

MA 398 Project

Our Geometry class is responsible for the April Science Library Exhibit. Our aim will be to provide an interesting and informative look at certain aspects of geometry and mathematics that are not as well-known as they should be. As far as the course is concerned, the educational goals are:

1. Gain experience communicating mathematical ideas to non-mathematicians.
2. Learn about and explore more deeply geometric ideas that go beyond what we cover in class.

The assignment:

There are five parts to the assignment:

1. Each student will write a single exhibit card for a collection of 4-6 books on a common geometric subject.
2. Each student will write an exhibit card for a mathematical object
3. Each student will contribute to a handout explaining the main themes of the exhibit and pointing to sources for further reading.
4. Each student will assist in the setup of the exhibit.
5. Each student will contribute to peer review of other students' exhibit cards.

The grading

Exhibit cards will be graded on both mathematical content and on the quality of writing. The other aspects of the assignment will be graded on a credit/no-credit basis. See below for guidelines.

Deadlines

Feb. 10 (Friday): During class visit the science library to look at books and the space.

Feb. 15 (Wed.): Topics for exhibit cards chosen.

Feb. 24 (Friday): Outlines of exhibit cards due.

March 2 (Friday): First draft of exhibit cards due for peer review.

March 5 (Mon.): Peer review of exhibit cards due.

March 9 (Fri.): Second draft of exhibit cards due.

March 16 (Fri.): Discussion of handout contents.

March 21 (Mon.): Final drafts of exhibit cards due.

April 2 (Monday): Set up exhibit (during class).

Materials for Science Library Exhibit

Students will be assigned to one mathematical object and to one collection of books. The student will choose for display 4-5 books from their assigned category on the basis of importance, interest, and aesthetics. Suggestions for alternatives are welcomed.

Physical Objects

Leather braid	Klein Bottle
Punctured Torus Bottle	Crocheted Hyperbolic Plane (and book)
Stone Trefoil	Polytopes

Books

History

Saul Stahl “Geometry: From Euclid to Knots”
Jeremy Gray “Janos Bolyai: Non-euclidean geometry and the nature of space”
John Stillwell “Sources of Hyperbolic Geometry”
Seth Braver “Lobachevski Illuminated”
David Hilbert “Foundations of Geometry”

Low-Dimensions

Donal O’Shea “The Poincare Conjecture”
Henri Poincare “Papers on Topology”
Jeffrey Weeks “The Shape of Space”
Alexandru Scorpan “The Wide World of 4-Manifolds”
William Thurston “Three-Dimensional Geometry and Topology”
Chow and Knopf “The Ricci Flow: An Introduction”

Differential Geometry

Spivak “Calculus on Manifolds”
McCleary “Geometry from a Differentiable Viewpoint”
Oprea “The Mathematics of Soap Films”
Almgren “Plateau’s Problem”
Spivak “A comprehensive introduction to Differential Geometry”
Bar “Elementary Differential Geometry”
Gibson “Elementary Geometry of Differentiable Curves”
Do Carmo “Differential Geometry of Curves and Surfaces”
Bloch “A first course in geometric topology and differential geometry”

Geometric Transformations

Brannan, Esplen, Gray “Geometry”
Rubik, et al “Rubik’s Cubic Compendium”
Farb and Fisher “Geometry, Rigidity, and group actions”
Mortenson “Geometric Transformations”

Topology

Firby and Gardiner “Surface Topology”
Francis “A Topological Picturebook”
Edelsbrunner and Harer “Computational Topology”
Guillemin and Pollack “Differential Topology”
Richeson “Euler’s Gem”

Fractals

Mumford, Series, Wright “Indra’s Pearls”
Falconer “Fractal Geometry”
Mandelbrot “Fractals and Chaos”
Peitgen and Saupe “The science of Fractal Images”

Guidelines for writing the exhibit cards

Each exhibit card should be approximately 100 words long. The body should be typed in Times New Roman with a font size of 14. The title should be in Papyrus at size 20. Each student will submit the final versions of both their exhibit cards by email to the professor.

Each exhibit card should provide an explanation and introduction to the books or object for the casual reader. The writing should be clear, concise, and engaging. As much as possible, technical words, phrases, and concepts should be avoided. The ideal exhibit card will ignite a spark of curiosity in the reader’s mind. Sample exhibit cards are included below.

Guidelines for the handout

The handout should provide compelling reasons for the importance of the mathematics represented by the books and objects on display and should guide the reader toward reputable and accessible books and websites for further reading. The content of the handout will be decided upon by the class and will be written by one or two students in consultation with the professor.

Sample Exhibit Cards

Written by Lauren Lessing and used with permission.

Memorial (Diantha Edwards Hairwork Memorial), 1859
Silk/Hair/Paper/Thread/Wood/Glass, 40 x 44.5 cm

During the nineteenth century, learning to make memorial pictures and samplers (decorative needlework pieces) was an essential part of a girl's education. Young women often incorporated hair into these objects. A long lasting and aesthetically appealing part of the body, hair was an intimate memento of deceased loved ones deemed suitable for domestic decoration. For this sampler, twenty-two-year-old Diantha Cole used the hair of both living and dead family members to create a memorial that undoubtedly held a prominent place in her Woodstock, Maine home. Such objects reassured Victorian Americans that, though temporarily separated by death, their families would be reunited in heaven.

John S. Blunt, *Mrs. Miller of Newton, New Jersey*, c.1830

Oil on canvas, 30 x 25 in.

Gift of Helen Warren and Willard Howe Cummings, 1957.017

Following the death of an immediate family member, nineteenth-century American women and older girls entered a period of ritualized mourning that commonly lasted two years. During the first twelve months—known as full mourning—they wore only black with very little adornment. They next moved into a period of half mourning, during which they incorporated white accents and black jewelry into their wardrobes. Finally, during light mourning, grey and lavender could also be worn. Although women who were not in mourning also frequently wore black, Mrs. Miller's abundance of jet jewelry—including a mourning ring on her left index finger—clearly conveys her status as a mourner.

The Gift: A Christmas and New Year's Present (Philadelphia, Carey and Hart [c1842])
[ROBSN PS2618 .P5 1842](#)

Open to engraving after Daniel Huntington's 1841 painting, "Mercy's Dream"

In Victorian visual culture, angels commonly appear to convey the dying to heaven or to welcome them there with open arms. Many adherents of the popular Spiritualist movement believed that angels also carried messages to the living on behalf of the dead. In nineteenth-century funerary sculpture and mourning imagery, angels (who are invariably young and beautiful) serve to soften and romanticize death.

This engraving after an 1841 painting by the American artist Daniel Huntington illustrates a scene in John Bunyan's seventeenth-century allegorical novel, *The Pilgrim's Progress*, in which a young woman dreams rapturously that an angel has appeared to carry her to paradise.

Erastus Dow Palmer, *Good Morning*, 1863
Marble, 16 in. x 12 1/2 in.
Lunder Collection, 117.2008

During a century when large families were common and child mortality soared above thirty percent, the loss of a child was a nearly universal experience. Parents assuaged their grief by displaying sweet, domesticated images of death in their homes and on the graves of their children. Palmer made sleep a gentle metaphor for death in several idealized sculptures of children including this one, in which a little girl peeking sleepily from between her bed curtains symbolizes a child reawakening in heaven. That viewers recognized and were deeply touched by such images is evident from the poem, "Lines Suggested by the Sight of a Beautiful Statue of a Dead Child," published in *Godey's Lady's Book* in 1834. Coming upon a life-like statue of a sleeping child, the writer laments, "I see thee in thy beauty! As I saw thee on that day-
-/ But the mirth that gladdened then thy home, fled with thy life away."