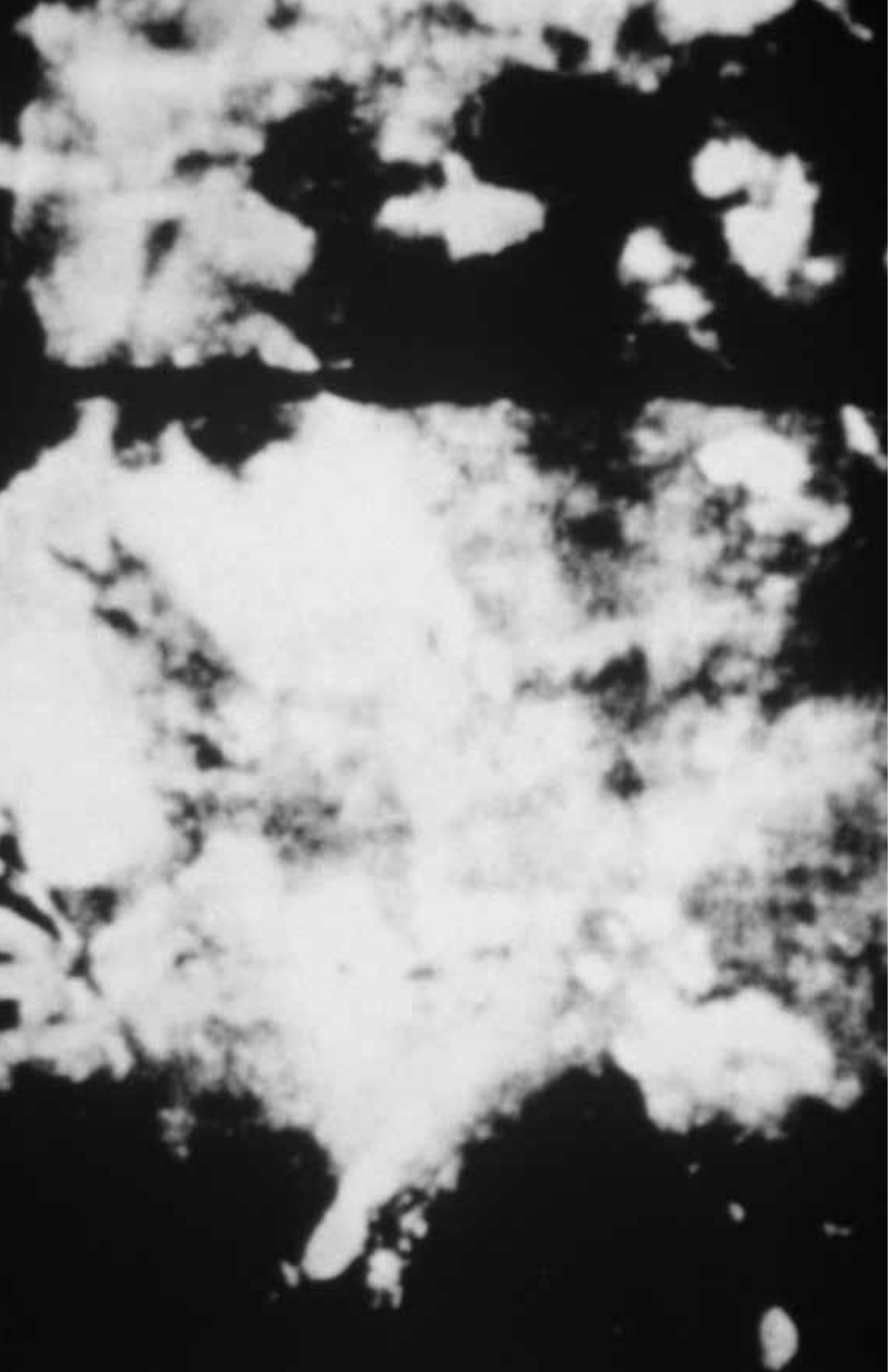

Permutations and Other Schema: A Few Notes on the Films of Stephen Broomer

By Clint Enns

Introduction

One of the concerns of this essay is to make some relatively basic mathematical knowledge about permutational structures and algorithmic editing accessible to a general audience, without compromising mathematical integrity. Moreover, I will attempt to explain how these structures and processes can be applied to filmmaking by exploring various applications and examples. In particular, it is possible to find some of these structures and procedures within some of the films of Stephen Broomer. Although it may be fruitful to analyze these structures and processes within Broomer's films, it is worth observing that within his work there are many other strategies at play including historical/spiritual/psychogeographical investigations, chance operations and a variety of aesthetic pursuits specific to individual films. Finally, I do not intend to further comment on why the decision to make use of these structures and processes is radical, since R. Bruce Elder's article "A Radical Sense of Form: Against organic unity, or Notes for discussion of Broomer's films," included in this volume, provides a persuasive theoretical explanation that argues against the organic unity of these forms, and demonstrates the historical importance of these constructions.

Permutational Structures

In mathematics, there are several ways to define a *permutation*. The most general way to define a permutation is as follows:

> A permutation of an arbitrary set X, is a *bijection* from X to itself.[2]

With this in mind, it is possible to define a permutation in a way that is more relevant to cinema, namely, as follows:

> A permutation is a linear ordering of all the elements in a set.

In other words, it is possible to think of a permutation as a list of all of the elements in the set with each element listed exactly once. For example, the permutations of the set {1, 2, 3} are 123, 132, 213, 231, 312, 321. In general, the number of permutations of the set X can be shown to be |X|!, where |X| is the size of the set. For instance, the number of permutations on the set {1, 2, 3, 4, 5, 6} is 6! = 6*5*4*3*2*1 = 720. In order to prove this simple result, it is easy to see that there are initially |X| choices for the first position, |X|-1 choices for the second position, until there is only one position for the last element of the set.

Even with this elementary mathematical knowledge, it is possible to see the role permutations can play in filmmaking given that films are, in essence, a linear ordering of shots. For instance, consider James Benning's *13 Lakes* (2004), a film consisting of 13 shots of the lakes with each shot lasting ten minutes. From these 13 shots, Benning would be able to construct 13! films, that is, approximately six billion different films simply by changing the shot order. In fact, given that 100ft of 16mm is 4000 frames, it would be possible to make 4000! = 4000*3999*3998*...*2*1[3] films simply by rearranging the frames. Taking this idea to its logical conclusion, Stan Douglas used a variation of this permutational structure to create *Journey into Fear* (2001), an installation that exhausts each of 625 possible combinations of sound and images, creating a work that lasts six and a half days. Douglas explains:

Journey into Fear is a film installation in which a picture tracks loops while its dialogue tracks are constantly changing. The timeline is broken in four positions (1-4) to permit branching. At these junctures, a computer randomly chooses which one of the five dialogue variations (A-E) will be performed. Each time the picture track repeats, a different combination of dialogue segments is heard until all permutations have been presented. [4]

Given the exhaustive nature of this approach (and this discussion), it seems worthwhile to explore alternative, and more subtle, uses of this permutational structure.

Anagrams, a permutational structure that involves re-ordering letters of a phrase to produce a new phrase by using all the original letters exactly once, is one way of rejecting the number of results produced by generating all permutations of a set. Given that language is fairly limiting,[5] by only considering permutations that form phrases, the number of permutations that can be used is greatly reduced. Broomer's film *Hang Twelve* (2014) is an anagram of the word wavelength, making reference to the seminal 1967 Michael Snow film of the same name. In addition, *Hang Twelve* contains a poem, read by the filmmaker:

Nice Eyes Revolt

Encores live yet
Slice every note, each notice sincere in secret
Lovers covet eyeliner to recite in vein or vesicle
Clever noise, silence or else

Again, this poem seems to consist of anagrams. Below is a further anagram of the poem. (I encourage readers to create their own.)

Serene Velocity

Serene Velocity
Serene Velocity – Insert a conscience cite here
Vision lover in revolt
I revere eyes eclectic tone
Sincere love, I enclose reels

The title *Nice Eyes Revolt* is an anagram of the phrase serene velocity, referencing the seminal 1970 Ernie Gehr film of the same name. More than being a simple homage though, these anagrams provide the key to decoding the structure of this work, namely, they allude to the underlying algorithms that Broomer used to construct his film.

Algorithmic Structures

Algorithmic art is art produced by following a finite list of well-defined instructions or by following a procedure/schema. Usually computers are associated with the production of algorithmic art; however, computers are not an essential part of the process. As previously alluded to, *Hang Twelve* (2014) would be considered a work of algorithmic art and the anagrams introduced provide the audience with a way of unravelling the underlying algorithm used to generate the work. Both *Wavelength* and *Serene Velocity* are works that experiment with cinematic space through structuring their work around the focal length of a zoom lens. Similarly, *Hang Twelve* is a work that is structured around focal length, however, Broomer expands on this previously explored theme by connecting it to the RYB colour wheel, a circle consisting of twelve equidistant colour sections arranged as follows: red; orange-red; orange; yellow-orange; yellow; yellow-green; green; blue-green; blue; blue-violet; violet; red-violet. At first glance these two concepts may seem disconnected, however, light (and more specifically, the refraction of light through a lens) and colour are both products of the same physical phenomenon; namely, electromagnetic radiation.

Hang Twelve is divided into twelve parts not including the prologue and epilogue. For the twelve sections, the focal length of the zoom lens was divided into twelve equal intervals. The first section begins with the focal length set at 12mm, for the second section the focal length is set at 24mm, continuing until the focal length for the twelfth final section is 144mm. In other words, the film is structured around the zoom. In the final section of the film, Broomer reads the poem *Nice Eyes Revolt* on screen before committing one final random act, the throwing of a pitcher of water at the camera, with the tossed water blocked by a window. In addition, each section is framed by one of the primary colours, continuously cycling through red, blue and yellow in that order. Between each section is a six-second cycle of twelve static frames representing the colour wheel – that is, the solid colours begin with red and end with red-violet. Finally, the prologue consists of twelve seconds of solid red and the film ends with twelve seconds of solid red-violet. One of the more interesting aspects of the film occurs in the epilogue, where the entire space is revealed in negative and the colour wheel is also shown one final time, also in negative. Through inverting the colours, Broomer estranges the space and seems to allude to the limitations of this predetermined system and of the RYB colour system itself – that is, Broomer may be alluding to colours that exist outside of those generated by the RYB colour wheel.[6] Taking this idea to its logical conclusion, the film may be hinting at ideas beyond visual representation.

Despite this rigorous structure, many of the sections of *Hang Twelve* create tension between predesigned plans and improvisations. In each of the sections, a spontaneous action occurs within the constructed frame. The events improvised by the performers – the filmmaker and his friends Blake Williams, Cameron Moneo, Emmalyne Laurin, and Eva Kolcze – include looking at themselves in the camera, playing with a mirror, sweeping, etc. In fact, the tension between these oppositional modes of production – rigid schemata and chance operations – can be found in many of Broomer's other films.

In *Christ Church - Saint James*, *Brébeuf* and *Conservatory*, Broomer uses a geometric schema to edit his film, once again playing with the tension between systematic and chance operations. By observing the geometric motifs in the works' essentially lyrical nature, it is possible to see fundamental tensions between an internal organic unity and an artistic unity based on external geometric configurations, as further discussed in Elder's "A Radical Sense of Form." For instance, consider the circular motif in *Brébeuf,* the hexadecagon motif in *Conservatory*, and the rectangular and semi-circle motif in *Christ Church – Saint James.*

Finally, consider *Championship*, one of Broomer's most challenging works. Kate Russell explains the origins of the film:

Stephen Broomer's *Championship* was born from a chance purchase and also deliberately uses chance methods. It was created from 8mm film reels that Broomer purchased unseen at auction. It transpired that the material was a series of amateur wrestling matches fought between high school boys in various gymnasiums. This fortuitous acquisition tendered the raw material from which Championship was created. Broomer speculates that the footage had remained unclaimed in a lab, making him its first viewer. Found by chance, reclaimed and repurposed, it has been transformed through chance procedures such as superimposition into a poetic and comic meditation on the human body.[7]

The film uses chance operations within a precise structure influenced by Owen Land's 1974 film *A Film of Their 1973 Spring Tour Commissioned by Christian World Liberation Front of Berkeley, California*, namely, three-frame alternations.[8] Similar to the use of lexical units in the *Canto* as described in detail by Elder in "A Radical Sense of Form," the use of rapid three-frame units, chance operations and superimpositions wrestles the found footage free from its previously linear structure. Elder further observes,

Artists' use of such variational processes motivated Hugh Kenner to propose in "Art in a Closed Field" that poets and novelists of the modern era redefine the boundaries of their respective practices by selecting specific elements from the medium with which they work (or, alternatively, from their environment) and ordering them according to laws or rules of their own devising. [...] For Kenner, the modernist aesthetic is based on the linguistic paradigm of a combinatorial process within a closed field, where what is important is the generation of novel syntactic relations.[9]

From this observation, it is possible to read *Championship* as a cinematic realization of the modernist aesthetic through the generation of novel *visual* relations, redefining cinematic boundaries by selecting the three-frame unit and ordering them according to a schema which incorporates chance operations. In fact, this seems to highlight one of the central strategies in Broomer's systematic work, namely, the creation of tension through problematizing a formal system's expected predictability by systematic incorporation of chance operations.

1. Special thanks to Cameron Moneo and Scott Birdwise for their editorial advice, R. Bruce Elder for his inspiring article and, of course, Stephen Broomer for his films.
2. A bijection, in mathematics, is a function that is *one-to-one* and *onto*. That is, a function is *one-to-one* if every element of the codomain is mapped to by at most one element of the domain and a function is *onto* if every element of the codomain is mapped to by at least one element of the domain. In other words, a function is a bijection if every element of the codomain is mapped to by exactly one element of the domain.
3. Needless to say this number is astronomically large.
4. Stan Douglas, *Journey into Fear*, (London: Serpentine Gallery, 2002), 26.
5. For instance, most of the books in the Library of Babel would be meaningless.
6. There are certain colours which cannot be expressed within a particular color model, often referred to as colours out of gamut. One of the standard examples is pure read which can be expressed in the RGB color space and cannot be expressed in the CMYK color space.
7. Kate Russell, "Championship [filmmaker Stephen Broomer]," HA&L, Hamilton Arts & Letters, Issue 6.2 (Fall/Winter 2013/2014): 2.
8. As discussed in personal correspondences with Stephen Broomer.
9. R. Bruce Elder, "A Radical Sense of Form: Against organic unity, or Notes for discussion of Broomer's films"