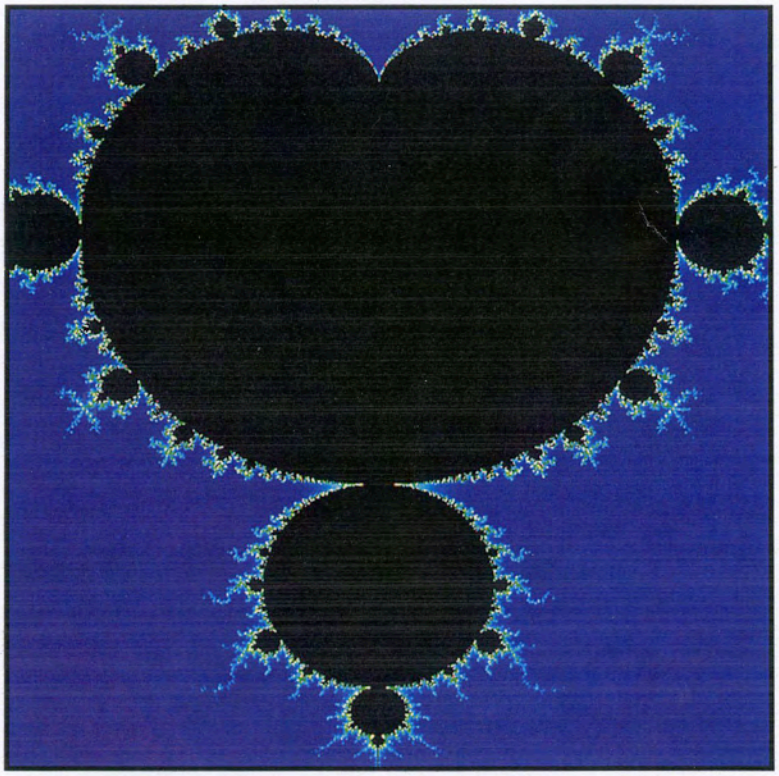

MATERIALIZING THE INVISIBLE

by Catherine Amidon

"In sum, my point has been that we have been moving, from the Enlightenment forward, toward a visual and, now, an electronically generated culture. Since the time of Plato, however, this visual culture and its magician-creators have suffered from a low status."

Barbara Maria Stafford *Good looking: essays on the virtues of images.* Cambridge: MIT Press, p.39.

ABOVE: Mandelbrot set.

JHANE BARNES is known in the fashion world as a menswear designer. Glossy magazines carry her ads, featuring well-built men clad in her printed and woven fabrics. What is advertised is on the surface, but behind Barnes' surfaces there is theoretical depth. Barnes has contributed significantly to the influence of technology on material culture. She was the first designer to bring weaving and surface design together through science, theory and technology. Not only has she produced textiles informed by science; her work has helped to redefine what is important knowledge in those fields.

Since the 1990s, Barnes has relied on theories of chaos and complexity, referring to the visualization of pattern based on mathematical concepts, in order to generate new designs through technology. Her teamwork with Dana Cartwright and Bill Jones, mathematicians and computer programmers, brought the languages of math and science to the core of Barnes' production. It is this collaboration, rather than simply the use of computer programs, which has made the results so rich and exciting. The overlap of information from separate fields has altered the usually hierarchical status of science in relation to textiles.

For the team to function it was necessary to create a mode of communication that would enable Barnes to transmit visual concepts to partners outside her field and, in turn, to understand their input. What developed was a two-way process allowing visual concepts to become mathematical and computer-coded, and for mathematics and code to become pattern. The members of the team dialogue intensely and work back and forth until Barnes achieves the desired results: a new suitable pattern.

Through her relationship with Cartwright and Jones, as well as through her design skills, Barnes has used mathematics to describe and interface with the world. More than just pattern design, her mathematical models of complex systems provide a structure for creative thought. As an artist, she has replaced the "Renaissance window" as a frame to look through with a potentially infinite framework of pattern drawn from scientific research.

Scientists often rely on visual metaphors to understand systems and render visual representations of the unseen. Common examples are diagrams of molecules and photographs of the passage of invisible waves through fluids. Biologists may sketch out maps of complex systems to better understand them. The genome project, so often in the news, is rendered understandable by visual analogy. This, rather than one-to-one matching, has allowed scientists to move forward in decoding very complex systems. For example, genetic markers (or distinct biochemical features) are "mapped" at intervals to create patterns through which whole systems can be understood without actually sequencing the three billion (or more) individual pieces of DNA in the human genome.

In the history of science, inquiry into these visualization processes and related mathematical codes mark a shift in the acquisition of knowledge. Fascination with the rate of change or speed of physical objects (rendered famous by Newton and Galileo and studied with algebra and calculus) has been superseded by an interest in coding complex systems. In this postmodern scientific era, the quest for knowledge is increasingly focused on the study of such areas as biological patterns. This change is reflected in Barnes' textile designs.

Barnes generates designs based on the mathematics underlying different visual metaphors in the sciences. For example, she uses fractals to create patterns. Fractals are

JJhane Barnes Shirts in production.
RIGHT: **Jhane Barnes** Cotton shirt with design created by using Fractal Geometry.

visually complex, mathematically generated, self-similar patterns that do not repeat. Barnes' interest in fractals began in the 1980s, when pattern-finding mathematical theorems in the sciences were on the rise. She may run a fractal-patterning sequence, like the Mandelbrot set, on the computer. Progressing from one mathematically-generated pattern to another, she can move them around until she finds a part she likes. She can then stop the movement and lift out a section to manipulate on the screen. For example, she may invert the pattern, put it on the diagonal, flip or rotate it, or re-color parts—all the alterations that were possible in manipulating of historic textile design are available to Barnes with her mathematically generated specimens.

In the second stage, forms are put into repeat. By overriding the non-repeat aspect that defined the original fractal, Barnes has subverted the rules of its underlying math. The resulting pattern no longer is a pure, abstract mathematical model; instead, Barnes has incorporated mathematics into her creative activity. What emerges is unique geometric pattern.

Barnes' combination of math, science and visualized knowledge (like fractals), as well as her cross-disciplinary work, make her a key figure of the postmodern era. The reconfiguration of current disciplines as discrete practices —e,g., computer science, architecture, and fashion—is changing with and in relationship to postmodern intellectual life. Knowledge that is considered central and essential has been fundamentally altered with the access to data and its manipulation allowed by the computer. Fully utilizing this, Barnes engages textiles in a discourse about the nature of knowledge and information related to science and technology.

Computers bring a certain logic and with that, as stated by Francois Lyotard, the French postmodern theorist, a revised process of "determining which statements are accepted as "knowledge" statements."* This approach to knowledge, in contrast to historic textile production, is central to what Barnes' process and knowledge of textile making have contributed. The science of mechanics and the mathematics of calculus sustained the eighteenth century Enlightenment, which was economically supported by the successes of the Industrial Revolution. If a single object embodied the intellectual, mechanical wealth of the

Jhane Barnes Cotton Photo Realism shirt. The use of many colors and a procedure similar to ink jet printing help to create the distinctive look.

Jhane Barnes Cotton Photo Realism short sleeve shirt created by a procedure similar to ink jet printing.

eighteenth century that was translated into broad economic gain in the nineteenth century, it was the Jacquard loom. The invention of the punch card-controlled mechanism for the drawloom by Joseph-Marie Jacquard in 1780 led to the 1804 development of the Jacquard loom that, in turn, allowed a quantum increase in production of complex woven fabric.

The binary system of the loom is ancestral to the computer that is reshaping demographics, production and trade policies. Although computers are driving mill looms, in weaving the zero and one rule still applies. The harness is either up or down. The weft and warp determine the linear geometry and establish the rules. The rules may seem more limiting than the unfettered gesture of the painter, but weaving is closer to creative forms like writing and music notation. Altering the rules allows new forms of symbolic language and purpose to emerge.

Jhane Barnes pushes the limits of the rules of binary process through her use of complex mathematics. Her innovative way of working was developed at a time when most designers were still doing Computer Assisted Design (CAD) with tools such as scanners and photographic images to input designs that were then manipulated. Favoring the manipulation of style, these processes make time the variable most altered by computer design. The slow work of repeating motifs across a fabric becomes instantaneous with CAD. Design effort can be and often is minimized in the exploration of pattern, scale and color, and instant prototypes are possible.

The Jacquard loom reminds us that modernism was, in part, defined by the Industrial Revolution's economic and socio-cultural imperative of proliferation. Postmodernist textile production heeds the call of a different revolution, a green design movement concerned with the environment and the residue of production. Barnes seeks to soften her ecological impact, while working within the traditionally polluting textile industry. Sensitivity to environmental issues has brought her to seek new forms of creation and manufacture.

In 1997, Barnes was among the first to bring photo realism printing into menswear. Not to be confused with photo realism as a painting style, this printing technique involves direct digital output onto undyed cloth. That means no dye baths, and therefore no dumping or environmental clean-up. No other dyeing method makes a greener statement. This process, developed in Japan in the 1980s, required that hardware, dye and printing equipment be adapted for specialized use. Motivating the research was a desire for print-as-needed fabric, principally for the auto

Jhane Barnes Bedding. Dragon Ensemble from the Japonica Collection. A woven jacquard cotton/linen blend.

Jhane Barnes Cotton PhotoRealism shirt with a grid-like pattern that creates depth.

Jhane Barnes Cotton/linen blend stretch woven sweater; fractal geometry used to create the pattern.

industry, so that high volume, profit-driven production could shift with market trends, eliminating stockpiles.

Photo realism in fabric printing means the end of the limited color spectrum that up to now has constrained the use of color in textile production. Subtle manipulations of color from mathematically-driven computer design processes may use millions of colors, rather than the hundreds that have limited many printed designs. Without this printing technology, the potential visual complexity afforded by CAD programs would be lost. This process also offers the advantage of lifting weaving's binary rule.

Although Barnes' production is highly conceptual, critics of art and culture generally view it with a skepticism not cast on painting and sculpture. The vestiges of neo-platonic theory and modern institutional traditions continue to cultivate an economically viable "high art," while western society remains suspicious of the ephemeral, craft, and other "marginal" art. Oil on canvas, rather than dye in fiber, is embedded in Western thought as apermanent art. The lack of respect for making without a permanent product (and related economic impact) and the suspicion of multiples (and related loss of originality) leaves museums and academia virtually unchallenged in their slow assimilation of contemporary fabric and fashion.

The traditionally defined history of modern art has encouraged a purity of visual experience not contaminated by media, fashion and commerce. Barnes engages all those socio-economic realities to help propagate a quality aesthetic experience. Far from the halls of academia that echo the triumph of multiculturalism and ideology over artistic formalism, her surface structure carries vestiges of history, textural elegance and mathematical theory.

Fashion remains outside the theoretic discourse that the computer, with its rapidly changing technology, has entered. Barnes' work as a designer of production textiles is necessarily influenced by aesthetics, fashion trends and profits. However, the creative impulse behind her process is tied to chaos and complexity theories that are affecting intellectual activity, academia and the borders of disciplines.

—Catherine Amidon, a curator and critic, is currently Director of Exhibitions at Plymouth State College in Plymouth, New Hampshire.

*Lyotard, J. F., around 1972, answering the question, "What is postmodernism?" in C. Jencks (Ed.), *The Post-Modern Reader*, St. Martin's Press, New York, pp. 138-50.