1.0 Introduction

Linguistics is the study of language.

In PHONETICS and PHONOLOGY, we study

(i) what sorts of sounds there are

- **Blackfoot:** p, t, k, ? , s, m, n
- **English:** p, t, k, b, d, g, f, v, s, z, ð, ..

(ii) the rules about how these sounds can combine into syllables, words, etc.,

<table>
<thead>
<tr>
<th>Blackfoot</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ist.tsksi.wa]</td>
<td>[ætl.ðow]</td>
</tr>
<tr>
<td>*[ɑɫ.ðow]</td>
<td>[ist.tsksi.wa]</td>
</tr>
<tr>
<td></td>
<td>(well-formed)</td>
</tr>
<tr>
<td></td>
<td>(not well-formed)</td>
</tr>
</tbody>
</table>

In MORPHOLOGY and SYNTAX, we study

(i) what sorts of words and morphemes there are
(ii) the rules about how these can combine into phrases, sentences

<table>
<thead>
<tr>
<th>Blackfoot</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>om-istsi</td>
<td>*those two-s book-s</td>
</tr>
<tr>
<td>naatoka-istsi</td>
<td>[ðoz tuz boks ]</td>
</tr>
<tr>
<td>sinakya'ts-istsi</td>
<td></td>
</tr>
<tr>
<td>dem-PL</td>
<td></td>
</tr>
<tr>
<td>two-PL</td>
<td></td>
</tr>
<tr>
<td>sinakya'ts-istsi</td>
<td></td>
</tr>
<tr>
<td>book-PL</td>
<td></td>
</tr>
<tr>
<td>“those two books”</td>
<td></td>
</tr>
</tbody>
</table>

In Blackfoot you can put plural morphology on numerals. In English you can't!

What is a morpheme?

A morpheme is the smallest, unanalyzable unit in a language that has meaning; it consists of (at least) a **FORM** and a **MEANING**.

But what is 'meaning'?

In SEMANTICS and PRAGMATICS, we study

(i) what sorts of meanings there are
(ii) the rules about how these meanings can combine
2.0 Theories of Meaning

Two Theories of Meaning:

1. Meaning as **TRUTH-CONDITIONS**
2. Meaning as **USE-CONDITIONS**

2.1 The Truth-Conditional Theory of Meaning

**Q1:** “What do you know when you know what a sentence means?”

According to the **Truth-Conditional Theory of Meaning**

→ You know what the world would have to look like, in order for that sentence to be true.

**SITUATION**

DB Cooper walked onto a Boeing 727 in 1971 with a bomb in his briefcase. He ordered a bourbon, and then demanded $200 000 from the FBI. Once he got the money, he let the passengers go (and paid for his bourbon), then ordering the pilot to follow a specific flight path. He then jumped out of the plane with a parachute and the $200 000.

DB Cooper hijacked a Boeing 727

→ **TRUE!** (This is a “truth-value judgement”)

**Q2:** “What do you know when you know what a word or morpheme means?”

→ You know how its presence/absence affects the truth conditions of a sentence.

DB Cooper hijacked **two** Boeing 727s

→ **FALSE!** (...as far as we know.)

**A SEMANTIC MINIMAL PAIR:**

| A = “DB Cooper hijacked a Boeing 727” | B = “DB Cooper hijacked **two** Boeing 727s” |
| (i) differ **minimally** in their form,¹ and (ii) have **different truth-conditions** |

¹ A has the numeral “two” (along with the grammatically required plural morphology). B doesn't.
2.2 The ‘Meaning as Use’ Theory of Meaning

Q: “What do you know when you know what a word/morpheme/sentence means?”

According to the ‘Meaning as Use’ Theory of Meaning

→ You know the sorts of situations that you can say that word/morpheme/sentence in (and not seem like a weirdo)

Did they ever find DB Cooper or the money?

DB Cooper might have hijacked the Boeing 727

...? That’s a weird thing to say.
I thought we already established that he hijacked it.

This is a “felicity judgement”

3.0 Formalizing Theories of Meaning

→ In SEMANTICS and PRAGMATICS, we study

(i) what sorts of meanings there are
(ii) the rules about how these meanings can combine

• “Meaning as USE” and
• “Truth-Conditional Meaning”

are different categories of meaning.

But how can we represent USE and TRUTH-CONDITIONS?

3.1 Model-Theoretic Semantics for Truth-Conditions

Q1: “What do you know when you know what a sentence means?”

According to the Truth-Conditional Theory of Meaning

→ You know what the world would have to look like, in order for that sentence to be true.

We can use a model to represent what the world has to look like.
There are THREE components to a model

1. The Ontology
2. Lexical Entries (i.e., the 'meaning' part of morphemes!)
3. Compositional Rules (how we interpret combinations of morphemes)

THE ONTOLOGY

The Ontology can be conceptualized like the physical components of a board game.

Consider the game Clue

- it's easy to see how you could model real-world situations using Clue game pieces.

You would use the character figurines to stand in for people in the actual world,
(eg. Colonel Mustard to stand in for Chenhao, Miss Scarlet to stand in for Sonja, ...)

In our model for language, we'll just represent these components with abstract elements:

a, b, c, d...

a stands in for Chenhao, b stands in Joel, c stands in for Clifford the big red dog...

We can call these abstract elements individuals

We'll probably want to be able to talk about more than just individuals though.

We'll want to be able to talk about events, times, etc.,

So we can represent these with more abstract elements in our ontology:

\[ t_1, t_2, t_3, ... \] (we use these to represent times)

Eg., \( t_3 \) might be last tuesday at 8pm.

\[ e_1, e_2, e_3, ... \] (we use these to represent events)

eg., \( e_3 \) might be the event of your eating breakfast this morning

So we have a bunch of elements (individuals, times and events) in our model, which we can use to talk about things in the real world (or things not in the real world).

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2  The choice of which letter of the alphabet to use is just arbitrary.
We use words/morphemes to refer to the elements in the ontology
(and so when we use the words we indirectly refer to things in the world)

**LEXICAL ENTRIES**

Lexical entries are the 'meaning' part of words and morphemes.

They refer to elements of the ontology, or sets of elements in the ontology.

For example,³

<table>
<thead>
<tr>
<th>Type</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME</td>
<td>DB Cooper</td>
<td>Refers to an individual in the ontology</td>
</tr>
<tr>
<td></td>
<td>d</td>
<td>The individual that stands in for the real DB Cooper</td>
</tr>
<tr>
<td>NOUN</td>
<td>dog</td>
<td>Refers to a set of individuals in the ontology</td>
</tr>
<tr>
<td></td>
<td>{c, f, y,...}</td>
<td>The set of individuals that stand in for dogs in the real world</td>
</tr>
<tr>
<td></td>
<td>c = Clifford, f = Fido, y = Yoshi</td>
<td></td>
</tr>
<tr>
<td>ADJECTIVE</td>
<td>red</td>
<td>Refers to a set of individuals in the ontology</td>
</tr>
<tr>
<td></td>
<td>{c, l, n,...}</td>
<td>The set of individuals that map onto red things in the real world</td>
</tr>
<tr>
<td></td>
<td>c = Clifford, l = Elmo, n = Mario</td>
<td></td>
</tr>
<tr>
<td>INTRANSITIVE VERB</td>
<td>barks</td>
<td>Refers to a set of individuals in the ontology</td>
</tr>
<tr>
<td></td>
<td>{c, f, y, s,...}</td>
<td>The set of individuals that map onto things that bark in the world</td>
</tr>
<tr>
<td></td>
<td>c = Clifford, f = Fido, y = Yoshi, s = Sammy the seal</td>
<td></td>
</tr>
<tr>
<td>TRANSITIVE VERB</td>
<td>love</td>
<td>Refers to a set of pairs of individuals in the ontology</td>
</tr>
<tr>
<td></td>
<td>{&lt;g, l&gt;, &lt;r, j&gt;, ...}</td>
<td>The set of pairs of individuals &lt;x,y&gt; where x loves y</td>
</tr>
<tr>
<td></td>
<td>&lt;g,l&gt; = Guinevere and Lancelot, &lt;r,j&gt; = Romeo and Juliet</td>
<td></td>
</tr>
</tbody>
</table>

³ This is a simple system that is ignoring the complication of times and events. A system that can talk about events will treat intransitive verbs not as sets of individuals, but as sets of <event, individual> pairs. And similarly, transitive verbs will not be sets of paired individuals, but sets of <event, <individual, individual>> pairs.
What about the copula “is”?

Some languages don’t require a copula to say something like “Clifford is red.” At this point, we will simplify and say “red” and “is red” both refer to the same thing - the set of red things.
This semantic/interpretation rule takes the syntactic rule $S \rightarrow NP \ VP$ and interprets it as set-membership.

We can call this semantic rule **PREDICATION**

**PREDICATION** is a claim about set-membership.

It claims that the individual referred to by the subject NP is a member of the set referred to by the VP.

$\rightarrow$ i.e., the actual world has to be that in way in order for the sentence to be true.

• Syntax can also take something like

  the adjective “red” and
  the noun “dog”

  and combine them into the NP “red dog”:

These combine via the syntactic rule: $NP \rightarrow Adj \ N$

This rule is semantically interpreted via a semantic rule called **MODIFICATION**:

**Recall:**

“dog” refers to the set of dog individuals $\rightarrow \{c, f, y\}$

“red” refers to the set of red individuals $\rightarrow \{c, l, n\}$

When “red” combines with “dog” via the **MODIFICATION** rule to form “red dog,” “red dog” refers to the **intersection** of those two sets

i.e., the set of things that are both (i) dogs and (ii) red.

**MODIFICATION** is interpreted as **intersection**

(i.e., as yielding the middle part of a venn diagram)
The simple semantic model only has two rules (so far):

1. **PREDICATION**
2. **MODIFICATION**

A more complex system will need a few more rules.

For instance, syntax allows a determiner to combine with an NP:

- eg., it can take “the” and “red dog” to form “the red dog”

The semantics model will need a rule to interpret this syntactic rule.

**Q:** If “red dog” refers to a set of individuals, what do you think “the red dog” refers to?

(i) a set of individuals
(ii) an individual
(iii) truth-conditions

**SUMMARY of the SEMANTIC MODEL**

Lexical entries refer to elements in the ontology (which stand in for things in the world). Compositional rules interpret combinations of lexical entries to systematically give us

(i) different references, or
(ii) truth-conditions.

When lexical entries (like “red” and “dog”) combine to form a complex element (“red dog”), the compositional rule **MODIFICATION** gives the speaker/hearer a systematic way of knowing what the complex elements (like “red dog”) refer to.

(The systematic method = intersection)

When complex elements like “Clifford” and “red dog” combine to form a sentence (“Clifford (is a) red dog”), the compositional rule **PREDICATION** gives the speaker/hearer a systematic way of defining the conditions in which the sentence is TRUE.

(The systematic method = a claim about set membership)

**The original question: “What is meaning?”**

→ In the truth-conditional framework, “meaning’ means

(i) **reference**
   (i.e., what individuals, or sets of individuals, the lexical entries refer to)

(ii) **truth-conditions**
   (i.e., conditions on what the world has to look like, for a sentence to be true)

**4** But not many more! Standard semantic frameworks usually only only need to assume three or four rules, where the PREDICATION rule is replaced with a more general-purpose interpretation rule.
3.2 A Model-Theoretic Semantics for USE-Conditions

Q: “What do you know when you know what a word/morpheme/sentence means?”

According to the ‘Meaning as Use’ Theory of Meaning

→ You know the sorts of situations that you can say that word/morpheme/sentence in (and not seem like a weirdo)

We can use a model to model the contexts-of-use

Models for context-of-use are called “dynamic” approaches

Assumption: The goal of a conversation is to exchange information about the actual world.

Since we don’t know everything,
the actual world could look a bunch of different ways.

Consider the following three sentences:

(S1) Joel is hungry.
(S2) Sonja loves her roller skates.
(S3) Chenhao dances.

The actual world could be several different ways, according to whether these are true or false:

eg., World 1:

(S1) Joel is hungry
(S2) Sonja loves her roller skates
(S3) Chenhao dances

World 2:

(S1) Joel is hungry
(S2) Sonja loves her roller skates
(S3) Chenhao dances

If we only consider these three claims, there are eight different ways the world could be:

<table>
<thead>
<tr>
<th></th>
<th>W₁</th>
<th>W₂</th>
<th>W₃</th>
<th>W₄</th>
<th>W₅</th>
<th>W₆</th>
<th>W₇</th>
<th>W₈</th>
</tr>
</thead>
<tbody>
<tr>
<td>S₁</td>
<td>F</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>S₂</td>
<td>F</td>
<td>T</td>
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<td>F</td>
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<td>T</td>
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<tr>
<td>S₃</td>
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<td>T</td>
<td>F</td>
<td>T</td>
<td>F</td>
<td>F</td>
<td>T</td>
<td>T</td>
</tr>
</tbody>
</table>

If we don't know whether any of these sentences are true or false, for all we know, the actual world could be any of these worlds (w₁, w₂, w₃, etc.)

The set of worlds, that, for all we know, could be the actual world, is the context set.

(The notion of CONTEXT SET comes from Stalnaker (1974, 2002)
In a dynamic approach, we assume that the goal of conversation is to determine which of these is the actual world.

Let's say I find out that Chenhao dances.

I tell you: “Chenhao dances”

What my saying this does is rule out worlds 1, 3, 5 and 6 from the context set.

We now know that the actual world can't be \( w_1, w_3, w_5 \) or \( w_6 \).

This means that the CONTEXT SET shrinks:

\[
\{w_1, w_2, w_3, w_4, w_5, w_6, w_7, w_8\} \rightarrow \{w_2, w_4, w_7, w_8\}
\]

By shrinking the context set, we get closer to determining what the actual world looks like.

→ When people say things, they should be shrinking the context set. If they don't, they sound weird (infelicitous)

Now recall the infelicitous utterance below:

When this guy says “DB Cooper hijacked a Boeing 727” he ruled out worlds where DB Cooper didn't hijack a Boeing 727.

Context Set: \( \{w_1, w_2, w_3, w_4, w_5, w_6, w_7, w_8\} \rightarrow \{w_2, w_4, w_7, w_8\} \)

The idea is that sentences with “might have” requires that the context set still contains worlds where

(i) “DB Cooper hijacked a Boeing 727” is true, and ones where
(ii) “DB Cooper hijacked a Boeing 727” is false

When he later says “DB Cooper \textit{might have} hijacked a Boeing 727,” he is talking as if the context set is still \( \{w_1, w_2, w_3, w_4, w_5, w_6, w_7, w_8\} \).

This is why we feel his utterance is \textit{infelicitous}. 
SUMMARY

Words/morphemes have both

(i) **truth-conditions**, and
(ii) **use-conditions**

- The truth-conditions tell us how to shrink the context set
  (i.e., what the world has to look like, in order for the sentence to be true)

- Use-conditions tell us what the context set has to look like before the shrinking occurs.  

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**References for Further Reading on Truth-Conditional Frameworks**


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**References for Further Reading on Dynamic Frameworks**


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5 This is a simplification. Dynamic Frameworks have many theoretically posited entities that get “updated” like the way the context set gets updated. For example, the set of “questions under discussion” (Roberts 1996) is an entity that gets updated as conversation proceeds. Felicity requirements are restrictions on what any of these discourse/context entities have to look like.