Individual Project for Math 102: Math and the Visual Arts

The goal of the individual project is for you to choose an area within mathematics and art and produce

- a portfolio of images (either created or assembled by yourself) that illustrate the area, and
- a paper that discusses the area and how your images show the connections between mathematics and art.

For example, if your topic was geometric patterns in African textiles, your portfolio might contain various images of African textiles and your paper might give an overview of African textiles and discuss the various symmetry types shown by your images. As another example, if your topic was curve stitching, you might create a number of different curve stitching patterns and discuss in your paper the means of creation.

Logistical Details

The project has the following deadlines:

March 12th: Submit a short description (one or two paragraphs) of the area you will be researching along with a list of possible sources. Please use MLA format when listing your sources. This portion of the project is worth 2% of your total grade and will be graded pass/fail. A passing proposal will contain a clear description of the area you will be investigating along with at least three sources which are either correctly cited or close to it.

April 2nd: Submit an outline of your paper and a proposed list of images. The outline should be at most one page and should describe the order of material presented and the arguments made. I highly suggest following a standard format (i.e., use III, A, a, .., formatting). For each image you plan to use, give a short description. This portion of the project is worth 3% of your total grade and will be given a letter grade based on the clearness of your outline and image descriptions.

April 23rd: Submit the final paper and collection of images. This portion of your grade is worth 10% of your final grade and will be based on the following criteria:

- Variety and quality of images: 30%
- Connections between the mathematics and art: 30%
- Mathematical accuracy: 20%
- Grammatical accuracy (spelling, grammar, flow of prose): 20%

I would not expect a paper less than three pages long (double sided with standard margins) to earn an A. The number of images in your portfolio will depend highly on the area chosen - please consult with me on how many would be appropriate.

Possible Project Areas

This list of possible project areas is by no means exhaustive. If you have interest in some other topic, please talk with me about it.

1. Specific mathematically inspired artists
   a. The “string art” of Naum Gabo, Barbara Hepworth, and Henry Moore

b. The geometric art of Malevich [See *Kazimir Malevich and the art of geometry* by John Milner in our library.]
c. The mathematically inspired sculpture of John Robinson [See http://www.cpm.informatics.bangor.ac.uk/sculpture/sculpture.html.]
d. The work of Tony Robbin inspired by thinking about the fourth dimension [See http://tonyrobbin.home.att.net/.]
e. The mathematically inspired sculpture of Helaman Ferguson [See http://www.helasculpt.com/.]
f. The polyhedral artwork of George Hart [See http://www.georgehart.com/.]
g. Dick Termes and his six-point perspective Termespheres [See http://termespheres.com/.]
h. Theo van Doesburg and his work *Arithmetic Composition I* [See the articles by Pimm and Walter on reserve.]
i. Josef Albers and his paintings on squares
j. Ivars Peterson's book *Fragments of Infinity* covers a range of mathematically inspired artists working today.

2. Mathematical analysis of indigenous and historical artwork
   a. Ethnographic studies of frieze patterns [See Chapter 6 of Marcia Ascher's book *Ethnomathematics* in our library, as well as http://www.nrich.maths.org.uk/mathsf/journalf/nov98/art1/.]
   b. The creation of curves by different cultures [See Chapter 2 of Marcia Ascher's *Ethnomathematics* as well as Chapter 6 of her book *Mathematics Elsewhere*.]
   c. Analysis of cultural tilings [See http://mathforum.org/sum95/suzanne/historytess.html for a collection of different links]
   d. The use of geometry in Native American artwork [See http://www.earthmeasure.com/.]
   e. The use of the sacred cut in classical architecture [See http://www.dartmouth.edu/~matc/math5.geometry/unit7/unit7.html.]
   f. Jay Kappraff's book *Connections* (in our library) has a large amount of material on historical connections in mathematics and art.
   g. The mathematics of mazes [See http://www.math.sunysb.edu/~tony/mazes/index.html.]

3. Mathematical techniques for creating artwork
   a. Celtic knots [See Section 2.2 of our book and http://www.wallace.net/knots/]
   b. Curve stitching [See http://ccins.camosun.bc.ca/~jbritton/string_art/, http://www.public.asu.edu/~aaafp/rhythm.html, or the book *Curve Stitching* by John Millington in our library.]
   c. Compass and Ruler constructions [See Section 3.1 and 3.2 of our book.]
   d. Penrose tilings [See Section 4.3 of our book]
   e. Rosette patterns [See Section 5.2 of our book]
   f. Islamic star patterns [See Section 5.5 of our book and http://www.cgl.uwaterloo.ca/~csk/washington/taprats/.]
   g. Map projections [See Section 11.2 of our book.]
   h. The Mandlebrot set and Julia sets - an extension of fractals [You can start at http://aleph0.clarku.edu/~djoyce/julia/julia.html.]
   i. The mathematical aspects of origami [http://web.merrimack.edu/hullt/OrigamiMath.html.]
   j. Mathematical quilting [See the book *Mathematical Quilts* by Ellison in our library.]