

MATHEMATICAL ARIADNE: THE LABYRINTH

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Subject

Daedalus built the labyrinth for Ariadne to dance in. The lady of the labyrinth, once goddess of the underworld (Persephone), comes and goes endlessly from the world of shadow. The rhythm of life-death-life is the basic idea of the *infinite*. In the Cuneiform tables of Mesopotamia the labyrinth is the “palace of the viscera” and is represented by a double spiral that replicates animal entrails inspected for divination purposes. The archive on the Babylonian viscera shows a similarity to the prehistoric labyrinths of northern Europe and Scandinavia. In Cnossus during the Minoan period, the double spiral changed into an angular meander based on a geometric scheme of four squares surrounding one square (of the Minotaur). Mythological caves and labyrinths express something mortal which is able to enter into a dialogue with life, of which the permanent symbol is light. The sun that illuminates the earth is the absolute metaphor of life and was so even for prehistoric man. In its double winding, the labyrinth describes the continuous cycle of life and of death. As a design of the infinite, it is the image of the totality of life-death. The double spiral was transformed into an angular meander at a precise moment, coinciding with a culture (Minoan)¹, into which the ability to reason had entered and established itself at the very heart of mythological culture. Ariadne is *two* Ariadne's: Ariadne of Crete and Ariadne of Dia (Naxos?). In Homer (the *Iliad*), the daughter of King Minos, who had become a mortal creature, helps the handsome young Theseus to exit the labyrinth by giving him a ball of yarn (a spiral). Upon Dionysus' wish, the young woman is then killed by Artemis. Or maybe not. After being held prisoner by Theseus on the Island of Dia (Nasso?), the young woman lay sleeping until Dionysus took her, boasting his right by an ancient law.

Myth and Body in Metaphysical Space

Mythological Hades (hell), the intestines (the body), the life-death rhythm and the relationship between the conscience and the unconscious, form a semantic grouping in de Chirico's work. De Chirico holds the various components close to himself through the continuous winding and unwinding of his personal history since

¹ The swastika labyrinth appears in the II palace of Cnossus. V. K. Kerényi, *Nel Labirinto*, Bollati Boringhieri, Turin, 1983.

childhood and his relationship to his parents. This is further manifested in the fundamental metaphor of his intestinal ailment (the labyrinth). Metaphysical painting combines person, psyche and world into one proposition. From its inception in 1910 the image vibrates with the concept of infinity. Its resonance box is space. The disposition or the ordering of space is young de Chirico's primary exercise in Paris, in the period from 1911 and 1915. His first annotations, conserved at the Musée Picasso of Paris in the *Eluard-Picasso Manoscritti* (after 1912), document a hidden reality of space. The accent falls unremittingly on prehistory and classicism, in particular on the arcades of Rome. According to rediscovered documental sources, de Chirico carried out paleoanthropological and archaeological investigations simultaneously in order to satisfy his philosophical need for a space as the frontier or limit between the inside and the outside (transcendental space). The metaphysical piazza is a perspective box from an erstwhile academy equipped with scenographic expedients and defined by mathematical and astronomical calculations (for the shadows). With children and primitive people space is a concept connected to the self. Thought uses *physical space* to locate external objects, while *psychological space* is the seat of internal experience. *Mathematical space* is a transcendental form or an ideal of space that is useful for the organization of the first two. The concepts of forward, backward, right, left, become length, width, height. Mathematical space generalizes physical space and mental space. Though when de Chirico confronted the psychic experience in its totality, oneiric space and the space of the unconscious were yet to be delineated as structure. It is only Cantor who gives an indication of this kind with *Transfinitum*.³

The dream (Cicero's *Somnium Scipionis*, Francesco Colonna's *Hyperotomachia Poliphili*) is the setting in which de Chirico's psyche presents itself. The connections between the phases and objects of dreams pose problems which do not fit into a frame of three dimensional space with linear time. Spearman's question is pertinent: "With what kind of cement or agglutination can one suppose that various ideas are mixed into a judgement?"⁴ Total conscience (conscience-unconscious) does not follow a linear path of succession and a development that is three dimensional, but homogenises times and facts that are distant from one to another and creates associations. However numerous and free they may be, these are never arbitrary. They are simply *infinite*. What interests us is to grasp the infinite as an *all*, which would allow it to become an image.

Analogous to David Hilbert's approach (1899), de Chirico creates *axioms* in his semantic groupings, in the sense that each object is transposed into definite relationships based on abstract groupings. Even Sigmund Freud treats the unconscious as structure in 1915.⁵ The difference is that de Chirico uses a method that has evolved and is up to date with contemporary mathematical logic. The artist possesses a painter's training and at the same time is, in every sense, the "son" of an

² This is understood by the notes taken by de Chirico on the back of the invitation of a concert composed by his brother Andrea in 1911 that carries an almost complete bibliography of anthropological studies of the 19th Century.

³ "Another demonstration *subsequently* showed that the hypothesis of a *Transfinitum in natura naturata* (transfinite created nature) makes possible a better and more complete explanation of phenomena, especially regarding organisms and psychic phenomena". Cantor, *Letter to Cardinale Franzelin*, cited in H. Meschowski, *Evolution of Mathematical Thought*, Holden-Day, San Francisco, 1965.

⁴ C. Spearman, *Psychology Down the Ages*, Macmillan, London, 1937.

⁵ S. Freud, *The unconscious*, in *SE*, XIV, p. 158-215. Freud denies that the unconscious is a mere "holder" of content, but that it is rather a system of rules between mental representations.

engineer. In order to render the leaps in time and the succession of events of the unconscious (and the dream) he applies the relationships to a multi-dimensional or infinite-dimensional network. In the Italian Piazza the lady of the labyrinth occupies the symbolic meeting point between life – the spiral drawn by the sunlight around the piazza⁶ – and the world of shadow closed inside the buildings at the sides. The piazza is simultaneously the focal point of the flow and course of sunlight and the casting of shadow. Basically, what de Chirico did was grasp the conscience and its opposite by using contemporary mathematical logic as he *played* with the mathematics of the infinite, Cantor's Set Theory (1883).⁷ The labyrinth is the focal point of this mathematical game, a “device of logic” that overturns painted space and written space (*Hebdomeros*, 1929). At the second exhibition of the Salon des Artistes Indépendants in 1913, the kind of space that de Chirico presented was an unprecedented mathematics soaked with the conscious (Metaphysics), compared to the naked mechanics of Futurist space.

Morphology. A Series of Metaphysical Labyrinths

In 1912, *Les plaisirs du poète*, indicated by Ralph Scheibler as the founding example of the Theory of Relativity in de Chirico,⁸ presents a meander inside the portico on the left.⁹ The spatial proposition of the meander enclosed in the “building” is already defined for the paintings that follow: in the prominent outward-jutting corner, the labyrinth exits to the outside in the form of a tetra-dimensional tetrahedron.¹⁰ The tetra-dimensional tetrahedron contains five vertexes and five tetrahedra. It results from the inserting of two three-dimensional tetrahedra one into the other. The uniting of two tetrahedra forms a group of vertexes, the spatial distribution of which is neither planar, nor three-dimensional, it is “elastic”. It fluctuates in an intuitive space rather than a visual space. It cannot be optically visualized by the eye of the observer, which can only conduct perspective functions. In fact de Chirico offers the spectator a life jacket in the form of angular perspective, by posing a second vertex of the tetrahedron just inside the external one. The observer can, with an effort, see them as the bases of pyramids in perspective. That's it: the invisible, the tetra-dimensional polygon, is *seen*. This is Metaphysics (beyond the physical). The operation is preformed mathematically. The diagrams produced by Courant and Robbins in 1941 indicate a development in n dimensions (infinite). Infinite space cannot be visualized in a three-dimensional geometric representation as it possesses more than the three Euclidean dimensions. It requires an ulterior “imaginary” geometry, non-Euclidean (from N. Lobačevskij)¹¹. The operation carried out by de Chirico is the first example in modern history of a mental analytical content being harmonically united with a geometrically plausible vision (perspective). In this regard de Chirico is the true heir to Henri Rousseau “The Customs Officer”, endowed with a propensity for mathematics. The continuation of the

⁶ See Jole de Sanna, Analysis of Form. Theory, in *De Chirico and the Mediterranean*, edited by J. de Sanna, Rizzoli, New York, 1998, p. 11-32.

⁷ I cite Cantor's theory, fruit of the so-called <diagonal procedure>: “Given any finite or infinite cardinal, there exists a greater one. More precisely, if S is a set, then the set CS (the set of the parts of S) in which the elements are all subsets of S , has a cardinal number greater than S . Therefore, beyond the finite cardinals there exists an infinite number of transfinite cardinals”. A. A. Fraenkel, *Teoria degli Insiemi e logica*, Ubaldini, Rome, 1970, p. 51.

⁸ R. Schiebler, *Giorgio de Chirico and The Theory of Relativity* (1988). See -*Metafisica*. Quaderni della Fondazione Giorgio e Isa de Chirico, n. 1-2, p. 211-222.

⁹ See J. de Sanna, *Metaphysical Mathematics*, in this periodical, p. 136-140.

¹⁰ R. Courant – H. Robbins, *What is Mathematics?*, Oxford University Press, London, 1941, p. 41.

¹¹ Lobačevskij called his new geometry “imaginary geometry” in his treatise on hyperbolic geometry, *Principles of Geometry* (1829-1830).

theme substantiates our analysis. *La lassitude de l'infini* of 1912 delineates the task in its true essence by declaring the infinite at the painting's base.¹² Once again the tetra-dimensional tetrahedron reappears with its vertex protruding outwardly from the base. And Ariadne appears, exhausted (how many calculations!). Once again on the left there is the trunk of a pyramid, while the surface of the piazza carries out a dilatation. The plane lifts up and rolls forward at the risk of Ariadne sliding off the painting: a second tetra-dimensional jump. *Le voyage émouvant* of 1913 presents a tetra-dimensional encounter of tetrahedra "on the inside" of the labyrinth.¹³ It is a definite and explicit model of an angular meander according to the mathematics of the infinite. The outer edge is oriented towards the back of the painting onto the piazza where a strip of horizon is seen. Three of the five edges are on the side facing us. Of particular importance is the space-time leap featured in the superimposing of the tetrahedra on a common base. This (relativistic) space-time leap draws an X on the ground by lengthening the base of the tetrahedron on the right. The incognito X is a dominating figure throughout de Chirico's period that concerns infinite space and relativity (In *L'énigme d'une journée* of 1914, he marked all of the window spaces along the upper profile of the portico with X's – windows that from this point on will become the symbol of dreams¹⁴ –. A similar design results at the left of the painting in the tetrahedron's shadow on the lighted plain. In this case, we are observing the encounter of two triangles while they slide toward each other. An X-ray photograph taken at the MoMA in New York confirms that the calculation is that of n dimensions (an infinite projection) according to Lobachevskij's hyperbolic geometry or "imaginary" geometry, as it was called in those days. Even the naked eye manages to read the preparatory lines through the transparent surface of the painting. The X-ray image also reveals a horizontally-positioned head in line with the tetrahedra (it is the head of Camillo Benso di Cavour, the head of state of the House of Savoy kingdom, who represented a paternal figure for de Chirico). The head of a statesman or "the father of the homeland" irrevocably clarifies the content of *Le voyage émouvant* as "psychic occurrence". In one blow, the labyrinth and the unconscious-abdomen, together with the child's mind and his subjection to and substitution of his father, are aggregated. This is what I mean by de Chirico's "grouping of mental objects". This constitutes the set and subset according to Cantor. In a variation on the theme, in *Il viaggiatore misterioso* (The Mysterious Traveller) of 1968, the subject exits the labyrinth (his inner self) and heads towards his "double" sitting on a cube (his conscious reflection). The sitting "double" is the protagonist of the *Bagni Misteriosi* (The Mysterious Baths, 1930-1973). It is Monsieur Dudron, the man "of the North"¹⁵ who personifies northern thinking and values (Swedenborg in particular). The addition of another group of meanings elevates the amalgamation of the content of *Le voyage émouvant* to "a greater set". In 1913 de Chirico establishes and demonstrates that it is only the

¹² See J. de Sanna, *Metaphysical Mathematics*, in this periodical, p. 143-144.

¹³ *Ibid.* p. 156-160.

¹⁴ *Ibid.* p. 167-169.

¹⁵ G. de Chirico, *Il Signor Dudron* (1930-78), Ed. Le Lettere, Florence, 1998.

image that possesses the faculty to make a space, which is only accessible through intuition, visible. The image is not a free representation in an “André Breton style” but rather a transcendental act, the result of conscience and mathematical reasoning and is also “extreme”. It is only much later on that the interpretation of the unconscious as a multidimensional structure produces the *psychic set* theory in psychoanalysis. Its theorist, Ignacio Matte Blanco, and de Chirico knew one another.¹⁶ Matte Blanco introduces the concepts of *displacement* and *unfolding* to explain the way in which the unconscious associates objects. This is precisely the idea on which *Le voyage émouvant* is built, concerning both the construction of the polyhedra¹⁷ and the temporal disjunctions in the narration, which the image manages, nevertheless, to connect. To recapitulate: de Chirico establishes the following as principals: a) that the deep inner psychology expresses its conceptions with the help of a spatial metaphor; b) that the infinite-dimensional structure of the conscience is an *all* even if it is infinite, it is a whole that can be individuated mathematically and not an *apeiron* or an unknown entity as considered by classical logic. This is not the end, not yet. De Chirico soon verifies that the mental infinity is an all, but an all that is riddled with paradoxes. The pitfall of Greek logic (Zeno’s paradox of Achilles being slower than the turtle) is presented again in an updated version for Cantor’s heirs. The painting *Le départ (La conquête du philosophe, 1914)* is full of paradoxes: the entrance of the labyrinth on the right; the breach in time at the back illustrated by the train travelling to the right in front of the tower and the ship moving in the opposite direction behind the tower; up above, the clock face hung like a sign; the two diverging artichokes on the cube.¹⁸ All are unequivocal symptoms of the discomfort created by the mathematical problem of the contraposition of natural numbers and enunciations that are true but that cannot be demonstrated (in our case: between mental and physical reality). It is for this same reason that Wittgenstein spoke of the labyrinth in his *Lessons on the Foundations of Mathematics* (Cambridge, 1939). When these dilemmas appeared, Ariadne disappeared momentarily only to reappear in 1915 in *Le double rêve du printemps*. On an easel in the centre, a painting within a painting is the synopsis of the “group of objects” of an Italian Piazza.¹⁹ Only half of Ariadne’s body is visible “beyond” a sliver of labyrinth. She is positioned on the easel, making the entire scene a study. In the Ferrara Interiors of 1915-1917, Hebdomeros’ “room” had already taken the piazza’s place as a highly concentrated area of mathematical enigmas. Ariadne is to reappear at each rebirth of de Chirico’s pictorial periods: in his so-called “Renoir” period; at the start of the 1940’s with Theseus’ profile drawn in the shadow cast by the labyrinth on top of her body; in the final period, immersed in the waters of the fountain where the artist places his re-birth from his imminent death.

Translated by Katherine Robinson

¹⁶ I. Matte Blanco, *The Unconscious as Infinite Sets* (1975), Duckworth Press, London, 1975. The relationship between the two is documented by witnesses.

¹⁷ In Courant and Robbins’ demonstration, the two tetrahedrons in the second figure (with five vertices) have a common base, the part above the base is also shared and thus five tetrahedrons are formed. If we want to represent all of them in three dimensions we have to take them apart and repeat them, otherwise they occupy the same space at the same time. This is not possible in a three dimensional space. R. Courant – H. Robbins, *What is Mathematics?* Oxford University Press, London, 1941.

¹⁸ See J. de Sanna, *Metaphysical Mathematics*, in this periodical, p. 164-166.

¹⁹ *Ibid.* p. 199.