NUMBER SYSTEM: VARIATIONS IN WEAVING

A thesis submitted to the College of the Arts of Kent State University in partial fulfillment of the requirements for the degree of Master of Fine Arts

by

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Before beginning my studies in the MFA program at Kent State University, I had already been a weaver for many years. Keenly aware of the relationship mathematics plays in all aspects of weaving, the work I have produced for my thesis comes from this understanding. I wanted to tie a specific mathematical theory directly into the design and construction of my work.
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I would firstly like to thank my Advisor Janice Lessman-Moss who has been an amazing source of strength and inspiration, and whose guidance has assisted me in my pursuit as an artist. Also thank you to her husband Al Moss. I would like to thank my partner Peter Giles who has encouraged me and provided love and support. And lastly a thank you to all my girlfriends at Kent State University, especially Casara Login for all their support and input during the creation of my MFA show.
NUMBERS SYSTEM: VARIATIONS IN WEAVING

Background

Before beginning my studies in the MFA program at Kent State University, I had already been a weaver for many years. Keenly aware of the relationship mathematics plays in all aspects of weaving, the work I have produced for my thesis comes from this understanding. I wanted to tie a specific mathematical theory directly into the design and construction of my work.

When exploring the Fibonacci sequence on previous occasions, I enjoyed the visual rhythm that evolved from the progression of numbers. Each Fibonacci number is the sum of the previous two numbers, beginning with 1. During my time at Kent, nature provided solace and support, which evolved into an intense connection. In closely observing nature and its seemingly random patterns, I now recognised it in relationship to Fibonacci numbers. Knowing that the sequence represented the universal principle of growth and creation, I felt it had a strong symbolic meaning for my own journey experienced in Kent and the USA.

The Fibonacci numbers are often found in nature in growth patterns of plants. Plants tend to grow in spirals as they reach for moisture, sunlight, and air, which are available somewhat cyclically. The tip of the branch moves spirally, in a circular motion
as it reaches for elements and gets longer. Thus, growth spirals are characterized by both circular motion and elongation.

As a branch grows, it generates leaves at regular intervals, after 2/5 or 3/5 of a circle of growth, or after 3/8, 8/13, 5/13, or other similar fractional parts of a circle growth. These Phyllotactic ratios are also Fibonacci ratios, their numerator and denominator are Fibonacci numbers. In addition to long stem plants, the Fibonacci ratios are observed in species of cactus, the palm and its spiral stubs around the trunk, and the bracts of pinecone. Besides nature the sequence provides endless fascination and intrigue and many mathematical relationships are found. Interestingly a pattern occurs when applying numeric reduction to the Fibonacci series which produces an infinite series of 24 repeating digits.

The Weavings

The Fibonacci progression is at the heart of my thesis work, providing the foundation for the development of the woven grounds. The size of the work relates to what is known in art and architecture as ‘perfect proportion’ or golden proportion conjointly affiliated with the Fibonacci numbers. The Swiss architect Le Corbusier had great faith in the mathematical order, perceiving the universe as closely bound to the golden ratio and the Fibonacci series, which he described as 'rhythms apparent to the eye and clear in their relations with one another.' In wanting to uphold these connections, the physical scale of each of my weavings was determined in relation to the body, and the width of the tool used to create the work (the loom). The maximum weaving width on the available loom was determined to be ambitious, yet still enabled a direct physical
connection with the process of weaving. Forty-two inches allowed for the complete expansion of my arms during the act of inserting wefts. The ratio 1.61803, which is derived from the perfect proportion, was then applied to this number to determine the appropriate length. This sets the basic parameters of each piece at 42 inches by 61 inches.

The systematic progression in the ground cloth is established by the bands of contrasting weft materials inserted in sections of varied widths derived from the Fibonacci numbers. The materials used create a rhythmical texture and movement in an achromatic palette across the field. To facilitate the insertion of the wefts in strips or bands, and engage the number system in the most direct way, the pieces were woven as vertical rectangles. For viewing rather, the weavings are installed as horizontal rectangles in a landscape format to enhance the spatial pictorial quality. The textural bands, composed of an accumulation of newspaper, alternate with the flat areas of cotton thread. The width of each band was determined by a unique Fibonacci progression. In the first weaving, ‘Part Disarray’ the identity of the newspaper is obscured through a wash of white paint applied to the paper in preparation for weaving. As a result, the material has an interesting atmospheric surface composed of subtle shifts of grey. The sections of cotton are smooth and uniformly white. In some of the weavings, different values of grey are used as a paint wash on the newspaper. This provides an additional element for change, and in ‘Bifold Observation’, and ‘Stage Nexus’, varied tonal shifts in the textural bands are developed to depict other progressions. Consequently these pieces have two systems working together - the Fibonacci progression and the value variations, creating greater compositional movement and distinction.
The decision to use recycled newspaper was a key aspect to the work and its transformation became meditative in process. After each page of paper was covered with a wash of paint, the pages were carefully stacked and shredded into approximately one inch strips with a jagged edged ruler. Then each strip was rolled, folded and rolled again – providing a stiff, fragile, textured linear element. This meticulous alteration of the form provides a unique material which is further transformed through its integration into the weaving. The newspaper was significant not only for its distinctive quality; it was also an environmental, ethical choice. As a ubiquitous, abundant material, commonly discarded in contemporary culture, it assumes a new value in this context.

Painting with various washes on the newspaper is a process akin to a palimpsest, which refers to something reused or altered but still bearing visible traces of its earlier form (Webster’s Dictionary). In painting the newspaper, the text is partially obscured or obliterated yet it retains something of its former character through the variations in value and colour which emerge subtly through the paint. By combining this visually and texturally rich material with sections of flat white yarn in the weaving, according to the Fibonacci system, an interesting ground cloth emerged. The beauty and order of this field presented potential for elaboration to create greater depth and individuality. And the materials used in the weaving while restrained in the structure seemed perfect to be alternatively configured for embellishment. Using small sections or units of transformed newspaper and salvaged thread scavenged from the loom after weaving provided flexibility for improvisation.
Veiling and partially revealing the ground cloth through the addition of smaller surface elements complements the original structural order. This creative act responds to the logical process of the weaving, building on the rigid grid imposed by the warp and the weft. This “second layer” expands the physicality of the plane with a new spatial environment that is more dynamic, playful, and/or fluid than the woven ground. Derived in response to the ground weaving it becomes its own uniquely irregular system. In ‘Catharsis’ the second layer contains repetitive linear threads which drape from the top edge of the ground over the entire field and beyond to the floor, echoing the strips of the weft. In other pieces pins are arranged intuitively as support for the threads or paper units to form additional structures or patterns. In ‘Part Disarray’ the thread extends beyond the boundary of the piece allowing interaction of light and shadow, which mimics the chaos of the physical elements and creates another dimension. The second layer creates complexity and adds visual and conceptual depth.

While the ground cloths are solid stable objects the second layers or surface embellishments are movable, fragile and/or temporary. This echoes the dualities of permanence vs impermanence, fragile vs strong, chaos and order perceived in the natural world. In this context, Sheila Hicks, an internationally recognized artist, explains, “weavers are … always either creating order out of chaos or breaking out of order.” Highly experimental artist Eva Hesse claims: “chaos can be structured as non-chaos. That we know from Jackson Pollock”. In identifying the pieces as installations, to be arranged on site, these pieces possess the quality of being complete in each environment, but must be recreated with each repeat of the display process.
Although the Fibonacci system was the primary focus at the start of the thesis, as the work evolved it provided the impetus to push and expand the work further by taking unanticipated risks. The initial weavings revealed themselves as the perfect foundation for impulsive, playful, response, allowing both aspects of the creative self to be embraced. The many visual and conceptual relationships that became apparent provides fertile territory for future development upon returning to Australia to continue my practice.
Figure 1

Part Disarray,
Recycle newspaper, gesso, cotton
and nylon thread, pins, 61”x42”, 2010
Figure 2

Catharsis,
Recycle newspaper, gesso, acrylic paint, cotton and nylon thread, 61”x 42”, 2010
Figure 3

Bi-fold observation,
Recycle newspaper, gesso, acrylic paint,
cotton and nylon thread, pins 2010
Figure 4

Stage Nexus
Recycle newspaper, gesso, acrylic paint, cotton and nylon thread, pins 2010
Figure 5

Bound Rapport,
Recycle newspaper, gesso, acrylic paint, cotton and nylon thread, pins 2010
Figure 6

Overview MFA Exhibition, Sculpture Gallery, 2010
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