

**The Semantics of Conditionals, Part 1:  
What's Wrong with an Extensional Semantics for Conditionals?**<sup>1</sup>

**1. Introduction**

**(1) Conditional**

A 'conditional' or 'conditional construction' or 'conditional sentence' is sentence of the form "if  $S_1$ , (then)  $S_2$ ".

Examples:

- a. If Dave takes his medicine, (then) he will get better.
- b. If Dave were a doctor, (then) his parents would be proud of him.
- c. If Dave had simply listened to me, (then) he wouldn't be in this mess right now.
- d. If you don't hand in the exam, (then) you won't get an A for the class.

**(2) Overarching Question**

What are the semantics of conditionals?

Sub-Questions:

- a. What are the truth-conditions of conditional sentences?
- b. How are these truth-conditions compositionally derived from the meanings of the component parts of the conditional?

**(3) The Plan:**

Let's first develop an answer to Question (2a). Then, based upon our answer to (2a), we will develop a system that answers (2b).

*In pursuing the 'plan' in (3), we will be guided by the following 'guiding intuition':*

**(4) Our Guiding 'Intuition'**

In a conditional sentence "if  $S_1$ , (then)  $S_2$ ", the *truth* of  $S_2$  is asserted to 'depend upon' the *truth* of  $S_1$ .

- $S_1$  is a 'condition' under which  $S_2$  is *true*.
- The truth of  $S_1$  'brings it about' that  $S_2$  is *true*.
- When  $S_1$  is *true*,  $S_2$  is also (thereby) made *true* as well...

*But, before we get started, there are a number of 'preliminaries' and 'caveats' to take care of...*

<sup>1</sup> These notes are based upon material in von Stechow (2007; Chapter 4).

## 1.1 Some Basic Terminology

In discussing the semantics (and syntax) of conditionals, it helps to have some terms to refer to the various ‘parts’ of the construction.

### (5) Antecedent

In a conditional sentence “if  $S_1$ , (then)  $S_2$ ”, the *antecedent* (of the conditional) is:

- $S_1$
- if  $S_1$

Another, less common term for the antecedent is the *protasis*.

### (6) Consequent

In a conditional sentence “if  $S_1$ , (then)  $S_2$ ”, the *consequent* (of the conditional) is:

- $S_2$
- then  $S_2$

Another, less common term for the antecedent is the *apodosis*.

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## 1.2 The Irrelevance of ‘Relevance Conditionals’

Although we will be taking the generalization in (4) as our ‘guiding intuition’ to the semantics of conditionals, it is important to note that *there are conditional sentences for which (4) is not true!*

Such conditionals – often called ‘relevance conditionals’ are illustrated below.

### (7) Relevance Conditionals

- a. If you’re hungry, there is pizza in the fridge.
- b. If Dave is worried about his grade, he can talk with his TAs.
- c. If you scare easily, then don’t watch *Friday the 13<sup>th</sup>*.

### (8) The Meaning of ‘Relevance Conditionals’

These sentences don’t seem to be asserting that the *truth* of the consequent depends upon the truth of the antecedent.

- Presumably, there’s pizza in the fridge whether or not you happen to be hungry.

Rather, the antecedent seems to be providing the conditions under which the consequent is *relevant*.

- That is, the assertion “there is beer in the fridge” is *relevant* if you are hungry.
- *If you are hungry, then something relevant to tell you is: there is pizza in the fridge.*

**In our discussion, we will systematically ignore such ‘relevance conditionals’...**

That is, we will only be considering conditional sentences for which the ‘guiding intuition’ in (4) is correct...

- *As we’ll see, capturing the meaning of this limited set of conditionals is hard enough*
- *However, it should also be acknowledged that a full theory of the semantics of conditionals should be applicable to both ‘relevance conditionals’ and the conditionals we will focus on here...*

**(9) An Interesting Property of Relevance Conditionals**

Lest you think that a separate treatment of ‘relevance conditionals’ is *completely* artificial, there are some ways in which they seem to grammatically differ from ‘regular’ conditionals:

For example, in most cases, relevance conditionals do not allow the consequent to be marked by the particle ‘then’.

- a. If you are hungry, (?? then) there is beer in the fridge.
- b. If Dave is worried about his grade, (?? then) he can talk with his TAs.

A systematic exception to this, however, is when the consequent of the relevance conditional is an imperative.

- c. If you scare easily, then don’t watch *Friday the 13<sup>th</sup>*.
- d. If you like shrimp and grits...then everybody say “oh yay-er”. (Outkast; ATLiens)

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**1.3 Ignoring Tense and Aspect**

There is another important fact concerning conditionals that our discussion here will ‘sweep under the rug’:

**(10) The Contribution of Tense and Aspect**

The meaning of the conditional can be affected the choice of tense and/or aspect in either the antecedent or the consequent.

- Broadly (and informally) speaking, the choice of tense/aspect can communicate ‘how likely’ it is that either the antecedent or the consequent will come about.

*As illustrated below, we can categorize conditionals based upon:*

- The tense/aspect of their antecedent and/or consequent
- The concomitant presuppositions about the ‘likelihood’ of the antecedent/consequent.

(11) **Some Further Sub-Types of Conditional** <sup>2</sup>

- a. Future Neutral Vivid
- (i) *Example:*  
If Dave is taking his medicine, then he will get better.
  - (ii) *Structure:*  
Antecedent and consequent are present tense.
  - (iii) *Semantic Property:*  
The antecedent and consequent might be true now, or might be false. Both are presented as equally ‘likely’.
- b. Future Less Vivid
- (i) *Example:*  
If Dave were taking his medicine, then he would get better.
  - (ii) *Structure:*  
Antecedent is ‘subjunctive’ (or ‘past tense’). Consequent is past tense.
  - (iii) *Semantic Property:*  
The antecedent and consequent might be true now, or they might be false. But, their actual truth is held out as ‘remote’ in some sense.
- c. (Past) Counterfactuals
- (i) *Example:*  
If Dave had taken his medicine, then he’d have gotten better.
  - (ii) *Structure:*  
Antecedent and consequent are past perfect (pluperfect).
  - (iii) *Semantic Property:*  
The antecedent is false now and false throughout the past, the consequent is false now.

*What about other combinations of tense and aspect in the antecedent and conditional?...*

- Here the facts get quite complicated...

\* If Dave were taking his medicine, then he will get better.

OK: If Dave took his medicine, then he will get better.

- Overall, this is an area of research this is comparatively ‘active’ at the moment...

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<sup>2</sup> For more on these various ‘subtypes’ and what they show us about the contribution of tense/aspect to the conditional, see (amongst others):

Iatridou, S. (2000) “The Grammatical Ingredients of Counterfactuality.” *Linguistic Inquiry* 31:2, 231-270.  
Arregui, A. (2004) *On the Accessibility of Possible Worlds*. PhD Dissertation. UMass, Amherst.

For our purposes here, we will (perhaps wrongly) *ignore* the tense and aspect of the antecedent and consequent...

- For better or worse, this is a ‘standard move’ in many discussions of the conditional...
- The assumption here being: *whatever it is that tense/aspect contribute, it is orthogonal to those aspects of the conditional’s meaning that are of key interest to us here...*  
(Namely, the sense in which it asserts that the truth of the consequent is ‘brought about’ by the truth of the antecedent).

*With all of this in mind, let us now attempt a statement of the ‘truth-conditions’ of a conditional...*

## 2. A Purely Extensional Semantics for Conditionals

We’ll begin our semantic treatment of conditionals by considering a *purely extensional* analysis of their truth-conditions:

- Under this analysis, the extension of the conditional is a purely a function of the *extensions* (i.e., truth-values) of the consequent and the antecedent.

*Why consider such an analysis?*

- Historic Reasons: For a while, such an analysis was the preferred ‘model’ of the semantics of natural language conditionals (particularly in such specialized ‘sub-languages’ as logic and mathematics).
- Expository Reasons: The failures of a purely extensional (truth-functional) semantics of the conditional will guide/motivate the development of our later intensional treatments.
- Intellectual Reasons: While it’s often held out as being ‘obviously wrong’, there are certainly some things that the extensional account *gets right!* Before we trash the account, it’s worth appreciating why people ever saw it as being plausible...

### 2.1 The Basic Extensional Treatment

Let us begin by considering our ‘guiding intuition’, repeated below:

#### (12) Our Guiding ‘Intuition’

In a conditional sentence “if  $S_1$ , (then)  $S_2$ ”, the *truth* of  $S_2$  is asserted to ‘depend upon’ the *truth* of  $S_1$ . (When  $S_1$  is *true*,  $S_2$  is also (thereby) made *true* as well...)

Following this intuition, we can clearly identify (at least) one circumstance when a conditional sentence will be false:

(13) **The ‘Falsehood’-Conditions of a Conditional (First Version)**

The sentence “If  $S_1$  then  $S_2$ ” is FALSE if  $S_1$  is TRUE and  $S_2$  is FALSE

Let us take a moment to convince ourselves of the truth of the generalization in (13)...

- Intuitively, if a conditional asserts that ‘*when  $S_1$  is true,  $S_2$  must also be true*’, that assertion is *falsified* if it is ever the case that  $S_1$  is true, but  $S_2$  is *false*.
- Furthermore, this prediction coheres with our natural language intuitions: Conditionals *do* seem to intuitively be false in cases where their antecedent is true and their consequent is false.

(14) **Examples of False Conditionals**

- a. If Obama is elected, then he’ll outlaw Christianity on his first day of office.
- b. If we invade Iraq, we’ll be greeted as liberators (by a majority of the population).
- c. If I drop my pen, it will float to the ceiling.

*So...the generalization in (13) does seem to be accurate...*

Now, let’s take the following **huge leap**:

Let’s strengthen that generalization in (13) to the bi-conditional in (14).

(14) **The ‘Falsehood’-Conditions of a Conditional (Second Version)**

The sentence “If  $S_1$  then  $S_2$ ” is FALSE *if and only if*  $S_1$  is TRUE and  $S_2$  is FALSE

Clearly, these ‘falsehood-conditions’ are equivalent to the truth-conditions in (15), and can be summarized by the ‘truth-table’ in (15).

(15) **Extensional Truth-Conditions for Conditionals**

“If  $S_1$  then  $S_2$ ” is T *iff* either  $S_1$  is F or  $S_2$  is T

(16) **Truth-Table Representation of the Truth-Conditions in (15)**

“If $S_1$ then $S_2$ ”	$S_1$	$S_2$
T	T	T
F	T	F
T	F	T
T	F	F

Observations:

- The simple ‘unidirectional’, ‘if’-generalization in (13) clearly seems correct.
- The stronger ‘bidirectional’, ‘iff’-generalization in (14) is less obviously correct, but is close enough to (13) to have a ‘hint’ of accuracy...
- The truth-conditional statements in (15) and (16) [which is actually equivalent to (14)] isn’t at all *prima facie* intuitive in the way (13) and (maybe) (14) are...
- **Nevertheless, a case can be made for the accuracy of the (purely extensional) truth-conditions in (15) and (16).**

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## 2.2 Arguments for the Extensional Semantics

### 2.2.1 Intuitive Logical Equivalences

The truth-conditions in (15) clearly predict that conditional sentences like (17a) should be logically equivalent to *disjunctions* like (17b).

#### (17) Structures Predicted to be Logically Equivalent

- a. **If  $S_1$  then  $S_2$**
- b. **Either it’s not the case that  $S_1$  or  $S_2$**

*Interestingly, there are many cases where this predicted equivalence is intuitively correct!*

#### (18) Sentences that are Intuitively Equivalent in Meaning

- a. **If you don’t hand in the exam, then you won’t get an A.**
- b. **Either you hand in the exam, or you won’t get an A.**  
(i.e., **Either it’s not the case that you don’t hand in the exam...**)
- c. **If Dave keeps talking, then we won’t make any progress.**
- d. **Either Dave stops talking, or we won’t make any progress.**  
(i.e., **Either it’s not the case that Dave keeps talking...**)
- e. **If the Red Sox trade Ortiz, then there’s no chance for the pennant.**
- f. **Either the Red Sox keep Ortiz, or there’s no chance for the pennant.**  
(i.e., **Either it’s not the case that the Red Sox trade Ortiz...**)

So... maybe there’s really something to the ‘disjunctive’ characterization in (15) of the meaning of conditionals?...

### 2.2.2 The Analysis of Certain Locutions in Mathematics and Logic

Consider the sentences in (19), particularly the rather awkward and artificial locution in (19b).

#### (19) The Locution of Interest

- a. Every boy smokes.
- b. For everything in existence, the following is true:  
If that thing is a boy, then that thing smokes.

It seems that the sentences in (19) are logically equivalent. If (19a) is true, then (19b) must be true as well, and *vice versa*.

*...so should our semantics for natural language predict this equivalence?...*

#### (20) A 'No' Answer

The locution in (19b) only 'sounds' equivalent to (19a) because we've been trained as linguists/logicians/philosophers to talk this way.

*Real* natural language conditionals don't behave this way...

#### (21) A 'Yes' Answer

While it's true that the locution in (19b) is rather artificial, and we aren't really exposed to it until we take classes in linguistics/logic/philosophy ...

- We pick up on this way of talking right away. It doesn't sound *impossible* to us to use (19b) to express the meaning in (19a).
- The locution in (19b) developed rather organically in the field of logic/philosophy  
(for those 'in the know', the syntax of first order predicate logic was partially inspired by the possibility of this locution, rather than the other way around...)
- Presumably, then, the artificiality of (19b) is less to do with the contribution of the conditional, and more to do with its 'funky' bi-clausal (and cataphoric) structure.

*So, it seems that a semantics for conditionals sentences should predict that (19b) will be true when the sentence in (19a) is true....*

(22) **Argument for the Extensional Truth-Conditions in (15)/(16)**

- So, suppose that the sentence in (19a) is T; *every boy smokes*.
- By assumption, we need our semantics for conditionals to predict that, for everything in existence, the following conditional is true:  
*If that thing is a boy, then that thing smokes.*
- Now, for all those entities that are boys, the following conditional is clearly true (in cases where (19a) is true):  
*If that thing is a boy, then that thing smokes.*
- But, what about those things that are *not* boys? By assumption, we need the following conditional to come out as true *whether or not they smoke*:  
*If that thing is a boy, then that thing smokes.*
- **The extensional semantics in (15)/(16) make exactly this prediction!**
  - Since the antecedent of the conditional is false for those things that are not boys...
  - ...our semantics in (15)/(16) predicts that it should be T for those entities, *no matter what the value of the consequent is (i.e., no matter whether those entities happen to smoke)*.

**An Aside:**

This is, in part, ‘the real reason’ why the extensional treatment of conditionals in (15) and (16) was so popular in the 19<sup>th</sup> and 20<sup>th</sup> centuries, and is still so fundamental to intro logic classes.

- The syntax of first order predicate logic treats *all* universal sentences as having the structure of (19b).
- Thus, a semantics for first order predicate logic does well to analyze the conditional (or the correlate of it in FOL) as having the semantics in (15) and (16).
- Consequently, the semantics in (15) and (16) was/is considered to be a ‘fair approximation’ of the meaning of natural language conditionals, for the purposes of encoding certain statements of mathematics, logic (and science...)

### 2.2.3 Judgments of Truth and Falsity

von Fintel (2007) relates the following ‘thought experiment’ by Suber (1997), which is intended to lend some credence to the extensional treatment of conditionals in (15)/(16).

#### (23) When Conditionals are ‘Lies’

Suppose that I make the following promise to you: “if I am well, I will come to class.”  
Now, let’s ask the following question:

*In the scenarios below,*

*did I keep my promise (was my promise something ‘true’)*

*did I break my promise (was my promise something ‘false’)?*

- |    |   |                               |
|----|---|-------------------------------|
| a. | I am well, and I come to class.           | PROMISE KEPT                  |
| b. | I am well, but I don’t come to class.     | PROMISE BROKEN!               |
| c. | I am not well, and I don’t come to class. | PROMISE KEPT (not yet broken) |
| d. | I am not well, and I come to class.       | PROMISE KEPT (not yet broken) |

So, it seems that our judgments regarding the truth-falsity of conditionals do match to some degree the predictions of the extensional semantics in (15) and (16).

...However, as you may well already know, there are a variety of insuperable problems that this ‘truth-functional’ semantics faces...

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## 3. Arguments Against the Extensional Semantics

### 3.1 Extensional ‘Falsehood’ Conditions are Too Strong

Recall that our extensional treatment in (15) states that conditional sentences are false if *and only if* the following holds:

#### (24) The ‘Falsehood’-Conditions of a Conditional (Extensional Semantics)

The sentence “If  $S_1$  then  $S_2$ ” is FALSE *if and only if*  $S_1$  is TRUE and  $S_2$  is FALSE

Thus, our extensional semantics predicts that a conditional is false *only if* the antecedent is (actually) *true* and the consequent is (actually) *false*.

However, this seems to be too strong a condition on the *falsehood* of conditionals...

Consider, for example, the conditionals in (25) and (26).

(25) **False Conditionals Whose Antecedents are (Possibly) False**

- a. If the sun explodes tomorrow, then Jupiter will explode tomorrow too.
- b. If Seth were a phonologist, then Jupiter would explode.
- c. If McCain had won, then Jupiter would have exploded.

**Key Observation:**

- Each of the conditionals in (25) is intuitively false.
- However, while we may believe that each of these conditionals is *false*, we don't necessarily also believe that the antecedent of each is *true*.
- For example, while it's clear that conditional (25a) is false, it's also clearly false that the sun will explode tomorrow...

(26) **False Conditionals Whose Consequents are (Possibly) True**

- a. If I wear the same sweater every day, then the sun will not explode next week.
- b. If UMass burns down, then we'll have a nice spring.
- c. If Obama swears on national television, then the economy will recovery 2010.

**Key Observation:**

- Each of the conditionals in (26) is intuitively false.
- However, while we may believe that each of these conditionals is *false*, we don't necessarily also believe that the consequent of each is actually *false*.
- For example, while it's clear that conditional (26a) is false, it's also clearly true that the sun will not explode next week.

(27) **Conclusion**

- Our extensional semantics was based on the (correct) generalization that a conditional is false *if* the antecedent is true and the consequent is false.
- However, from this true generalization, we leapt to the much stronger generalization that a conditional is false *if and only if* its antecedent is true and the consequent false.
- As we see from cases like (25) and (26), this stronger generalization – embodied in our extensional semantics in (15) – is *too* strong... conditionals can be false *without* their antecedents actually being true or consequents false.

(28) **Some Foreshadowing of an Intensional Approach**

Moreover, let's reflect upon *why* we think the conditional in, say, (25a) is false:

- Because, given our knowledge of astrophysics, it seems possible (imaginable) for the sun to explode and Jupiter not to also explode too (but, rather, get vaporized with all the other planets)...
- That is, there is at least *one* possible world where the antecedent is true and the consequent is false...

*Idea:*

When we consider whether a conditional is false, we ask "is there *any* possible world where the antecedent is true and the consequent is false..."

(The extensional semantics in (15) works only for those cases where this 'falsifying world' is the *actual* world)

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**3.2 Failure of Classical Inferences with Some Natural Language Conditionals**

The semantics in (15)/(16) predicts that certain inferences with conditionals are valid:

(29) **Strengthening the Antecedent**

a. *Inference Pattern*

If p then q. Therefore, if p and z, then q.

b. *Proof of Validity*

- Suppose "if p then q" is T.
- By (15), either "p" is F or "q" is T.
- If "p" is F, then "p and z" is also F, and so "if p and z then q" is T.
- If "q" is F, then "if p and z then q" is also T.

(30) **Transitivity (Hypothetical Syllogism)**

a. *Inference Pattern*

If p then q. If q then z. Therefore, if p then z.

b. *Proof of Validity*

- Suppose the following are true: "if p then q" and "if q then z".
- For a contradiction, assume that "if p then z" is false.
- By (15), "p" is true, and "z" is false.
- Since "if p then q" is true, then (by (15)) "q" must be true, too.
- Since "if q then z" is true, then (by (15)) "z" must be true, too.  
(Contradiction)

(31) **Contraposition**

- a. *Inference Pattern*  
If p then q. Therefore, if not q, then not p.
- b. *Proof of Validity*
- Suppose “if p then q” is T.
  - By (15), either “p” is F or “q” is T.
  - If “p” is F, then “not p” is T, and so (by (15)) “if not q, then not p” is T.
  - If “q” is T, then “not q” is F, and so (by (15)), “if not q, then not p” is T.

Unfortunately, as has long been noted in the philosophical and logical literature, these inferences are not universally valid with natural language conditionals.

(32) **Failure of ‘Strengthening the Antecedent’**

- a. If kangaroos has no tails, they would fall over.
- b. If kangaroos had no tails, **and had crutches instead**, they would fall over.

(33) **Failure of ‘Transitivity’**

- a. If Hoover had been a communist, he would have sold secrets to the Russians.
- b. If Hoover had been born in Russia, he would have been a communist.
- c. If Hoover had been born in Russian, he would have sold secrets to the Russians.

**Side-Note:**

One might ask:

*Does (33) really show failure of ‘transitivity’? After all, the consequent in (33b) isn’t completely identical to the antecedent of (33a)...*

True... but recall that we are (perhaps wrongly) ignoring the contribution of tense and aspect. If we ignore tense and aspect, these two clauses are identical...

(34) **Failure of Contraposition**

- a. (Even) if Goethe hadn’t died in 1832, he wouldn’t be alive today.
- b. If Goethe were alive today, then he would have died in 1832.

*... One of the greatest difficulties for the extensional semantics in (15) is the way that **modals** semantically interact with conditionals....*

*(... and as we will see, this will continue to be a problem even for certain, more ‘sophisticated’ intensional theories of conditionals...)*

### 3.3 The Semantics of Conditionals Containing Modals

Conditional sentences in which the consequent contains a modal pose very difficult problems for the extensional semantics in (15).

In order to see this, however, we will have to first spell out a rather detailed scenario (adapted from that in von Stechow 2007).

#### (35) The Scenario: Lost on the Highway

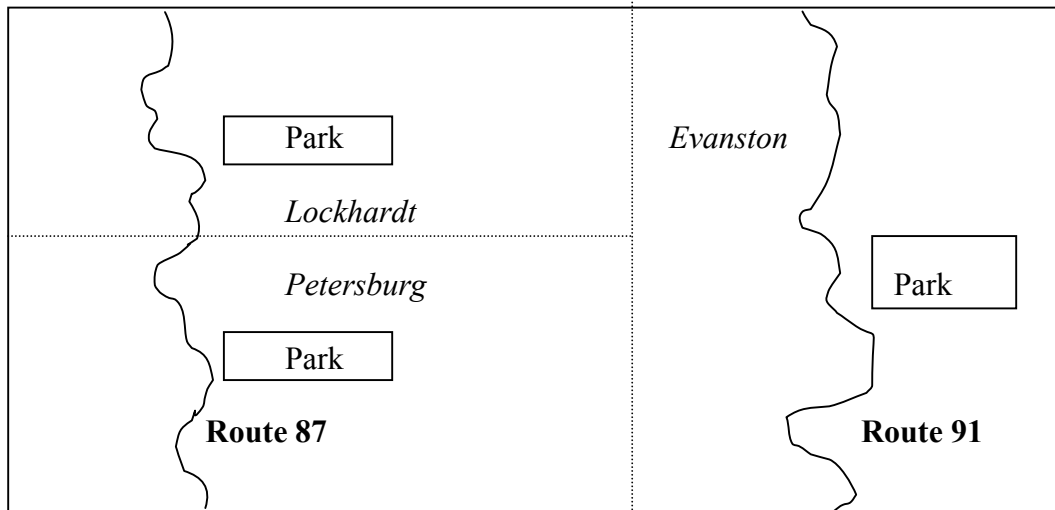
Sandy and Kim are driving to the town of Lockhardt for a party.  
They've gotten lost, though, and no longer know (exactly) what road they are on.

**However, they do know the following:**

**They are either on Route 87 or Route 91**

**They've just passed a park.**

Sandy checks the map and sees the following picture:



- Route 87 passes by two parks, one in Lockhardt and one in Petersburg
- Route 91 passes by one park, in Evanston

#### (36) The Crucial Data

If, after looking at the map, Sandy uttered (36a), she would be saying something *true*.

If, after looking at the map, Sandy uttered (36b), she would be saying something *false*.

- a. If we are on Route 87, then we might be in Lockhardt. (True in (35))
- b. If we are on Route 91, then we might be in Lockhardt (False in (35))

... So, clearly, we need our theory of conditionals to predict that (36b) is *false* in context (35).

(We also need it to predict that sentence (36a) is true in context (35)...

but that actually won't be a problem...the problem is our extensional account predicts that *too many* things are true)

So, what does our extensional semantics in (15) predict regarding the truth-conditions of (36b)?

Let's start by assuming that our semantics just directly interprets the surface form in (36b)...  
(i.e., there is no fancy covert movement going on in the sentence.).

**(37) Truth-Conditions Predicted by Our Extensional Account, Part 1**

- a. Structure at LF:  
[ [ If we are on Route 91 ] [ then we might be in Lockhardt ] ]
- b. Predicted Truth Conditions (Rough, Informal Statement)  
*Either* we are not on Route 91, or  
there are worlds compatible with our knowledge where we are in Lockhardt.

**PROBLEM:**

The truth-conditions in (37b) are *extremely weak*. They predict that (36b) is true just so long as *there are worlds compatible with our knowledge where we are in Lockhardt*.

- But – by assumption – Sandy and Kim don't know where they are, and so (of course) there are worlds consistent with their knowledge where they are in Lockhardt.
- Consequently, (37b) *wrongly predicts* that (36b) is TRUE in (35)

So, clearly, our extensional semantics for conditionals does not assign to LF (37a) the intuitive meaning of (36b).

Let's try something else, though... Let's assume that by LF, the modal moves and takes scope over the entire conditional. *Does our semantics now give us the right reading?...*

**(38) Truth-Conditions Predicted by Our Extensional Account, Part 2**

- a. Structure at LF:  
MIGHT [ [ If we are on Route 91 ] [ then we be in Lockhardt ] ]
- b. Predicted Truth Conditions (Rough, Informal Statement)  
There are worlds compatible with our knowledge where:  
*Either* we are not on Route 91, or  
we are in Lockhardt.

**PROBLEM:**

The truth-conditions in (38b) are also *extremely weak*. They predict that (36b) is true just so long as *in some worlds consistent with our knowledge, we aren't on Route 91*.

- But – by assumption – Sandy and Kim don't know which road they are on, and so there are worlds consistent with their knowledge where they aren't on Route 91...
- Consequently, (38b) *wrongly predicts* that (36b) is TRUE in context (35)!

(39) **Conclusion**

Our extensional semantics does not assign to either LF (37a) or (38a) the actual truth-conditions of sentence (36b)...

... and so our extensional semantics for conditionals doesn't accurately capture the truth-conditions of conditional sentences whose consequents contain modal auxiliaries...

So, what's going wrong here with our extensional semantics?

If we reflect upon the ways we might try to paraphrase the intuitive content of sentences (36a) and (36b), the following picture seems to come into view...

(40) **A 'Guiding Intuition' We'll Return to (Much) Later**

Sentence (36a) is *true* in context (35) because:

**If Sandy and Kim *learned* that they were on Route 87,  
they would conclude (given the map) that they might be in Lockhardt.**

Sentence (36b) is *false* in context (35) because:

**If Sandy and Kim *learned* that they were on Route 91,  
they wouldn't conclude (given the map) that they might be in Lockhardt.  
Indeed, they would conclude that they *must not* be in Lockhardt.**

For now, however, let's simply acknowledge the following general conclusion:

(41) **General Conclusion**

The 'extensional' truth-conditions for conditionals in (15)/(16) are not correct.

- The conditions of 'falsehood' they impose are too strict.
- They validate inferences that are not formally valid in natural language.
- They cannot capture the truth-conditions of conditional sentences whose consequents contain modals.

*In the remainder of our discussion, we will see how an 'intensional' approach to the semantics of conditionals can help us to overcome the obstacles outlined above...*