Textiles, Math, and Computers

by Jhane Barnes

September 9, 2010

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This article explores how I design, with emphasis on how I work with a mathematician and a software developer to create design tools. I also talk about how I explore the relationships among design, mathematics, and science.

How I Design

For most people, designing leads to a product, that is, an object that has been designed. But for the designer herself, there is the equally important matter of the process of designing. As a professional designer, I spend most of my time within that process, so it's important to me.

For many designers, the design process is tied to drawing. That is, the designer uses pens, chalk, or paints to draw out a design on paper. Today these elements likely take an electronic form, but the principle of manual drawing is still there: it's the designer's fine motor skills and artist's eye which create the design.

In contrast, for me the design process is more built around tools than around drawing. I have always liked using machines as design tools. For example, I enjoy designing woven fabrics, because I get to work in a logical way to set up a loom so that it weaves a design that I intend. Thus, I don't literally draw the design of the fabric; rather, I create the circumstances under which the design appears. This is an indirect way of designing, in which I have control over the design but do not literally use fine motor skills to draw it.

To use a modern idiom, the way I design is more closely related to computer algorithms than to traditional artistic drawing. This is literally true, by the way, as will become clear below. So, I had best explain right away about algorithms!

An algorithm is a collection of rules that define a process that leads to a predictable result. The important words here are rules, process, and result. Algorithms are the basis of computer software, in the sense that software is simply an algorithm stated in a computer language.

Of course, I began my career before there were personal computers. Back then, I would often create woven textiles by creating rules for how yarns were threaded into a loom, and then systematically exploring variations on those rules. I didn't think of

myself as following an algorithm, but conceptually, that's what I was doing.

Imagine how I felt when I got my first computer (an Atari)! I was ecstatic. What a powerful tool! I love finding new software and experimenting with its design possibilities. For example, many mathematicians write software as a visualization tool, that is, to help them "see" mathematical ideas. I like to use such software for its creative possibilities.

It is perhaps not surprising that eventually I met a mathematician who used mathematics to create weaves, and perhaps it was inevitable that we would become collaborators.

How I Met Bill and Dana

I met Bill (William Jones) in 1992 by good fortune, when we happened to be at the same trade show. Bill was selling a computer program called WeaveMaker. I was captivated by it. It created weave-able patterns, all by itself! Upon my return to New York, I sent some WeaveMaker designs off to mills for sampling. Several months later Bill visited my studio and got to see actual fabrics designed by his software. He was as amazed and delighted by this experience as I had been when I first saw his software. Thus began a collaboration which continues today.

Bill is a mathematician who enjoys surface patterns. He has devoted much of his time to writing software that turns mathematical concepts into visual form. In the year before I met him, Bill had turned his attention to weaving. Unlike printed surface patterns, woven patterns have to obey the constraints of the machinery upon which the fabric is woven. Bill had been learning those rules and adapting his ideas accordingly.

Meanwhile, as Bill and I were encountering each other, Dana Cartwright, a physicist and software developer, joined up with Bill to help along Bill's newly founded company, Designer Software. Dana brought Macintosh software skills, plus a love of science and technology (his undergraduate degree is in Physics), into the company.

Dana's role in our collaboration has been to write software tools that allow me to more easily work with Bill's intensely mathematical ways of doing things. He often acts as a translator as well!

How We Work Together

Learning to work with a mathematician and a software developer was a challenge! Designers and technical people are poles apart, intellectually. We have quite different ways of looking at the world. In addition, the world of textiles has an extensive and arcane jargon that is far from standardized around the world.

Fundamentally, designers care about form, about how things look, while mathematicians and software developers are all about function. Sure, that's not completely true, but it gets at a fundamental truth about the differences that we had to overcome. And all of us have enjoyed the challenge of learning how to work together. In other words, while the reason we work together is to create designs, on a personal level we've derived enjoyment, and more than a few laughs, from learning to speak each other's language.

It took us all a number of years to find common ground. Bill and Dana had to learn about textiles, and I had to learn about mathematics and the ins and outs of software.

What it all comes down to this is: I have taught Bill and Dana about esthetics, in particular, my personal take on good design. This involves shapes, textures, and layering, which are some of the elements that make up a design. Moreover, there are things which should not be in a design, such as elements that create visual streaks or clumps. And, since my designs are all wearable, there are many practical considerations, such as how the design will be manufactured and priced.

Bill and Dana, in turn, have taught me about mathematics and software. Just as I have not tried to turn them into designers, so have they not attempted to turn me into a mathematician nor a software developer.

Our collaboration, then, works like this. I come up with ideas or inspirations which I pass along to Bill and/or Dana. They then work their magic, creating either a computer tool or a mathematical formula that allows me to rapidly explore variations on my idea. The word "rapid" is important here. By having software tools and mathematical formulas available with just a mouse click, I can rapidly explore hundreds of designs, all of which are different, and yet fall within the overall design concept I initially articulated. And from these hundreds of designs, I pick the very best ones to go into production.

In a way, this is like having dozens and dozens of designers working for me, creating designs among which I pick and choose. But instead, a team of three people work together to create computer software and tools that help create designs according to my ideas of good designs. This combination of talents yields wonderful designs quickly. It's fun, for us, and it helps give my customers an endless stream of fresh looks while preserving that unique "Jhane" look.

Geek Fashion

by Heidi Bender

My name is Heidi, and I am one of Jhane's assistant designers. I am a rare breed of fashionista-computer nerd.

As a toddler, I would climb out of my crib at night and scribble all over my walls with my orange crayons. Always orange. I don't know why my mother didn't just throw away the orange crayons. I was always creative, and I excelled in art class, as well as many other right-brained activities. However, I discovered that I was really good at left-brained activities as well, like math.

My mom is left handed. She loves to cook, and has a flair for decorating her home — she is typically right-brained. My dad is extremely left-brained, he's a numbers guy. He loves money.com and Business Week, and in fact, I can't remember ever seeing him read a fiction book. In high school, I enjoyed both art and math. I was encouraged by my parents to pursue both activities, but always felt I was supposed to pick one or the other.

Although I took A.P. Calculus my senior year and tested out of all my college math requirements, art did eventually win. I went to Philadelphia to study painting at Tyler School of Art. When I got to art school, I met the most amazing group of creative, inspiring, and artistic (right-brained) people. But the left-brained thinkers were few and far between.

I still felt really unresolved because only half of my brain was being challenged. Years after I graduated, still trying to figure out what I wanted to do, I started hand knitting. I realized that I really loved figuring out the interloopings of the yarn which create fabric. I wanted to design fabric for bulk production.

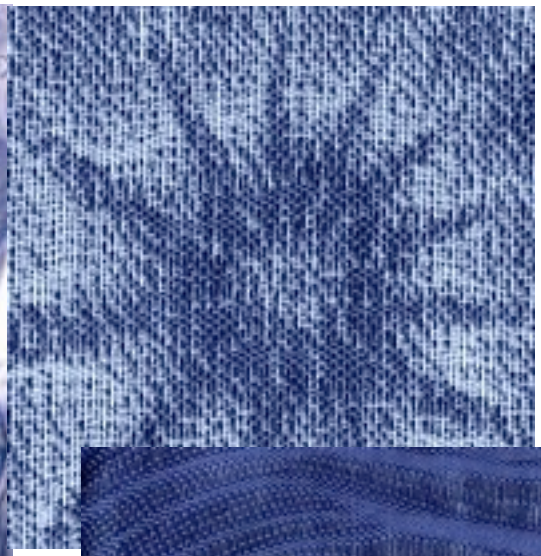
I attended FIT and studied Textile & Surface Design. Besides satisfying my creative side, weaving also engaged the left side of my brain — how many vertical threads vs. how many horizontal threads, figuring out complicated weave structures, and the science behind the different fibers which make up yarn and are woven into fabric.

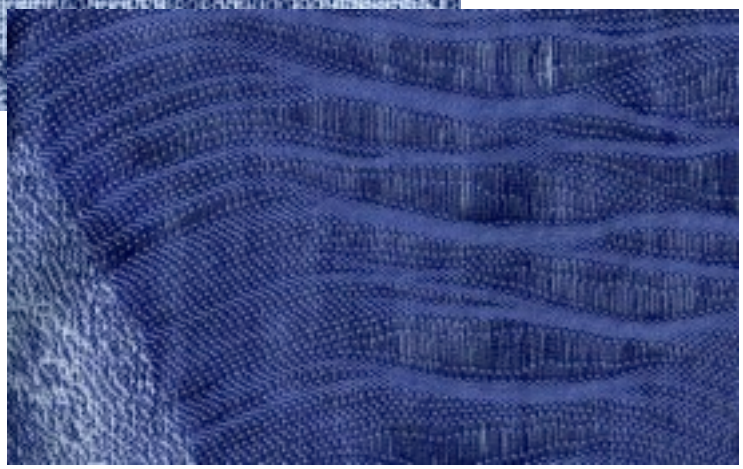
I remember hanging out with an old art school friend, and trying to describe why textile design was such a good fit for me. I described how sometimes designs are very complicated or have deep concepts behind them, and sometimes just an orange scribble is enough.

When I started working for Jhane almost a year ago, I found her to be creative and artistic, and also inspired by mathematics and algorithms. In fact, Jhane employs mathematicians who write her exclusive proprietary software which we use to generate abstract geometric designs.

Working with Jhane, I have discovered my inner computer person. I have learned to use so many new graphics programs. We're using software that no one else in fashion is using like fractal software, mathematical generators, and 3-D animation software. We're even beta testing brand new software as well. I still love Adobe Photoshop and Illustrator, and I've looked to other industries to find alternative ways to use these programs. Since the main focus of our sportswear line is shirts, I took a pattern-making class to learn how a shirt is constructed. By the way, there is a lot of math and geometry involved in pattern-making.

A lot of the skills that I learned as a fine artist are transferable to textile design. For instance, even in menswear, it is important to know how to draw flowers traditionally, before you can draw flowers abstractly. Color is the first thing that people notice, and if it's not pleasing to the eye or flattering, it doesn't matter how well a garment fits or how innovative the fabric.





We just finished designing our Spring 2010 line, which was loosely inspired by grafitti and painting. Some of these shirts were actually approached in the same way that I would make an abstract painting, with the exception that I used a computer to literally layer high resolution scans of paint strokes, drips and splatters, instead of real paint which is messy and toxic. In fact, many art critics and mathematicians believe even the action paintings of Jackson Pollock are based on fractals.

-Heidi Bender, Assistant Designer at Jhane Barnes Menswear