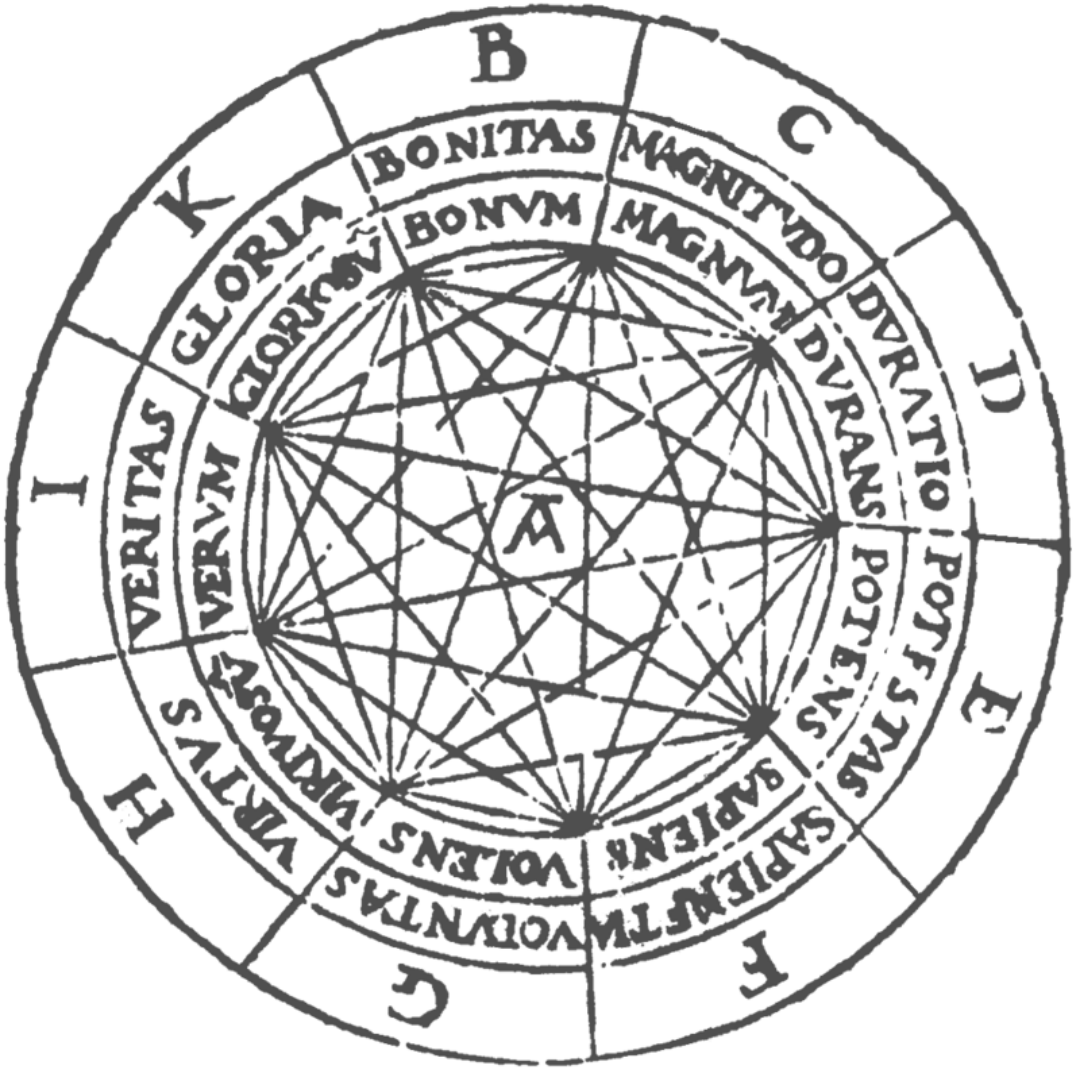
The Square of Opposition

Question:
How do we assess categorical arguments for validity?

Homework!

This!

Level I:
Immediate Inferences and the Square of Opposition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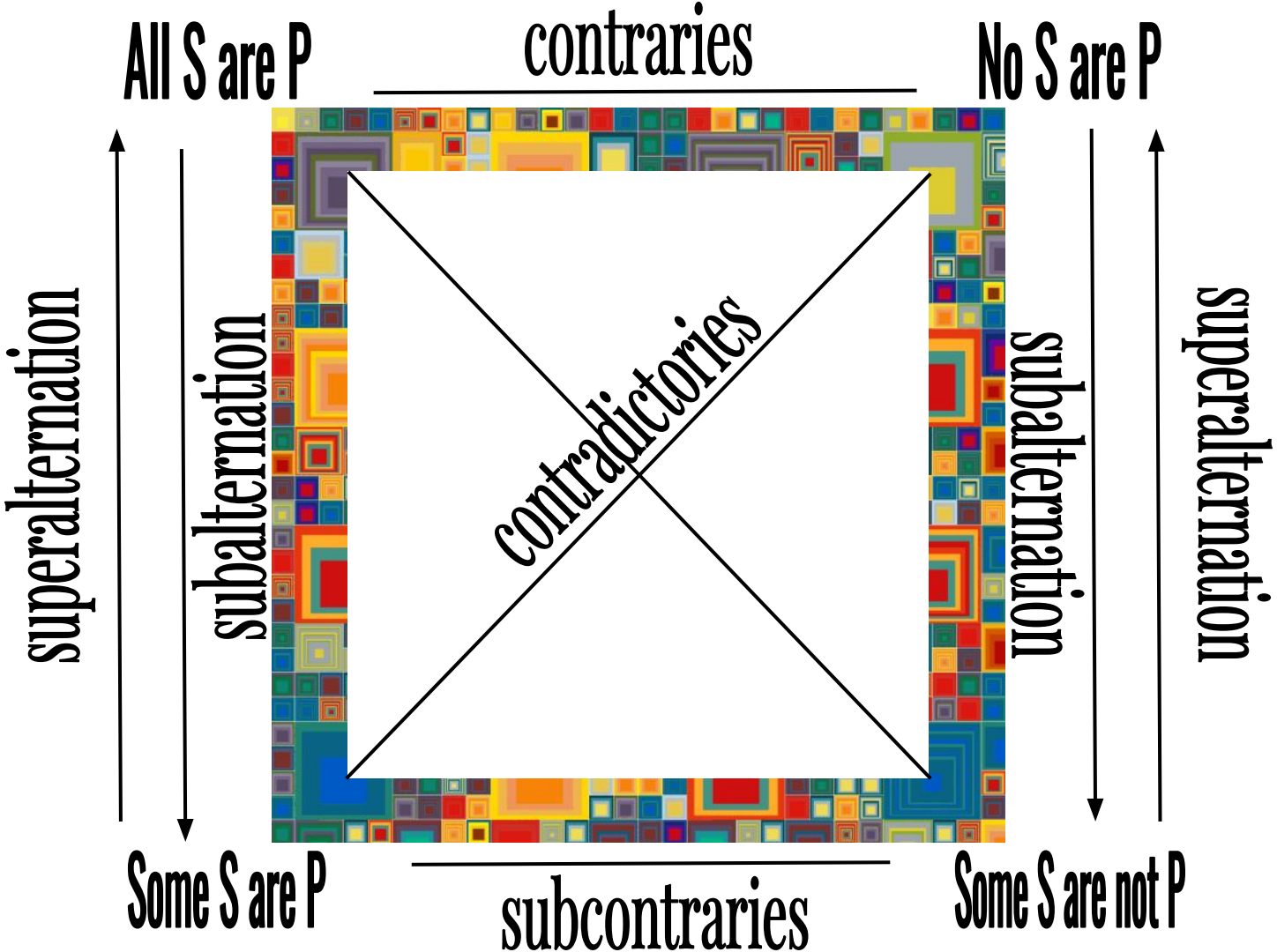
All S are P
contraries
No S are P
superalternation
subalternation
contradictories
subalternation
superalternation
Some S are P
subcontraries
Some S are not P

Note:

There are various ways to assess immediate inferences for validity, such as the the laws of conversion, obversion, and contraposition or the use of Venn diagrams.

We will cover only the Square of Opposition here. We will use Venn Diagrams for categorical syllogism later.

Steps:

1. Write out the argument.

1. All reptiles are cold-blooded.
2. Therefore, it is false that some reptiles are not cold-blooded.

Steps:

1. Write out the argument.
2. Assess which type of sentence of categorical logic the statement is and write the letter beside the premise.

The universal affirmative (A): All F are G
The universal negative (E): No F are G
The particular affirmative (I): Some F are G
The particular negative (O): Some F are not G

A
O

1. All reptiles are cold-blooded.
2. Therefore, it is false that some reptiles are not cold-blooded.

Steps:

1. Write out the argument.
2. Assess which type of sentence of categorical logic the statement is and write the letter beside the premise.
3. Write the truth-value (either T or F) next to the sentence letter of both the premise and the conclusion. (Note: If the sentence is just asserted, that means it’s true.)

(T) A
(F) O

1. All reptiles are cold-blooded.
2. Therefore, it is false that some reptiles are not cold-blooded.

Steps:

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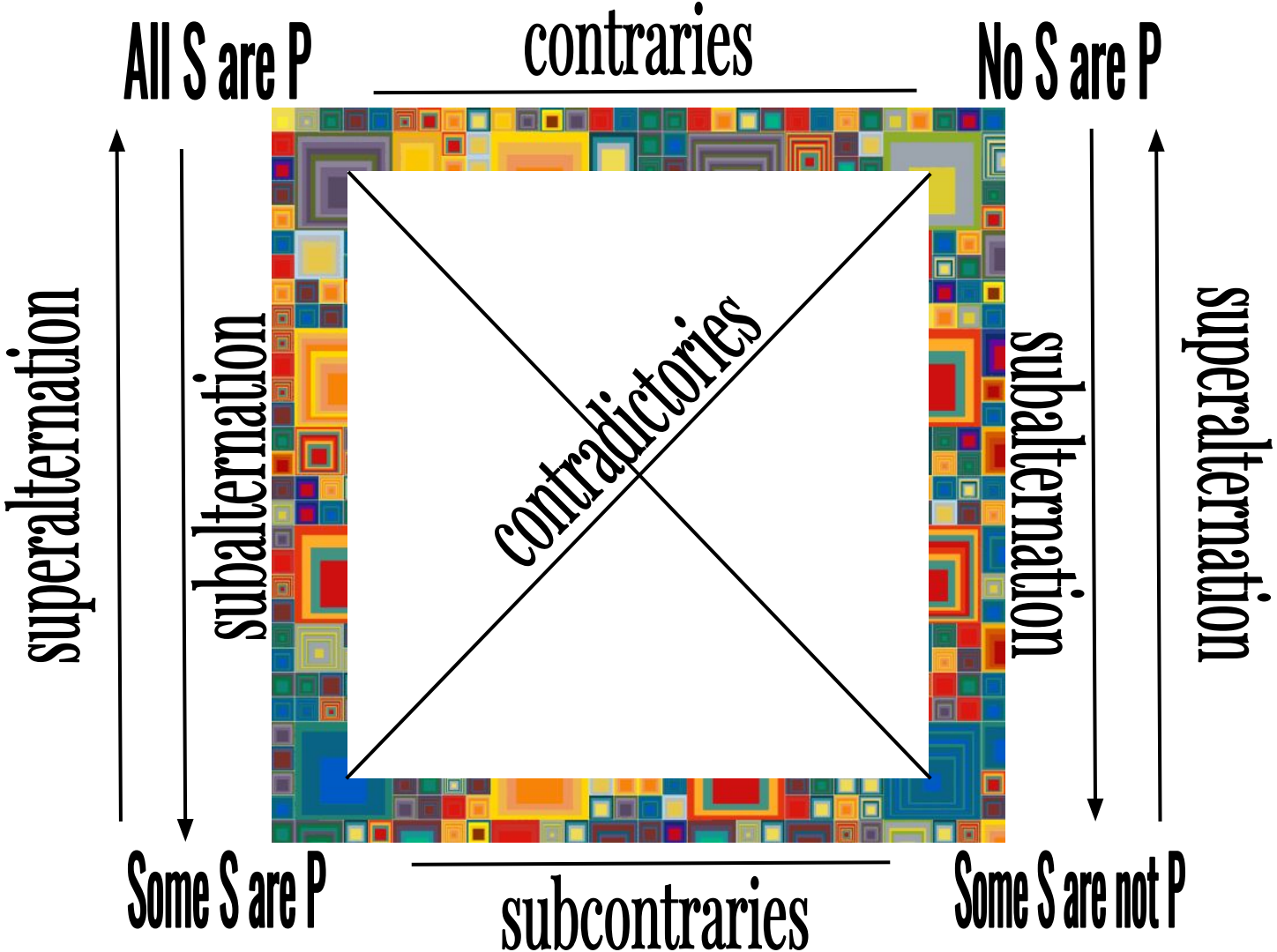
2. Assess which type of sentence of categorical logic the statement is and write the letter beside the premise.
3. Write the truth-value (either T or F) next to the sentence letter of both the premise and the conclusion. (Note: If the sentence is just asserted, that means it’s true.)
4. Discover what the truth-value of the premise implies.

In other words...

Use the Square of Opposition to figure out the truth-value of the rest of the sentences given the premise.

But remember(!), use **ONLY** the premise.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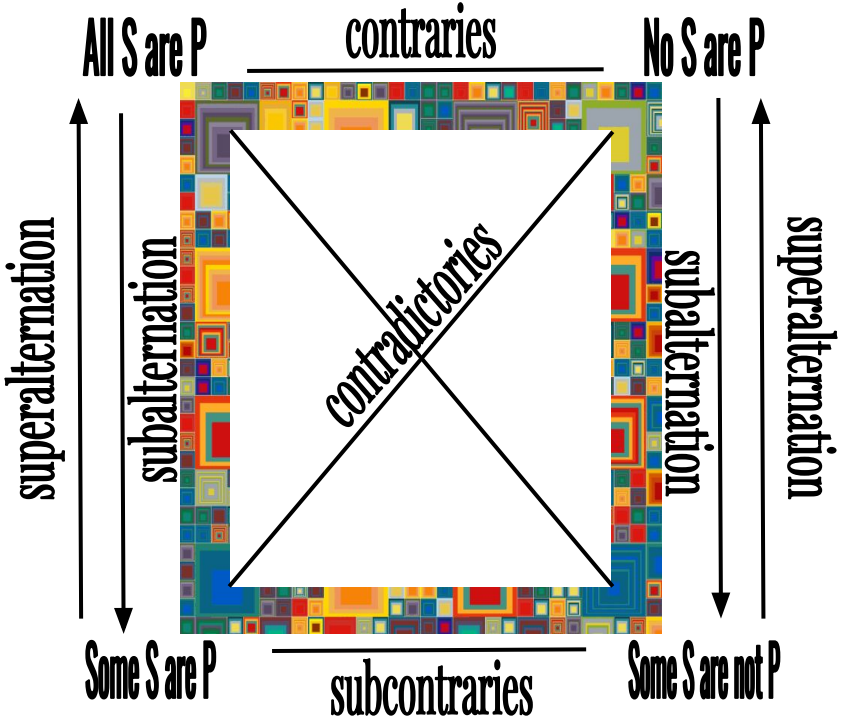
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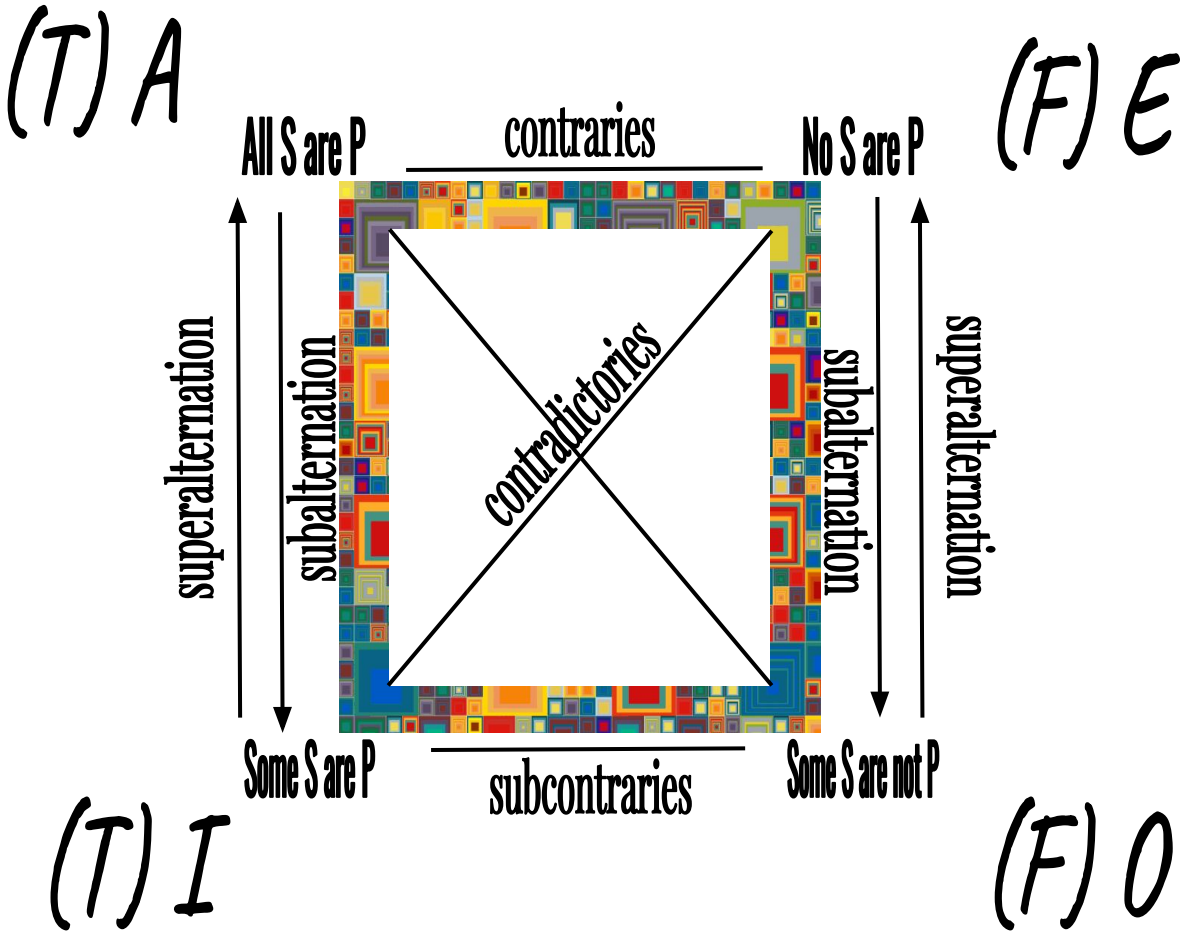
2. Therefore, it is false that some reptiles are not cold-blooded.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Time to Check!

Do the inferences that you made on your Square of Opposition **match** the conclusion of the argument?

RULE:

Check that the truth-value of the conclusion **matches** the truth-value for the relevant sentence-type on your Square of Opposition.

If they do match, the argument is valid; if not, it is invalid.

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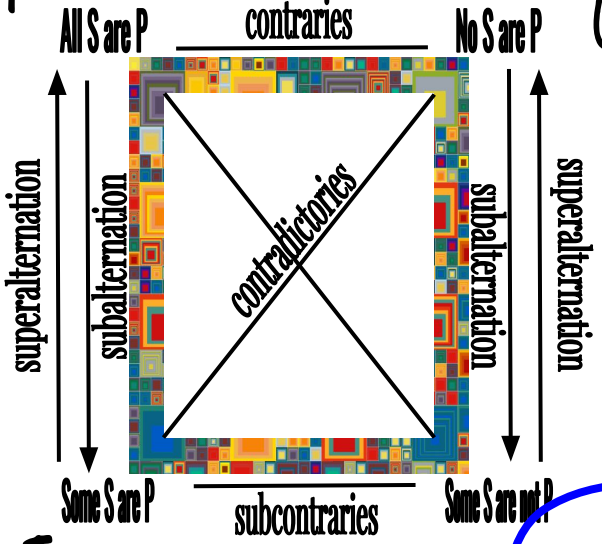
(F) O 2. Therefore, it is false that some reptiles are not cold-blooded.

(T) A

(F) E



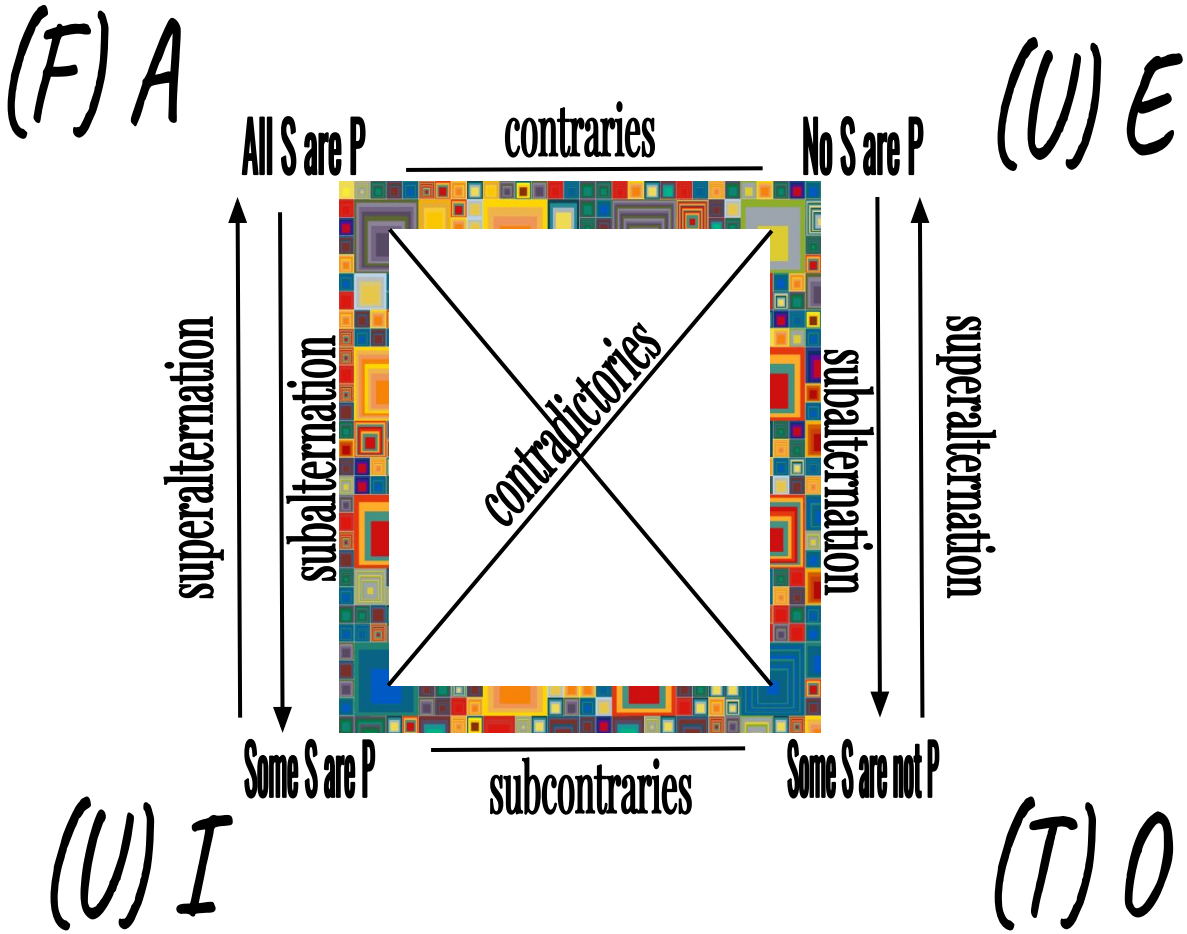
(T) I

(F) O


It's Valid!

(F) A 1. It is false that all kleps are foo.

(T) I 2. Therefore, it is true that some kleps are foo.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(U) I
(T) O

(F) A 1. It is false that all kleps are foo.

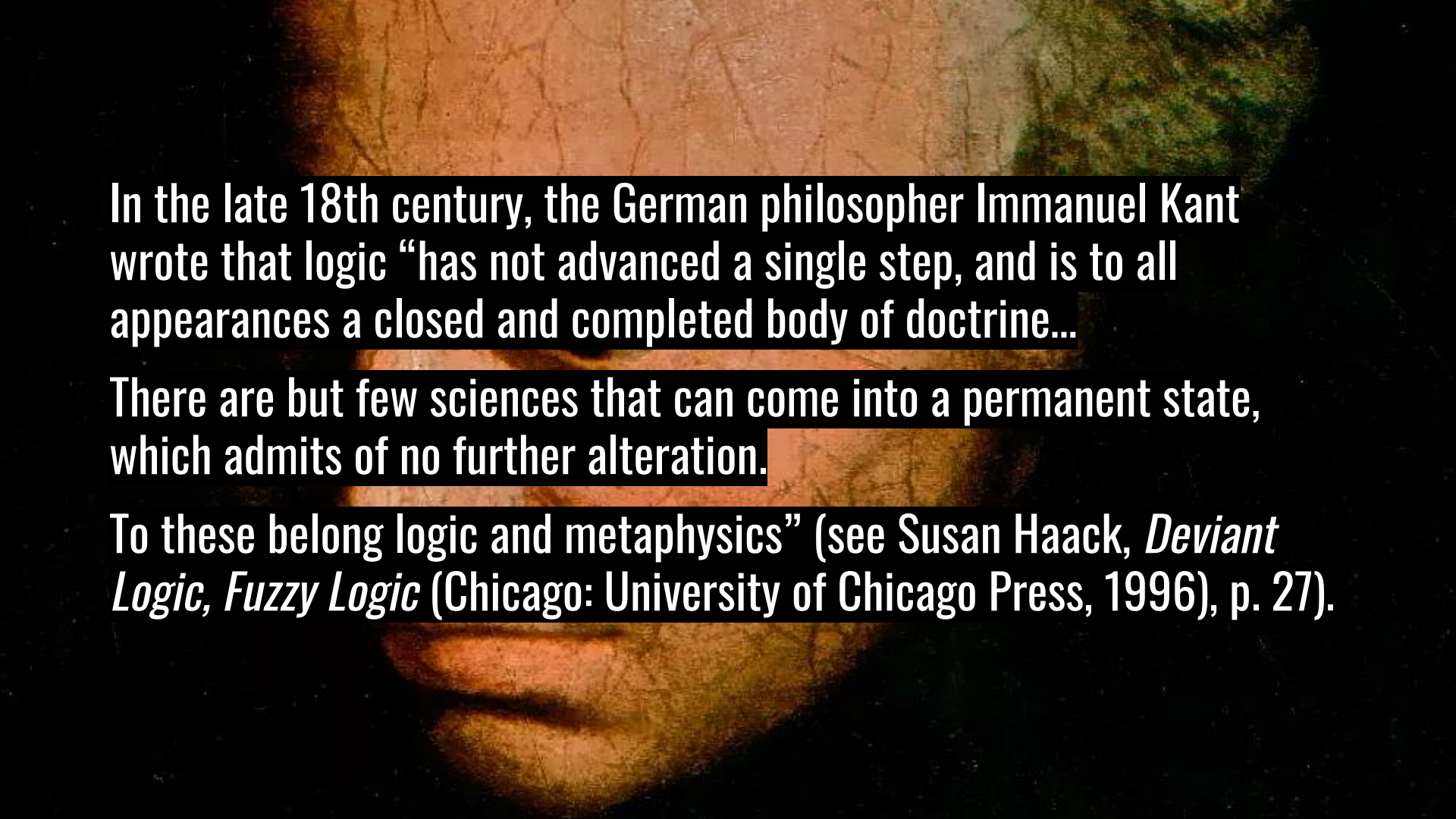
(T) I 2. Therefore, it is true that some kleps are foo.

INVALID

Homework!

This!

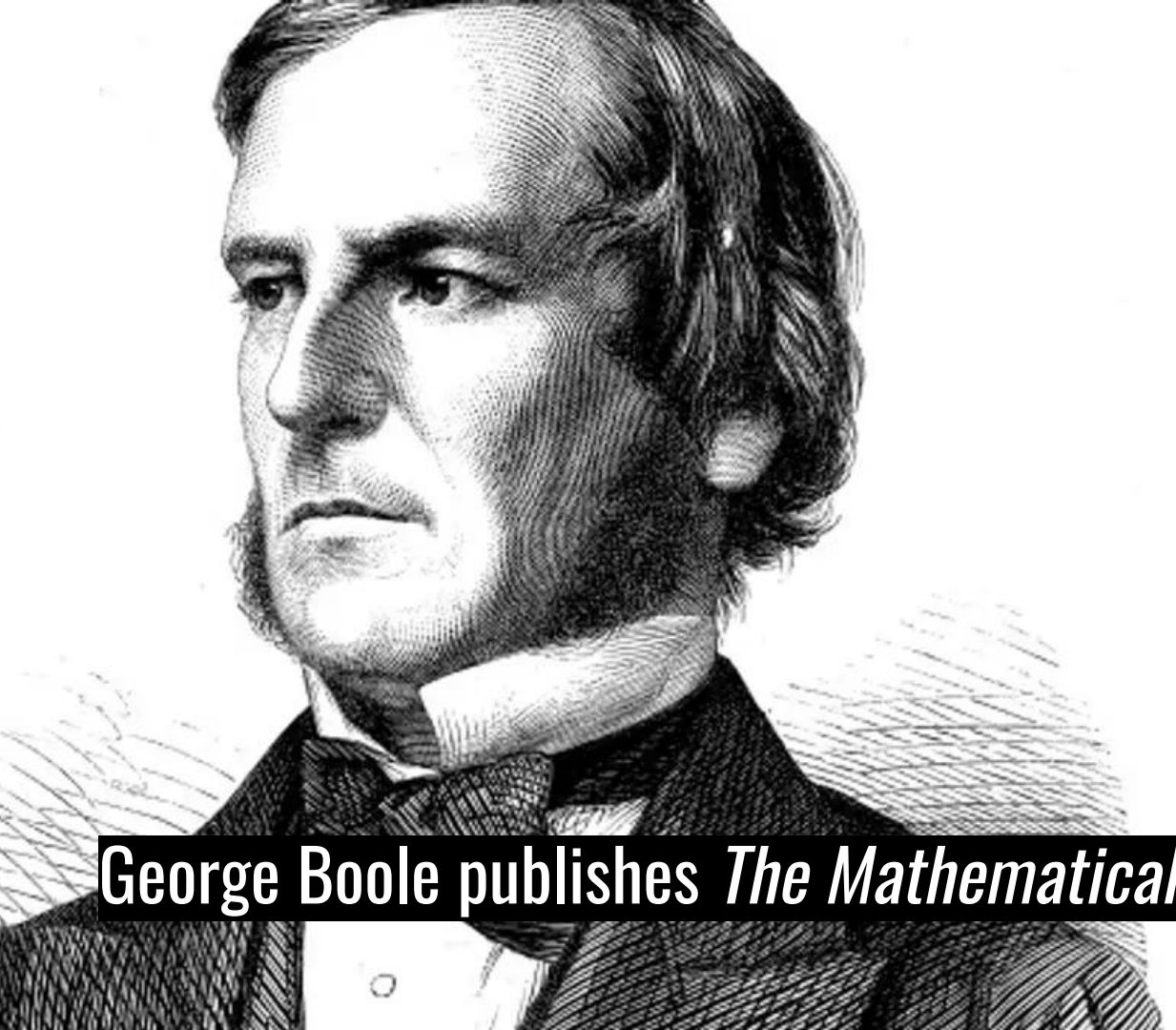
Storytime!



In the late 18th century, the German philosopher Immanuel Kant wrote that logic “has not advanced a single step, and is to all appearances a closed and completed body of doctrine...

There are but few sciences that can come into a permanent state, which admits of no further alteration.

To these belong logic and metaphysics” (see Susan Haack, *Deviant Logic, Fuzzy Logic* (Chicago: University of Chicago Press, 1996), p. 27).



THE MATHEMATICAL ANALYSIS

OF LOGIC,

BEING AN ESSAY TOWARDS A CALCULUS
OF DEDUCTIVE REASONING.

BY GEORGE BOOLE.

Ἐπικοινωνοῦσι δὲ πᾶσαι αἱ ἐπιστῆμαι ἀλλήλαις κατὰ τὰ κοινά. Κοινὰ δὲ λέγω, οἷς χρῶνται ὡς ἐκ τούτων ἀποδεικνύντες· ἀλλ' οὐ περὶ ὧν δεικνύουσιν, οὐδὲ ὃ δεικνύουσι.

ARISTOTLE, *Anal. Post.*, lib. I. cap. XI.

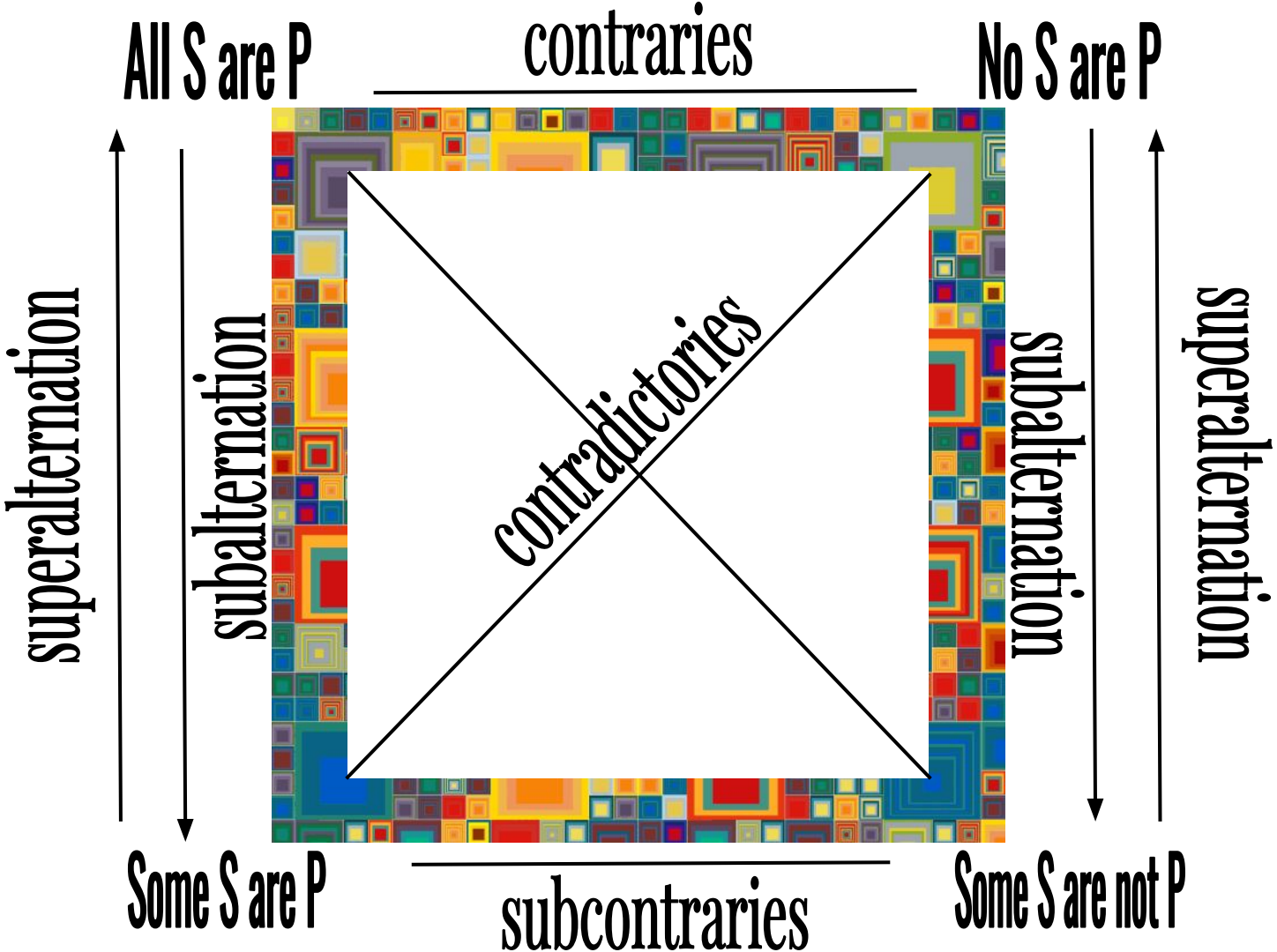
CAMBRIDGE:

George Boole publishes *The Mathematical Analysis of Logic*, 1847

Consider the following proposition:
“All dragons are things that are magical.”

Question:
Is this proposition true or false?

All pianists are persons who are handsome.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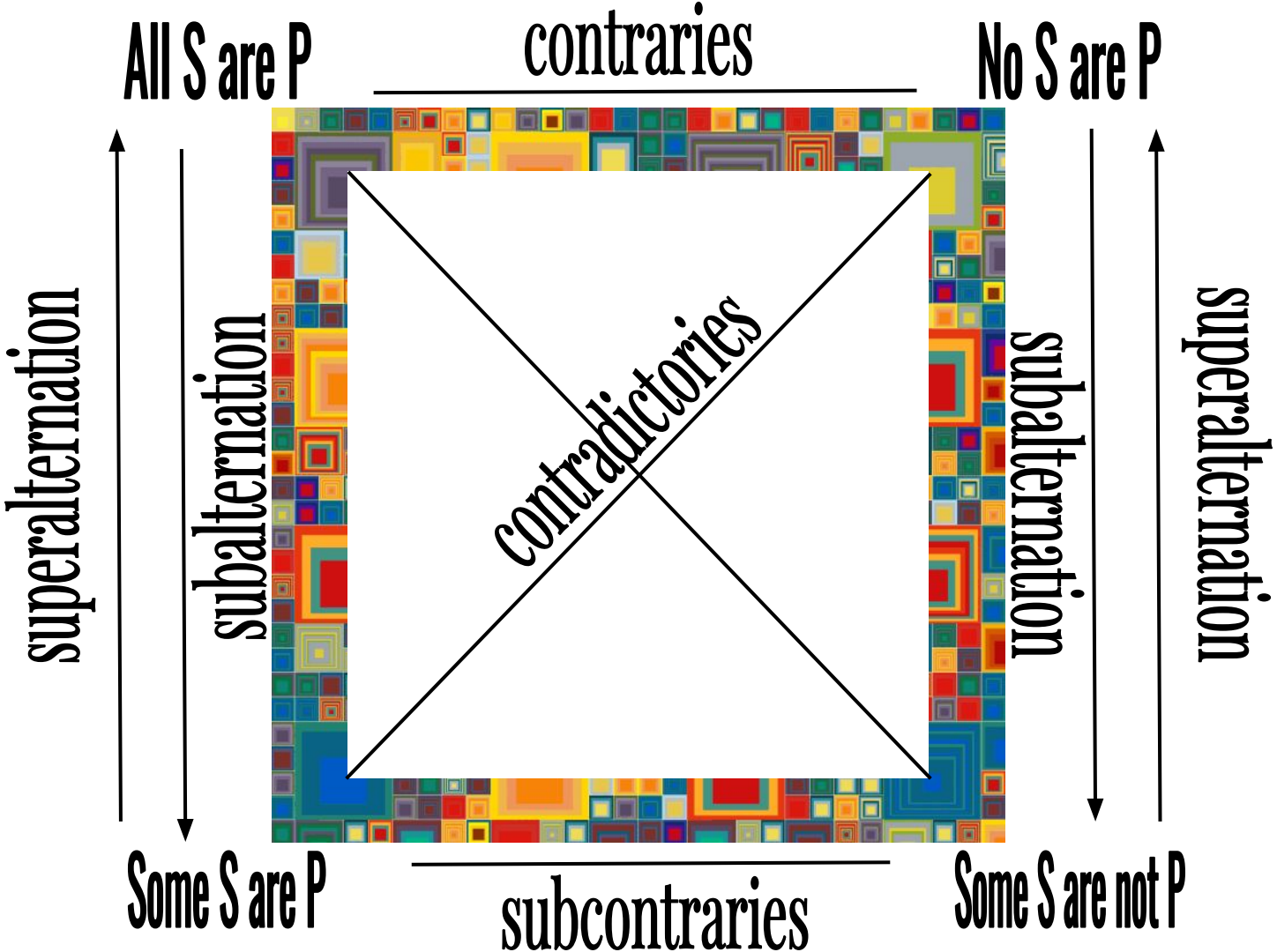
All harks are things that are scary.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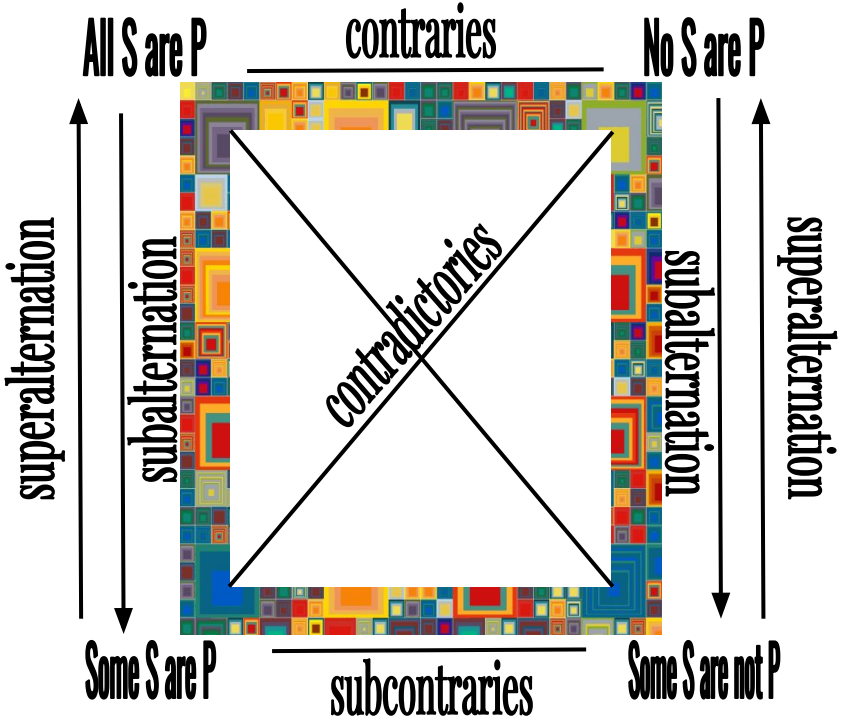
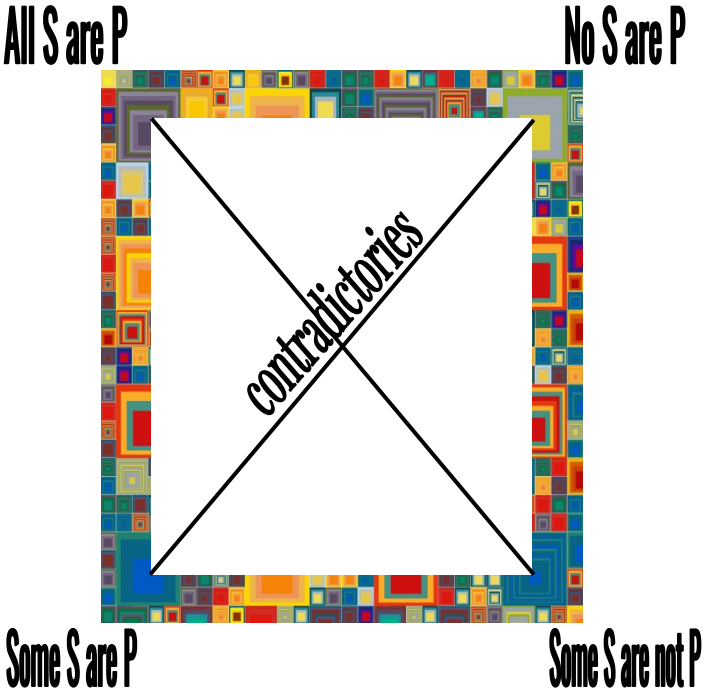
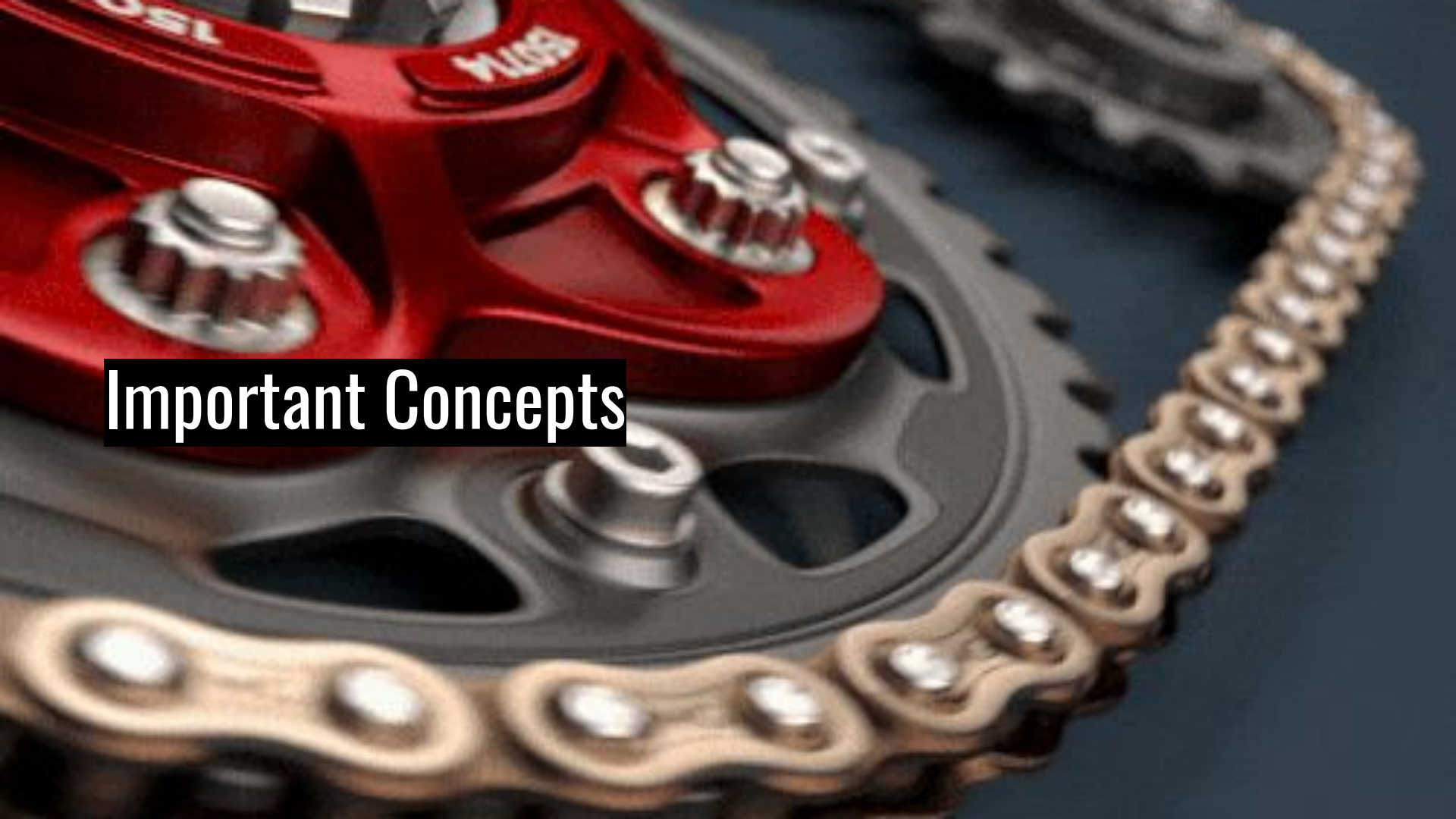


The Traditional Square of Opposition



The Modern Square of Opposition



Important Concepts

The existential viewpoint is taken when one interprets a categorical sentence such that its subject term denotes actually existing things; aka the Aristotelian viewpoint, or the traditional viewpoint.

(Ie, The categorical proposition “All F’s are G”, should be interpreted as F’s exist and they are G.)

The hypothetical viewpoint is taken when one does not interpret a categorical sentence such that its subject term denotes actually existing things; aka the Boolean viewpoint, or the modern viewpoint.

(Ie, The categorical proposition “All F’s are G” should be interpreted as ***if*** F’s exist, they would be G.)

The subject term names an empty class if the category the term denotes, ie refers to, does not contain any actually existing things.

Special cases of logical concepts

“The bottom line, then, for using the existential or hypothetical viewpoints, is this: If the terms of a universal categorical statement [**A** or **E**] refer to things that either do not exist or that we do not wish to assume exist, then we interpret the sentence from the hypothetical or Boolean viewpoint; that is, as saying that *if there were to be an S*, then it would belong to such and such a group, and so on.

On the other hand, if the terms of a categorical statement refer to something everyone in the conversation believes exists, then we assume the Aristotelian or existential viewpoint” (Herrick 2013: 173).

Special cases of logical concepts

And so we need to add a caveat when we are using the Square of Opposition to assess immediate inferences:

Note that if we are taking the hypothetical or Boolean viewpoint, we must use the Modern Square of Opposition.