PHIL100 §0203,0205,0207 TA: Wm Kallfelz
Sept 22, 2006 Syllogistic Logic – Week III (Final week)

- **Validity, Validity, Wherefore art Thou?**

Recall the Notes :

Analysis of Rules A-E (From the Logic Section - p2 of Odell's first handout): *click here*

posted on my section website
http://www.glue.umd.edu/~wkallfel/PHIL100Fall2006/WK/index.html

In these notes you'll see a systematic analysis of applying rules (A) – (E) to the total number of 4^4=256 different kinds of SFCS[1]. As you'd suspect, and what the handout precisely confirms, is that most of these cases are invalid. (As shown on page 8, the total # of *valid* kinds of SFCS turn out to be on 44, or only 17% of the cases.) So chances are rather high that if you stumble across an SFCS at random, it's going to be invalid (83% as a matter of fact). So it's useful to know a thing or two about *which* of those SFCS are the valid ones.

The Medieval logicians already had a rather clever mnemonic device for remembering those valid SFCS. I list a few examples below. (I'm not going to list all 44 cases).

1. '**B**a**r**b**a**r**a**-1' (or AAA_1)
2. '**Cel**a**re**nt-1,2' (or EAE_1, EAE_2)
3. **Darii**-1,3 (AII_1, AII_3)
4. **Ferio** (EIO)

Etc…

The above are all Latin proper names. Notice that the vowels in the names (highlit in bold) tell you what mood you're dealing with. 'Barbara' is weakly valid, in the sense that only "she's" only valid in one of her four figures. Celarent and Darii, on the other hand, are valid in first and second, first and third figures, respectively. Ferio, on the other hand, is valid no matter what.[2] Ferio is an example of a strongly valid SFCS, since "his" validity is independent of figure.

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[1] There are 256 different kinds, because as the handout details: 4 different kinds of major premises (A,E,I,O) × 4 different kinds of minor premises (A,E,I,O) × 4 different kinds of conclusion (A,E,I,O) × 4 different kinds of figure = 4^4=256 total.
[2] You can't help but worry about someone who is always consistent, no matter what ☺

In class we've already numerous examples of "Barbara-1," as this AAA_1 syllogism is an example of *transitive* reasoning (i.e., 'All S are M,' 'All M are P,' therefore 'All S are P'. I extra reversed the order of the major and minor premises to sho the transitive structure.)

Here are some examples of when Barbara is invalid:

- (Barbara-2) "If anyone's unhappy, then they didn't do well, **so** Sara must have done well, because she's happy."

  unhappy → *not-M*; didn't do well → *not-P*; Sara → *S*; done well → *P*; she → *S*; happy → *M*

S = The class of all entities consisting of only member (Sara-singularly refering)
M = The class of all entities who are happy
P = The class of all entities who do well

So the major premise is of the form: **If *not-M*, then *not-P*.** As discussed in Wednesday (Sept 20) as well as in last discussion section (Sept 15), this is the conditional contrapositive version of the *A*-form: **All *P* are *M*.**

So the SFC has structure:

All *P* are *M*
All *S* are *M*.
∴ All *S* are *P*.

This is an example of AAA_2 ("Barbara-2"). It's *invalid* because it violates rule (C), since none of the occurrences of *M* are distributed (*M* is the predicate of two A-forms, therefore not distributed.) In everyday logical parlance, this is an example of the fallacy of *affirming the antecedent.* For if you translate the major premise in A form (conditional), one could restate the above SFCS as: "If anyone does well, then they're happy. Sarah is happy. Therefore Sarah did well." No doubt you see why this reasoning is incorrect. There could be lots of reasons why Sarah is happy (she could have just one the lottery, etc…) that have absolutely nothing to do with her doing well.

Barbara-3,4 are even more obviously fallacious:

- Barbara 3 (Example). "Every mouse is furry, and all mice are animals, so every animal is furry." (HUH?)

- Barbara 4 (Example). "Every mouse is a small animal, and all small animals are lightweight, so everything lightweight is a mouse." (HUH??)

As an exercise, analyze Barbara-3, 4 as above. What you'll discover is that Barbara-3 and 4 both violate rule (D).

Celarent1,2 are valid. All his four figures are:

Fig 1	Fig 2	Fig 3	Fig 4
No ***M*** **are** ***P*** **All** ***S*** **are** ***M*****.** **∴ No** ***S*** **are** ***P*****.**	**No** ***P*** **are** ***M*** **All** ***S*** **are** ***M*****.** **∴ No** ***S*** **are** ***P*****.**	No *M* are *P* All *M* are *S* ∴ No *S* are *P*.	No *P* are *M* All *M* are *S*. ∴ No *S* are *P*.

While Fig3,4 violate Rule (D). Try to come up with some examples of all four figures, using ordinary language.

Darii1,3 are valid. All his four figures are:

Fig 1	Fig 2	Fig 3	Fig 4
All ***M*** **are** ***P*** **Some** ***S*** **are** ***M*****.** **∴ Some** ***S*** **are** ***P*****.**	All *P* are *M* Some *S* are *M*. ∴ Some *S* are *P*.	**All** ***M*** **are** ***P*** **Some** ***M*** **are** ***S*** **∴ Some** ***S*** **are** ***P*****.**	All *P* are *M* Some *M* are *S*. ∴ Some *S* are *P*.

While Figs 2,4 violate Rule (C). Try to come up with some examples of all four figures, using ordinary language.

Ferio is always valid. All his four figures are:

Fig 1	Fig 2	Fig 3	Fig 4
No ***M*** **are** ***P*** **Some** ***S*** **are** ***M*****.** **∴ Some** ***S*** **are not-*****P*****.**	**No** ***P*** **are** ***M*** **Some** ***S*** **are** ***M*****.** **∴ Some** ***S*** **are not-*****P*****.**	**No** ***M*** **are** ***P*** **Some** ***M*** **are** ***S*** **∴ Some** ***S*** **are not-*****P*****.**	**No** ***P*** **are** ***M*** **Some** ***M*** **are** ***S*****.** **∴ Some** ***S*** **are not-*****P*****.**

‘Ferio,’ is close to the Latin word ‘Ferro,’ (Iron). Strong guy indeed! Try to come up with some examples of all four figures, using ordinary language.

- **When the A,E,I,O forms don't apply**

On the one hand, the A,E,I,O forms, originally developed by Aristotle, seem to exhaust all possibilities -- when seeking to boil down statements- or (or truth-evaluable sentences, i.e. sentences that can be determined as True or False.) In other words, the A,E,I,O forms seem to be, like in the case of the DNA molecule, the fundamental 'enzymes' out of which the richness of logic is based. (Keep in mind the Syllogistic logic you're learning is only one rather simple 'organism' based on the A,E,I,O forms). But even in Aristotle's time, and especially in the Medieval era, logicians knew this wasn't so. There *are* instances of elementary truth-evaluable sentences that defy categorization into A,E,I,O forms. But it took over two thousand years -- and a radical revision of logic from the ground up, initiated by the great 19th century mathematician/logician/philosopher Gottlob Frege to develop logical forms which could cover the cases where the A,E,I,O forms could not. Pretty smart guy, that Aristotle!

Here are two examples of such elementary statements (unable to be translated into A,E,I,O form)

1. **(Quasi-numerical expressions):** "**Most** of the people interviewed preferred brand X," "**Very few** of the people interviewed preferred brand X."
2. **(Mixed Quantification expressions):** "**Every** person has **some** mother," "In **every** joy in love resides, **a** thousand woes or more abide" (16th cent verse - Traeherne), "To **everything** , **there is a** season." (Ecclesiastes)

In case 1., "most" and "few" would have to be translated as "some." So in I-form: "Some S are P" (S: people interviewed / P: entities that like brand X). But the above statements say two different things, logically speaking! (We certainly would not want to say they're logically equivalent. But the A-form implies that they are)

The problem is that "all" (= "each," "every," "any",...) and "some" (="there exists," "there is a," "a," "not all," ...) and "not" are essentially *qualitative* notions that cannot capture *quantitative* information, except in the simplest cases (in the cases in which it suffices just to know if "all," or "some" holds)

In case 2., notice that the "some" depends on the "all" in an interesting way. But "some" is particular, and 'all' is universal. A,E are universal (affirmative/negative) whereas I,O are particular (affirmative/negative). So A,E,I,O automatically makes "all" and "some" independent of each other. Suppose we tried to translate the above. Consider the first case A-form: "All S are P" (S: people, P: entities that have mothers) On the face of it, it *seems* okay. But automatically notice how the "some" got dropped in the predicate. This is how the Medieval logicians sought to 'solve' the problem.

But consider this instance: "For **every** dollar of profit the company will donate **a** penny to charity." Translated into A form: "All S are P" S: dollars of profit, P: donations consisting of a penny. So if the company made 1 million dollars, then the A form would imply there's nothing wrong with the company donating just one penny to charity! Suppose we try to fix with by making the above into a conjunction of an A and I form: "All S_1 are P_1" & "Some S_1 are P_2 " where: S_1 = dollars, P_1= entities that are profit, P_2= entities consisting of a penny in charity.

Well that 'solution' just renders the problem more explicit. We *know* what the the statement means..*a* penny towards goes for *every* dollar in profit. But the problem with the A,E,I,O forms, no matter how ingenious, is that the particular-universal dependency is not captured.

A,E,I,O forms deal with simple classes of abstract entities (recall the blob drawings that indicate which terms -- the subject or the predicate-- get distributed). There are basically three ways to combine such blobs: a) Embed one blob entirely inside the other (A-form case), b) b) Have the two blobs overlap in such a way that one is not completely inside the other (I,O forms), c) Don't have them overlap at all (E form). But as you can imagine, overlapping blobs cannot capture this interesting dependency between particular and universal.