6. History of Mazes and Labyrinths

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Definitions

2 Cretan-style Labyrinths
- How to draw a Cretan-style labyrinth
- Origins of Cretan-style labyrinths
- Labyrinths as metaphors for architectural complexity
- European labyrinths
- Asian labyrinths
- North American labyrinths

3 Roman Labyrinths

4 Christian Labyrinths
- Labyrinths in monastic manuscripts
- Labyrinths in medieval churches
- Turf labyrinths in the British Isles

5 Mazes
- Origins
- Garden mazes
- Miscellaneous mazes

6 Bibliography
Labyrinths

A *labyrinth* is a randomly convoluted path. Typically, it is *unicursal*: having no branches. Labyrinths are used for decoration, folk and religious ceremonies, and spiritual symbolism.

The word likely originates from the ancient Greek word *labrys*, a double-headed axe used by the Minoans on the island of Crete. Thus, *labyrinthos* may mean “house of the double-headed axe.”
Mazes

A *maze* is an intricate network of paths, usually designed as a puzzle. Thus, a maze having branches is said to be *multicursual.*

The hedge maze at Hampton Court.
Seven-circuit Labyrinth
Now, you try!
How to draw a seven-circuit labyrinth

Step 1: Draw the *nucleus* as a cross with four rounded corners and four dots.
How to draw a seven-circuit labyrinth

Step 2: Connect the top leg of the cross to the upper-left corner.
How to draw a seven-circuit labyrinth

Step 3: Connect the upper-left dot with the upper right corner.
How to draw a seven-circuit labyrinth

Step 4: Connect the upper-right dot with the upper-left corner.
Step 5: Connect the left leg of the cross with the upper-right corner.
How to draw a seven-circuit labyrinth

Step 6: Connect the right leg of the cross with the lower left corner.
Step 7: Connect the lower-left dot with the lower-right corner.
Step 8: Connect the lower-right dot with the lower-left corner.
Step 9: Connect the bottom leg of the cross with the lower-right corner.
Now, try again!
Estimating the path length

Imagine that we cut each wall perfectly in half, and uncoil the labyrinth so that the branchless path assumes the form of a long, thin rectangle.

\[ A = (w + t) L \]

where,

\[ w = \text{width of the rectangular passage}, \]
\[ t = \text{original wall thickness}, \]
\[ L = \text{path length}. \]

The area of this rectangle is \( A = (w + t) L \). Thus, \( L = \frac{A}{w + t} \)
Eleven-circuit Labyrinth
Ancient Cretan-Style Labyrinths

One of the oldest known labyrinths: rock carving at *Tomba del Labirinto*, Luzzanas, Sardinia (c. 2500–2000 BCE).

Cretan-Style Labyrinths on Coins

Cretan coins (from 430 to 67 BCE) from the British Museum.

Fisher and Gerster, 1990 [1, p. 16].
The Minotaur, a mythical beast that was half man and half bull, lived in a labyrinth on the island of Crete, designed by Daedalus for King Minos. Every nine years, seven Athenian men and seven Athenian maidens were to be sacrificed to the Minotaur. Theseus, son of King Aegeus, ruler of Athens, traveled to Crete in order to slay the Minotaur to end this barbarism. Before Theseus entered the maze, King Minos’s beautiful daughter, Ariadne, gave him a ball of golden thread to help him mark his way. And so we obtain the idiom “to thread a maze.”

Theseus’s *Voyage to Crete* (detail), Master of the Campana Cassone, Musée du Petit Palais, Avignon, France, (Art Resource/NY), c. 1500.
The palace floor plan, c. 1500 BCE, [2, p. 47]. Were its myriad of passages, connecting over one-thousand rooms, the inspiration for Daedalus’s mythical labyrinth?
Labyrinth of King Amenemhet III (1842–1797 BCE)
El Faiyum, Egypt

“The Labyrinth surpasses the pyramids. It has twelve courts, all of them roofed, with gates exactly opposite one another, six looking to the north, and six to the south. A single wall surrounds the entire building. There are two different sorts of chambers throughout — half under ground, half above ground, the latter built upon the former; the whole number of these chambers is three thousand, fifteen hundred of each kind. The upper chambers I myself passed through and saw, and what I say concerning them is from my own observation; of the underground chambers I can only speak from report: for the keepers of the building could not be got to show them, since they contained (as they said) the sepulchers of the kings who built the Labyrinth, and also those of the sacred crocodiles. Thus it is from hearsay only that I can speak of the lower chambers. The upper chambers, however, I saw with my own eyes, and found them to excel all other human productions; for the passages through the houses, and the varied windings of the paths across the courts excited in me infinite admiration, as I passed from the courts into chambers, and from the chambers into colonnades, and from the colonnades into fresh houses, and again from these into courts unseen before. The roof was throughout of stone, like the walls; and the walls were carved all over with figures; every court was surrounded with a colonnade which was built of white stones, exquisitely fitted together.”

(HERODOTUS, Histories, II, 148, c. 450 BCE)
Labyrinth of King Amenemhet III (1842–1797 BCE) 
El Faiyûm, Egypt (cont.)

A speculative design of the Egyptian labyrinth at Fayum created by Althanasius Kircher, *Turris Babel Sive Archontologia*, Amsterdam, 1679.

(From, Kern, 2000 [2]).
Cretan Labyrinths in Ireland

The "Hollywood Stone", (c 500 CE) was discovered near Hollywood in West Wicklow, Ireland. It can now be found in the Visitor Center in Glendalough.

Fisher and Gerster, 1990 [1, p. 28].

See also www.labyrinthireland.com/irishlabyrinths.html
Troy Towns of Scandinavia

Stone labyrinth in Copenhagen, Denmark. [2].
Tantric drawings from Northwestern India

Seventeenth century manuscript likely originating from Rajasthan. [2, p. 293].
Cretan-Style Labyrinths in India

Rock Carving at Halibid, India (c. 1200 CE) contains approximately five circuits, with a center spiral.

From, Kern, 2000 [2, pp. 284–287].
Cretan-Style Labyrinths in India

Rock Carving at Halibid, India (c. 1200 CE) contains approximately five circuits, with a center spiral.

From, Kern, 2000 [2, pp. 284–287].
Ancient Cretan-Style Labyrinths in Sumatra

Decorative column at the royal residence in *Purmatang Purba, Sumatra*.

Herman Kern, 2000 [2, pp. 296–298].
Native American Labyrinths

Native American wall relief at Casa Grande, near Phoenix, Arizona. Dating, such inscriptions is prone to uncertainty. The wall was finished c. 1200 CE, but when was the labyrinth inscribed? Kern [2] and Schuster [4] question speculations that this design in the southwestern United States results from post-Columbian European influence. (Seventeenth century Spanish missionaries would have spread a Christian design, discussed below.)

From Herman Kern, 2000, [2, p. 300].
Hopi Indian petroglyph near *Oraibi, Arizona*.

From Herman Kern, 2000, [2, p. 299].
The Man in the maze

The Pima Indians believed in a spirit named “Siuku,” (called “litoi” by the Papago or Tohono O’odham tribe), who would burgle people’s homes, cause other mischief, and escape to his house, high on top of Baboquivari Mountain, by following a path so convoluted and labyrinthine that no one has every found it. [2]. That these labyrinths are deeply rooted in Native American folklore, suggests that they were not the product of European colonization. A modern Pima Indian basket, Fisher and Gerster, 1990 [1, p. 20]
Other Ancient Cretan-Style Labyrinths

- Ceramic vessel found at Tel Rifa’at, Syria (c. 1300 BCE).
- Clay tablet found at Pylos, Greece (c. 1200 BCE).
- Rock carving at Padugula in South India (c. 1000 BCE).
- Rock carving at Val Camonica in Northern Italy (c. 1000–500 BCE).
- Rock carving at Kom Ombo in Egypt (c. 50 BCE).
- Drawing in Sutan, East Afganistan, “Shamaili’s House.”
- House of Lucretius, Pompeii, Italy (before 79).
- The Rosaring in Uppland, Sweden (c. 815).
- Volundarhus, a stone labyrinth in Iceland (c. 1200).
Roman Labyrinths

Roman labyrinths can be found throughout Europe. Floor mosaic from a Villa in Cremona, Italy. First century CE.

(www.theoi.com/Gallery/Z45.2.html)
Jericho Labyrinths

A parchment manuscript from Abruzzi, Italy, c. 815 CE that depicts the City of Jericho (URUEM GERICHO) as a seven circuit, Cretan-style labyrinth. This is one of the earliest of many of such depictions of Jericho as a labyrinth. However, the rationale for this particular association is not known. Perhaps it is inspired by the biblical passage, “By faith the walls of Jericho fell, after the people had marched around them for seven days.” [Hebrews, 11:30] The sketch to the right of the labyrinth represents Solomon’s knot. A later Greek manuscript attributes the invention of the labyrinth to King Solomon. [2, pp. 126–131]
Circular “Christian-Style” Labyrinths

The oldest known representation of the Chartres-style labyrinth is found in a calculation book, from the monastery of St. Germain-des-Près, Paris. Calculation books like these were used for tracking astronomical cycles, and for determining the days of Easter, which follow a lunar cycle. The labyrinth appears on the flyleaf, which is dated 989.

(Kern, 2000, [2, p. 112])
The Rise of the Gothic Basilica

Vezaley Basilica (c. 1050 CE)
St. Denis Basilica (c. 1150 CE)

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This small 12th century wall carving appears in the Cathedral of San Martino in Lucca, Italy. The Latin text to the right of this labyrinth, visible in the lower drawing (from Durand, 1857), translates to

*Here is the labyrinth that Daedalus from Crete built, and which no one can exit once inside; only Theseus was able to do so thanks to Ariadne’s thread.* [2].
The labyrinth in the Cathedral of Sens, France, was destroyed in 1768 in order to repave the floor in marble. After the repairs, the labyrinth was not restored. Kern states that it was destroyed because children played on it during religious ceremonies [2]. Church records also indicate that the labyrinth was used for an annual procession and dance every Easter since the 13th century (Wright 2001 [5]). The design is the mirror image of the Chartres labyrinth.

Illustration from Kern, 2000 [2, p. 163].
Labyrinth in Chartres Cathedral (c. 1220)

From Herman Kern, 2000 [2].
Labyrinth in Reims Cathedral (c. 1290)

The drawing at right was written c. 1585, by Jacques Cellier, and translates to

This is the labyrinth [dedalus] in the nave of the church and the people in it represent the architects who supervised the construction of this church.

The design was constructed out of black marble, set in white stone. Each architect is depicted at work, with their tools: a square and compass. The octagonal labyrinth was destroyed in 1778, because the noise it generated by young children at play was deemed to be too distracting for the canons during their worship.

From Herman Kern, 2000 [2].
Labyrinth in Amiens Cathedral (1288)

The drawing at right was dated 1611, by Dom Nicolas de Rély, a Benedictine monk, and authenticates the original design of the labyrinth set in the nave of the cathedral of Amiens. The original labyrinth was replaced with an exact replica in 1897, following restoration to the floor that began in 1827. Though the design is octagonal, the order of the turns mirrors that of the labyrinth at Chartres.

From Herman Kern, 2000 [2].
Turf Labyrinths in the British Isles

Kern, 2000, [2, p. 251].
The Invention of the Multicursal Maze (c. 1420)

Parchment leaves from *Designs for Instruments of War*, by Giovanni Fontana, a Venetian doctor. The left design is circular like many church labyrinths of the day. Note however the innovation of junctions. The maze walker must now decide which path to take! (From Kern, 2000 [2, p. 138].) Interestingly, the script is in code.
A unicursal garden maze design by Hans Vredman de Vries (Antwerp, 1615).
The Rise of the Garden Maze

A multicursal garden maze design by Hans Puec (Antwerp, 1592).
The Hedge Maze at Hampton Court Palace.

(Photograph from Herman Kern, *Through the Labyrinth*, Prestel, Munich, 2000.)
The 2003 Great Vermont Corn Maze

www.vermontcornmaze.com
The 2006 Great Vermont Corn Maze

www.vermontcornmaze.com
Bach’s “Little Harmonic Labyrinth”

Johann Sebastian Bach
(31 March 1685 – 28 July 1750)
(Portrait by Haussmann, 1748.)

(Kern, 2000, [2, p. 244])
The Myth of Theseus

(Cartoon by Charles Addams, *The New Yorker*, June 7, 1976.)
Some modern mazes

Intel Xeon 5600, Hexacore has over 1,000,000,000 transistors.
“It’s not a big truck. It’s a series of tubes.”
“It’s not a big truck. It’s a series of tubes.”

The Blue Brain Project, Ecole Polytechnique Federale de Lausanne, Switzerland
http://bluebrain.epfl.ch
\[ F = ma \]
\[ \nabla \cdot B = 0 \]
\[ \nabla \cdot D = 4\pi \rho \]
\[ \nabla \times E = \frac{\partial B}{\partial t} \]
\[ \nabla \times H = \frac{\partial D}{\partial t} + 4\pi J \]
\[ \Delta S \geq 0 \]
\[ i\hbar \frac{\partial \psi}{\partial t} = \mathcal{H} \psi \]
\[ R_{\mu\nu} + \left( \Lambda - \frac{R}{2} \right) g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu} \]
Bibliography I


Bibliography II

[5] Craig Wright, 
*The Maze and the Warrior: Symbols in Architecture, Theology, and Music*, 

[6] www.visualcomplexity.com contains many interesting examples of complex structures, things that we might classify as “conceptual labyrinths.”