political protest as they were surreptitiously smuggled into Capital Hill stationery. [12] SWAMP's work often interrogates dichotomies of various forms. The group's projects *Tardigotchi* and *Spore balance* compositions poised between biological organisms and artificial life, a special sort of nature/culture reflection with a nod to Mary Shelley and golems of Jewish folklore.

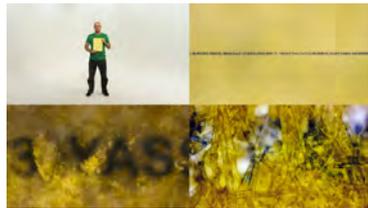


Fig 6. SWAMP, *Notepad*, 2008, Photo by SWAMP. [12]

### The Age of Creative Coding

Symmetry is not only expanded by conceptual exercises: the personal computer and the age of creative coding is reconnecting perhaps where the artists of the Alhambra left off. Joshua Davis has been known since the early days of Macromedia Flash, not only for carving out a new domain of code-driven graphic design, but also for freely sharing this code. In collaboration with James Cruz, his recent *Hype* project provides ample scripting tools for experimenting with colour, form and text. [13] Some of his recent creations with this framework have rendered amazingly vibrant graphics (sometimes with a finishing touch by hand – see Fig. 7).



Fig 7. Davis, Joshua, 2012, Photo by Pere Virgili.

A more popular predecessor to Hype is the educational programming language Processing. Casey Reas and Benjamin Fry evolved Processing out of John Maeda's group at MIT's Media Lab; their innovation quickly became a mainstay in curricula seeking to introduce computer programming to art and design students. [14] While the fact that Processing and Hype are freely available establishes a platform for creative coding, it is equally important to have code examples that illustrate design iterations. Many leaders in the creative coding community (including Davis and Reas) have shared such work frequently. A Whitney Museum commission by Reas titled {Software} Structures illuminates the boundless possibilities with circles. Starting with two overlapping circles to construct a perpendicular bisector, the artist develops his compositions with a series of savvy progressions (see Fig. 8) – sharing each step of code along the way. [15]



Fig 8. Reas, Casey, *Structure 3*. 2004. [15]

Originally built with Processing, CatsEye is a software project developed at Victoria University of Wellington that focuses on sketching patterns using imported images. [16] The p6m tessellation method heavily employed in the Islamic arts (see Fig.1) is one of the central mechanisms used in this software (see Fig. 9).



Fig 9. *CatsEye*, Image from Douglas Easterly and Ben Jack <http://catseye.graphics>. [16]

CatsEye uses p6m in a different way than ancient precursors: instead of underscoring the beauty of geometry, the manipulated tile is used to crop a scanned drawing, leveraging a simple, yet powerful, feature of modern computer graphics. This tool, along with transitioning the output through various forms of digital

and analogue media, supports Easterly's attempt with recent paintings to utilize, but ultimate break, symmetry (see Fig. 10).



Fig 10. *Léger Comme Un Esprit*, 2014, Image from Douglas Easterly <http://www.douglasteasterly.com>.

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