Cryptograph: An Exhibition for Alan Turing

Spencer Museum of Art / University of Kansas
March 24 - July 20, 2012

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Cryptograph: An Exhibition for Alan Turing

This Spencer Museum of Art exhibition is co-sponsored by and was conceived in consultation and collaboration with the Information and Telecommunication Technology Center and the Biodiversity Institute at the University of Kansas.

This catalogue is based on the exhibition label copy and three short essays from the exhibition brochure.

The exhibition and catalogue are offered in cooperation with The Alan Turing Year:
http://www.mathcomp.leeds.ac.uk/turing2012/

ISBN 10: 0-913689-56-4
SHORT ESSAYS

I

Our celebration of Alan Turing is long overdue. Best known for breaking the German Enigma codes during World War II, his contributions to mathematics, logic, and computer science were the catalyst for today's technological revolution. What he envisioned was a mathematical machine—called the “a-machine”—capable of simulating other machines. The a-machine executed a collection of instructions to manipulate data. The numbers and symbols manipulated by the a-machine were both data and instructions for manipulating that data. Sound familiar? What Turing imagined was the logical basis for what we now call a stored program computer. So powerful was the a-machine that it was proved to be capable of logically implementing and executing any computable function.

Today we know the a-machine as the Turing Machine, and every undergraduate computer science student still studies it. John von Neumann realized the mathematical Turing Machine as the physical von Neumann architecture that remains the basis of every electronic computer constructed. Today billions of computers—more than 20 for every living human being on earth—are driving the information age, controlling our critical systems, and revolutionizing our society. Yet, if one asks a random person on the street who invented the computer, almost no one will know.

There is more to Turing than his contributions to computer science. Turing was a gay man in 1940's England when being gay was illegal. Making his social situation worse, he stuttered, was considered donnish, and he almost certainly suffered from Asperger Syndrome. Although well-liked by his colleagues, Turing was definitely not the celibate, cuddly, absent-minded, messy-haired stereotype we have created for our great scientists. While his work in cryptography remained classified and thus unknown to the public, he was prosecuted for gross indecency. He was forced to undergo chemical castration, his clearance was revoked, and he was forced to give up his work in cryptography. Although he is now recognized among the greatest heroes of World War II, he committed suicide at the age of 41, long before he could
know the impact his work would have. Long before his contributions should have ended. Long before we would celebrate his life.

Today we appropriately celebrate the Turing Centennial through art. Through the appreciation of patterns and the information they represent. Turing’s machine was not inevitable. It was not a discovery. It was a singular act of creativity that changed and continues to change the world forever.

Perry Alexander
Director, Information and Telecommunication Technology Center (ITTC)
University of Kansas

II
Artworks have the uncanny ability to trigger memories, associations and connections. Our goal in this exhibition is to draw heavily on this potential of art to connect and visualize ideas in order to evoke the kinds of problems that fired Alan Turing’s imagination and research, such as the relationship between mathematics, machine, and mind: the encryption of information; the finding of meaning in patterns; the idea of artificial intelligence; and the application of mathematics to understand morphogenesis (how and why different organisms have evolved their specific patterns and forms).

We have chosen works of art that we believe are especially evocative of Turing’s intellectual world. For example, Albrecht Dürer’s 16th-century masterpiece, Melencolia I (seen here in a very close copy), invokes a magic square, a geometrical solid, and architectural tools to addresses the limits of human intelligence; Rohini Devasher’s Bloodlines, inspired in part by the work of evolutionary biologist Richard Dawkins, gives us a visually stunning meditation on morphogenesis; Bruce Conner’s remarkable inkblot drawing, August 2, 1995, might be seen as an essay on folding or as a collection of symmetries; and David Byrne’s tree diagrams ask us to consider the invisible relationships between categories.

Given Turing’s essential role in solving key problems that led to the development of the modern computer, we have also
taken this opportunity to share a number of works that would be unthinkable without the advent of the computer, including several key works from the early years of computing: a painting by Brion Gysin, *I Am That I Am*, that derives from the permutation poem composed with the help of a computer algorithm written by Gysin’s collaborator, Ian Sommerville, in 1959; and one of the monuments of early computer art, an algorithmic drawing produced with a plotter in 1970 by the husband and wife team of Colette Stuebe Bangert and Charles Jeffries Bangert. Butt Johnson’s *Study for Untitled (Eh Feck)* is an homage to Tetris®—the electronic tile game developed by Alexey Pajitnov in 1984; Alex Dodge’s *The Legendary Coelacanth* incorporates an EPROM memory chip; and Nolan Lem’s *metaWebern no. 2* makes specialized use of computing to generate a musical score and a musical recording.

It is important to acknowledge that the underlying code in these computer projects is in itself an art form. Karen Hanmer’s 2002 artist’s book, *BEAUT.E(CODE)*, wonderfully articulates this idea by sharing responses from computer professionals when asked what they find beautiful, compelling, or imaginative in the act of programming, such as “Well-written code is like well-written prose. There’s a flow. A clarity;” or “Beautiful software reflects a profound understanding of the world in some way.”

We might consider Turing’s contribution in terms of his ability to mediate between the conceptual realm of mathematics, the organic realm of the human mind, and the material realm of computers. The arts, sciences, and all creative work increasingly play provocative roles by engineering, connecting, and negotiating these realms as we move toward a future in which disciplines blend and seep into one another with startling new knowledge hybrids, such as Biocomputing, that build upon Turing’s precedent of synthesizing the seemingly disparate.

Stephen Goddard  
Senior Curator, Spencer Museum of Art  
University of Kansas  

III
Life is code. Not zeros and ones but A, C, G, T strung along the DNA strand of every virus, microbe, plant, and animal on the planet. A stands for Adenine, C for Cytocine, G for Guanine, and T for Thymine, the four base elements that order into genes and coil into a double helix. Their sequence is the software of life. They code the body, its creation, its construction. They tell it what to do, when to do it, and how. They shuffle, breed, and produce novel codes, generating the diversity of life. They mutate, malfunction, and make copying errors, crashing the program of life. They are the ghost in our machines, the silent ciphers behind our conscious “I think, therefore I am.”

Life is code with emergent properties. What first emerges are bits of DNA in a protein envelope living freely as a virus or bacterium, or living imprisoned inside a cell of a larger being, shackled as the cell’s mitochondrion to produce energy, or the ribosome to produce proteins, or the nucleus to command, control, regulate, and reproduce. Like software, life’s emergent properties cascade into ever increasing complexity and synchrony: cells meld into tissues, tissues into organs, organs into systems, systems into individuals, individuals into species, and species into breathing ecosystems. The emergent properties, like program code, are self-referent: ecosystems are the life-support systems of the planet on which every gene, cell, tissue, organ, system, individual, and species depend for survival.

Life is code that magically transforms the digital into analog, into evolutionary motion color. The staccato sequences of billions of A, C, G, and T become a blanket of algae staining the Nile red, a field of spreading sunflowers washing the Kansas prairie yellow, a thousand flamingos alighting on Lake Naivasha, dyeing the shoreline pink, a plague of brown locusts blotting out the Saharan sun, and the archaic coelacanth, massive and monstrous, murky in the depths of the Indian Ocean, an ancient knot on the code’s Tree of Life.

Like Alan Turing, it took mathematical cryptographers to decode life’s software, most famously, James Watson, Francis Crick, Maurice Wilkins, and Rosalind Franklin. Like Turing’s computational “universal machine,” they conceived and discovered life’s “universal machine” in which the genetic code is, simultaneously, the data--the actual
sequence and permutations of A, C, G, T—and the instructions that the data codes for: turn on, turn off, assemble that protein, make two legs, two hands, brown eyes, black hair, a mind wired to be brilliant, a singular individual called Alan Turing.

Leonard Krishtalka
Director, Biodiversity Institute
University of Kansas
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Glen Baldridge
born 1977, Nashville, Tennessee
*Double D’s*, 2009
lithograph, screenprint, woodcut, gold leaf on paper
Museum purchase: Museum of Art Acquisition Fund, 2010.0015.a,b

Baldridge’s *Double D’s* demonstrates that the same letters can have radically different meanings especially when tied to other visual clues, such as color, font, and additional characters ("&," in this case) and the viewer’s awareness of visual culture. One person’s Dunkin’ Donuts is another’s game of Dungeons & Dragons.

SG
Courtesy of the artists

Colette Stuebe Bangert
born 1934, Columbus, Ohio
Charles Jeffries Bangert
born 1938, Fargo, North Dakota

Large Landscape: Ochre and Black, 1970
algorithmic drawing, colored inks on computer-plotter paper
Gift of Colette Stuebe Bangert and Charles Jeffries Bangert, 1999.0232
Colette and Jeff Bangert were pioneers in the early days of computer-generated graphic art. This work, a unique algorithmic drawing, was produced by one of the Bangert’s programs (MELLY) written in the Fortran programming language. The artists recall that the steps involved in making this and similar works included typing code onto IBM 80-column punched cards with a keypunch machine, delivering the cards to the I/O (input output) desk at the KU Computer Center to have the program read from the cards and converted onto magnetic tape, receiving the tape from the I/O desk, and connecting the tape to a Calcomp plotter that did the actual printing.

Colette recently reflected, “When I first saw this drawing plotting...I knew I had never seen such a drawing...it influenced much of what I did from then on, and then I began to very slowly see what Jeff and I had drawn then to even now.”

SG

Courtesy of the artists
Colette Stuebe Bangert  
born 1934, Columbus, Ohio  
Charles Jeffries Bangert  
born 1938, Fargo, North Dakota  

The Plains Series II: MARCH, 2012  
algorithmic drawings, inkjet prints on paper  
Loaned by the artists

Colette and Jeff Bangert created an algorithmic work (MARCH) especially for this exhibition. The two programs were written in the C# programming language. AC4030 generates the foreground, which involves one-dimensional composition. AC4031 draws the background image, which involves blended colors.
David Byrne
born 1952, Dumbarton, Scotland, United Kingdom
active United States

Winnebago Trainspotters in the Universe, 2002
pencil on paper
Museum purchase: Lucy Shaw Schultz Fund, 2009.0016

The Evolution of Category, 2003
David Byrne noted in 2005 that his wonderfully playful explorations of diagrams started "a few years ago as instructions to myself in a little notebook—'draw an evolutionary tree on pleasure,' or 'draw a Venn diagram about relationships...'") The full body of nearly 100 drawings was published as a book in 2006 under the title Arboretum. In each of these drawings, Byrne explores unanticipated connections between things and/or ideas.

For the Evolution of Category the artist explains:

In the Borges story “The Analytical Language of John Wilkins” he describes a Chinese system of categorization that breaks down the world into Things The Emperor Owns and Everything Else. Claude Lévi-Strauss claimed that one of the most basic categories we humans have is “Can I eat it?” and then, “Do I like to eat it?” The way we categorize and perceive the world is sometimes based on what seem like arbitrary criteria.

For example, there could be intersecting layers of categories: brown things, brown things that are alive, brown things that will hurt me, brown things that make nice pants material. One imagines a kind of plaid semi-translucent three-dimensional Venn diagram representing these categories and their intersections. The number of categories in the world is, therefore, larger than the number of things in the world.
In these works, Saul Chernick considers the impermanence and mutability of meanings that are invested in icons and symbols. He incorporates imagery drawn from woodcuts created in 15th- and 16th-century Northern Europe, along with aspects of the visual languages of computing. In Chernick’s own words, these images seek to “merge the conventional idea of
an icon as a representation of the sacred, with the modern-day, technological conception as an image that represents a specific file, directory, window, option, or program.” Through his juxtaposition of these two forms of visual communication, the artist reveals each as a cryptic system whose significance is determined, in part, by the experiences of its viewers and its participation in a broader web of meanings.

Chernick suggests that the iconography of computing, as we know it, with its windows, toolbars, and drop-down menus, will someday fall into obscurity, just as the symbolic implications of Renaissance imagery have become confused with time. However, by juxtaposing these visual means of transmitting information, the artist also foregrounds formal and conceptual continuities that seem to bridge temporal boundaries that separate past from present. Thus, Book of Windows and Pangea demonstrate the compelling allure and weight of symbols, even in the absence of their original contexts.

CFK

© 2012 Conner Family Trust, San Francisco / Artists Rights Society (ARS). New York
Bruce Conner was active in many media and modes; his work spanned surrealism, cinema, assemblage, collage, and conceptual art. Throughout the 1990s he perfected a means of making drawings with multiple, nearly symmetrical inkblots. Conner was no doubt riffing on the work of the 1920s Swiss psychologist, Hermann Rorschach, who developed a psychological test that depended on the subject's interpretation of inkblots. These interpretations or perceptions were then analyzed psychoanalytically or through the use of algorithms.

Inkblots are made by applying ink to paper and then folding the paper while the ink is still wet so as to create a symmetrical (or nearly symmetrical) form by pressing the folded paper together and then opening it back up. Although seemingly random, Conner excelled at carefully controlling this process and he gave his drawings of multiple inkblots a sense of order through their grid-like organization. That these near-symmetrical forms are made possible by folds is provocative in computing science and genomics, where "folding" structures to find meaning and calculate values is a particularly important technique.

SG
Rohini Devasher  
born 1978, New Delhi, India  
active India

**Bloodlines**, 2009  
single-channel video, inkjet print, projection panel mounted on aluminum, two DVDs, Sony Beta archival tape  
Museum purchase: Helen Foresman Spencer Art Acquisition Fund, 2010.0066

In the scientific realm, as the rate of genetic modification accelerates, the boundary of form and function blurs and these chimera become more of a possibility of what could be.

—Rohini Devasher

Using mirrors and video feedback, Devasher created seven “mother” creatures (seen in the center of the composition) that were in turn used to spawn related families of biomorphic creatures. This large digital print charts these relationships. In the accompanying video, each creature is
projected with a radioactive glow on a black field. Devasher has been consumed with fashioning a universe of biomorphic entities in her prints and large-scale drawings. She calls the work “a warehouse full of impossible monsters,” an idea derived from evolutionary biologist Richard Dawkins (The Blind Watchmaker). In this work, Devasher dares to imagine a world of possibilities that may or may not exist, providing a genetic sequence through her artistic practice.

The light radiating lines seen in the background of Devasher's print describe a circular rendition of the “three-domain system” that organizes the evolutionary tree of life into three kingdoms on the basis of genetic similarities and the sophistication of cellular structure, as in the rendering below:

![Tree of Life Diagram](http://itol.embl.de/)

Courtesy Interactive Tree of Life (http://itol.embl.de/)
Alex Dodge
born 1977, Denver, Colorado

Everything Appears as it is: Infinite, 2011
six-color thermographic UV screen print on two-ply museum board
Museum purchase: Letha Churchill Walker Memorial Art Fund, 2012.0008

The title for this work is taken from a passage in William Blake’s The Marriage of Heaven and Hell. "If the doors of perception were cleansed every thing would appear to man as it is, infinite." For Dodge, the swimming pool encapsulates a similar dichotomy by invoking the systematic, gridded geometry of the tiled pool, as well as a chaotic system of turbulent waveforms that suggests a human or, in his terms, an organic presence. In the artist’s own words, “these images [of swimming pools] engaged an ordered logic represented by architectural form and digital space being uprooted by the chaos of complex and organic systems.”

Everything Appears as it is: Infinite was modeled in 3ds Max, a 3D computer graphics program. The pool and the waveforms were created separately, and Dodge photographed puddled ink to create the border-contours of the layers. SG
In *The Legendary Coelacanth*, Dodge provides us with a provocative juxtaposition of biological and technological evolution; of genetic code and computer code. The woman in a fetal position, in the same briny world as the coelacanth, puts humanity in direct contact with both biological and electronic realms. Asked about this, the artist expanded:

The extended systems of communication that are nested in the work are genetic across multiple species, to more higher-level human systems of language and
printing, and eventually non-human systems, but each intertwined with each other.

The memory chip is an AMD Am27C020 chip with ultraviolet 2 Mbit erasable, programmable, read-only memory (EPROM). The artist explains:

I don't usually have the opportunity to explain the memory chip in detail. I chose this version of memory chip for a few reasons. On one hand the clear window allows the viewer to see the actual etched silicone semiconductor inside. This I thought was a wonderful way of revealing the extension from the seemingly antiquated and traditional printmaking process of engraving that the image on paper is made with... because the process of making integrated circuits is really just another form of printmaking itself. All modern chips are simply made with photo lithography...very very small photo lithography, but in principle the same photo and acid resist techniques used to print all information since Guttenberg. The other reason I wanted to use this chip is that it is ultraviolet light erasable: that is, you can clear the chip’s memory by exposing it to extreme ultraviolet light. I thought that it was a wonderful sort of symmetry that even the virus contained on the chip could be vulnerable like all other life.

The virus itself is a real but harmless computer virus, a modified form of NRLG or NuKE's Random Life Generator. The modified version that I made and dubbed the "coelacanth virus" doesn't have a destructive payload...and wouldn't even be able to run on/infect most of the computers on the net today.

SG
Coelacanth at the KU Natural History Museum
Latimeria chalumnae,
972mm total length. Weight 13.5kg.
Captured on island of Grand Comore in the Comore Islands in 1986 by a local fisherman.
KU 22082
(may be seen by request - contact Ichthyology Collection Manager)

Coelacanths are known from the fossil record from as far back as 65 million years ago. All were thought to be extinct until December 1938, when Marjorie Courtenay-Latimer, curator at the museum in East London, South Africa, found a strange fish in a pile brought in by a trawler to the harbor. There are now five known populations of coelacanth (Sodwana Bay, South Africa; Madagascar; Kenya; the Comore Islands; and Sulawesi, Indonesia) and two distinct species. Little is known of coelacanth biology or ecology. They are known to live between 150-200 meters down and migrate closer to the surface at night to feed. They are slow growing and give birth to live young from eggs larger than a softball. They selectively live in volcanic cave-type environments, hence their patchy distribution. The largest population is thought to be in the Comores, a small island group off the western coast of Africa, and number approximately 500 individuals which can be identified by the white spotted pattern on their bodies, much like whales tails are used to identify individual whales.

Coelacanths are classified as severely endangered and threatened species due to extremely small population sizes, slow growth and reproduction and relatively high incidental bycatch by local fishermen (10-15 per year). Every coelacanth in a museum has a Coelacanth Conservation Council (CCC) number. This one is number 140.

AB
Wilhelm (Willi) Geißler
born 1895, Hamm, Germany; died 1977, Wuppertal, Germany

Der Musiker (The Musician)
Der Arbeiter (The Worker)
Der Dichter (The Poet)

from Der künstliche Mensch / Zehn Blätter der Anklage
(The Artificial Man / Ten pages for the prosecution),
circa 1925
from Kunst der Jugend (Art of Youth) no. 7
woodcut
Museum purchase: Elmer F. Pierson Fund, 2011.0075.06, 08, 11

Alan Turing would have been eight years old when the word “robot” first appeared shortly after World War I, in Karel Čapek’s play of 1920, R.U.R. (Rossum's Universal Robots). Only a few years later Geißler produced a remarkable series of woodcuts showing mechanical people busy at their professions: soldier, mathematician, musician, dancer, bureaucrat, king, poet, schoolmaster, gymnast, and worker. The War brought horrendous damage by new machines of war, and left many people dependent upon mechanical prosthetic devices. In its aftermath, Geißler—who had served as a soldier from 1916-1918—created this series satirizing a world populated with electro-mechanical robots. The musician, for example, sits at the piano playing “The Soul of Music,” and the author of the short preface to the portfolio, Dr. Oswald Schmitt, wrote that the mechanical man is the Grabkreuz [“trench-cross” or burial ground] of Europe. Turing, however, was instrumental in moving us rapidly from a mechanical to an electronic age; from his theoretical “Turing machine” to the real world of computing and all its progeny.

SG
Brion Gysin
born 1916, Taplow, England, UK; died 1986, Paris, France
untitled strip painting (I Am That I Am), 1961
watercolor, acrylic on paper
Loaned by the Estate of William S. Burroughs, L1990.001

Brion Gysin, an experimental artist, poet and inventor of the “cut up” technique made famous by his collaborator William S. Burroughs (1914-1997), was quick to investigate the ways computing might serve the arts. Gysin had been captivated by the Old Testament phrase “I am that I am” (God’s answer to Moses’ question about God’s name - Exodus 3:14). Noticing that the phrase lacked symmetry, Gysin observed “all I had to do was to switch the last two words and it asked a question: 'I Am That, Am I?'” In 1960, Cambridge-educated mathematician and technician Ian Somerville collaborated with Gysin by producing a computer algorithm that created and randomized all of the permutations of the five-word passage.

SG

Karen Hanmer
born 1961, active Chicago, Illinois
BEAUT.E(CODE), 2002
ink, punching, rubber band
BEAUT.E(CODE) is a book made up of 36 keypunched computer cards. Created by book artist Karen Hanmer in collaboration with computer professionals, each page bares a personal statement about what these individuals find beautiful, compelling, or imaginative about the act of programming. The cards themselves represent an analog method of storing and transmitting computer code that, while obsolete, was the primary support for data from the advent of the jacquard loom in the 19th century through the 1980s. Standard cards such as these were designed at the IBM Corporation in 1928, and contain 80 columns, each with 10 numerical positions. The contributing writers of BEAUT.E(CODE) limited their statements to less than 80 characters (the maximum content of any single punched card), demonstrating an elegant concision that echoes their individual statements about the refinement and grace of well-written code.

KU’s Nichols Hall, home of the Information and Telecommunication Technology Center (ITTC), was designed to resemble a keypunch computer card.

CFK
Hausa-Fulbe peoples
Fulbe, Sahelian
woven food cover, 1982
plant fiber, coiling, dyeing
Gift of Professor Beverly Mack, 2011.0199

The food covers made by the Hausa-Fulbe peoples of northern Nigeria incorporate woven “signature” patterns that identify the village in which the food cover was made. While the Hausa-Fulbe peoples can identify where a food cover was made on the basis of its pattern there appears to be no “code book,” no published resource with this information.
Butt Johnson
born 1979, Suffern, New York
Study for Untitled (Eh Feck), 2009
lithograph
Anonymous gift, 2010.0019

Russian scientist Alexey Pajitnov used a rack-mounted 64 kb Elektronika 60 computer to develop the electronic tile game Tetris® in Moscow in 1984. For a person well-versed in the game this is not a random pattern but a pattern created by the seven shapes known as Tetrminos (shapes formed by four, connected squares). The player lost the game when the Tetrminos were falling too fast for the player to keep up and move them into a proper, densely packed, winning position.

SG
Stephen Johnson
born 1964, Madison, Wisconsin
The Letter "N", 1995
pastel, watercolor, gouache, charcoal, on paper
Museum purchase: Peter T. Bohan Art Acquisition Fund, 2005.0059

In 1995 Johnson published an ABC book, Alphabet City, based on letters hidden in the urban environment. This is the letter N.

SG
Philosopher Hiroshi Kawano, who has just enjoyed a major retrospective at ZKM (Center for Art and Culture, Karlsruhe, Germany), has been involved with computers as art makers (he does not like the term "computer artist") since 1964. He participated in two early portfolios of computer-generated art. Art Ex Machina of 1972 and the SDL Portfolio of 1973 (the latter was commissioned by Systems Dimensions Limited). Both portfolios were published by Gilles Gheerbrant in Montréal, and both include an artist’s statement to accompany each print. The SDL Portfolio also includes biographies and a description and/or a schematic diagram describing the program used by each artist.

The other participants in the Art Ex Machina portfolio are: Manuel Barbadillo, Ken Knowlton, Manfred Mohr, Frieder Nake, and Georg Nees.; and the other participants in the SDL Portfolio are: Manuel Barbadillo, Ken Knowlton, Manfred Mohr, Georg Nees, John Roy, Zdeněk Sýkora, Roger Vilder, and Edward Zajek.

SG
Nolan Lem
born 1986, Kansas City, Missouri

metaWebern no. 2, 2011
graphic rendering, inkjet printing, digitally adapted music
Loan from the artist

The artist explains:
metaWebern is a series of audio-visual compositions that utilizes a computer program that performs different-processed based operations onto written scores and their complementary sound recordings. This selection uses the music and scores of the Viennese composer, Anton Webern (1883-1945)
These graphic renderings depict a non-linear process whereby the pixel width of each page in the score is arranged side-by-side along with the other pages in the score. Upon each iteration, the width of each score "snippet" is widened at a rate that doubles each time ($2^n$).

The subtle variations of the individual scores' parameters—alignment, margins, notehead, articulation markings, fonts—unwind to reveal iterative textures. Ultimately these renderings depict the repetitive deconstructions of the scores' notational elements, forming a visual representation of the notations as they emerge from the score.

To hear the composition, use your cell phone to dial 785-338-9467 and enter 86#

SG

Courtesy of the artist
In this preliminary study, Massad shows his calculation of the golden ratio, in order to construct a golden rectangle that he then uses to lay out his composition for *Pears*. The golden ratio, which has many applications in many fields of endeavor, is defined as:

The division of a line so that the whole is to the greater part as that part is to the smaller part (i.e., in a ratio of 1 to 1/2 ($\sqrt{5} + 1$)), a proportion that is considered to be particularly pleasing to the eye.

Or, expressed graphically:

\[ \frac{a+b}{a} = \frac{a}{b} \]

\[ a+b \text{ is to } a \text{ as } a \text{ is to } b \]
This ratio (approximately, 1.6180339887498948482) appears in art, architecture, and book design; in fractal geometry and crystal formation; it is also closely related to the Fibonacci sequence that, in turn, can be observed in many naturally occurring forms.

SG

Charles Maurin
born 1856, Le Puy, France; died 1914, Grasse, France
Le Géomètre (The Geometer), circa 1900
etching
Museum purchase: Letha Churchill Walker Memorial Art Fund, 2011.0057
This print is probably a portrait of François-Rupert Carabin (1862-1932), a friend of the artist who was best known as an art nouveau furniture designer. The complex form in the foreground is the carved back of the sitter's chair.

The geometric diagram that the sitter (Carabin) contemplates is probably an inexpertly drawn “golden triangle” or “sublime triangle,” an isosceles triangle in which the ratio of the hypotenuse to the base is equal to the "golden ratio," for which please see the adjacent pair of works by Dan Massad.

SG

Courtesy of the artist

Andrew McLaren
active Calgary, Alberta
Annual Report, 2006
inkjet printing, lamination, matches, two pence coin
Museum purchase: Elmer F. Pierson Fund, 2012.0007

McLaren has worked for many years on an "object-based calendar system" utilizing hand-made dice (six-sided for the standard year, eight-sided for leap years). Although he found the physical installations of his "time machines" to be difficult to maintain, they remain an interesting analog to other computing machines.

SG
Paul Noble
born 1963, Dilston, Northumberland, England, UK
A. 2002
Paul's Place, 2002
etchings
Museum purchase: R. Charles and Mary Margaret Clevenger
Art Acquisition Fund, 2009.0173-74

For much of his career Paul Noble has been at work on an expansive and detailed visualization of his fantastic and personal city, Nobson Newtown, which the artist described as
"town planning as self-portraiture." In some passages of the enormous drawings that form part of this effort, the individual structures take the form of letters allowing words to be teased out of clusters of buildings. The artist described this wordplay as "the painstaking design of a special font based on the forms of classic modernist architecture."

The two prints exhibited here form a contiguous landscape that features the letter "A" and "Paul's Place," the artist's private domain with an outdoor sculpture studio and a spindly jungle gym that may be inhabited by an encrypted message.
SG

Oswald Mathias Unger
born 1926, Kaisersesch, Germany; died 2007, Cologne, Germany
Morphologie: City Metaphors, 1982
offset lithograph
Museum purchase: Elmer F. Pierson Fund, 2012.0005

In this small volume, architect, artist, and theorist Oswald Mathias Unger engages with morphology, the biological study of the internal and external forms of life, which focuses particularly on structures and patterns. Rather than limiting his scope to the natural world, Unger playfully explores the morphology of his entire visual universe, incorporating prints, drawings, photographs, and diagrams.
from a range of sources and time periods. He narrates this exploration through single words, iterated in English and German, alluding to the morphologies of language as well as form. Ungers creates a dialogue between the micro and the macro through the juxtaposition of maps, city plans, and architectural diagrams with representations of human figures, plants, animals, and even cell structures.

In the introduction to his artistic inquiry Ungers states: “This book shows the most transcendental aspect, the underlying perception that goes beyond actual design. In other terms, it shows the common design principle which is similar in dissimilar conditions. There are three levels of reality: the factual reality—the object; the perceptual reality—the analogy; and conceptual reality—the idea, shown as the plan—the image—the word.”

CFK

Hannah Weiner
born 1928, Providence, Rhode Island; died 1997, New York, New York

**Signal Flag Poems**, 1968
from **SMS Portfolio**
offset lithograph
Museum purchase: Letha Churchill Walker Memorial Art Fund and Gift of Mr. and Mrs. William Shearburn, 1994.0027.25
As the artist states in her concise introduction, these poems are both drawn from and transformed into the signals set forth in The International Code of Signals for the Use of All Nations. Conceived in 1855, this code facilitated communication between ships at sea. These three-letter alphabetic ciphers could be created visually by flags and later combinations of lights, or sonically by Morse code. This system not only allowed sailors to communicate across wide swathes of ocean, but also functioned as a kind of common language that could be understood regardless of linguistic or national affiliation. Therefore, like mathematics and art, this code transcends verbal barriers. Furthermore, Weiner’s use of The International Code of Signals allowed the poet/artist to navigate fluidly between the visual, written, and spoken expression. CFK
Attempts to interpret this composition, conceived by the German renaissance artist and humanist, Albrecht Dürer (and seen here in an excellent copy of the print by Jan Wierix) have generated vast amounts of scholarly discussion. In the mid-20th century, German art historian Erwin Panofsky called it “in a sense a spiritual self-portrait” of Dürer. Indeed, the interests and practices of the original engraver invite such a reading. As both an artist and mathematician, Dürer
produced work that was informed by his belief that beauty was dependent on a system of measurement. He wrote that “the measurements of the earth, the waters, and the stars have come to be understood through painting.” The ancient concept of ideal proportions relates to the modern field of mathematical biology, where mathematical tools aid the understanding of non-linear biological mechanisms. Just before engraving Melencolia I, however, Dürer conceded that no mathematical system could sufficiently define beauty. Panofsky states that, like the personification of Geometry with her tools of measurement, Dürer reached a melancholic state because he suffered from the limits of the human mind. He yearned for a mathematical theory that would overcome the shortcomings of his own intellect. Despite numerous attempts at identifying the key to unlocking its meaning, the work remains enigmatic.

LJW

![Image of a diagram with various geometric shapes and annotations.](image)

Courtesy of the artist

Michael Winkler
born 1952, Lima, Ohio
Ligns. 2006
offset lithograph
Museum purchase: Elmer F. Pierson Fund, 2012.0006
“Language is curled and bent to replicate an intuitive process”

In this statement, pulled from the idiogrammatic text of Ligns, the author/artist reveals how his work conflates word and image by creating linear ciphers that correspond to words by connecting letters arranged in circular diagrams. The artist calls these signs “spelled forms,” a term that seems to link the process of spelling to the fabrication of forms through drawing or sculpture. While Winkler uses these ciphers throughout many of his artworks, Ligns functions as a kind of manifesto, articulating the artist's thoughts about the intersections of visual and written communication and their confluence in codes and symbols.

CFK

Courtesy of the artist

Xu Bing
born 1955, Chongqing, Sichuan province, China
active China, United States

Page proof from Book from the Sky (Volume 1, Page 91), 1987-1991
woodcut
Museum purchase: Gift of Arthur Neis, 2008.0332

First exhibited in China in 1988 and 1989, Book from the Sky (evoked here by a page proof) is an undertaking of epic
proportions that addresses the relationship between language and authority and expresses the artist’s conflicted feelings toward words and books in post-Cultural-Revolution China. Xu Bing designed 4,000 characters, carved them in wooden blocks, and used them to print the four volumes of Book from the Sky with painstaking attention to traditional methods of printing and binding. However, the seemingly authentic Chinese characters are inventions of the artist and cannot be read. Although illegible, the work does carry a powerful message, as Xu Bing himself noted, “to change the written word is to strike at the very foundation of a culture.”

SG

Adding a twist to the pictographic roots of Chinese writing, Xu Bing’s landscapes represent landscape elements with appropriate characters—the character “tree” for a tree (or many of them for a forest), a pile of the character “mountain” for a mountain, etc. The landscapes also

Xu Bing
born 1955, Chongqing, Sichuan province, China
active China, United States
offset lithography on Nepalese paper, plastic case
Museum purchase: Gift of Arthur Neis and the Museum of Art Acquisition Fund, 2008.0333.01-4
incorporate sentences describing the changing elements in the landscape. Thus the “landscape” can be read both pictorially and verbally. This series of postcards reproduces landscript drawings in Xu Bing’s sketchbooks made during a trip to the Himalayan Mountains outside of Katmandu. The postcards were sold as part of the artist’s effort to raise funds for the poor he encountered in Nepal.

SG