A Primer in the Semantics of English

“Some Nuts and Bolts”
Chapter 0: Preliminary Issues
  0.1 What Sentences Do
  0.2 Standing-for and Truth
  0.3 Structural Ambiguity
  0.4 Quantified DP’s

Chapter 1: The Semantics Of Symbolic Logic
  1.1 Atomic Sentences and their Parts
  1.2 Connectives
  1.3 Identity
  1.4 The Universal Quantifier
  1.5 The Existential Quantifier
  1.6 Making Quantification Precise
  1.7 Generalized Quantifiers
  1.8 Mixed Quantifiers and Scope

Chapter 2: Sentences and Determiner Phrases
  2.1 The Syntax
  2.2 Phrase Structures for this Chapter
  2.3 DP’s, Scope, and Logical Form
  2.4 Coordinating Conjunctions
  2.5 Narrative Discourse and the Semantic of ‘and’
  2.6 Implicature and the Semantics of ‘or’
  2.7 Adjectives
  2.8 Context
  2.9 Relative Clauses
  2.10 Adjectival Prepositional Phrases
  2.11 Anaphora

Chapter 3: Verb Phrases, Tense, and Aspect
  3.1 An Overview of the Extended Semantics of VP’s
  3.2 Events and States
  3.3 Thematic Relations
  3.4 Verb Modifiers
  3.5 Tense
  3.6 The Perfect and the Progressive
  3.7 Temporal Adverbials
  3.8 Decomposition

Chapter 4: Complements, Meanings, Speech Acts
  4.1 Introductory Ideas
  4.2 The Syntax and Semantics of that-Clauses
  4.3 Adequacy of the Theory
  4.4 De Dicto and De Re
  4.5 Parasitic Tense
  4.6 The Syntax and Semantics of to-Clauses
  4.7 Sentence Adverbs
  4.8 Speech-Act Theory
  4.9 Questions
Preface

This is a beginning text on the semantics of English, intended for readers who have some prior acquaintance with theories of the syntax of English in the generative tradition. The book assumes no other background than this.

We use language for many purposes, but primary among them is the purposes of making statements about the world, asking questions about what the world is like, and urging people to do things. Such uses exploit the fact that sentences of our language “say things” about the world. For example, it is crucial to our understanding of the sentence “Not all cows are spotted” that it has a subject that stands for things in the world -- for cows -- and a predicate that stands for a characteristic -- being spotted -- that things in the world can have. The ‘not’ also plays a crucial role, not by referring to anything in the world, but by “reversing” whatever claim would be made about it. The net effect is a sentence that, by dint of its construction and how its various parts pick out things in the world, says something that is true or false. (In this case, it says something true.) Semantics, as understood here, is primarily the study of how parts of language relate to things in the world, and how this, together with how sentences are constructed, results in truth or falsity. This study also involves us in questions of meaning, for reasons that will be discussed. It does not directly address questions of the psychology of sentence understanding, or the social factors that influence the use of language.

The goal of the book is to survey some of the central elements of semantic theory as it is understood today. The field is vast, and there are many competing views, with subleties that cannot be addressed in an introductory text. The theories presented here are “central” versions of mainstream views on a number of mainstream issues. They are presented without the numerous qualifications that would be needed in a scholarly work, without many details of application, and without a full set of credits to people who have contributed to an understanding of the topic. The reader should take everything with a grain of salt, trusting only that the material presented here will prepare one to approach more intensive study with some basic understanding of the phenomena addressed and some ideas that have been thought to be worth developing.

Exercises are included, with three goals. One is to test the reader’s understanding of the theories that are given. A second is to explore some additional topics not covered in the main text. A third is to raise questions about the adequacy of the theories that have been presented. Sometimes the best we can do at a given moment in time is to learn an inadequate account along with learning where and how it is inadequate.
What Sentences Do

Suppose that a person communicates with another by uttering the sentence: "Your shoelace is untied." For this communication to be successful, the sentence uttered must do two things:

1. It must express a thought (express a meaning) which gets communicated from the one person to the other.
2. It must say something true or false about the real world.

Consideration of the first job -- consideration of meaning -- will occupy us in chapter 4 of this text. The other job -- how it is that a sentence can say something true or false about the world -- will occupy us here and in chapters 1-3.

Of course, for a communication to be successful, much more than this must be accomplished. The speaker may be criticizing the hearer for a slovenly appearance, and the hearer doesn’t get the full message unless s/he realizes this. Alternatively, the speaker may be trying to create a closer bond with the hearer by appearing helpful. Speakers intend their utterances to accomplish many things, and they expect their hearers to recognize these things. For some of these purposes, the choice of words does not matter -- if, for example, your point is to show that you have a robust voice. But many of these purposes are accomplished only if the hearer understands what is literally said by the words. This text focuses on what the literal contents of the words are, leaving the study of other aspects of communication to another enterprise, usually called “pragmatics”. We will occasionally discuss pragmatic issues to help us decide what part of a message needs to be included in the semantics, and what part is pragmatic. But our primary goal is the literal semantics of sentences, including both meaning and how a sentence relates to the world so that it makes a true or false claim about the world. (We will also consider the literal use of words in imperatives and interrogatives, and how these relate to claims about the world.)

Whether a sentence is true or false depends partly on the ways in which its components are related to things in the world, and partly on its structure. In the example above, the sentence has a simple subject-predicate form, and each part stands for something in the world; the subject stands for something, (an object--a shoelace), and the predicate does too (to things that are untied). We will focus here on how it is that these factors determine something which is true or false.

A sentence is a perceptual object, consisting of a sequence of things: written marks, or pronounced sounds, or produced gestures (as in American Sign Language). It must have some kind of structure which allows us to combine the meanings related to the individual parts of the sentence so as to produce the complete thought that gets communicated. And in order to relate to the world, it must also have a structure that provides a means for determining whether the sentence is true or false, based on what the parts of the sentence stand for. These structures are not at all obvious from the grossly perceived parts of the
sentence, which, in the case of a written sentence is just a sequence of letters, spaces, and some punctuation marks. Fortunately, linguists who work on analyzing the syntax of natural language have come up with theories that attribute refined and complex structures to individual sentences. In this course we will take for granted that these analyses are successful, and we will explore how to use the syntactic structures that linguists have discovered as the basis of a systematic theory of semantics.

**Standing-for and Truth**

We begin by looking at a grossly over-simplified semantic theory for very simple sentences. We do this in order to get an initial idea of some of the sorts of issues that semanticists face, which we may use as a model for the more sophisticated approaches developed in the remainder of the text. Our initial semantics will be for an extremely simple and artificially constrained piece of English. Even in this very simple context, we will quickly discover some problems that need to be solved.

Consider the following (over-simplified) language. The sentences of this language are built up of two kinds of phrases, which we will call “Subjects” and “Predicates”. We suppose that the syntax of this language can be represented by the kind of grammatical theory popular among generative linguists. That theory has two components, a **lexicon** and a set of **syntactic rules**. The lexicon for this language lists the possible Subjects (in this language there are four of them) and the Predicates (also four in number):

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Predicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bill</td>
<td>is walking</td>
</tr>
<tr>
<td>Jose</td>
<td>is running</td>
</tr>
<tr>
<td>Maria</td>
<td>is sitting</td>
</tr>
<tr>
<td>Quincy</td>
<td>is singing</td>
</tr>
</tbody>
</table>

A sentence consists of a subject followed by a predicate. That is, the language consists exactly of sentences that are generated by the single phrase structure rule:

\[
\text{Sentence} \rightarrow \text{Subject} \text{ Predicate}
\]

This rule lets us generate phrase structures into which we insert words to make sentences, such as the following:

```
Sentence
   /\        \\
Subject | Predicate
       /\     \\
  Maria  | is sitting
```
This generates the sentence ‘Maria is sitting’, and it also labels the parts and how they are related to one another. The same information can also be written on a single line using labeled bracket notation, as follows:

\[
\begin{array}{c}
\text{[Sent [Subj } \text{Maria } \text{][Pred is sitting ] ]}
\end{array}
\]

It should be apparent how these two notations encode the same information.

Suppose that we are interested in the truth and falsity of the sentences of this language. If we already knew the answers, we could address this question piecemeal, by listing the truth-values of each sentence. There are only 16 sentences in this language, so this could be done, for example, by a table:

<table>
<thead>
<tr>
<th></th>
<th>is walking</th>
<th>is running</th>
<th>is sitting</th>
<th>is singing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bill</td>
<td>False</td>
<td>True</td>
<td>False</td>
<td>True</td>
</tr>
<tr>
<td>Jose</td>
<td>True</td>
<td>False</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td>Maria</td>
<td>False</td>
<td>False</td>
<td>True</td>
<td>False</td>
</tr>
<tr>
<td>Quincy</td>
<td>False</td>
<td>False</td>
<td>False</td>
<td>True</td>
</tr>
</tbody>
</table>

However, there are two things that are unsatisfactory about this approach. One is that we might not know the answers, and our semantic theory would then have nothing to say. The other is that just listing the answers misses an important generalization; it says nothing about how the individual words in a sentences determine whether that sentence is true or false. For these reasons, it is better to give a theory that combines specific facts about individual words with some generalizations. These semantic generalizations will be given in parallel to the syntactic theory. The semantics will thus have two parts. The first part is an expansion of the lexicon so that the lexical entry for each meaningful word or phrase states what the word or phrase stands for. We will expect something like the following information to be included:

Each subject stands for a thing:

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Semantic Info:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bill</td>
<td>‘Bill’ stands for the person, Bill.</td>
</tr>
<tr>
<td>Jose</td>
<td>‘Jose’ stands for the person, Jose</td>
</tr>
<tr>
<td>Maria</td>
<td>‘Maria’ stands for the person, Maria</td>
</tr>
<tr>
<td>Quincy</td>
<td>‘Quincy’ stands for the person, Quincy</td>
</tr>
</tbody>
</table>

Each predicate stands for a class of things:

<table>
<thead>
<tr>
<th>Predicates</th>
<th>Semantic Info:</th>
</tr>
</thead>
<tbody>
<tr>
<td>is walking</td>
<td>‘is walking’ stands for the class of things that are walking.</td>
</tr>
<tr>
<td>is running</td>
<td>‘is running’ stands for the class of things that are running.</td>
</tr>
<tr>
<td>is sitting</td>
<td>‘is sitting’ stands for the class of things that are sitting.</td>
</tr>
<tr>
<td>is singing</td>
<td>‘is singing’ stands for the class of things that are singing.</td>
</tr>
</tbody>
</table>
The second part tells how what the parts stand for determine whether the whole sentence is true or false. So in parallel to the syntactic rule for forming sentences, we have the following semantic rule:

**Sentences:** A sentence is true iff the thing that its subject stands for is a member of the class that its predicate stands for.

(The word ‘iff’ used here is the logicians’ abbreviation for ‘if and only if’.)

The semantic rule for Sentences states the semantic generalization that is missed by just listing the answers. This generalization, together with how things are in the world, completely determines the truth-values of the sentences of the language. Of course, if we don’t know how things are in the world, we won’t know the truth-values of the sentences. But we can’t expect a study of language alone to give us such knowledge; for that, we need to investigate the world as well. What our rules do instead is summarize a portion of our knowledge of how our language is able to make claims that are true or false; the language works this way no matter how things turn out in the world. For example, one application of our rule for Sentences tells us:

‘Bill is walking’ is true iff what ‘Bill’ stands for is a member of the class of things that ‘is walking’ stands for.

```
Bill          is walking
STANDS FOR           STANDS FOR
x   is a member of    X
```

The lexical principles for ‘Bill’ and ‘is walking’ tell us what these words stand for, so we can reason to:

‘Bill is walking’ is true iff the person, Bill, is a member of the class of things that are walking.

```
Bill          is walking
STANDS FOR           STANDS FOR
😊   is a member of the class of things that are walking
```
Preliminaries

Set theory says that a thing is a member of the class of things that are walking iff that thing is walking. So from the above we may conclude:

‘Bill is walking’ is true iff Bill is walking.

But isn’t this result trivial? Yes, and no. It sounds especially trivial because our semantics is being conducted in the same language as the language under investigation. If the languages were different, it would not sound trivial. For example, suppose our artificial language consisted of words in French. Then our rules would be:

‘Guillame’ stands for the person, Bill.

‘marche’ stands for the class of things that are walking.

Applying our semantic theory as above, we would end up with:

‘Guillame marche’ is true iff the person, Bill, is walking.

This no longer looks so trivial. The apparent triviality of the English formulation is a result of its being obvious, and this obviousness is usually taken by semanticists as a sign of the correctness of the theory. This is analogous to obvious claims like:

‘Maria is walking’ is a grammatical sentence of English

which are part of the output of a theory of syntax.

There is another advantage of this generalization-based approach over the tabular approach. Suppose that we add a new predicate to the language: ‘is crying’. Then we need to add only a single lexical entry to say which class the new predicate stands for:

The predicate ‘is crying’ stands for the class of things that are crying.

We would now have a complete account of the expanded language, whereas the piecemeal approach would require adding truth-values for four new sentences. It is generally thought that speakers of languages understand how their sentences relate to the world in some such rule-governed general way, as opposed to piecemeal, and this explains why all that is required to evaluate sentences containing a new word is to learn what that new word stands for. The general principles you learned as a child.

EXERCISES:

1. Use the theory just given to show that ‘Jose is singing’ is true iff Jose is singing.

2. Our theory is expressed using the semantic terminology ‘stand for’. Instead of ‘stand for’, other terminology is often used: ‘refer to’, ‘denote’, or ‘signify’. Rewrite the semantic rule given above in this other terminology.
Structural Ambiguity

We now want to get a feel for how to expand the kind of simple semantic theory discussed so far. Suppose that we add predicate conjunctions and predicate disjunctions to the language. We can do this with the following phrase structure rule:

```
Predicate → Predicate {and or} Predicate
```

This would let us make new predicates, like:

- *is walking and is sitting*
- *is running or is singing*

These, in turn, would let us make sentences like ‘Jose is running and is singing’:

```
Sentence
| Subject | Predicate
|---------|-----------
| Jose    | Predicate
|         | Predicate
|         | {and}     
|         | {is running} {is singing}
```

There then seem to be two natural ways to expand our semantic account to accommodate these. One way -- not a very good way -- would be to revise our existing rule of truth to sentences with simple predicates, and introduce the following rule for complex ones:

```
A sentence with a {disjunctive conjunctive} predicate is true iff {at least one both} of the corresponding simple sentences are true.
```

This rule would tell us that ‘Maria is walking and is sitting’ is true iff both of these are true:

- *Maria is walking*
- *Maria is sitting.*

It is apparent that in this case this will yield the right answer.

However, there is another way to get the same results, a way which is simpler and more elegant. Instead of revising our rule for evaluating sentences, we leave it as is, as a completely general rule, and we add a semantic rule for compound predicates to parallel the new syntactic rule that we have introduced. This rule will say what a complex predicate stands for in terms of what its simpler parts stand for.

Semantic rule for complex predicates:
A disjunctive conjunctive predicate stands for the union of the classes that its parts stand for.

(The union of two classes A and B is the class C of things that are in either or both of A or B; the intersection of two classes A and B is the class C of things that are in both A and B.)

For example, the conjunctive predicate ‘is walking and is singing’ stands for the intersection of the classes of things that are walking and things that are singing, that is, it stands for the class of things that are both walking and singing. And the disjunctive predicate ‘is walking or is singing’ stands for the union of the classes of things that are walking and the things that are singing, that is, it stands for the class of things that are walking or singing (or both).

Our theory now yields the intended obvious result that ‘Jose is running and is singing’ is true iff Jose is running and is singing, as follows:

‘Jose is running and is singing’ is true iff what the subject, ‘Jose’, stands for is a member of the class that the predicate, ‘is running and is singing’, stands for.

The subject, ‘Jose’, stands for Jose.

The predicate, ‘is running and is singing’, stands for the intersection of the classes that ‘is running’ and ‘is singing’ stand for. That is, it stands for the intersection of the class of things that are running with the class of things that are singing. So it stands for the class of things that are running and are sitting.

So ‘Jose is running and is singing’ is true iff Jose is a member of the class of things that are running and are sitting.

So ‘Jose is running and is singing’ is true iff Jose is running and is sitting.

EXERCISE: In the proof just given, identify which principle of the semantic theory validates each step in the proof

Will this approach work in general? Well, we have to be careful to see exactly what we are generating. This is because the rule we have stated for complex predicates is a recursive one; it lets us make complex predicates out of simple ones, and we can reapply the rule to make even more complex ones out of these. For example, given the predicates:

\[ \text{is running} \]
\[ \text{is singing} \]

we can form the conjunctive predicate:

\[ \text{is running and is singing} \]

Then, combining this with:
is walking
we can form the complex disjunctive predicate:

\[ \text{is walking or is running and is singing} \]

Likewise, given the predicates:

\[ \text{is walking} \]
\[ \text{is running} \]

we can form the disjunctive predicate:

\[ \text{is walking or is running.} \]

Then, using this together with

\[ \text{is singing} \]

we can form the complex conjunctive predicate:

\[ \text{is walking or is running and is singing.} \]

So we can form the same predicate in two different ways! Is this a problem? Yes. Consider Jose, who is walking but is neither running nor singing. And consider the sentence:

\[ \text{Jose is walking or is running and is singing} \]

Is this true or false? This question cannot be answered, because the sentence is \textit{structurally ambiguous}. If we generate the predicate of this sentence from these simpler ones plus \textit{or}:

\[ \text{is walking} \]
\[ \text{is running and is singing} \]

then the answer is yes, since Jose is walking. But if we make that predicate from these plus \textit{and}:

\[ \text{is walking or is running} \]
\[ \text{is singing} \]

then the answer is no, since he is not singing.

It appears, then, that if a sentence can be generated in two different ways, we will somehow need to keep track of those ways, since a sentence might be true when seen as generated in one way and false if seen as generated in another way. The two ways of generating it correspond to two importantly different structures. The syntactic structures that we base our semantic theory on must somehow encode this difference. In the present case, this is easy; we can just look at the phrase structure trees which generate the sentences in question, and we can base our semantic theory on such trees. For example, the two different phrase structure trees for the sentence under discussion are these:
In "labeled bracket notation", these are:

\[
\begin{align*}
\text{[Sent[SubjJose] [Pred[is walking] or [Pred[is running] and [Pred is singing]]]]} \\
\text{[Sent[SubjJose] [Pred[is walking] or [Pred[is running]] and [Pred is singing]]]}
\end{align*}
\]

If we apply our semantic rules to these different structures, we will get different results. In such an application we apply the rules to each node, going up the tree. For example, our lexical rules tell us what each of the lowest nodes stand for:

Subject  
\text{Jose}  

Predicate  
\text{is walking}  

Predicate  
\text{is running}  

Predicate  
\text{is singing}
Predicate | stands for the class of things that are running

\( \text{is running} \)

Predicate | stands for the class of things that are singing

\( \text{is singing} \)

Then for the leftmost complex predicate we apply our rule for compound predicates to get:

\[
\begin{align*}
\text{Predicate} & \quad \text{stands for the class of things that} \\
\text{Predicate} & \quad \text{are walking or running} \\
\text{Predicate} & \quad \text{is walking} \\
\text{Predicate} & \quad \text{or} \\
\text{Predicate} & \quad \text{is running}
\end{align*}
\]

Then we apply the rule for compound predicates to the conjunction of this predicate with the rightmost one, to get:

\[
\begin{align*}
\text{Predicate} & \quad \text{stands for the class of things that are walking or running, and are also singing} \\
\text{Predicate} & \quad \text{is singing} \\
\text{Predicate} & \quad \text{and} \\
\text{Predicate} & \quad \text{is running} \\
\text{Predicate} & \quad \text{or} \\
\text{Predicate} & \quad \text{is walking}
\end{align*}
\]

Finally, we combine the subject and predicate by our subject-predicate rule (and use some set theory) to infer that ‘\(\text{Jose is walking or is running and is singing}\)’ is true iff Jose is walking or is running and is singing.

This illustrates the policy that we will take for granted throughout this text: we do not try to formulate semantic principles for sentences based on their “surface form” alone; rather, our semantics will be based on \textit{analyzed sentences}. Specifically, this means that we give semantic analyses of a sentence along with the phrase marker that analyzes it. Another way of describing this that is used in the literature is that we give analyses of “readings” of sentences.
EXERCISE:
1. Give two ways to analyze the sentence ‘*Quincy is singing and is walking or is running*’.
2. Give a semantic analysis of the sentence on each reading. If the facts about Quincy are the ones given in the table above, what are the truth-values of these readings?

**Quantified DP’s**

Our treatment of complex predicates was not difficult to develop. But things are not so easy when we turn to sentences containing “general” subjects. Most subjects of sentences are not proper nouns; they are complex things (they are DP’s -- “determiner phrases”) containing common nouns; examples are ‘*every giraffe*’, ‘*a cow*’, ‘*some elephant*’, ‘*everybody*’ (= ‘*every person*’). How are we to handle these? The point of the present section is to show that these cannot reasonably be treated as if they were just complicated versions of what we have seen so far.

Consider the word ‘*somebody*’. It can serve as the subject of a sentence, so perhaps we just need to add it to our list:

<table>
<thead>
<tr>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bill</td>
</tr>
<tr>
<td>Jose</td>
</tr>
<tr>
<td>Maria</td>
</tr>
<tr>
<td>Quincy</td>
</tr>
<tr>
<td>somebody</td>
</tr>
</tbody>
</table>

Syntactically this is fine; we now generate sentences like ‘*Somebody is walking*’. The question for our semantic theory is then: what does the word ‘*somebody*’ stand for? It turns out that no way of answering this question seems to be coherent.

First, ‘*somebody*’ cannot stand for Bill, because the sentence:

*Somebody is walking*

is true, but Bill is not walking. (Assume temporarily that the table of truth values given above reflects the actual facts.) Nor can it stand for Maria, or for Quincy, for the same reason. And it cannot stand for Jose, because the sentence:

*Somebody is running*

is true, although Jose is not running. So it must stand for somebody else, perhaps not a normal person at all. OK, let’s pick out the "right" thing, and assign it to ‘*somebody*’. For present purposes call this thing "smbdy". So we have:

‘*somebody*’ stands for smbdy.

Unfortunately, even this artifice cannot work. The reason becomes apparent when we ask which sets of things smbdy is a member of. Since both of these sentences are true:
Somebody is walking
Somebody is running

smbdy must be in the set of things that are walking, and also in the set of things that are running. So it is in the intersection of those two sets. However, that is exactly the condition that will make this sentence true:

Somebody is walking and is running.

But that sentence is not true. Any semantics that forces us to say that it is true is on the wrong track. So we cannot assign smbdy to ‘somebody’, and, by parallel reasoning, we can’t assign any thing whatsoever to ‘somebody’. Our semantic theory is not working.

But perhaps we only need a minor adjustment in our approach? In the case of proper names, we have selected a single entity to be what that name always stands for. But maybe what ‘somebody’ stands for varies from sentence to sentence? For example, in the sentence:

Somebody is walking

perhaps the subject stand for Jose, who is walking, and in the sentence:

Somebody is running

it stands for Maria, who is running. However, the mystery returns when we ask what ‘somebody’ is to stand for in the sentence:

Somebody is walking and is running.

Apparently, we can choose anyone at all in this case, since the sentence with ‘somebody’ is false, and whoever we pick, we get false. So our policy for ‘somebody’ might be this: if the sentence is true, then find a name that, when substituted for ‘somebody’, makes the sentence true, and assign whatever that name stands for to ‘somebody’. If the sentence is false, then decree that here, ‘somebody’ stands for anything at all.

Although odd, maybe this would work. But if it works, it does so at the price of giving up one of our goals: to say how it is that what the words of a sentence stand for determine whether the sentence is true or false. We have now reversed this policy by determining that in some cases, such as with ‘somebody’, we have to know whether the sentence is true or false before deciding what the word stands for. Partly for this reason, people who work in semantics generally assume that a different kind of approach is called for in developing the semantics of complex DP’s. This approach was made well-known by Bertrand Russell in a famous paper (“On Denoting”), published in 1905. The new technique resembles the kind of semantics commonly associated with symbolic logic. We will devote chapter 1 to learning about this kind of approach, and in chapters 2-4 we will apply the techniques learned there to English.
EXERCISE:

Suppose it just doesn’t bother you that you might need to tell whether a sentence is true or false in order to figure out what some part stands for. And suppose you like the idea of treating ‘somebody’ as a name which varies what it stands for from sentence to sentence. Can you expand on the treatment of ‘somebody’ given above so that it works in general? Can you also do this for the word ‘everybody’? How about the word ‘nobody’? In considering ‘nobody’, take into account this quotation from *Through the Looking Glass*, by Lewis Carroll (Chapter 7):

“"I see nobody on the road," said Alice.

“I only wish I had such eyes,” the King remarked in a fretful tone. “To be able to see Nobody! And at that distance, too! Why, it’s as much as I can do to see real people, by this light!”"
Preliminaries -- Answers to the Exercises

EXERCISES page 5:

1. Use the theory just given to show that ‘Jose is singing’ is true iff Jose is singing.

   ‘Jose is singing’ is true iff what ‘Jose’ stands for is a member of the class of things that ‘is singing’ stands for.

   The lexical principles for ‘Jose’ and ‘is singing’ tell us that ‘Jose’ stands for Jose, and ‘is singing’ stands for the set of things that are singing, so we can reason to:

   ‘Jose is singing’ is true iff the person, Jose, is a member of the class of things that are singing.

   Set theory says that a thing is a member of the class of things that are singing iff that thing is singing. So from the above we may conclude:

   ‘Jose is singing’ is true iff Jose is singing.

2. Our theory is expressed using the semantic terminology ‘stand for’. Instead of ‘stand for’, other terminology is often used: ‘refer to’, ‘denote’, or ‘signify’. Rewrite the semantic rule given above in this other terminology.

   The answer will be given here for ‘denotes’:

   Each subject denotes a thing:

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Semantic Info:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bill</td>
<td>‘Bill’ denotes the person, Bill.</td>
</tr>
<tr>
<td>Jose</td>
<td>‘Jose’ denotes the person, Jose</td>
</tr>
<tr>
<td>Maria</td>
<td>‘Maria’ denotes the person, Maria</td>
</tr>
<tr>
<td>Quincy</td>
<td>‘Quincy’ denotes the person, Quincy</td>
</tr>
</tbody>
</table>

   Each predicate denotes a class of things:

<table>
<thead>
<tr>
<th>Predicates</th>
<th>Semantic Info:</th>
</tr>
</thead>
<tbody>
<tr>
<td>is walking</td>
<td>‘is walking’ denotes the class of things that are walking.</td>
</tr>
<tr>
<td>is running</td>
<td>‘is running’ denotes the class of things that are running.</td>
</tr>
<tr>
<td>is sitting</td>
<td>‘is sitting’ denotes the class of things that are sitting.</td>
</tr>
<tr>
<td>is singing</td>
<td>‘is singing’ denotes the class of things that are singing.</td>
</tr>
</tbody>
</table>

   Sentences: A sentence is true iff the thing that its subject denotes is a member of the class that its predicate denotes.
EXERCISE page 7: In the proof just given, identify which principle of the semantic theory validates each step in the proof.

Our theory yields the intended obvious result that ‘Jose is running and is singing’ is true iff Jose is running and is singing, as follows:

(1) ‘Jose is running and is singing’ is true iff what the subject, ‘Jose’, stands for is a member of the class that the predicate, ‘is running and is singing’, stands for.

This is by the rule for sentences:

**Sentences:** A sentence is true iff the thing that its subject stands for is a member of the class that its predicate stands for.

(2) The subject, ‘Jose’, stands for Jose.

This is by the lexical entry for ‘Jose’:

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Semantic Info:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jose</td>
<td>‘Jose’ stands for the person, Jose</td>
</tr>
</tbody>
</table>

(3) The predicate, ‘is running and is singing’, stands for the intersection of the classes that ‘is running’ and ‘is singing’ stand for.

This is by the rule for complex predicates:

| A disjunctive conjunctive predicate stands for the union intersection of the classes that its parts stand for. |

(4) That is, it stands for the intersection of the class of things that are running with the class of things that are singing.

This is from (3) together with the lexical entry for the parts:

Each predicate stands for a class of things:

<table>
<thead>
<tr>
<th>Predicates</th>
<th>Semantic Info:</th>
</tr>
</thead>
<tbody>
<tr>
<td>is running</td>
<td>‘is running’ stands for the class of things that are running.</td>
</tr>
<tr>
<td>is singing</td>
<td>‘is singing’ stands for the class of things that are singing.</td>
</tr>
</tbody>
</table>

(5) So it stands for the class of things that are running and are sitting.

This is by the definition of ‘intersection’:

the intersection of two classes A and B is the class C of things that are in both A and B

(6) So ‘Jose is running and is singing’ is true iff Jose is a member of the class of things that are running and are sitting.

This is from steps 1, 2, and 5

(7) So ‘Jose is running and is singing’ is true iff Jose is running and is sitting.

This is from (6) by set theory.
EXERCISES page 11:

1. Give two ways to analyze the sentence ‘Quincy is singing and is walking or is running’.

   Sentence
   ├── Subject
   │    └── Quincy
   │
   │   ├── Predicate
   │   │    └── is singing
   │   ├── Predicate
   │   │    │   ├── and
   │   │    │   │   ├── Predicate
   │   │    │   │   │   └── is walking
   │   │    │   │   └── Predicate
   │   │    │   │       └── is running
   │   │
   │   │   └── or
   │
   │   └── Predicate
   │       └── is walking

   Sentence
   ├── Subject
   │    └── Quincy
   │
   │   ├── Predicate
   │   │    └── is singing
   │   ├── Predicate
   │   │    │   ├── and
   │   │    │   │   └── is walking
   │   │    │   └── Predicate
   │   │    │       └── is running
   │   │
   │   │   └── or
   │
   │   └── Predicate
   │       └── is running

2. Give a semantic analysis of the sentence on each reading. If the facts about Quincy are the ones given in the table above, what are the truth-values of these readings?

   The following diagrams illustrate what each node stands for:
The sentence is true iff Quincy is singing and is walking or running. According to the information given, Quincy is not either walking or running, so the sentence is FALSE.

The sentence is true iff Quincy is either both singing and walking or is running. According to the information given, Quincy is not walking, so he is not both singing and walking; he is also not running, so the sentence is FALSE.
EXERCISE page 13: Suppose it just doesn’t bother you that you might need to tell whether a sentence is true or false in order to figure out what some part stands for. And suppose you like the idea of treating ‘somebody’ as a name which varies what it stands for from sentence to sentence. Can you expand on the treatment of ‘somebody’ given above so that it works in general? Can you also do this for the word ‘everybody’? How about the word ‘nobody’?

This can be done in many different *ad hoc* ways. Here is one.

First, change the rule for sentences as follows:

**Sentences:** A sentence whose subject is not ‘nobody’ is true iff the thing that its subject stands for is a member of the class that its predicate stands for; if that subject does not stand for anything at all, then the sentence is false. A sentence whose subject is ‘nobody’ has the opposite truth-value from the corresponding sentence whose subject is ‘somebody’.

Then use the following recipe for what a subject stands for:

Somebody: If the predicate does not stand for the empty set, then ‘Somebody’ stands for the alphabetically first person who is a member of the set that the predicate stands for. If the predicate stands for the empty set then ‘Somebody’ stands for anything.

Everybody: If the predicate stands for a set containing every person, then ‘Everybody’ stands for Bill, and if the predicate does not stand for a set containing every person, then ‘Everybody’ does not stand for anything.

Nobody: It doesn’t matter what ‘nobody’ stands for.