

Notes - Logic Seminar, 3-18-12 (organizational/first meeting)

Logic is natural

- “Now you may be surprised to know that all of us already use logic all the time. Natural human reasoning instinctively recognizes things like inferences and contradictions, and as a thinker you have been doing this from the time you became able to think.” (An Introduction to Traditional Logic [ITL] at 1).
- I illustrated this point with a piece of conversation that I had with my six-year old son, Leo, which was prompted by my observation of a person with many tattoos. The following ensued:

Dad: “People with tattoos annoy me.”

Leo: “Then Uncle Jimmy annoys you.”
- Leo reasoned logically, using, as Sullivan will explain, a first figure syllogism called “Darii” (ITL at 152). This valid syllogism, symbolized, reads:

All M is P [universal affirmative proposition]

Some S is M [particular affirmative proposition]

Therefore, some S is P. [particular affirmative proposition]
- Leo’s reasoning, expressed in this syllogism, was as follows:

“All persons with tattoos [M] are people who annoy dad [P].”

“Uncle Jimmy [S] is a person with a tattoo [M].”

“Therefore, Uncle Jimmy [S] annoys dad [P].”
- As an aside, Leo’s syllogism involved an enthymeme, i.e., an unexpressed premise, the minor premise, “Uncle Jimmy [S] is a person with a tattoo [M].”
- In Aristotle’s *Prior Analytics*, Book I, Ch. 4, he gives the following account of the “Darii” syllogism: “Let all B be A and some C be B. Then if ‘predicated of all’ means what was said above, it is necessary that some C is A.”
- Leo, as one would rightly figure, has never read Aristotle. And, yet, he was able to utilize “Darii.” How? Quoting Sullivan, “Natural human reasoning instinctively recognizes things like inferences....” (ITL at 1).

Truth and validity

- A **sound** argument is a **valid** argument with actually **true** premises.
- The conversation with Leo illustrates these key ideas introduced by Sullivan in Chapter 1.

- Sullivan draws a distinction between material and formal logic: material logic is concerned with determining the truth or falsity of premises; formal logic is concerned with determining the validity of arguments. (ITL at 7).
- The conclusion that Leo confronted me with, that my brother annoys me, was the result of a valid argument but the conclusion was not true – my brother does not annoy me. [Note: Sullivan states several times that only premises are true or false; but, as he does elsewhere recognize, conclusions are also true or false.
- Because the argument was valid but the conclusion false, the premises cannot both be true. This follows from the definition of a valid argument as one in which the truth of the premises guarantees the truth of the conclusion, i.e., if the premises are true, the conclusion must be true. If both premises in my example were true, then the conclusion would have to be true. But the conclusion is not true, therefore the premises are not both true (*modus tollens*).
- The minor premise is true, as my brother really does have tattoos.
- Therefore, the major premise is not true: it is not the case that all persons with tattoos annoy me.
- Leo, by use of logic, exposed a petty prejudice of mine.
- In the same way, logic can expose other, more serious prejudices. One could easily substitute identity by tattoo with identity by race.
- I remember reading somewhere about a Supreme Court justice, on the bench when *Brown v. Board of Education* was decided, who explained how his perception of African-Americans changed when, as a young man, he heard African-Americans playing jazz in New Orleans. An encounter with particular persons, plus some “Darii” reasoning, changed the mind of a future Supreme Court justice and the law of our land (assuming I got the story right).

Propositional and predicate logic

- We touched on a fundamental topic in the development of logic, namely the advent of predicate logic.
- The following is from Daniel Bonevac, Deduction: Introductory Symbolic Logic [Deduction]: “The split between syllogistic and sentential logic, which began in Greece in the third or fourth century B.C., persisted for more than two thousand years. Neither theory could account for arguments that the other took as paradigms of correct reasoning.” (Deduction at 137).
- Propositional logic is another name for sentential logic.
- Propositional logic provides for an analysis of arguments based upon connectives linking atomic or simple sentences. The connectives are negation (symbolized by “-”), conjunction (“and” symbolized by “&” or “•”), disjunction (“or” symbolized by “v”), conditional (“if, then” symbolized by “>”), and the biconditional (symbolized “≡”)
- The point to emphasize now is that propositional logic analyzes arguments on the basis of the relationship between propositions as opposed to the relationship between the terms within propositions.
- For example, propositional logic treats the proposition, i.e., atomic sentence, “All humans are mortal,” as a single unit, and gives it a single symbol, “H” (or “M” or what have you).

- In a standard syllogism, say “Darii,” discussed above, propositional logic cannot show its validity.
- Propositional logic could only give us something like the following:

T (for “All persons with tattoos are people who annoy dad ”)

U (for “Uncle Jimmy is a person with a tattoo”)

Therefore A (for , “Uncle Jimmy annoys dad”)

- There is no valid inference to draw from this symbolization of the argument.
- As Bonevac explains, “The validity of arguments such as [our “Darii” example] depends on the structure within sentences, not on the structure relating distinct sentences. No theory that declines to analyze what sentential logic calls ‘atomic’ sentences can hope to account for syllogistic reasoning.” (Deduction at 136).
- Predicate logic, developed in the 19th Century by Frege and Peirce (separately), provides a method for analyzing simultaneously the internal structure of atomic sentences, i.e., the relationships between a proposition’s terms, and the relationship between propositions through the connectives listed above.
- Thus, predicate logic is generally regarded as a more powerful tool than classical logic inasmuch as it can account for more varied forms of deduction.
- So the story goes. Our task, in part, is to find out for ourselves how much reasoning classical logic captures.