*Modal logic (one of the non-classic logics)*

In this optic we reason in terms of **necessity** and **possibility**.

There is also a broader sense of modal logic: it deals with the whole range of types of reasoning which are not centered on truth functions (Epistemic, Deontic, Temporal…).

*Aristotelian Modal Logic (context of syllogism)*

Aristotle had something to say about this type of logic, in the context of syllogism. In Prior analytics he finds four types of modal logic:

* Plain or Assertonic
* Necessity
* Possibility
* Two-way possibility (or contingent).

Within each of these types there is a further distinction. The general aim of Aristotle here is to see which pair of propositions logically implies which type of conclusion.

Despite all these, his work on modality was really very severely criticized.

*Problems with Aristotle’s modalities*

A modern commentator, Becker A., explained the reason why Aristotle got into so much trouble: the problem is that Aristotle seems to confuse the two types of modality, and this conduct to equivocate.  According to him there are two types of modalities in Aristotle:  “All lions are necessarily animals”. We might mean  (1) either it is a necessary true (2) it is true that for every and each lion, the being an animal necessarily applies to it.   “Everything lying down in a particular place is in fact a lion”.  It is true of each and everything that is there that being a lion applies to it, but it is not a necessary true that thing is a lion. (it is not a necessary truth that a thing lying down in a place is a lion, one way of a reading is true, and the other is not.) It depends by the fact that we can read a modal statement in two ways.

***De Dicto/ De Re Modalities***

* ‘De dicto' modalities concern entire statements, so necessity is a property of what is expressed by a proposition. We are looking at the entire statement in its completeness, and we wonder if it is necessary.
* ‘De re’ modalities are property of the things on which the proposition assert something. We wonder if that thing applies only to that thing. We are referring to the subject to which the statement gives a particular fact. De Re necessity is a type of natural necessity; but natural necessity is not be to confused with logical necessity.

Aristotle doesn’t make this distinction, he doesn’t clarify what meaning of the two he uses. This distinction is very important because **whatever is true ‘de dicto’ is not necessarily true ‘de re’.**

*Necessity and Essentialism*

…Unless we bring in a particular type of perspective (**essentialism**). If we argue that something has necessarily a property we can say that that property is the essence of that subject. ‘De re’ modality becomes married to a kind of natural necessity that can’t be confused with logical necessity. The necessity of a logical inference does not depend on the way the world is.

**SUMMARY**

1. “De Dicto” modal claim is one in which a whole proposition is attributed a modal property.
2. “De Re” modal claim is one in which an object is attributed a modal property.
3. If some “De Re” modal claims are true, Essentialism follows: objects have essences at least insofar as they have some properties necessarily.

***C.I Lewis***

The father of modal logic is **C.I. Lewis**. He didn’t want to invent a new type of logic, he just reflected on some problems coming out from the work on material implication of Russell. Lewis came out with this idea of modal logic. The problem was the one posed by material implication.

**Material implication (P—>Q)**

The verb ‘to imply’ has several different meanings, which can be convey by the pair “if…then”. There are different type of conditional reasonings:

* Logical type
* Definitional type
* Causal type
* Decisional type.

**P (antecedent)** *-> (material implication)* Q (consequence).  Material implication is just a connective. We want to apply the test of being true or false.

**Implication: True or False and Paradoxes of Material Implication**

P Q If P then Q

T T T —> Ok

T F F —> Ok

F T T —> PROBLEM

F F T —> From F only derive F so it’s true

A question we want to raise is wether we can apply our true or falsity test. In order to answer we use a tool, which is the ‘truth table’.  We have two statements and then the implication.  P materially implies Q, it is false that P is true and Q is false.  If Q is true, the implication is still true independently from P.  ‘The moon is made of green cheese’ -> ‘2+2=4’. The material implication is true independently by P. Even if P and Q are both false, the implication is true. It is true that from a false antecedent I derive a false consequence. These are called ‘**paradoxes**’ and the truth table helps us to see them graphically.

Root of Paradoxes:

* The truth value is independent of the sentence’s content, but…
* Without content there is no implication
* The truth functionality loses relevancy

Why material implication?

There is a bit price to pay in this type of reasoning. If the true value of the combined sentence is a function of the true value of the antecedent and consequence alone, what we are concentrating on is the truth value of the sentences, independently on the content we put in each sentence. We are still acting within the borderline of classic logic (logical form of statement is what we concentrate on). In the case of material implication this doesn’t work: if the content is irrelevant, we might actually put in the implication whatever content we want, and the contents could be utterly unrelated to one another. Material implication has the property that a false proposition might imply almost anything. “What a useless type of reasoning.” (Lewis).

***Lewis: Strict Implication***

Lewis introduces what he names **strictly implication**

* It is impossible that A is true and B is false.
* A strictly implies B
* The Truth of A is inconsistent with the falsity of

***1) He introduces the pair possible/impossible***. This shows a further aspect, that the logical validity or consistency are not sufficient to represent the correctness of the piece of reasoning.

***2) Validity and Correctness***

We need to add further connotation: we need to add things like **relevance**, and **congruence**.

***3)*** ***No contradiction not enough***Still we need to give an ultimate correction in order to make this work. We need to create connection of congruence (relevance and coherence) between the elements of the reasoning.