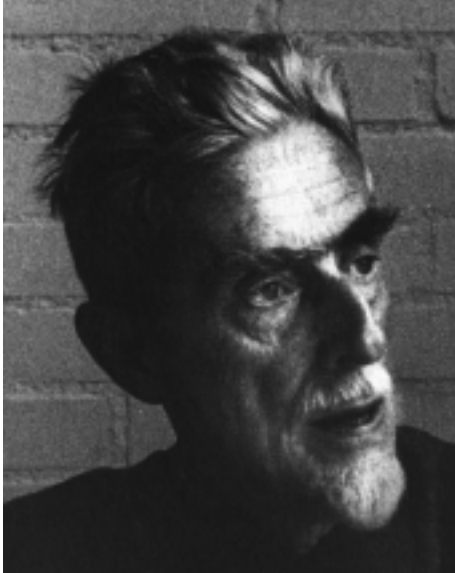


# 我的分析藝術論文



Maurit Cornelis Escher  
1898 – 1972

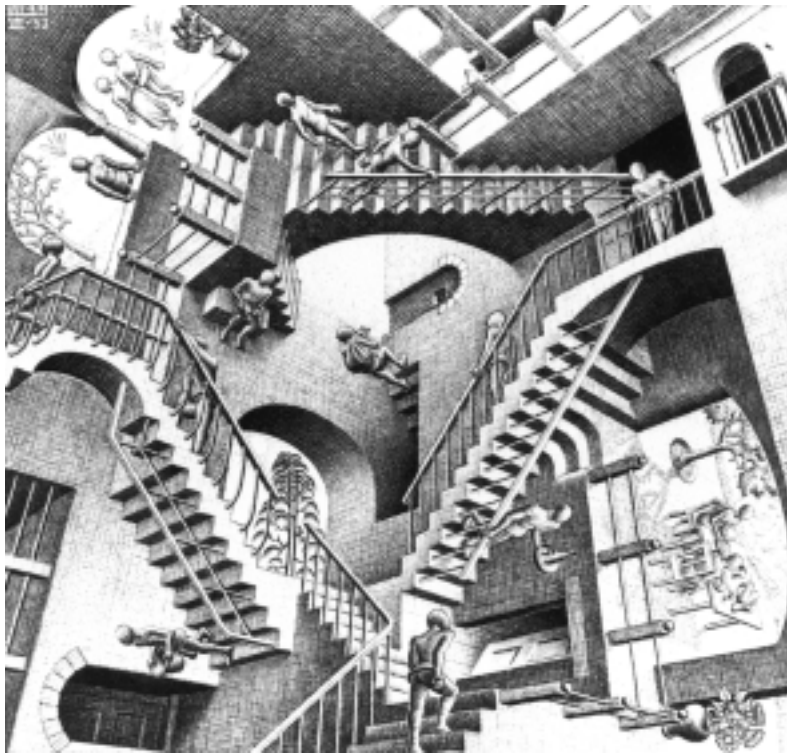
If I am not mistaken, the words “art” and “artist” did not exist during the Renaissance and before: there were simply architects, sculptors, and painters, practicing a trade.

Thus, I am a *graphic artist* **heart and soul**, though I find the term “artist” rather embarrassing.

# Escher Exploring Philosophy

## Conceivable World

In *Relativity* (Plate 1) three gravitational forces operate perpendicularly to one another. Men are walking in crisscrosses on the floor and the stairs. Some of them, though belonging



(Plate 1) *Relativity*, Lithograph,  $10\frac{7}{8} \times 11\frac{1}{2}$ ", 1953

to different worlds, come very close together but cannot be aware of one another's existence.

Let me give some examples: in the center a fellow with a coal bag on his back comes up from a cellar. But the floor on which he sets his right foot is a wall for the sitting man to his left, and to his right is another man, coming downstairs, who lives in a third world.

Another example: on the uppermost staircase (of which I show you enlargement on the right hand side), two persons are moving side by side and both from left to right. Yet one *descends* and the other *ascends*.

*Relativity* (Plate 1), in which there occur blatantly impossible images. Those staircases are "islands of certainty" upon which we base our interpretation of the overall picture. Stressed the fact, above, that internal consistency of a formal system

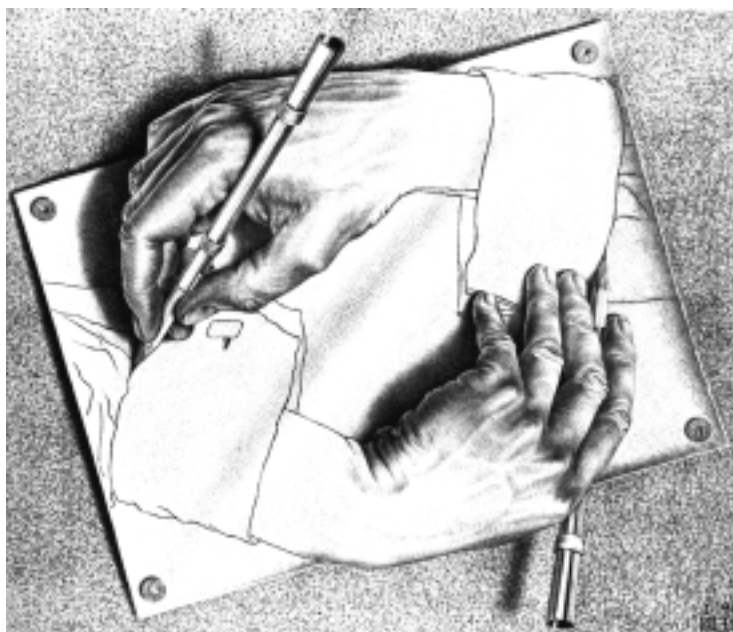
(together with an interpretation) requires that there be some imaginable world. In some sense, by merely inventing the concept, we have shown that such worlds are indeed **conceivable**; but in a deeper sense, they are also quite **inconceivable** (*This in itself is a little contradiction*).



Details from *Relativity*

## Strange Loop

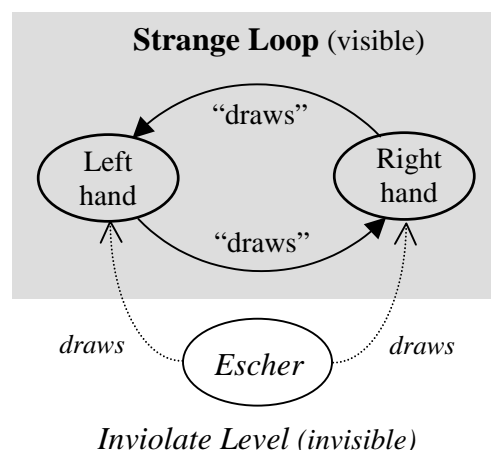
Escher was the creator of some of the most intellectually stimulating drawings of all time. Many of them have their origin in *paradox*, *illusion*, or *double-meaning*. Mathematicians were among the first admirers of Escher's drawings, and this is understandable because they often are based on mathematical principles of symmetry or pattern. But there is much more to typical Escher drawing than just symmetry or pattern; there is often an underlying idea, realized in artistic form. And in particular, the **Strange Loop**<sup>1</sup> is one of the most recurrent themes in Escher's work.



(Plate 2) Drawing Hands, Lithograph, 11×13", 1948

For instance, the lithograph *Drawing Hands* (Plate 2). At the left, a sheet of paper is pinned upon a background with four thumbtacks. A right hand, holding a pencil, sketches a shirt cuff on it. It is only a rough sketch, but a little farther to the right a detailed drawing of a left hand emerges from the sleeve, rises from the plane, and comes to lift. At its turn this left hand is sketching the cuff from which the right hand emerges.

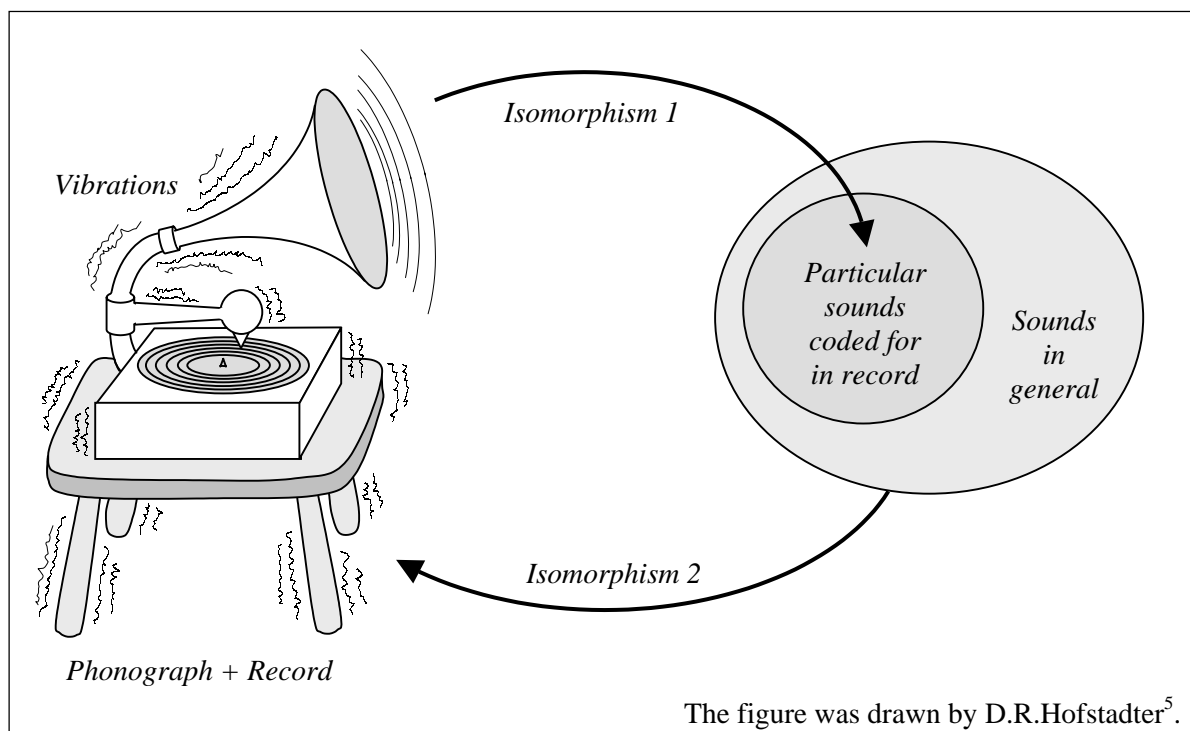
By observations, Escher realized *Strange Loops* in several different ways, and they can be arranged according to tightness of the loop. A two-step *Strange Loop* of abstract diagram (Escher's *Drawing Hands*) is shown. At the top (a seeming *paradox*); also, you see the inviolate level below it, enabling it to come into being. One could further Escherize the Escher picture, by taking a photograph of a hand drawing it. And so on. In the examples we have seen of *Strange Loop* by Escher, there is a conflict between the finite and the infinite, and hence a strong sense of *paradox*. Intuition senses that there is something mathematical involved here.



## Gödel's Theorem

Strange loop in mathematical systems has its origins in simple and ancient intuitions. In its absolutely barest form, Gödel's discovery involves the translation of an ancient paradox in philosophy into mathematical terms. That paradox is the so-called *Epimenides Paradox*, which is a one-step strange loop. By using isomorphism<sup>2</sup> characteristic to explain **Gödel's Theorem**<sup>3</sup> of *Epimenides Paradox* in a record player system as shown below.

The below figure<sup>4</sup> is illustrate that no sufficiently powerful record player can be perfect, in the sense of being able to reproduce every possible sound from a record. Why?



The main point is that there are two levels of meaning for grooves in the records. The chain of two isomorphisms are depicted in the figure. Notice that isomorphism 1 is the one which gives rise to the *level one*<sup>6</sup> meaning. The *level two*<sup>7</sup> meaning is more implicit than the level one meaning, because it is mediated by the chain of two isomorphisms. It is the level two meaning which “backfires”, causing the record player to break apart. What is of interest is that the production of the level one meaning forces the production of the level two meaning simultaneously — there is no way to have level two. So it was the implicit meaning of the record which turned back on it, and destroyed it.

By means of this *Epimenides Paradox Strange Loop* system, we could say that no sufficiently powerful formal system can be perfect, in the sense of reproducing every single true statement as a theorem, as well as Gödel says.

## Postmodern Paradox

“Whether, as with *Gödel’s Proof*, one can demonstrate the logical impossibility of any internally self-coherent theory of the *postmodern*”<sup>8</sup>. Now Gödel has effectively established the existence in the arithmetic system of a proposition that is neither demonstrable nor refutable within that system; this entails that the arithmetic system fails to satisfy the condition of completeness.

Robert Venturi<sup>9</sup>, indeed, cites it as “proof of ultimate inconsistency in mathematics”. Strictly, this formulation is wrong: the point of *Gödel’s Theorem* is not that mathematics is inconsistent, but that the price of regarding it as consistent is that we must accept its **incompleteness** (or uncertainty). If *Gödel* demonstrated that arithmetic is forever incomplete, then that, for the constructivist, need be no problem: for *constructivism*, systems are only derived from an activity, rather than, as in typical platonist or formalist schemes, knowing being the implementation of a system. “Completeness”, however important for system, has no application in the context of activities.

I made the point that the striking feature of postmodern scientific knowledge is that the discourse on the rules that validate it is (explicitly) immanent to it. What was considered at the end of the nineteenth century to be a loss of legitimacy and a fall into philosophical “*pragmatism*” or logical positivism was only an episode, from which knowledge has recovered by including within scientific discourse, the discourse on the validation of statements held to be laws. As we have seen, this inclusion is not a simple operation, but gives rise to “**paradoxes**” that are taken extremely seriously and to “*limitations*” on the scope of knowledge that are in fact changes in its nature. The mathematical research that led to *Gödel’s Theorem* is a veritable paradigm of how this change in nature takes place.

According to above discussions, Escher’s work (e.g. Hands with Reflecting Sphere<sup>10</sup>) could be realized by the following steps to make the conclusion that:

*Contradiction* —→ *Strange Loop* —→ *Gödel’s Theorem* —→ *Paradox* —→ *Uncertainty*

**The Philosophy of Escher’s work is Uncertainty of Postmodernism.**

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## Notes:

- <sup>1</sup> The “**Strange Loops**” phenomenon occurs whenever, by moving upwards (or downwards) through the levels of some hierarchical system, we unexpectedly find ourselves right back where we started. (Here, the system is that of visual keys — descend and ascend).
- <sup>2</sup> Notice that every type of “copy” preserves all the information in the original theme, in the sense that the theme is fully recoverable from any of the copies. Such an information preserving transformation is often called **isomorphism**.
- <sup>3</sup> **Gödel’s Theorem** appears as Proposition VI in his 1931 paper “On Formally Undecidable Propositions in Principia Mathematica and Related Systems I”. It states: *All consistent axiomatic formulations number theory include undecidable propositions*.
- <sup>4</sup> Visual rendition of the principle underlying *Gödel’s Theorem*: two back-to-back mappings which have an unexpected boomeranging effect. The first is from groove-patterns to sounds, carried out by a phonograph. The second — familiar, but usually ignored — is from sounds to vibrations of the phonograph. Note that the second mapping exists independently of the first one, for any sound in the vicinity, not just ones produced by the phonograph itself, will cause such vibrations. The paraphrase of *Gödel’s Theorem* says that for any record player, there are records which it cannot play because they will cause its indirect self-destruction.
- <sup>6</sup> Level One is that of music.
- <sup>7</sup> Level Two meaning depends upon a chain of two isomorphisms:  
(1) isomorphism between arbitrary groove patterns and air vibrations;  
(2) isomorphism between arbitrary air vibrations and phonograph vibrations;
- <sup>8</sup> Adopted from **Postmodernism**, F. Jameson p.xii  
— *an antifoundationalism that really eschews all foundations altogether, a non-essentialism without the last shred of an essence in it* — is a speculative question; its empirical answer is that none have so far appeared, all replicating within themselves a mimesis of their own title in the way in which they are parasitatory on another system (most often on modernism itself), whose residual traces and unconsciously reproduced values and attitudes then become a precious index to the failure of a whole new culture to come to birth.
- <sup>9</sup> **Robert Venturi** wrote a book about postmodernism “Complexity and Contradiction in Architecture” in 1966.
- <sup>10</sup> Hands with Reflecting Sphere, Self-portrait by M.C. Escher (lithograph, 1935). Such a globe reflection collects almost one’s whole surroundings in one disk-shaped image. The whole room, four walls, the floor, and the ceiling, everything, albeit distorted, is compressed into that one small circle. Your own head, or more exactly the point between your eyes, is in the central point. You are immovably the focus of your world.  
*Contradiction* → *Strange Loop* → *Gödel’s Theorem* → *Paradox* → *Uncertainty*  
Self-Portrait against Sphere → Two-step Strange Loop → Gödel’s Proof → Motif → Postmodernism.

