# LING 510, Lab 3
**September 23, 2013**

| **Agenda:** |
|---|
| • Go over Homework 1<br>• Go over JYW, if there are questions<br>• Go over function application (what we ended with on Thursday) |

## 1. Frequently missed questions on Homework 1

- The full key will be posted on Moodle! If you are unsure why you missed something, ask me, ask Ilaria, or check the key.

- In the future, if you are asked to list the members of the set, **put them in curly brackets!** If you don't, you will lose points.

- **PLEASE STAPLE! SEPARATED PAPERS RUN THE RISK OF NOT BEING GRADED**

***Part One: Exercises on Set Theory***

**(1) m. False**

B ⊆ G is false where B = {a,b} and G = {{a,b}, {c,2}}. a and b are not members of G. If we were to write out all of the subsets of G, they'd look like the following:

{{a,b}}, {{c,2}}, {{a,b},{c,2}}

you can see that {a,b} is not a possible subset of G.

**n. True**

{B} ⊆ G is true. B = {a,b}, so {B} (i.e., "the set containing set B") can be written as{{a,b}}. Looking above where we wrote out all the subsets of G, you can see that {{a,b}} is, in fact, a subset of G.

**r. True**

{{c}} ⊆ E is true. Set E is {a,b,{c}}. We can say that {{c}} is a subset of the set {a,b,{c}} because every member of the set {{c}} is in {a,b,{c}}. This is true because {c} is a member of both {a,b,{c}} and {{c}}.

**(4) b. Which sets are subsets of S1?**

S1 is {{Ø}, {A}, A}

It's subsets are:
- S6 = Ø (because the empty set is a subset of every set)
- S1 (because every set is a subset of itself)
- S8 ={{Ø}}
- S3 = {A}
- S4 = {{A}}
- S5 = {{A}, A}

Why is S9 not a subset of S1? Where S9 = {Ø, {Ø}}. If we compare S1 and S9, is it true that every **member** of S9 is also a **member** of S1? It is not true. Ø is a **member** of S9 but is not a **member** of S1.

**Remember**:
The empty set Ø is automatically **subset** (all by itself) of every set,
but is not a **member** of every set.
Many sets (including S1) don't have Ø as a member.

**(6)** **e. D ∪ F**, where D = {b,c} and F = Ø. D ∪ F = {b,c}. Why is Ø not in there? Because Ø is the empty set…i.e., the set without **any** members. If you take the union of {b,c} and a set containing nothing, you get {b,c}. It's like adding 0 to a number. A general rule is that the union of **any** set and the empty set is just the first set.

What if we asked you for D ∪ {Ø}? Then you would say {b, c, Ø}. That is because now we're taking the union of D and a set that **does** have something in it...it's only member is the empty set. So, when you take the union of two sets, you make a new set containing **all** of their members. Ø is a member of the latter set, so it goes in the new set that you make.

**q.** G – B, where G = {{a,b},{c,2}} and B = {a,b}. The answer is {{a,b},{c,2}}. That means we have taken nothing away from G. Why? Because set B has no **members** in common with G. G contains as a member the **set** {a,b} but doesn't contain a and b on their own. Thus, B has no members in common with G so nothing is subtracted out.

***Part Two: Semantic Relations***

**Remember: How do Chierchia and McConnell-Ginet define an entailment?**

A entails B iff: Whenever A is true, B is true.

**A test for entailment:** If you say *A and not B*, is it a contradiction (AKA, can't be true in any situation)? If so, A entails B.

**!!! Tip 1:** Another way to connect A and B to test for entailment is to say *A…in fact, not B*. If by saying this you have contradicted yourself, then A entails B.

**!!! Tip 2:** Sometimes *but* will sound better than *and* or *in fact*. You can also use *A but not B* to test for entailment.

Using these tests is called testing whether you '**cancel**.' Implicatures can be cancelled. Entailments cannot be.

**Key to the symbols used below:**
a ⇒ b = a entails b          a → b = b follows from a (b is an implicature)

**(4)** a. I ate half of the cake.
b. I didn't eat all of the cake.          a → b

Many of you said that *a* entails *b* in (4) when *b* is actually just an implicature of *a*. How do we know? **Let's apply the test:**

✓I ate half of the cake and it is not the case that I didn't eat all of the cake.

*Or, more colloquially (because two negatives make a positive)…*
✓I ate half of the cake and I ate all of the cake.

*Or, even more colloquially (given the pro-tip above):*
✓ I ate half of the cake…in fact, I ate all of the cake.

- It is true that when a person says the sentence 'I ate half of the cake,' most reasonable people will conclude that this person didn't eat all of the cake. If they had eaten the whole thing, they should have said so. **It is true, then, that b is an implicature drawn from a.**

- The exact same reasoning applies to (9).

**Linguistic Aside:**

Implicatures that are always drawn, no matter the context, are called *conventionalized implicatures*. In (4), we can say that *b* is a conventionalized implicature of *a*. Whenever a person says 'I ate half of the cake,' any reasonable person would conclude that they must not have eaten all of the cake. If they had eaten the whole thing, they would have said so.

…in the very first week, someone mentioned numerals. Some linguists believe that the 'exactly' interpretation of numerals is also a conventionalized implicature. They think this because the following can be said:

(i) a. Mary has three children…in fact, she has four!
b. Mary is 5'3" tall…in fact, she is 6' tall!

If these sound odd, think of a roller coaster scenario for (ib): if you see a sign that says "You must be 5'3" tall to ride this ride!" and you are 5'7", do you conclude that you can't ride?

**Question:** *If when we say 5'3" we don't mean 'exactly 5'3," then what could we mean?*

**(6)** a. Margo usually drinks tea at breakfast.
b. Margo sometimes drinks tea at breakfast.
c. Margo doesn't always drink tea at breakfast.

a ⇒ b    a → c    b → c

The response we were definitely wanting to see was a ⇒ b. How do we know that a entails b? **Again, we can apply our test:**

**Contradiction:** Margo usually drinks tea at breakfast but it's not the case that she sometimes drinks tea at breakfast.

**Another aside:**

Why am I using the collocation *it's not the case that…* rather than just throwing *not* or *doesn't* in there somewhere? Because when we apply our contradiction/cancellation test for entailment between *a* and *b*, we want to make sure that we negate the entirety of *b*.

**A possible error that you might have made:** You go to apply the test and think you get the following…. Margo usually drinks tea at breakfast but sometimes she doesn't drink tea at breakfast.

This is not a contradiction, you say! So *a* must not entail *b*!

**But wait.** When you negated *b*, you put negation "lower than" *sometimes*. This is a misapplication of the test and its given bad results.

**Question:** Can you see why a → c and b → c ?

**(7)** a. Sally stopped gambling.
b. Sally used to gamble.
c. Sally does not gamble now.
a ⇒ b (a ⇒ or → c) b → a b → c

We were especially looking for the first one.

How do we know that *a* entails *b*? **Let's apply the test:**

**Contradiction:** Sally stopped gambling…in fact, it's not the case that Sally used to gamble.

There's something about the verb *to stop Verb-ing* that entails that the subject used to *Verb*.

Why might we think that a entails c? **Let's apply the test:**

Sally stopped gambling and it's not the case that Sally does not gamble now.

*Or, more colloquially:*
Sally stopped gambling and she gambles now.

**This may sound like a contadiction to you because how you interpret the verb *stop*. If so, you'd say that *a* entails *c*.**

*An alternative line of reasoning that many people had:* You can stop but then start again. Simply saying 'Sally stopped gambling' doesn't guarantee she didn't start again. If you used this reasoning, then you'd conclude that *c* is just an implicature of *a*.

## 2. JYW Assignment – Any Questions?

- Do animal alarm call systems exhibit compositionality?
    - What is compositionality?
    - What do monkey and/or prairie dog alarm call systems look like?
    - …are they compositional?
    - How do these findings fit into a broader context? (E.g., do animals have true linguistic capabilities)

- **Focus on compositionality**. This is not just a rehash of LING 101 essays on animal language. This is specifically about compositionality and what it takes for a language-like system to show compositionality.

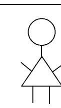
## 3. Practicing Function Application

✱ **Note:** In this section, I will use *italics* for object language and plain text for meta-language. ✱

- **Principle of Compositionality (Partee 1995):** The meaning of a complex expression (like a sentence or a compound) can be computed from the meaning of its component expressions.

- **Some notation:** $[[X]]^s$ = the extension of X in situation *s*.

**Extensions that we've seen so far**

| *Category:* | *Extension:* | *Example:* |
|---|---|---|
| **Referential Noun** | Actual entity (individual) | [[*Elizabeth*]] =  = Elizabeth |
| **Sentence** | Truth value | [[*Elizabeth is talking*]]$^s$ = 1 *iff* Elizabeth is talking in *s*. |
| **Predicate** | Function from entities to truth values | **See below** |

- **Question:** What were the two major (equivalent) ways to represent the extension of predicates like *is talking*?

- **Answer:** We can write it as a set of individuals and as a characteristic function of that set.

- Let's practice with a very small situation $s_1$. The domain of entities (individuals) is just two people: {Elizabeth, Ilaria}. Elizabeth is talking in this situation and Ilaria is not.

**1)** ***Set:***

In the current situation s1, [[*is talking*]]$^{s1}$ = {Elizabeth}

**2)** ***Characteristic Function:***

> **Note!** There's a number of ways to write characteristic functions. They are listed out in 2a-2d.

**2a)** ***Writing a characteristic function for a particular situation as a table:***

$$[[\textit{is talking}]]^{s1} = f: \begin{bmatrix} \text{Elizabeth} \rightarrow 1 \\ \text{Ilaria} \rightarrow 0 \end{bmatrix}$$

**Remember:** f : A → B is read "the function f such that it that maps A to B"

**2b)** ***Writing a characteristic function for a particular situation as a set of ordered pairs:***

[[*is talking*]]$^{s1}$ = {<Elizabeth,1>, <Ilaria,0>}

**Remember:** All functions can be written as sets of ordered pairs.

**2c)** ***Writing a characteristic function for a particular situation using the following notation:***

$f_1$: $D_e \rightarrow D_t$

For all $x \in D_e$, $f(x) = 1$ iff x smiles in $s_1$.

> **Note!** The notation in (2c) notation is especially useful if you have a very large domain of entities or you don't know all the truth values that each entity maps onto.

**2d)** ***You can also write characteristic functions so that they can be used in any situation.***

For any s, $f_1$: $D_e \rightarrow D_t$

For all $x \in D_e$, $f(x) = 1$ iff x smiles in s.

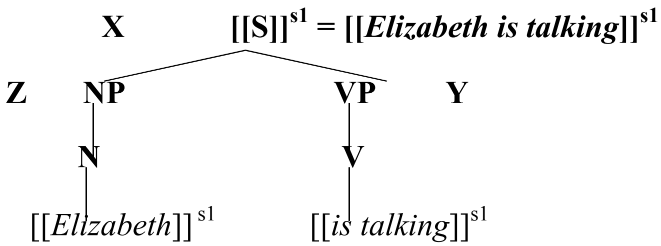
> **Note!** The only thing that is different between (2d) and (2c) is that in (2d), you say "For any s…" while in (2c), you're talking about a specific situation (e.g., s1).

## ★ Function Application (for branching nodes) is a recipe for putting <u>extensions</u> together in a particular way ★

**Function Application:** If X is a branching node that has two daughters – Y and Z – and if [[Y]] is a function whose domain contains [[Z]], then [[X]] = [[Y]]([[Z]])

**What we get from having Function Application at our disposal:** Our system can now derive the extension of a sentence (its truth value) from the extensions of its component parts and from the facts of the world.

### Example 1:




**Prompt: Compute the truth conditions of the sentence *Elizabeth is talking* assuming *s1* as your situation of evaluation.**
**Show lexical entries, subproofs, and the calculation of truth conditions.**

### Example 2:

You know the following is true about the situation $s_2$. The domain of entities (individuals) in $s_2$ is {McGee, Herschel, Buttercup, Priscilla, Prudence}. McGee, Buttercup, and Herschel are orange cats. Priscilla and Prudence are not orange cats.

**Prompt: Compute the truth conditions of the sentence *Prudence is an orange cat* assuming *s2* as your situation of evaluation.**
**Show lexical entries, subproofs, and the calculation of truth conditions.**

### Example 3:

Calculate the truth value of the sentence *The main instructor of 510 is from Italy*.

**Prompt: Compute the truth conditions of the sentence *The main instructor of 510 is from Italy* assuming $w_0$ (the real world) as your situation of evaluation.**
**Show lexical entries, subproofs, and the calculation of truth conditions.**