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Figuring the Digital

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FIGURING THE DIGITAL

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ABSTRACT

This body of work is a way of understanding, reflecting on, and contributing to a contemporary dialogue about the impact of digital technology and the Internet on society by looking at the organization of information that lies behind the computer screen, and creating work that is sourced directly from the Internet but becomes a tangible object in the physical world. I use methods of mass production and marketing to create artwork that values individuality over homogenization and complexity over efficiency, co-opting practical digital technology for the purposes of physical beauty. The work should inspire a sense of wonder through its complexity and scale, and reference recognizable visual systems.

I create systems for moving through the internet and generate images in which the size, shape and repetition of each line is determined by the organization of existing websites and information published on social networking sites like Facebook.com. I employ a single system constructing a drawing in which the outcome changes based on the data I feed it. The graphs I produce evoke a sense of linking, web, or interconnectedness.

Large, radial, laser cut and hand folded paper medallions are sourced in these graphs and reference rose windows or Islamic patterning, touching upon the divine while simultaneously evoking the underlying structures of the natural world. The work escapes the conventional shape and scale of the computer screen, grappling, in a physical way with something that does not exist in relation to the body, and offering an alternative to addressing advancing technology.

This work references artists ChanSchatz, Annoka Faruqee, and Janine Antoni but distinguishes itself with formal beauty, the relationship to the divine, and the potential for association to other forms, bringing digital technology in dialogue with nature and history by pointing to commonalities in their structures.

ACKNOWLEDGMENTS

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CHAPTER ONE

INTRODUCTION

This body of work is a way of understanding, reflecting on, and contributing to contemporary dialogue about the impact of digital technology and the Internet on society. Although I'm working with issues related to the computer, there is not a visual reference to a mouse, a computer screen, or a web page. While we may be able to signify the digital through images of the computer hardware, the pixilation of the screen, or the graphic information we see on websites, these might be thought of as vehicles for communicating the content of the Internet. However I'm looking at the organization of information that lies behind the screen. That is, the interconnected system of codes written in range of different computer languages interpreted by various programs and operating systems. It is my intention through this work to create systems of 'looking' at the Internet as an immaterial organism that extends to computer screens globally, and from the information I gather create work that is sourced directly from the Internet but becomes a tangible object in the physical world.

The second component of this work's relationship to its historical context is the use of methods of mass production and marketing, which are becoming faster and more efficient with the advent of digital technology, to create artwork that values individuality over homogenization and complexity over efficiency by employing hi-tech tools to create unique, labor intensive, hand-made objects.

The goal of this work is not to critique the application of technology for marketing purposes and its challenge to the diversity of available products, but more importantly it

is to develop a system that uses these available technologies for the purposes of beauty. The resultant work should inspire a sense of wonder through its complexity and scale, and as a consequence of process, referencing visual systems we already understand, particularly biological structures and representations of the divine.

My meticulously cut and folded, radial paper objects hover between feeling biological and religious. This makes sense as both have relationships to math. In biology, plant parts organize themselves around mathematic principles. Leaves are grouped and arranged in ways that can be described by the Fibonacci sequence, and crystals take shape based on the geometry of their component molecules. In religious decoration, patterns are also developed around mathematical principles. Because Islamic decoration does not use representations of life, it relies on geometric pattern, and renaissance architecture organized around a combination of geometric shapes.

By gathering data from rather banal internet sources, using computer based drawing and three dimensional modeling programs, and the high-tech equipment conventionally used to turn out rather bland product packaging to create images, forms, and installations that touch on the sublime, I am co-opting practical digital technology for the purposes of physical beauty.

CHAPTER TWO

ADVENTURES IN THE DIGITAL LANDSCAPE: DATA COLLECTION

To begin a project, I lay out a simple set of rules that regulate the way I move through the Internet to learn something about its structure. I think of my movement through the Internet as a series of test cases. This is not a broad-based study but a sample of how one might move through the space of the Internet. My goal is to get a feeling for the 'shape' of the space. To understand how communities are connected or one might find herself oceans away from where she started inside of an hour.

I began doing the research for *Facebook Spiralgraphs* as a method of looking at the way people can be associated through the Internet. I chose Facebook because it is a popular, mainstream social networking site. Within student communities, Facebook is a part of mainstream culture. Because it is so commonly used, I felt it would not point to issues of Internet subculture, which would be distracting to the work of elucidating structure. Further, Facebook has an efficient and fairly rigid system of linking profiles by interest, thus I was able to focus on looking at the way individuals are linked and grouped based on common interests.

I think it is interesting that I can be passively associated with a group of other people just by listing a word, a title, a term, or name with my profile. If I click on a word I entered, Facebook pulls up a directory of people who have also cited that thing. I don't have to go to a meeting, or join a fan club I only need to have an interest and express it and suddenly I have access on some level to a group of people I do not know in the physical world.

Within Facebook.com over 30 million people have posted profiles that include listings of favorite activities, movies, music, and television programming (as well as information on employment, address, age, gender, etc.). When I click on a name or title in one of those lists, the site runs a search of all the profiles in my networks that also include that name or title and shows me that list of people. My networks are Buffalo (my hometown) Italy (where I spent four months), Notre Dame (my alma mater) and Clemson (the university I am currently at). Thus, if I open my profile, go to the section for favorite movies and click on *Casablanca*, I get a list of people, who are a part of one of my networks, who have also listed Casablanca as a favorite movie. When I click on a name in that list, a can view that individual's profile.

To collect data for the images, I start with my own Facebook profile and choose one topic to follow (television, music, or movies). I choose an item within that topic (I'll use movies as an example), and use a random number generator from random.org to pick a movie from my list. This brings me to a list of people who had also cited that movie; the number of people in that list becomes the first number in my data set. Using the random number generator, I choose a profile from that list and again randomly choose a movie listed in that profile, giving me another list and another number for my data set. I continue this way until I hit one of two dead ends: either the search returns only one profile, or it returns over 500 profiles. (Facebook does not return numbers for over 500 profiles). This gives me a list that is usually 3-6 numbers long. By starting with this system, I am engaging Facebook users as unwitting participants in the work because their

common interests and activities determine the scale and form of a series of 'spiralgraphs' generated from this information.

The piece www.montanabrides.com to www.yakasawa.com was a way for me to answer the question: "How webby is the web?" For me, a very webby web would include sites with a lot of links to other sites with a lot of links to other sites and so on. The initial idea was to trace a path in which I start at one website and try to get out of it and all subsequent sites as quickly as possible

As a way to start this game, I ran a Google.com search describing the scenario I was in when it started. Literally, I searched "getting out on a Wednesday over coffee" and chose the first listing (www.montanabrides.com). It is important to me that these games start at a fairly arbitrary point because I am looking at the structure of the linking not the content of the sites. Later, as I will describe, this produces a strange but appropriate disconnect between the titles and work.

From here I set a few parameters to keep me from getting distracted by content. First, I could 'move' 'forward' only by clicking on links within the site. I would not knowingly choose advertising links, and I would not enter any information (name, email address…) to move forward. When presented with options, I decided which link to choose based on what I though would get me out of that particular site fastest (for example, if the first page included only links to other spots within the site, choosing the "links" link would be a good decision). And take me the furthest (a link to Coca-Cola.com is likely to get me stuck, while a link to an individual's Myspace page is likely to provide a lot of links to a lot of other sites).

I conducted this search for 25 hours, visiting over 1000 pages within 642 websites. Each page I visited was recorded. From here I counted how many pages I had to go through within each site to link to a different site, this gave me a sequence of 642 numbers ranging from 1 to 38. Again, this data was used to generate an image. By using this system of travel, I gather a first person account of wandering through space. Again, my final graph will be shaped by what other Internet users have created on the Internet.

CHAPTER THREE

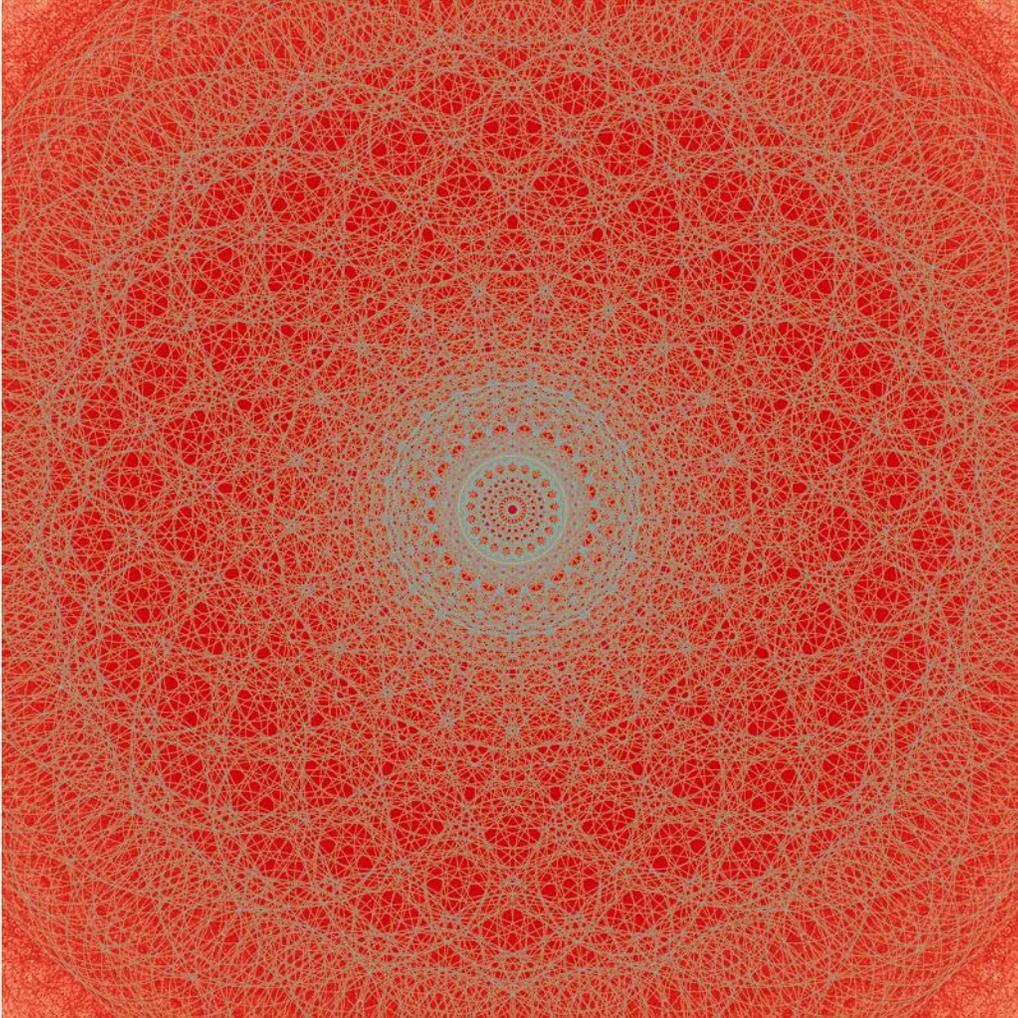## NOT QUITE A MAP: CREATING IMAGES FROM DATA

Figure 3.1: *Figure C1.1 (Junebug, Secretary, Pan's Labyrinth)*

When I design a system for looking at the Internet, I do it with a general sense of the graph I will produce in mind. That is, I design a system for mining data, and a system for representing it that has some visual relationship to the idea that I am looking at. When I am looking at social networks, the resulting graphs evoke a sense of volume and interconnectedness, and when I am looking simply at movement, the graph reads a little like a roadmap or a tracing of a particular wandering.

I use the data from Facebook described above to create a series of spiralgraphs. For example, in the image subtitled *Junebug, Secretary, Pan's Labyrinth* (fig 3.1) started with the numbers 26, 208 and 364, that is, I found 26 people who listed *Junebug* as a favorite movie, 208 who listed *Secretary*, and 364 who listed *Pan's Labyrinth.* Using Adobe Illustrator, I draw three polygons with 26, 208, and 364 sides respectively. Each side of every polygon is the same length, so I can align one edge of the first shape with one edge of the next. Using the first polygon as the center, I place 26 208-sided polygons around the first shape, joining each along a side, from there I place a 346-sided polygon along each of the 208 sides of each of the 26 polygons I had placed before. Each group of shapes is assigned a different color, which I choose to achieve a sense of balance and depth within each composition. In this way, I have created a single system for drawing that changes based on the information I enter into it.

This method creates a complex radial pattern that references the idea of the web that I am working with. These graphs/maps of Internet social networks can both stand alone as two-dimensional work and be used to structure form and decoration for my larger project.

I have hung these images in a way that they might read as presentation graphics because I want them to be understood as part of a system. I built an index in which the viewer can look through my source images by physically turning the pages of my index (Fig 3.2). This is a documentation of my exploration of the Internet.

Figure 3.2: Installation view of *Facebook Figures*

These graphs are titled so that they connect both to the source information and create and path between this work, my collages, and the folded paper pieces. For example, this first print contextualized the series of spiralgraphs as *Facebook Figures (movies, television, music)*. Following this, there is a graph titled *Figure C1.1 (Junebug,*

Secretary, Pan's Labyrinth). On the opposite wall, there are corresponding collages

titled *C1.2 a, b and c*, and the related folded paper mandala is titled *Figure C1.3.*

As I described above, the graph for the *www.montanabrides.com to*

www.yakasawa.com is based on a single string of small integers, each representing the

number of mouse-clicks it takes for me to get from one site (through a link) to another.

The graph is drawn by going through the numbers in sequence. Each number relates to a

line whose length in proportional to that number, thus, since the first four numbers are

1,4,1 and 2, the first four lines are 1, 4, 1, and 2 units long. The starting point of each line

is the end point of the previous line, and it extends in a direction 90 degrees

counterclockwise from the direction of the previous line. Thus, if the first eight numbers

are 1,4,1,2,5,1,1 and 4, the line drawing starts at a point (say 0, 0) and vertical line, one

unit long is drawn. The line then "turns" 90° Clockwise so that a second line segment,

beginning at the top point of the first line and extending four units to the right is drawn.

A third line, turning another 90° extends one unit down from the endpoint of the previous
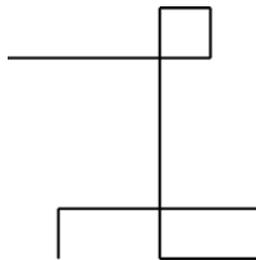
line and so on. The resulting form will look like this:

Figure 3.3: Explanatory Drawing for *www.montanabrides.com to www.yakasawa.com*

With the help of Dr. Keith Davis, an astrophysicist who writes data-visualization programs for his own research, I wrote a small program in IDL, software designed for use in physics research to draw this graph. The final form, both in my specific case and when we ran this small program with random numbers, tends to produce forms that are more concentrated at the origin and broaden as they move out. Evoking the shape of a funnel cloud. Incidentally this system, if applied to a random number sequence, can be used to loosely describe a "random walk" the term used for the way that a photon, moving randomly within the sun, comes to escape the sun's atmosphere and cast light. In fact, Davis modified the code we wrote to demonstrate this idea for an educational astronomy presentation at the University of Notre Dame.

I placed a large plotter print of this drawing on the floor at the entry to the gallery, inviting visitors to walk on top of it, leaving footprints, traces of their physical movement through space over the documentation of my movement through internet space.
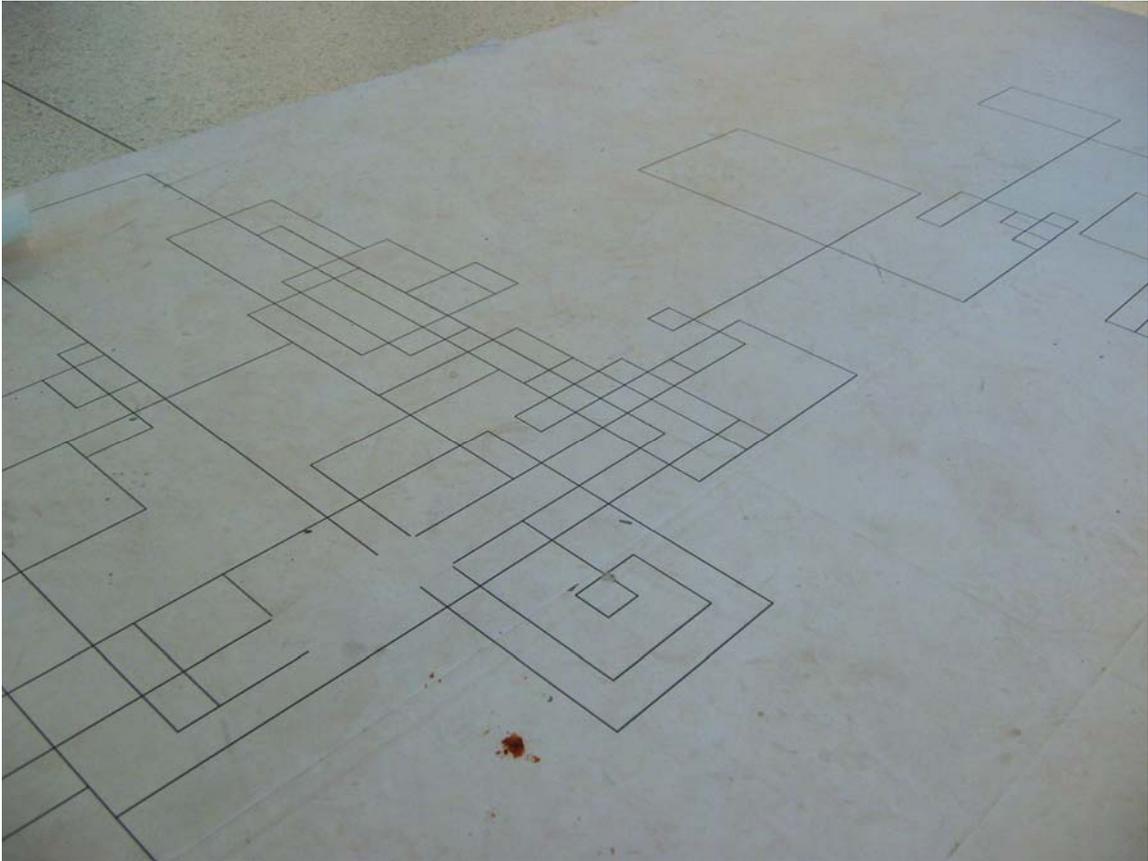
Figure 3.4: Installation view of *www.montanabrides.com to www.yakasawa.com*

Three things become important to the content of the work. First, the form begins to reference the natural form of a funnel cloud. Like the spiralgraphs begin to reference the natural ordering of crystals or seed pods, here, the man-made structure of the Internet, along with my system of describing it happened to fall into sync with the natural world. Second, I unknowingly developed a system for describing my Internet wanderings that comes very close the physical phenomenon of the random walk. Third, these forms become most interesting when a high density of numbers is used to produce them. This

reflects the increase in density of information that is one of the major changes on our experience since the advent of the Internet.

The images described above become source material for a series of work in which the flat document, through cutting and folding, becomes a three-dimensional object as described in the following chapter.

CHAPTER FOUR

FLAT to FLAT-FOLD: GENERATING FORMS FROM GRAPHS

Figure 4.1: Installation view of *Figuring the Digital*

My three-dimensional forms are based on the data I have gathered and the graphs I have produced. The systems of structuring and visualizing information gathered from the Internet become my reference in a way that a landscape might be a reference for a painter. For me, this is a way to *look at* and *represent* an experience that does not come bound to a physical form.

From the *Facebook Spiralgraphs*, I pulled the two-dimensional graph into relief, picking up patterns from the density of line and the overlap of shape. In a sense, the objects grow out of the flat graph. The graphs allow me to create a complex radial pattern because the system has already achieved a complex radial symmetry. I can pick up on certain shapes that repeat fluidly. Thus, from a pile of information, I create a new form. The forms, because of the complexity that the computer allows, can be very beautiful. They tend to reference religious architecture and decoration. They evoke rose windows, Islamic patterning and mosaic (figure 4.1 background).

Within the *www.montanabrides.com to www.yakasawa.com*, the line drawing I produced in IDL becomes a map for the placement of two large paper objects. These objects (figure 4.1 foreground) offer a detailed view of my travel within a particular site and are placed along the line representing that travel. The objects become markers, signposts within the space of the line. While the initial map primarily describes the movement between sites, the objects use movement within a particular site as a reference. These objects are body-height, thus they interact with the audience in physical space. They interrupt movement, highlighting the disconnect between the physical space of the gallery and the virtual space of the Internet.

These mysterious objects, which float over my escape diagram, suggest that these objects are something the viewer might encounter during travel, pointing them back to the source research. The scale of the objects approaches that of statuary, creating a link between the tradition of sculpture and my process, which depends upon hi-tech digital tools.

In a sense, this is a way for me to explore what is possible for sculpture when I imagine what these tools can do instead of what they were built to do. By mastering software and equipment used to produce mass-market products, I am able to co-opt them for the purposes of art. While my methods and materials reference a contemporary context in which technology is used to create an efficient, homogenous product, I am using them to produce complex, unique, labor-intensive sculpture. I am addressing the fact that technology is often used in ways that reduce diversity by using the same technology to create individual beauty.

I am using the program FormZ to design the objects what will be constructed out of paper. FormZ is a program most commonly used for Architecture and Product Design to produce a plan for a building or product that will be handed over to engineers and manufacturers who do the work of bringing these objects into the world. My use differs because I am also doing the labor of building, and FormZ is just a tool that helps me to overcome the challenge of creating a flat fold pattern for the creation of objects. Once the forms are modeled in FormZ, they can be unfolded automatically so that I am able to determine the exact shape of each facet or plane rather quickly. Because I am intimately familiar with the character of the paper I am using, and I often go back and forth between

the paper and the computer as I am designing, the form of the piece in the digital model is created in dialogue with the physical reality of its construction.

Once the forms are unfolded in FormZ, I bring them into Adobe Illustrator to lay the pieces out for ease of construction and efficient use of paper. These digital files are used by either a laser-cutter or a CNC cutting table, which will both cut and score the patterns into my paper, either Bristol board or paperboard. This allows me to efficiently cut complex patterns and to maintain the hard, straight, clean cuts associated with mass production.

Because the forms are so complex, there is a bit of tension within them and a lot of my earlier work did not hold together as well as I would have liked. However, it was important to me that the structure of the objects was also the surface of the objects. This makes it feasible that they could be do-it-yourself, and brings them closer to the idea of the mass-produced. In solving this problem, I fell into a nice convergence of form, process, and concept. I was already using materials and methods of the mass produced to create beauty, so I was able to address technical problems by looking to the construction of flat-fold boxes in industry. I began to use a system of locking tabs and I started using paperboard, a material used in industry for cereal boxes, gift boxes, and fast food packaging. This material gave me a cold, white surface, again suggesting industry within complex, nearly religious or organic forms

I also came to work with people in industry. I have been cutting my boxes at Clemson's packaging science department and I am working with people who sell paper and design for industry in order to source materials, thus I am in close contact with the

business structure that I am referencing. The idea of co-opting the mass produced became, for me more than just a visual metaphor, but also a concrete part of my process.

The surface I present is, at least at moments, clearly related to industry. This queues the viewer into a contemporary context in which we are regularly in contact with packaging made in a similar way. However, the complexity of the objects helps to achieve beauty out of a banal material. Moreover, I have individualized a process and a material that is overwhelmingly used to homogenize output. In a sense, this is "outsmarting" the forces at hand instead of fighting against them. I am claiming the tools developed to create efficiency in marketing and industry, for a project that is complex, individual, and necessarily handmade. I am taking advantage of what is available from industry to imagine what is possible in an art context.

In this way, I am working to capitalize on what might be good about digital technology for artists. Because as artists we are competing with an unprecedented amount of visual information and man-made objects (MTV and Wal-Mart) it makes sense to use technology to make work inexpensive, accessible, and visually engaging. By using 3D modeling programs, traditional printers, and a laser cutter, I am able to make larger, more complex objects than I could by hand.

As my flat-fold patterns are cut, they begin to take on, for the first time, a materiality that is subject to the rules of the physical world. From here, the forms have a definite scale and location, they must be able to hang on the wall, rest on a table or floor, or be hung from the ceiling. While the flat surfaces, sharp folds and complex geometries are identifiable as digital constructs, these forms are larger than the computer screen we are

used to using to access the digital. They interrupt movement, they cast shadows, and they change the physical space that they occupy.

I have taken a set of data gathered from the spaceless space of the internet and used it to create objects that not only have concrete form, but also begin to reference other forms we are used to experiencing in the physical world. For me this is a way to grapple with something that does not really exist in relation to the body. They take on a scale the breaks with the conventions of the computer screen and more closely relates to the vastness of the Internet and the scope of its impact. Cerebrally, we know that the information we receive through the Internet is coming from different locations, but it is all received at this very specific site, the computer screen. It does not have a scale or a physical boundary.

The objects are more interesting because of their construction (Figures 4.2 & 4.3). I'm using paper, a common, fragile material to make a lot of structure. I hope that the form draws the viewer into the way they are made. By hanging these medallions away from the wall I have exposed their construction. Thus the viewer can understand that the surface and the structure of the paper are the same thing. I think that relates well to my struggle to give a unified voice to the structure of digital technology. The tabs on these pieces might point to something else, they suggest the potential for growth and change, they are not closed.

left, Figure 4.2: *Figure A 3.3* detail

right, Figure 4.3: *Figure B1.3* detail

The installation of work tells a story of the generation of the work. While it is not so important to me that my audience fully comprehends the specific technical aspects of how the graphs are drawn or the forms are built, it is important to understand that the source material for these forms comes from the Internet. I have addressed this by including references to the websites I am mining. From here I have displayed my "findings" as charts and graphs. They hover between the output of a research lab and the colorful, playful forms found in fine art. They are presented in this way because I want the viewer to understand them not as isolated works, but instead as a part of a larger system. The titling relates them to the folded work, helping the viewer to understand that they are connected. In the next iteration, these graphs are collaged with scrap parts from my flat-fold construction as a way to indicate a relationship between the graphs and the objects

While my forms, because they are planar, are necessarily geometric there is enough complexity that they begin to feel organic. Like forms found in nature, my work is based on a series of underlying elements that repeat to create a structure. The structures I am tracing on the Internet come to reflect the structure of organic life. They look like organisms themselves, or close-ups of seed pods, flower buds, or crystals. Beauty, in both cases, has to do with underlying order, by using the structure, of the internet in place of the graphic information we receive from it, I am able to achieve an organic beauty not normally associated with the experience of the internet.

In one sense the Facebook Spiralgraphs and resultant paper forms are designed up to recall religious decoration. They exist on an architectural scale and exhibit radial symmetry. As fragile, white objects they suggest something sublime or transcendent. This is appropriate to the role of the Internet as a social networking device and a mode of broadcasting information because this has historically been the role of the church. Further, digital information often takes on the character of the divine. It exists, in a sense, as formless, timeless and space-less. It is only through devices, specifically computers (which can include calculators, cell phones, PDA's, laptops…) and printers of all types that the information takes shape. As artists have traditionally represented the divine, an entity without concrete form, I am giving shape to the strange space of the Internet.

CHAPTER FIVE

CONTEMPORARIES

There are several contemporary artists who are working with similar ideas of

mapping, the creation of systems and hi-tech process, and art's relationship to digital

media. These artists have claimed digital media for art while at the same time reflecting

on the digital, thus the computer is not just a tool for making an image, but the systems of

production influence the form and content of the work.

ChanSchatz is a two-person team that has generated a system of portraying

individuals based on information participants offer up in their "Interactive Design

Module. The characters that result are bright, illustrative symbols placed in slick, cleanly

printed silk canvases. They have created a handbook outlining their process. As Toby

Crockett wrote "As the Handbook makes clear, the ChanSchatz editions represent only

the material output of a larger conceptual framework which is itself to be more properly

considered as the ultimate work of art." (Crockett, 2003) The system for production, the

level of interactivity and the construction of a set of symbols based on numbers and code

in place of recognizable signs become important parts of the work. This resonates well

with my own system of production in which I have developed a method using

information, not images, as source material for creating visual art

John Simon has created code to generate compositions in a style reminiscent of

Mondrian or Albers. In the series "Winds Across the Inner Sea" these compositions are

displayed on framed LCD screens. The work reflects on the relationship between the

design of a system and the creation of an image. Like ChanSchatz, the artist designing

systems that do part of the job of creating artwork. Both are creating art objects based on

digital information. Although the work (as a digital file) has the potential to be replicated

like a mass product it is, because of its context and function, clearly identifiable as fine

art. In a way that relates to what I have described in my own work, these artists are re-

purposing the materials and methods of contemporary industry, design, and marketing to

create artwork that is reflective, aesthetic and engaging for an art audience.

Artists who are not so closely tied to digital media also work with systems and

mapping, addressing the way that visual communication is effected by our understanding

of charts and graphs. In Janine Antoni's *Slumber*, Antoni slept hooked up to an EKG

machine, used the readout as a pattern for a blanket to be woven the next day. She slept

under this blanket the following night, again attached to the EKG, producing a pattern to

weave on the following day. Here again, the artist creates a dialogue between

information and its graphic representation and the physical reality of space and the body.

Painter Anoka Faruqee makes paintings using a series of 'pixels' in the shape of

Islamic tiles. This work employs the pixel, a distinctly digital phenomenon, within the

tradition of painting. When the artist produces a series of three identical paintings in

different sizes, she changes the size of each pixel but not its color, so that in a photograph

the three paintings are indistinguishable from each other. It touches upon the issue of

scale within the digital. Her images cease to have a distinct size once they are

photographed, recalling the idea that perception of scale on the internet is tied to the

format of the screen and recognizable symbols that may offer a sense of actual scale as

the information behind the screen does not have the same relationship to the body as a

painting or sculpture. The information we most commonly see on the screen has a variable size. For example, I can view the same site on a blackberry screen and on a projection screen. Thus, this work highlights a marked difference between digital information and more traditional methods of relaying visual information.

My work draws from a lot of these things. Like ChanSchats, I'm creating a new system of symbols to talk about information, like Faruquee I'm talking about scale, like Antoni I'm introducing physical labor into the presentation of information, relating to the body both in scale and in the labor of construction

What is distinct from these references is the formal beauty, the relationship to the divine, and the potential for association to other forms that my work offers. This work might reference something religious or biological, and that's appropriate because, for example, like my work, biology relies on an underlying structure of the organization of parts, and in renaissance architecture, overlapping geometries informed the design of buildings, and Islamic decoration, because it is not representational, is often driven by geometry. The relationship between this work and those systems is not entirely coincidental. It brings digital technology in dialogue with nature and history, by pointing to the structures.

CHAPTER SIX

CONCLUSION

In conclusion, I want the viewer to be able approach this work on a purely formal level,

and for the amount of labor that goes into it. But then become curious about the material

that relates to cereal boxes and computer printouts, and understand the potential for the

material when it is acted on in a more intuitive, less efficient way. And to look at the

unification of structure and form, and then to back up and understand that I've taken

something very common and used it to create this sublime, reflective construction.

I'm interested in the idea that art is a generous act, so I've invested a lot of labor

into the creation of these contemplative forms. In place of presenting an opinion,

modeling and existing system, or proposing a question, I am offering both formal beauty

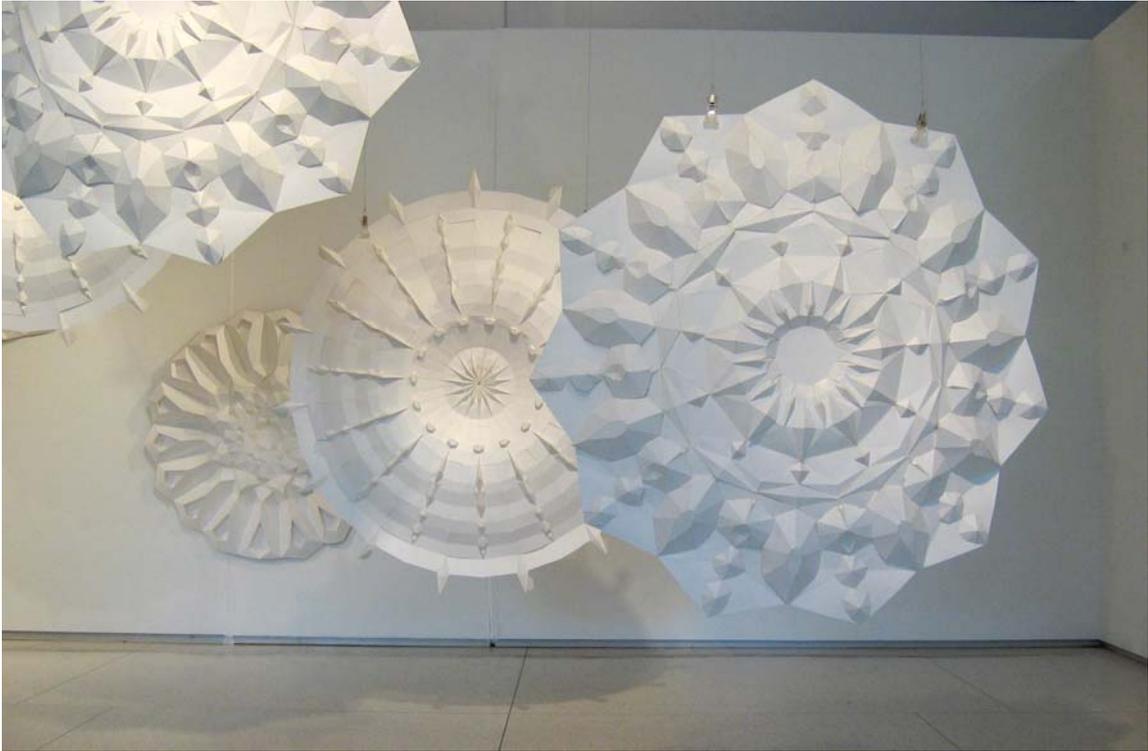and a space to consider the role of the digital in the physical world.

Additional Images

Figure A-1: Installation view of *Figure C1.3, Figure A3.3,* and *Figure B1.1*

Figure A-2: Installation view (2) of *Figure C1.3, Figure A3.3,* and *Figure B1.1*

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