

**A Theoretical Consideration
on Abstraction and Concretization
from a Phenomenological Psychological
and Educational Perspective**

By

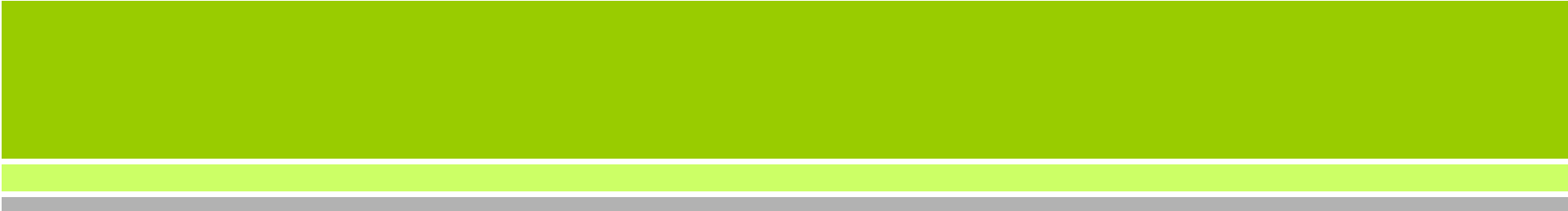
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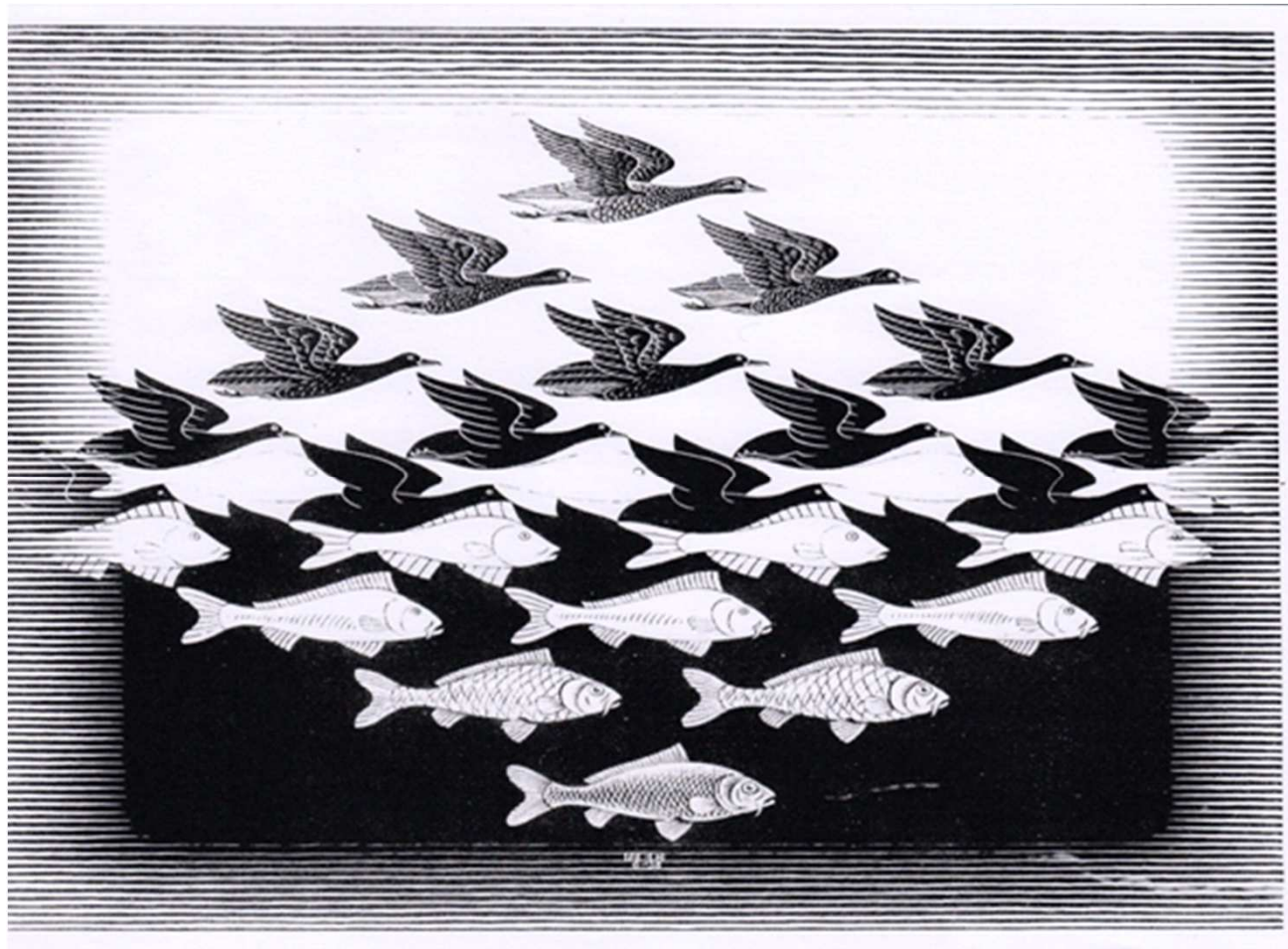


**“Scientific research consists
in making what is discontinuous continuous and
in making what is continuous discontinuous”**

(Henri Poincare cited by Jean Piaget)

M. C. Escher Sky and Water I. 1938

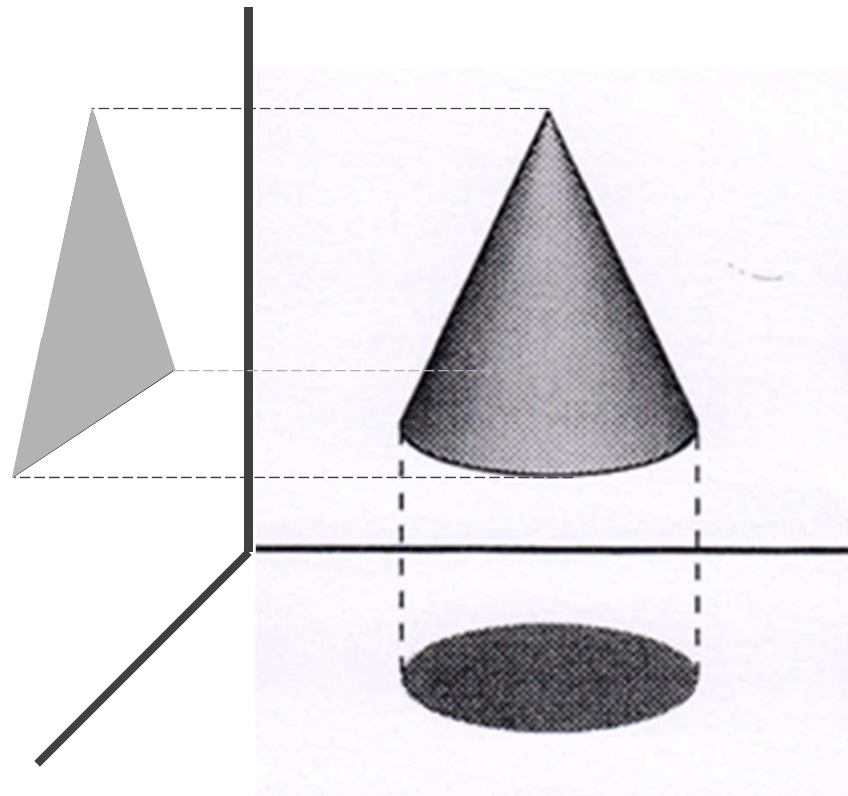
Continuous ? Discontinuous?



The First Law of Dimensional Ontology

by Viktor E. Frankl :

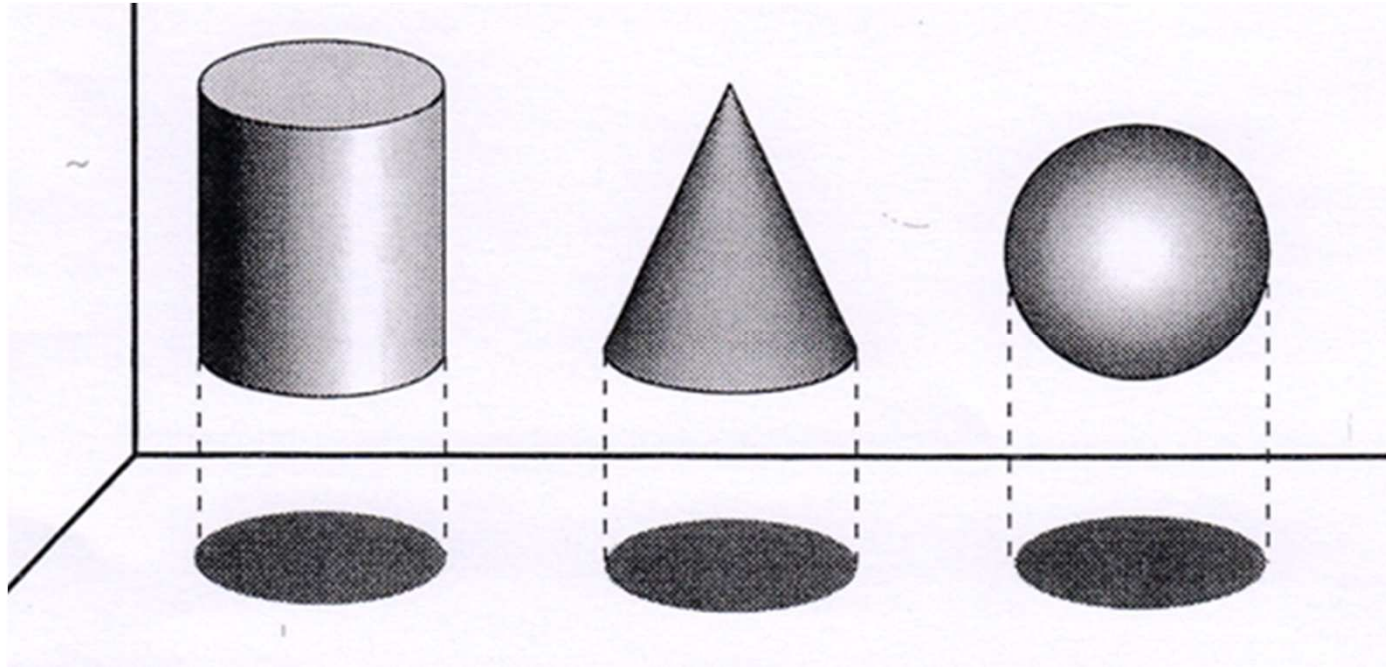
”Incompatible!”



The Second Law of Dimensional Ontology

by Viktor E. Frankl:

”Ambiguous!”





The first tradition

regards ACF (Abstraction and Concept Formation) as

***“disregarding the particulars and
extracting the common features”***

The second tradition,

on the other hand, regards ACF as

“common response to dissimilar stimuli”

(Pikas, 1966, p.231-232) .



A falling leaf !



Yellow! (Red!)



It's fall! It's Autumn!



Gravity!



The Law of Gravitation!

“Now it reveals the hidden side,

now the other,

-----thus it falls, an autumn leaf”

Ryokan (1758—1831)

うらをみせ おもてをみせて ちるもみじ 良寛



1. A falling leaf!

2. Yellow! (Red!)

3. It's Fall! It's Autumn!

4. Gravity!

5. The Law of Gravitation!

**6. “Now it reveals the hidden side, now the other,
-----thus it falls, an autumn leaf.**

The Intentional Structure of Abstraction in Consciousness

The Ideas Intuited (the far term)

“the way of one’s own dying”

“The Law of Gravitation”

“Gravity”

“Fall. Autumn”

“Yellow”(“Red”)

“A falling leaf”

The Sight observed (THE NEAR TERM)

The Subjects (Observers):

YOU : A Child, A Color specialist, A Botanist, Physicists, A Zen monk, etc.

The Intentional Structure of

Abstraction

The Subject intends

The Far Term: **The Abstract**

via

The Near Term: The Concrete

Varieties of exemplary Abstracts from different kinds of Abstractions

- (1) **“shape, size, color”** and **“attribute, object, phenomena”**
- (2) **“thing”** and **“nothing”**
- (3) **“object”** and **“subject”**
- (4) **“consciousness”** and **“unconsciousness”**
- (5) **“Lie”, “dream”, “imagery”, “mind”, and “ego and self”,**
“You and I”, “World and I”.
- (6) **“capital”** and **“value”(Marx)**
- (7) **“directive correlation”**(G. Sommerhoff: W.Ross Ashby), **“purposeful behavior”, “integration”, “stability”, “equilibrium”, “structure”, “system”**
- (8) **“Airplane”** and **“UFO: Unidentified Flying Object”**
- (9) **“the exit of a building, and the exit of a forest”**(Yoshida, 1980)
- (10) **“the multiplication of plus numbers, and the multiplication of minus numbers.”**(Yoshida, 1977)

And so on. Ad infinitum.

The Intentional Structure of

Concretization

The Subject intends

The Far Term : **The Concrete**

via

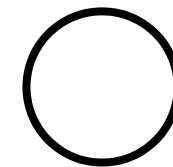
The Near Term: The Abstract

Both ways “from C to A” and “from A to C” are:

One-to-many correspondences.

Far terms ○、◎、◌、△、□、… ◻○、◎、◌、△、□、…

Near terms ◻○



Abstraction

Concretization



Diversity of views in Mathematics
With respect to her own Ontology and Epistemology

- 1) Formalism**
- 2) Creativism**
- 3) Realism**
- 4) Constructivism**
- 5) Intuitionism/Intuitionism**
- 6) Conventionalism**

And so on.

A Series of the Abstract Images of “Abstraction and Concretization”

From

(1) the **“One-way Abstraction”** from the Concrete to the Abstract,

(2) the **“Two-way Round-trip of Abstraction/ Concretization”**

between the Concrete and the Abstract, then to

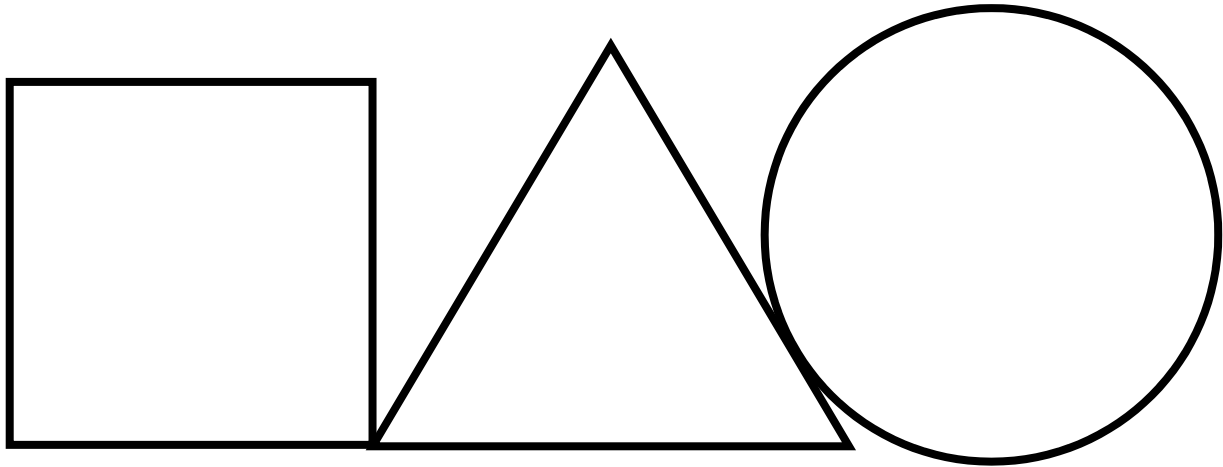
(3) the **“Circular movement between Abstraction and Concretization”**.

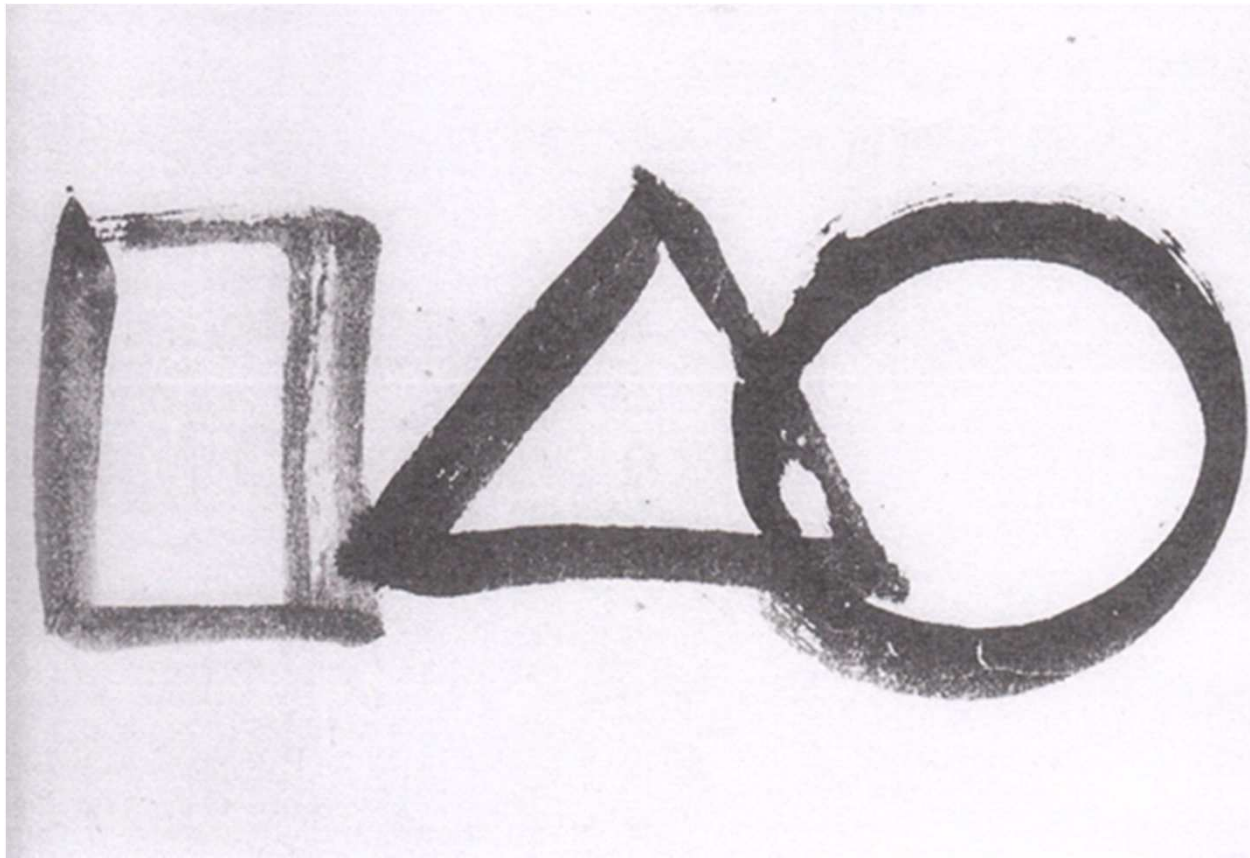
And, to

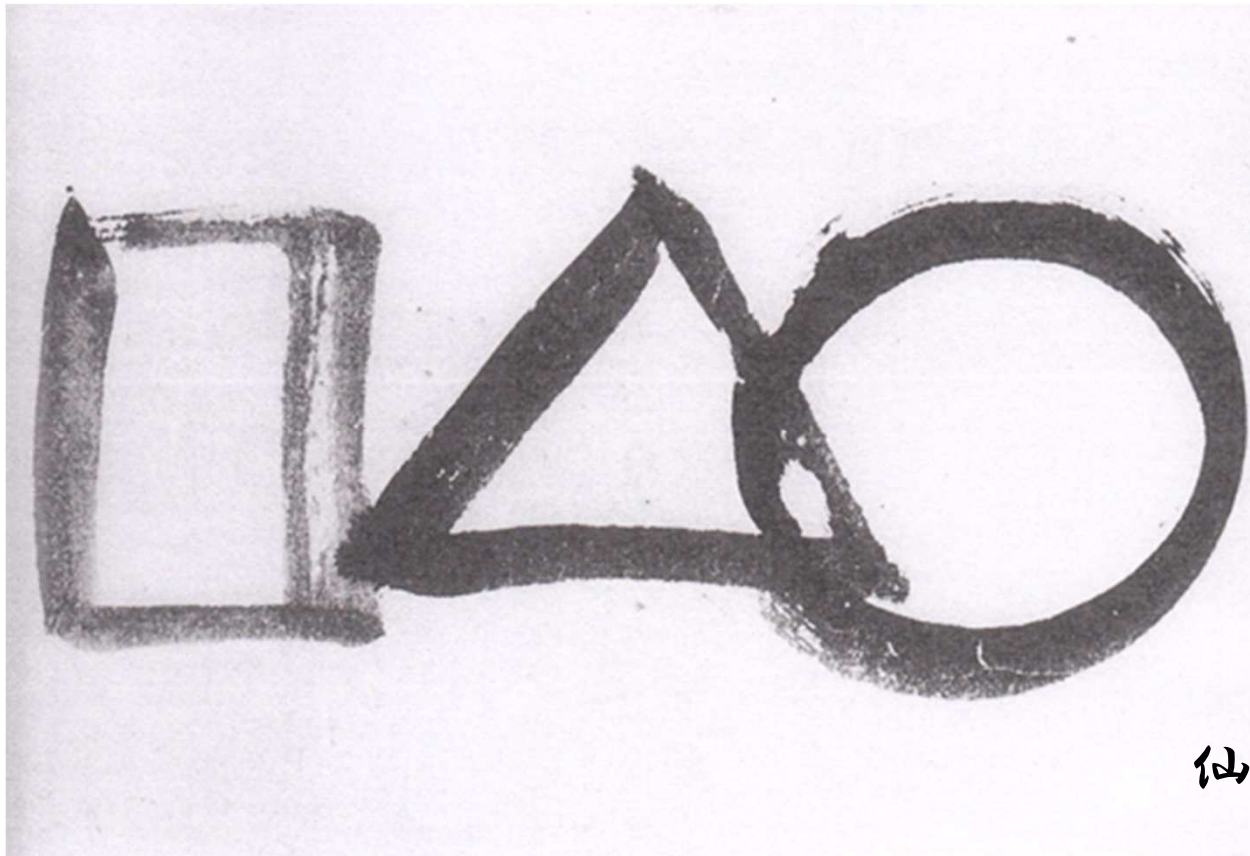
(4) the **“Spiral Ascending and Descending”** of “Abstraction and

Concretization”. And, to (5) the **“Double Spiral of the Series”**.

And further, to (6) the **“Multiple Spirals of the Series”**. Ad infinitum.







仙屋



(1) **Earth, Fire, and Water.**

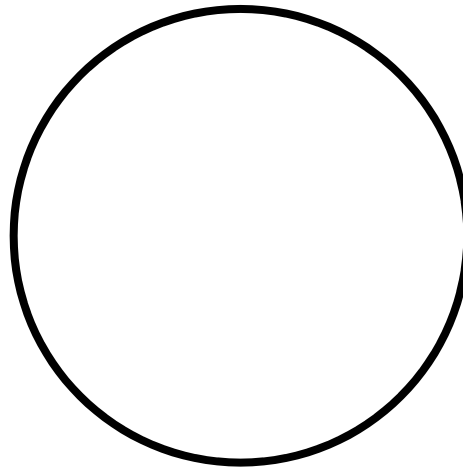
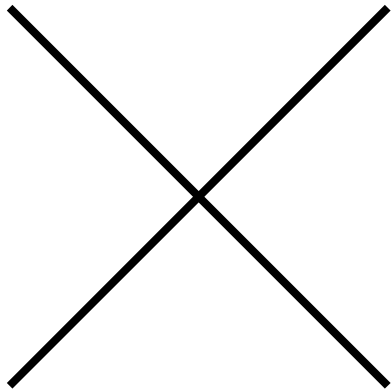
(2) **Tendai (天台), Shingon (真言), and Zen (禪):**

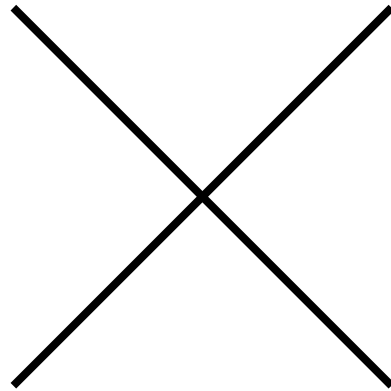
The three sects of Buddhism.

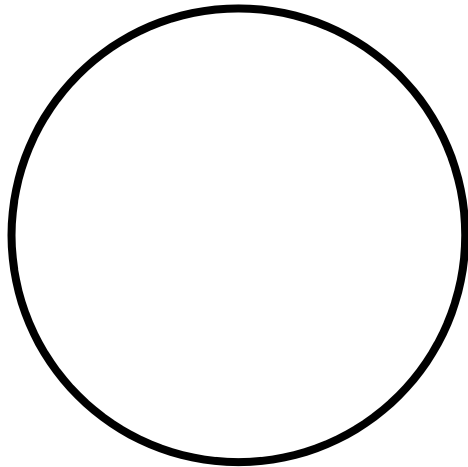
(3) **Saikoro (Dice, サイコロ), Mt.Fuji, and the Globe.**

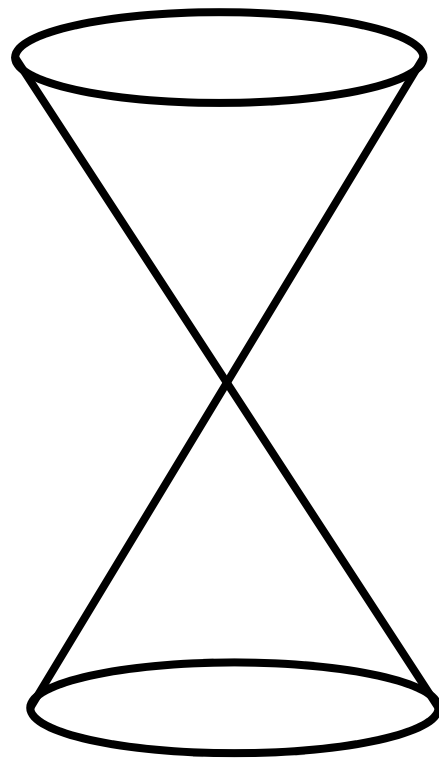
(4) **The Entire Universe.**

And so on, probably with many other possible alternatives.



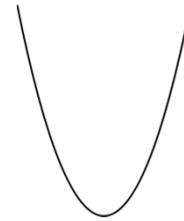








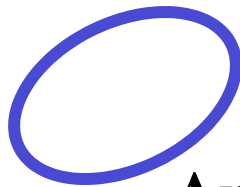
A Cross



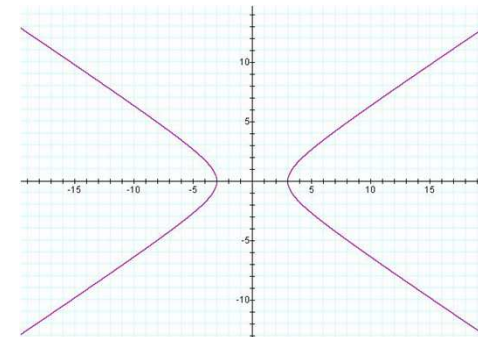
A Parabola



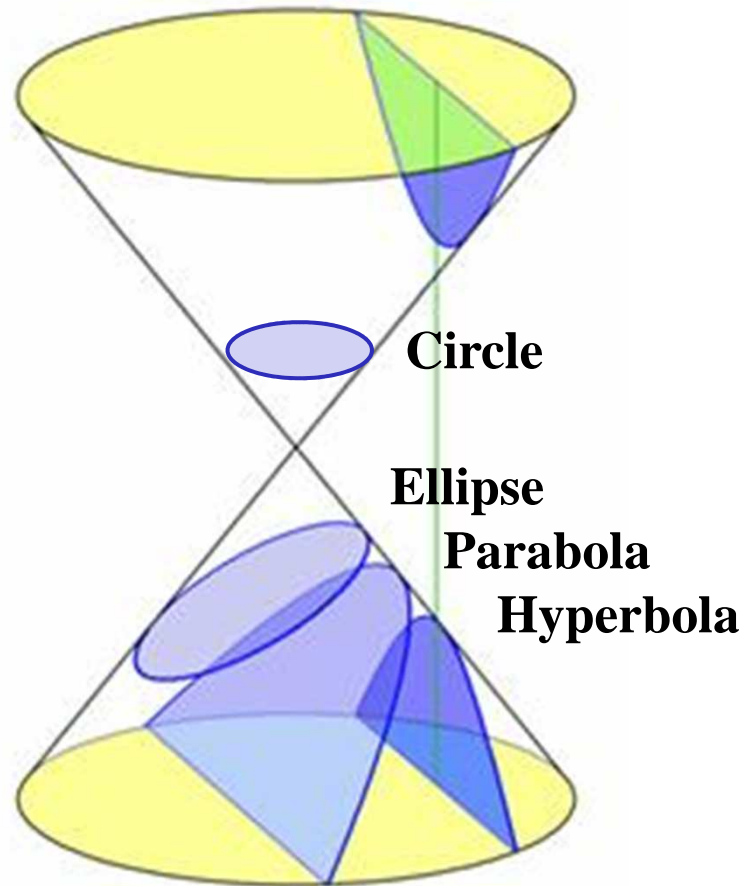
A Circle



An Ellipse



A Hyperbola



Rudolf Arnheim writes:

...these geometrical figures were treated first as separate, static concept, they had to be restructured in order to emerge as aspects of one unitary dynamic concept. This perceptual restructuring, performed against the grain of the primary evidence, revealed the ellipse as a distorted circle, the straight line(*the Cross*) as a limiting case of the parabola. The discovery served, in the words of Poncelet “to broaden the ideas, to link by continuous chain truths that seem remote from each other, and to make it possible to embrace in a single theorem a throng of particular truths.” / The story of the conic sections shows how closely concept formation is related to the perception of structural simplicity.

(Arnheim, R. 1969. *Visual Thinking*, Univ. of California Press. p. 184-186.)

Intentional Structure of Consciousness

(B) as the far term(**Abstract**)

(A) as the far term(**Concrete**)

↑ **Abstraction**

↑ **Concretization**

(A) as the near term(**Concrete**)

(B) as the near term(**Abstract**)

The “Middle/Mediator” Between the Abstract and the Concrete

Abstraction

Concretization

The Abstract

The Concrete

(the far terms)

The M

The M

(the Middle terms)

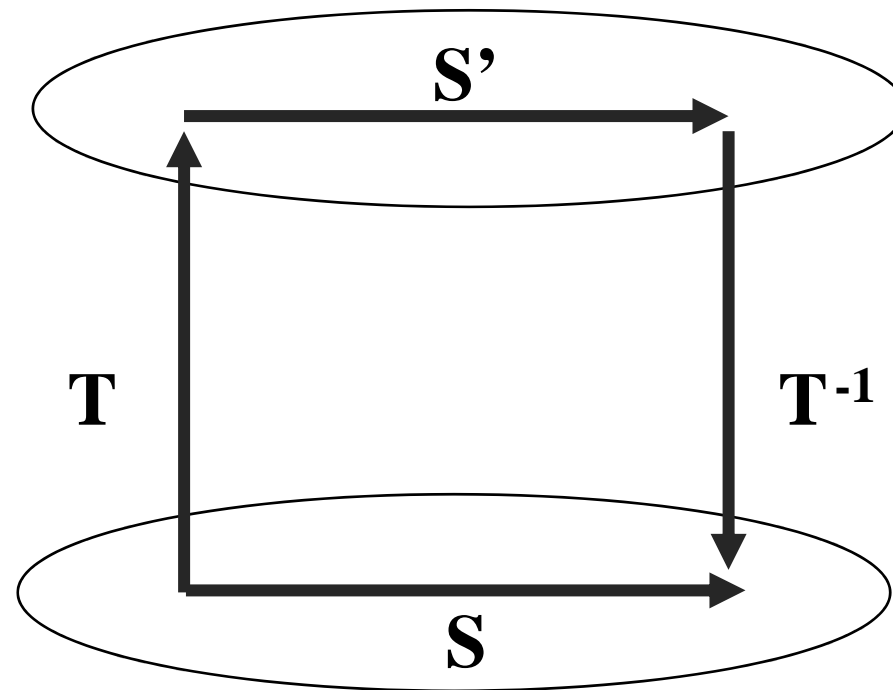
The Concrete

The Abstract

(the Near Terms)

A Set-theoretical Formulation
by W. Ross Ashby

$$\mathbf{S} = \mathbf{T}^{-1} \mathbf{S}' \mathbf{T}$$



The Middle Term in the Set-theoretical Formulation

Abstraction

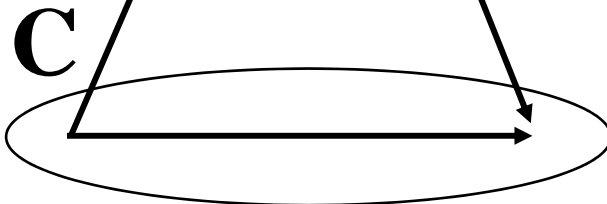
The far terms:



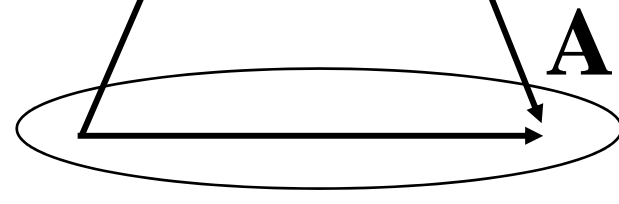
The Middle terms:



The Near Terms:



Concretization



A Modification of the Set-theoretical Formulation

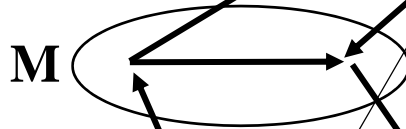
Abstraction

Concretization

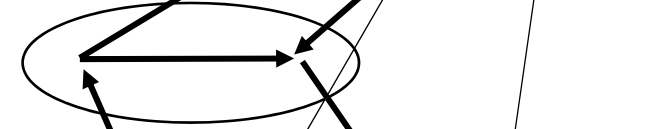
The far terms:



The Middle terms:



The Near Term:



A Categorical Manifesto

An attempt had been made to show that “category theory provides a number of broadly useful, and yet surprisingly specific, guidelines for organizing, generalizing, and discovering analogies among and within various branches of mathematics and its applications”
(**A Categorical Manifesto**, by Joseph A. Goguen, 1989, p.12)

A Category-theoretical Formulation of Abstraction

The Far term

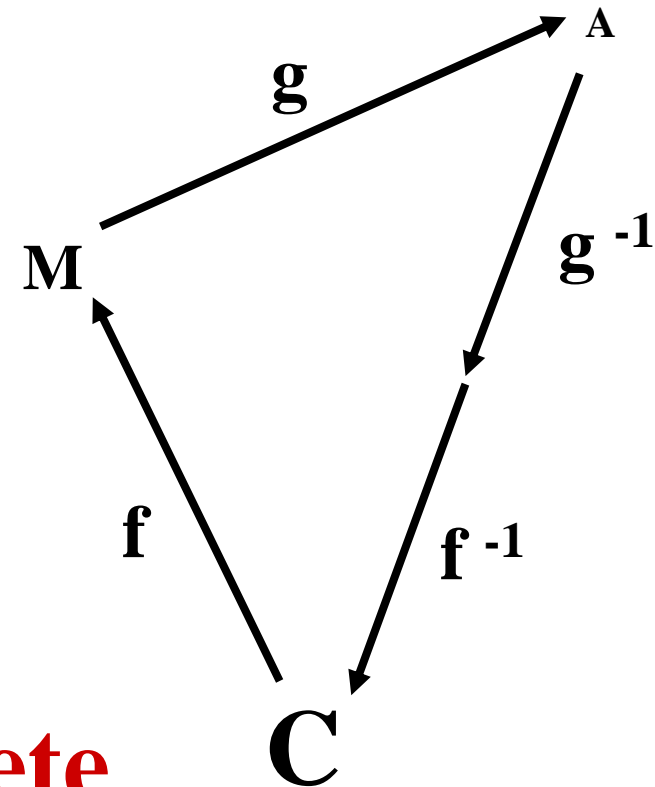
The **Abstract**

The Middle term

The MAM

The Near term

The **Concrete**



A Category-theoretical Formulation of Concretization

The far term

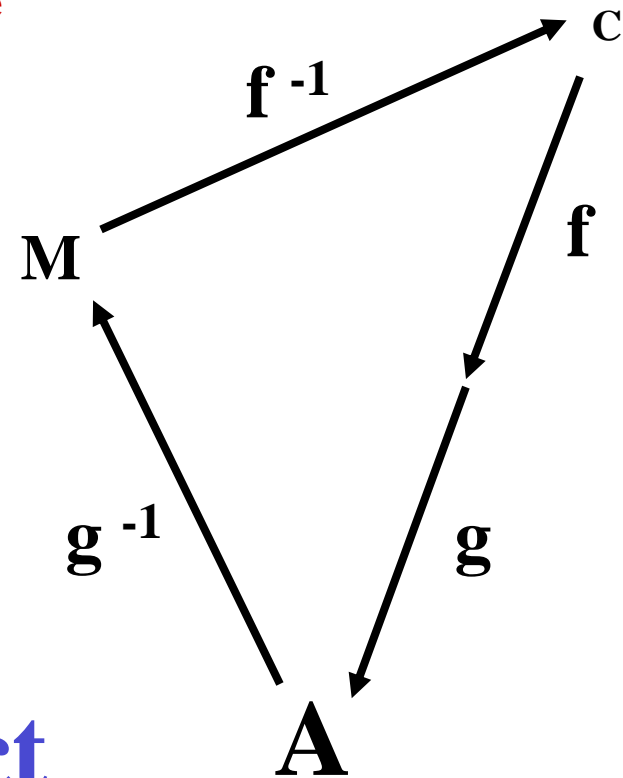
The **Concrete**

The Middle term

The MAM

The Near term

The **Abstract**





Essential for Knowledge and Wisdom

MAM (Metaphor, Analogy and Model)

MAC (MAM and Abstraction and Concretization)

MAM with MAC

is Essential for Knowledge and Wisdom.



The essence of Phenomenology:

“To see **oneself** is to see the **world**,
and to see the **world** is to see **oneself**.”

That is the fundamental attitude of
Phenomenology.”

(by Jiro Watanabe, 1978)



The essence of Education:

“Let us grow together!”

(by Enosuke Ashida, 1952)

My message: Simultaneously,
(1) by “Seeing the world and ourselves”,
(2) by “abstracting and concretizing” with
MAM (Metaphor- Analogy- Model), and also
(3) by “cognizing and communicating”,
“Let us grow together!”
to embody Knowledge and Wisdom for
enjoying Life to live “Diversity in Harmony”
MAM with MAC!

Aki Yoshida

“Happiness and Misery”

“My other piece of advice, Copperfield,” said Mr. Micawber, ”you know. Annual income twenty pounds, annual expenditure nineteen nineteen six, result happiness. Annual income twenty pounds, annual expenditure twenty pounds ought and six, result misery.”

(From Charles Dickens *David Copperfield*. 1952/1849, p.176.)