Deductive Logic

in

Natural Language

by

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In one of the most influential passages of modern philosophy, René Descartes wrote about being and nothingness.

On looking for the cause of [my] errors, I find that I possess not only a real and positive idea of God, or a being who is supremely perfect, but also what may be described as a negative idea of nothingness, or of that which is farthest removed from all perfections. I realize that I am, as it were, something intermediate between God and nothingness, or between supreme being and non-being.

It is not our purpose glibly to criticize great philosophers, yet it must be said that many logicians have thought that these remarks invite confusion of a peculiarly noxious sort. (What is it that participates in this idea of nothingness? Nothing?) Similar confusions and ambiguities underlie the appeal of the anarchist bumper sticker,

No government is better than no government.

The slogan would have us understand that it is as good to have no government at all as it is to have a government of any variety. Unfortunately, if it can be so understood, the slogan equally can be
taken to express the absurdity that not having any government at all is better than not having any government at all. And, even as the (seemingly) contrary doctrine that not having any government at all is not better than having a government of whatever variety you choose. Taken literally and carefully, what the sentence means is that there is no worst government (that is, none better than no other), a proposition that perhaps is true even by anarchist lights. But you are not likely to get this message as a car bearing it races by.

These perplexities all arise from a failure to appreciate the logic of quantifier expressions. In Chapter VII we recognized that for logical purposes the syntactic category of Noun Phrase had to be subdivided. Eligible substitutions under Leibniz's Law were there confined to designators, which were to be distinguished from other Noun Phrases. However difficult designators were to delimit, the need to distinguish them from quantifier expressions is illustrated by the following travesty.

| (No number) is greater than every other number. | True |
| (No number) = (every number). | True |
| (Every number) is greater than every other number. | False |

As in Chapter VII the relevant expressions have been bracketed and the identity symbol introduced in order to make visible the purported application of Leibniz's Law. To make the difficulty unmistakable we should ask ourselves whether indeed no number is greater than every other number and indeed no number is identical with every number. Even as we assent to these arithmetical propositions, we yet will deny that every number is greater than every other. And there will lie the difficulty for Leibniz's Law—unless, as in our formulation of it, that law is restricted to apply only to designators.

What we are beginning to recognize is a category of Noun Phrase whose logic is at odds with the traditional definition of a noun as the name of a person, place, thing, or idea. The passage from Descartes tempts us to misunderstand the noun "nothing" as indeed the name of a thing, but not of any ordinary thing. As a name, "nothing" seems to refer to a particularly mysterious thing, alluring to some among us, a ghost or a shadow of a thing. In the sections to come we will learn why this is a serious logical misunderstanding. More constructively we will begin to learn how to handle the logic of a very wide and very fascinating class of linguistic expressions.

The following are grammatical sentences of English, each with its own Noun Phrase followed by the Verb Phrase "loved Maria." (As
it happens the sentences are all true with respect to the situation of the musical *West Side Story.*)

Two guys loved Maria.
Not many Jets loved Maria.
Some Polish guy loved Maria.
None but young people loved Maria.
Most of those fighting loved Maria.
No Jet other than Tony loved Maria.
A handsome, serious one loved Maria.
None of the Jets' girlfriends loved Maria.
Only Tony and the Puerto Ricans loved Maria.
Some members of the two gangs loved Maria.
All of the girls working in the dress shop loved Maria.
Fewer guys than you might expect to love her loved Maria.
Some guys that didn't know each other very well loved Maria.

None of these main Noun Phrases are designators. All of them turn out to be quantifier expressions, a term that seems appropriate to "two guys," but less so to "no Jet other than Tony" or "all of the girls." The term is traditional among logicians, and indeed there are ever so many numerically definite quantifier expressions—"three guys," "fifty-nine members of a gang," "a trillion and one grains of sand," and so on. As we understand them better we will see that in fact all quantifier expressions have implications as to quantity or number, though in many cases—"Nobody shot Maria"—the number in question is zero.

Without explicitly defining quantifier expressions, we can say a few things to help get a feel for them. They are all Noun Phrases. One-word quantifiers, among them "everyone," "something," "nobody," "ever," and "somewhere," consist of just one word. (In §31 we will begin investigating the logic of quantifiers by focussing on the simplest of these.) With the exception of one-word quantifiers, quantifier expressions characteristically incorporate one or more general terms. Common nouns like "guy" and "Jet," adjectives like "handsome" and "serious," and verbs in adjectival form like "fighting," are general in that they apply to more than one thing. Characteristically the common nouns in question are count nouns;
the nouns "guy," "member," and "Jet"—unlike "sugar," "courage," or "five"—have a plural form. Occasionally such count nouns stand alone as Noun Phrases, as in the sentence, "Roses are red." But more frequently there are words that go with the count noun to form a Noun Phrase, words like "a," "some," "no," "fifty-nine," "none but," "most," "all," and "each." In the more long-winded cases there seem to be clauses incorporated into the quantifiers, taking advantage of recursive rules of English grammar that let the expression grow without bound. These are some of the Noun Phrases that qualify as quantifiers. It would be no simple matter to specify the syntax of quantifier expressions in more detail, and we will not attempt to do so. More important is to recognize that the quantifier expression as a whole does not designate a specific person or thing. In fact the logical function of quantifier expressions is not to refer or designate at all. Their function is more subtle and is best understood by considering inferences that involve quantifier expressions as we will do before long.

This last point applies in particular to quantifier expressions involving the indefinite article "a" (or "an") and the closely related word "some." When Maria sings, "FOR I'M LOVED BY A PRETTY WONDERFUL BOY!" of course she has Tony in mind. But her friends, using the same expression, are thinking of Chino. The quantifier expression may well apply to both Tony and Chino in that each of them may be a pretty wonderful boy. But unlike a designator ("the wonderful boy that sang to Maria on the fire-escape"), the quantifier expression "a pretty wonderful boy" does not designate either of them. This can be seen by again considering Maria's friends. Suppose Chino had been killed, or that he had realized that Maria was in love with Tony. In either case, she might well not have been loved by Chino at the time her friends were singing. But her friends' sentence, "She is loved by a pretty wonderful boy," would have remained true, and not because it is ambiguous. Even if what her friends had in mind was that Chino loved her, even if they in some sense were referring to Chino, the sentence they were using simply meant that some wonderful boy or other loved her as they sang. Since Maria felt—and was—so pretty, it wouldn’t be surprising if lots of them did!

There is a familiar convention of narrative that complicates this point. In introducing a particular person or thing into a narrative, it is conventional to initially use the indefinite article, and thereby provide a context that secures a reference for descriptive indexicals using the definite article.
(1)
A pretty, young girl moved from Puerto Rico to join her family in New York. The young girl had a daring brother who belonged to a gang of street kids. Her brother was the leader of the gang.

In this passage the expressions "a pretty, young girl," "a daring brother," and "a gang of street kids" are used to indicate that the narrator has in mind a specific girl, brother, and gang. These are subsequently referred to by the descriptive indexicals, "the young girl," "her brother," and "the gang." Those indexicals are indeed designators, referring respectively to Maria, Bernardo, and the Sharks. Even so, "a pretty, young girl" remains perfectly general, whoever the narrator means to introduce. The point is clinched by remembering the stricture on Leibniz's Law. Knowing that Bernardo was her brother, we are entitled by Leibniz's Law to infer from the sentences in (1) that Bernardo was the leader of the gang. But knowing that Anita was (also) a pretty, young girl does not entitle us to infer that Anita moved from Puerto Rico to join her family in New York. The difference between "a" and "the," which at first seems minuscule, turns out to be all the difference between designators and quantifiers.

THE SIMPLEST QUANTIFIERS: "EVERYONE," "SOMEONE," AND "NO ONE" §31

Arguments whose validity depends essentially on quantifier expressions are numerous and varied. That their logic can be complex is illustrated in the following valid argument.

| Most of the Sharks know Maria. |
| Most of the Jets know Bernardo. |
| Any who do not know Maria do not know Bernardo. |
| All of the gang members are either Jets or Sharks. |

Most of the gang members know Maria.

When it is changed slightly, the result is an argument that is not valid.
Most of the Sharks know Maria.
Most of the Jets know Bernardo.
Any who do not know Maria do not know Bernardo.
Most of the gang members are either Jets or Sharks.
Most of the gang members know Maria.

It is easy to describe a possible situation with respect to which all of the premises of the latter argument, including the revised fourth one, are true but yet the conclusion is false. Doing so involves specifying how many there are of various sorts, and so the logic of the argument pretty clearly verges on arithmetic.

To establish a beachhead with quantifier logic, while avoiding numerical calculation, logicians have focussed first on the simplest quantifiers, here represented in these grammatically simple sentences, each with a one-word main Noun Phrase, each true with respect to the situation in *West Side Story*.

(Ia) Everyone knew Maria.
(1b) Someone loved Maria.
(1c) No one killed Maria.

A glimpse of the logic of these sentences will enable us to become clearer about their meaning. Since—by the time of the last scene, which centers on her—everyone knew Maria, both Tony and Bernardo did (obviously) and so did Officer Krupke (less obviously). But what about Vladimir Putin? Since everyone knew Maria, must Putin have known her? No. When we say "everyone," the force of the quantifier is relative to a universe of discourse. Here the discourse is a musical play, so it is natural to take the cast of characters to comprise the universe over which the quantifier ranges. In other cases the boundaries of the universe of discourse might not be so clear, and perhaps there are assertions ("God loves everyone") whose universe of discourse is meant to be all-encompassing. It is not only in cases where the individuals are fictional that the universe of discourse is restricted. If a teacher says, "Everyone passed," she is not including Putin. Presumably the universe of discourse for her "everyone" is the class of students she is teaching.

Let's go on with our survey of these simplest quantifiers. Since Tony loved Maria, someone did. But Chino did also, so in saying that someone did we don't mean exactly one. Note that even if everyone loved Maria, it would still be true that Tony loved her, and thus that
someone did. So the sentence (1b) "Someone loved Maria," does not conflict with the sentence "Everyone loved Maria," that is, it does not mean that someone, but not everyone, loved Maria, though it is sometimes used with that implication. Finally, if Chino had killed Maria, or she had killed herself, it wouldn't be true that no one killed her. And thus since it is true, Chino must not have, and Maria herself must not have. Equally Krupke must not have. Again the generalization is relative to the universe of discourse. When the teacher says, "No one may leave the room," her prohibition does not extend to the principal.

As we mentioned from the outset, each of the sentences in (1) is very simple grammatically, as simple as,

(2) Tony killed Bernardo,

whose phrase-marker would be exactly the same, short of the terminal symbols. Even so, their implications are much wider. For each of these one-word quantifiers, we will formulate two logical rules for use in tableau, one for the sentence itself, and one for its negation, as it might arise in a rule-governed tableau.

As for negations, these occur in ordinary discourse as well as in the constructions of tableau. A survey of some sentences expressing them and their syntactic derivations calls our attention to new grammatical complications. The negation of (1a) is pretty smoothly formulated as

(3) Not everyone knew Maria,

whereas the negation of (2) would be

(4) Tony did not kill Bernardo.

When that modification is applied to (1a) we are in for a surprise.

(5) Everyone did not know Maria.

Sentence (5) is ambiguous. It might be meant as equivalent to (3), the negation of (1a). But equally it might be meant as denying that anyone knew Maria, i.e., as saying of each of them that he or she did not know Maria. What we have here is an ambiguity of scope, similar to syntactic scope ambiguities that we explored in Chapter VI, but not as simply explained. Still it's worth a try.

In Chapter V we explained syntactic ambiguities by providing distinct phrase-markers for a single terminal string. A phrase-marker for (3) is pretty easy to put forward, even without benefit of appropriate rewriting rules.
Here the negating word "not" applies syntactically to the sentence within. That same phrase-marker with different terminal symbols gives the terminal string,

Not Tony killed Bernardo,

which is not grammatical. But it is easy to suppose that an obligatory transformation,

\[
\text{Not NP VP} \Rightarrow \text{NP do not VP}
\]

applies to the phrase-marker, yielding the derived string (4). And, on the understanding of (5) as equivalent to (3), the same transformation would seem to be at work.

Another parsing of (5), to make manifest the syntactic ambiguity, would look like this.

(7)
Whether or not further linguistic inquiry would provide support for a
grammar with the requisite rewriting rules and transformations,
these phrase-markers make the essential point that in one way of
understanding (5), the (underlying) phrase-marker (6) has "everyone
knew Maria" within the scope of "not," while in the other way of
understanding (5), the phrase-marker (7) has "did not know Maria"
within the scope of "everyone." Like the cases we studied in
connection with grouping in Chapter VI, the syntactic ambiguity is
an ambiguity of scope as we defined that notion in §18.

Let's see what happens when we try to extend this explanation to
similar cases with other one-word quantifiers. How is the negation
of a "someone"-sentence smoothly expressed? In analogy with (4), we
might expect,

\[ \text{Not someone wanted to fight,} \]

\[ \text{to become acceptable to our ears by being transformed into,} \]

(8) \[ \text{Someone did not want to fight.} \]

If so, we are on thin ice, because in saying (8), which is
unambiguous, we do not deny,

(9) \[ \text{Someone wanted to fight.} \]

To deny (9), we should say,

(10) \[ \text{No one wanted to fight.} \]

Focussing on (10) in its own right, we formulate,

(11) \[ \text{No one did not want to fight.} \]

This latter, unlike (5), is also unambiguous. But it does not exactly
negate (10); it might be that neither (10) nor (11) is true.

The difficulties and curious behavior of (8) through (11) can be
sorted out only by considering their logical relations with instances
and rules for them in tableaux, something we will get to in §32.
However that turns out, the general worry about quantifiers and the
scope of "not" illustrated in the contrasting phrase-markers (6) and
(7) seems to be present in sentences (8) through (11) as well. It turns
out that the Conjunctions "and" and "or" give rise to similar worries
about scope. To address these worries adequately, we must challenge
a grammatical principle that was implicit in the allusion to
transformations in the previous paragraphs and that underlay the
deployment of transformations in logical analysis in Chapter VI.

According to the methods of §23 we are to analyze the sentence,

\[ \text{Riff supported either the Jets or the Sharks,} \]
Either Riff supported the Jets or Riff supported the Sharks, and introduce the rule-governed connective "\( \lor \)" between the simple sentences. In calling it an equivalent, we presume that the two sentences are synonymous. Here we implicitly rely on what has been known to linguists as the **Katz-Postal Hypothesis**, which is the supposition that grammatical transformations always preserve meaning. According to this hypothesis the underlying string is synonymous with the derived string whenever a transformation operates. Linguists have long known of cases that apparently disprove this hypothesis in its full generality. And we are on the verge of recognizing a case that itself counts as an exception. Since the quantifier "everyone" is a Noun Phrase, the same account that we saw above with the Noun Phrase "Riff" applies to the sentence,

\[(12) \text{ Everyone supported either the Jets or the Sharks.}\]

On this account, it derives transformationally from the underlying sentence,

\[(13) \text{ Either everyone supported the Jets, or everyone supported the Sharks.}\]

This violates the Katz-Postal principle—because (12) and (13) clearly differ in meaning. In fact, with respect to the situation in *West Side Story*, (13) is obviously false, while (12) is arguably true.

Our thin ice has broken, and we find ourselves in the deep water of linguistic theory. Let's stick with the explanations we developed in Chapters V and VI for whatever guide they give us as to the syntactic structures, including underlying structures, of sentences like (12). But let's recognize that the **Katz-Postal Hypothesis** is not true in full generality and that the use we made of it in Chapter VI is confined to a class of cases. We want to draw a contrast between (12) and (13), one that is pretty clearly a matter of scope. Since we are sticking with the transformational account of the syntax of (12), we cannot appeal to distinct parsings to support the contrast we want. So we will begin speaking of **logical scope**. In (12) the logical scope of "or" is narrow, within the scope of "everyone." What this means is that, in a tableau, the rule for "or" cannot be applied to (12). By contrast, in (13) the logical scope of "or" is wide, and within that scope are two occurrences of "everyone."

With the notion of logical scope we can contrast,

\[(14) \text{ Somebody loved Tony, and somebody killed Tony,}\]
which is true with respect to *West Side Story*, with,

(15) **Somebody loved Tony and killed Tony,**

which is not true. In (14) the Conjunction "and" has wide logical scope vis-a-vis the quantifiers. The sentence can be paraphrased using the rule-governed "&," and in a tableau the rule for "&" can be applied directly. But in (15), the logical scope of "and" is narrow, within the scope of "someone," and so the sentence cannot be paraphrased using "&," which after all is a *sentence* connective. Similarly,

(16) **No one belongs to both the Jets and the Sharks,**

is true with respect to *West Side Story*, while,

(17) No one belongs to the Jets, and no one belongs to the Sharks,

is not true, and so the distinction of logical scope must be made for them. The Conjunction "and" has narrow logical scope in (16), within the scope of "no one," while in (17) "and" has wide logical scope.

As is already evident, this notion of logical scope relates to the kinds of situations with respect to which the sentence in question is true. Thus it rightly influences the construction of tableaux. We will make substantial use of it in the next two sections as we introduce tableau rules for quantifiers and bring them into play with rules for connectives. As for the Katz-Postal Hypothesis and the mysteries of what is the grammatical basis of logical scope, let's linger over another contrast, this one implicating the passive transformation. In the sentence,

(18) **Either Riff or Tony restrained everyone,**

the Conjunction "or" has wide logical scope. Here the sentence is synonymous with the underlying sentence,

Either Riff restrained everyone, or Tony restrained everyone,

or at the very least it *can* be understood that way. Surprisingly, the passive voice version of (18),

(19) **Everyone was restrained by either Tony or Riff,**

is not synonymous with them. In (19) "everyone" has wide scope. Unlike the favored reading of (18), sentence (19) is true with respect to a situation in which Tony restrained some, Riff restrained others, but neither restrained everyone, though everyone was restrained by one or the other of them. Figuring out why we leave to theoretical linguistics.
Summing up what we have learned, one-word quantifiers indeed qualify as a kind of Noun Phrase, and syntactic explanations of what is grammatical and what is not carry over from Chapters V and VI without ramification. (The explanations make use of phrase-markers and transformations of the sort developed in those chapters.) When we consider the logic of these quantifiers, on the other hand, we recognize that this unramified syntax is deceptive. For logical purposes, we must make distinctions of scope that are not explained by it. To appreciate the force of those distinctions, we will consider inferences involving quantifiers. To apply the method of tableaux to such inferences, we will need to develop rules for quantifiers in tableaux. It is to these tasks that we now turn.

§32 TABLEAU RULES FOR THE SIMPLEST QUANTIFIERS

Having glimpsed the logic of the simplest quantifiers, we are ready to codify what we have noted, in rules that will serve to handle these quantifiers where they arise in tableaux. To fall under these rules a sentence must be grammatically simple—no Conjunctions or Subordinating Conjunctions—and in it there must occur a single one-word quantifier. That is to say, among its Noun Phrases there must occur exactly one quantifier expression and it must consist of a one-word quantifier. We also will give rules for the negations of sentences meeting these restrictions. As we will see, these rules will serve arguments with complex premises and conclusions so long as the quantifiers do not participate in the complexity. In particular, these rules will accommodate tableaux in which rule-governed connectives also occur, so long as all of the quantifiers have narrow scope relative to those connectives, narrow scope under the familiar syntactic definition of §18. In each case in what follows, we will see first a precise formulation of the rule in question, followed by an explanation.

Simple Rule for "Everyone": If in any path of a tableau there occurs a simple sentence with the single one-word quantifier "everyone," you may append to any branch below that occurrence the result of replacing "everyone" with any designator that already appears in the tableau. Do not check off the sentence with "everyone."
We begin with a rule that is particularly easy to justify. It is an application of this rule that takes us from "Everyone knew Maria" to "Tony knew Maria." Since "everyone" means everyone, any name or other designator can replace it in a simple sentence, so long as the bounds of the universe of discourse are not breached. Thinking in terms of the rationale for tableaux generally, any open path of the tableau in which an "everyone"-sentence occurs represents a way for that sentence and the others in the path to be true. Anyone who is mentioned in the path is ipso facto in the universe over which the "everyone" ranges. And whatever is true of everyone in that emerging situation is of course true of the particular individual just mentioned. Thus any way of the "everyone"-sentence being true is also a way of the new sentence being true as well.

The developing tableau reflects the discourse comprised by the argument or set of sentences under consideration. Thus any designator already occurring is fair game. But the rule gives license for no other designator (not "Putin"!). Not only does this restriction keep us in bounds, it also keeps us from profligacy in application of the rule. With a cast of even a dozen characters the logic of "everyone" would yield a dozen instances. Not all of them are relevant to the aim of the tableau, which is to make inconsistencies explicit. If a quantifier sentence conflicts with other sentences in a set, the conflict will become explicit by means of designators that already do or will occur in the tableau. Even with the restriction to designators in the tableau, many potential applications of the rule will not be fruitful, so the rule permits us to append instances without requiring it. Of course the "everyone"-sentence should not be checked off since further instances may become relevant later in the tableau.

**Simple Rule for "Someone":** If in any path of a tableau there occurs a simple sentence with the single one-word quantifier "someone," append to each branch below that occurrence the result of replacing "someone" with a proper name that does not already occur in the tableau. (Conventionally we choose the alphabetically next neutral proper name.) Check off the sentence with "someone."

Unlike the one for "everyone," the rule for "someone" can be executed once and for all. Only one sentence is appended, and the "someone"-sentence is checked off. Yet despite its simplicity of execution, the "someone"-rule is harder to explain and justify. It will help us to see the rule in action. Let us begin with a consistent
set of two sentences and see that applying our rules will be harmless in that no inconsistency will be introduced.

| Someone was a gang member. |
| Someone was not a gang member. |

First notice that both of these sentences are true with respect to the situation of *West Side Story*, bearing out our conviction that they are consistent. Even so, the result of replacing "someone," in the first sentence, with "Maria" or "Krupke" would not be true. Equally, the result of replacing "someone" with "Bernardo" or "Riff" in the second sentence would not be true. And if we replaced both cases of "someone" with "Tony," our tableau would close even though the original sentences are perfectly consistent. We need a better-conceived strategy for introducing a designator in place of "someone."

Your impulse might be to pick a designator—for example, "Riff"—that results in a sentence—"Riff was a gang member"—that is true with respect to the situation you have in mind. There are two serious drawbacks to this prospect. First, as in the example, "Someone called the police," the "someone"-sentence might be true with respect to your favored situation though you do not know who the someone was. Second, and more deeply, in building a tableau you are trying to describe a possible situation with respect to which all of the sentences in a particular set are true. Whether they really are true with respect to your favored situation, and even whether your favored situation is really possible, may be no easier to recognize than whether the set of sentences under consideration is consistent. As we have often seen, if we were perfectly clear-headed, we would need no techniques for logic.

It is clear that care is required in replacing the quantifier with a designator if our aim is to accommodate all possible situations truly described by the "someone"-sentence. The expedient enjoined by the rule is to pick what we call a **neutral proper name**, a proper name that does not occur in the tableau and that does not commit us in any way to any characteristic other than that expressed in the "someone"-sentence. To serve this purpose we will provide a stock of such neutral proper names, names that do not occur in the present cast of characters, that are not likely to occur in other tableaux you construct, and that are neutral even with regard to gender. The rule
suggests that we use the alphabetically next such name, and since this is the first application of the rule, we have "Alex."

\[
\begin{array}{c}
\checkmark \text{ Someone was a gang member} \\
\checkmark \text{ Someone was not a gang member} \\
\hline
\text{ Alex was a gang member }
\end{array}
\]

Next we have "Bo."

\[
\begin{array}{c}
\checkmark \text{ Someone was a gang member} \\
\checkmark \text{ Someone was not a gang member} \\
\hline
\text{ Alex was a gang member } \\
\text{ Bo was not a gang member }
\end{array}
\]

Now both of the quantifier sentences have been checked, and there is nothing more to be done. The unchecked sentences form an obviously consistent set, so our verdict is that the original set is consistent. That is just the verdict we want. No inconsistency has been introduced by the "someone"-rule.

Now let's turn to an obviously inconsistent set of two sentences where applying our rules will make recognition of the inconsistency mechanical.

\[
\begin{array}{c}
\text{ Everyone was a gang member.} \\
\text{ Someone was not a gang member.}
\end{array}
\]

Even though we have an "everyone"-sentence, no application of the "everyone"-rule is permitted now because no designator yet occurs in the tableau. Applying the "someone"-rule to the "someone"-sentence, we introduce "Alex."

\[
\begin{array}{c}
\checkmark \text{ Everyone was a gang member} \\
\checkmark \text{ Someone was not a gang member} \\
\hline
\text{ Alex was not a gang member }
\end{array}
\]

Having introduced a neutral name, we now have a designator in the tableau and can apply the "everyone"-rule.
Everyone was a gang member
\( \sqrt{\text{Someone was not a gang member}} \)

<table>
<thead>
<tr>
<th>Alex was not a gang member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alex was a gang member</td>
</tr>
</tbody>
</table>

Now the tableau closes because we have a sentence and its negation in the only path. Application of the "someone"-rule has enabled us to bring out the conflict between the original sentences, in particular by enabling us to specify a relevant instance of the "everyone"-sentence.

In this case the inconsistency of the original set was pretty obvious, so no objection arises to our introducing the neutral name under the "someone"-rule. But imagine another case where the "someone"-rule has been applied, and it is objected,

Who is this Alex, anyway? The sentence says, "Someone joined a gang." Who is to say it was Alex? That doesn't even sound like someone who would join a gang. Maybe it was someone else who joined the gang. "Someone joined a gang" occurred among a set of sentences, the "someone"-rule was followed, and the tableau closed. Maybe if you had named the right person we would have had an open path.

The reply is that the novelty of the neutral name is precisely what gives it the best chance of keeping the tableau open. If choosing this new designator results in a conflict with other sentences, perhaps spawned from other quantifier-sentences by means of other rules, choosing any other designator would have results just as bad. Put another way, if there is any possible situation with respect to which all of the sentences in the original set are true, including "Someone joined a gang," there will also be a possible situation with respect to which they are true in which it is Alex (perhaps among others) who joined a gang.

**Simple Rule for "No one":** If in any path of a tableau there occurs a simple sentence with the single one-word quantifier "no one," you may append to any branch below that occurrence the result of first replacing "no one" with any designator that already occurs in the tableau and then negating the outcome. Do not check off the sentence with "no one."

The rule for "no one" is as easy to justify as the rule for "everyone" and only a little harder to execute. Consider these two
sentences, which we can easily see are inconsistent with one another.

<table>
<thead>
<tr>
<th>No one shot Maria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chino shot Maria</td>
</tr>
</tbody>
</table>

The problem with them is brought out by remarking that since no one shot Maria, Chino did not. The rule permits us to record this by introducing the negation of "Chino shot Maria," where this latter sentence is the result of replacing "no one" with "Chino."

<table>
<thead>
<tr>
<th>No one shot Maria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chino shot Maria</td>
</tr>
</tbody>
</table>

\[ \neg \text{Chino shot Maria} \]

Just as with the "everyone"-rule, restricting the instances to those designators already occurring keeps us within the bounds of the universe of discourse. It also helps keep us within the bounds of relevance to the objective of closing the tableau. Even with this restriction, we are permitted to append "\( \neg \) Maria shot Maria" since the designator "Maria" also occurs in the tableau. We refrain because the tableau closes without it, showing that indeed the original set is inconsistent. Notice in this rule the crucial feature of the quantifier "no one." When we say that no one shot Maria, we don't mean that some ghostly someone shot her, but rather that Chino did not, nor did Maria, nor did anyone else.

The "no one"-rule is equally effective in bringing out the inconsistency in a set of sentences where no relevant designator occurs.

<table>
<thead>
<tr>
<th>Someone warned Tony</th>
</tr>
</thead>
<tbody>
<tr>
<td>No one warned Tony</td>
</tr>
</tbody>
</table>

We could append "\( \neg \) Tony warned Tony," but it wouldn't contribute to closing the tableau. Instead we apply the "someone"-rule, introducing the first neutral name.

\[ \sqrt{\text{Someone warned Tony}} \]

<table>
<thead>
<tr>
<th>No one warned Tony</th>
</tr>
</thead>
</table>

\[ \text{Alex warned Tony} \]
sentences, which we can easily see are inconsistent with one another.

\[
\begin{align*}
\text{No one shot Maria.} \\
\text{Chino shot Maria.}
\end{align*}
\]

The problem with them is brought out by remarking that since no one shot Maria, Chino did *not*. The rule permits us to record this by introducing the negation of "Chino shot Maria," where this latter sentence is the result of replacing "no one" with "Chino."

\[
\begin{align*}
\text{No one shot Maria} \\
\text{Chino shot Maria} \\
\neg \text{ Chino shot Maria}
\end{align*}
\]

Just as with the "everyone"-rule, restricting the instances to those designators already occurring keeps us within the bounds of the universe of discourse. It also helps keep us within the bounds of relevance to the objective of closing the tableau. Even with this restriction, we are permitted to append "\(\neg\) Maria shot Maria" since the designator "Maria" also occurs in the tableau. We refrain because the tableau closes without it, showing that indeed the original set is inconsistent. Notice in this rule the crucial feature of the quantifier "no one." When we say that no one shot Maria, we don't mean that some ghostly someone shot her, but rather that Chino did not, nor did Maria, nor did anyone else.

The "no one"-rule is equally effective in bringing out the inconsistency in a set of sentences where no relevant designator occurs.

\[
\begin{align*}
\text{Someone warned Tony.} \\
\text{No one warned Tony.}
\end{align*}
\]

We could append "\(\neg\) Tony warned Tony," but it wouldn't contribute to closing the tableau. Instead we apply the "someone"-rule, introducing the first neutral name.

\[
\begin{align*}
\checkmark \text{ Someone warned Tony} \\
\text{No one warned Tony} \\
\text{ Alex warned Tony}
\end{align*}
\]
Now we have a designator that is relevant to closing the tableau, so we put it in place of "no one," not forgetting to introduce the negation symbol.

\[ \sqrt{\text{Someone warned Tony}} \]
\[ \text{No one warned Tony} \]
\[ \text{Alex warned Tony} \]
\[ \neg \text{Alex warned Tony} \]

Of course the result is the negation of a sentence that already occurs in the path, and so the (only) path closes.

Our several applications of the three simple quantifier rules have had pretty obvious outcomes, but their purpose has been to portray the rules in action and to assure us that these rules represent sound principles of reasoning. We will soon employ the rules as we construct a rule-governed tableau for a difficult argument, but first we are reminded that the process of constructing counter-sets and—for some of the rules—the process of constructing tableau structures both result in negated sentences. What if the sentence in question is a quantifier sentence? To handle it, we will need rules for negations of simple sentences with single one-word quantifiers.

**Negation Rule for "Everyone":** Append the result of replacing "everyone" with a proper name that does not already occur in the tableau. (Use the next neutral name.) Check off the sentence with the negated "everyone."

The statement of this rule is very spare, but more is going on with it than appears. To appreciate how it works, let’s keep in mind the smooth way of expressing the negation of an "everyone"-sentence, for example,

(1) Not everyone was a gang member.

In saying (1), we are committed to there being a counterexample to the universal generalization that everyone was a gang member. That is to say, we are committed to there being someone who was *not* a gang member, though we may well not know who that counterexample is, or even if there is more than one. Again we make use of our neutral names, again choosing one that does not so far appear in the tableau. The wording of the rule presumes that the negation is expressed with the rule-governed "\(\neg\)," as in,
With that set-up, what we can do is simply replace the "everyone" with the chosen neutral name:

- Alex was a gang member.

When we do so, the negation—which had wide scope—fortuitously remains to make for the counterexample.

It is important to recognize that the negation rule for "everyone" applies not only to negations introduced in the course of building a tableau, but to ordinary formulations as well, negative sentences that may have appeared in the original set of sentences. One example is the ambiguous sentence,

(3) Everyone was a not gang member,

when it is understood as denying that everyone was a gang member. So understood, it should have been rewritten as (2) so that it falls under the rule we are discussing. In short, the negation rule for "everyone" applies to any grammatically simple sentence in which "everyone" has narrow scope, within the scope of "not."

The negation (2) leaves it open how many counterexamples there are, so a conflict will arise in the case of one counterexample if it will arise at all; for that reason, the negation can be checked off once the rule is applied. Alex, whoever he or she may be, serves as the representative counterexample. There lies the contrast with reading "everyone" in (3) as having wide scope. Under that reading, (3) denies of everyone that he or she was a gang member, so not only is Alex not a gang member, but also Riff is not and Bernardo is not and Tony is not. The wide-scope reading of (3) can never be checked off; it falls under the "everyone"-rule itself, not under the negation rule. That is the essence of "everyone" having wide logical scope.

Negation Rule for "Someone": Append the result of dropping the negation and replacing "someone" with "no one." Check off the sentence with the negated "someone."

Negation Rule for "No one": Append the result of dropping the negation and replacing "no one" with "someone." Check off the sentence with the negated "no one."

The remaining negation rules are particularly easy, for as we have already recognized, the negation of,

Someone killed Maria,
is naturally expressed as,

No one killed Maria.

And the negation of,

Tony fought with no one,

is naturally expressed as,

Tony fought with someone.

We take advantage of the close relationship between "someone"-sentences and "no one"-sentences by simply dropping the negation and switching to the other quantifier word whenever the negated "someone" or the negated "no one" occurs. Since the new sentence is simply the more natural formation of the original, the original can be checked off.

§33 THE SIMPLEST QUANTIFIERS IN TABLEAUX

The tableaux we looked at in the last section did not surprise us with their outcomes. Their purpose was to illustrate the quantifier rules and confirm their effectiveness. But there are many quantifier arguments that are confusing to follow and to assess. It is with them that tableaux have their importance. Several one-word quantifiers occur in the argument below, contributing to its difficulty. All of them occur in complex sentences, within the scope of Subordinate Conjunctions.

(1)

If someone pulls a knife, then everyone will be drawn in.
No one will stop the fight if Tony is drawn in.
Bernardo will kill someone unless someone stops the fight.
If either Tony or Bernardo is drawn in, Maria will be heartbroken unless no one gets hurt.

Maria will be heartbroken if Riff pulls a knife.

First we introduce rule-governed connectives. Since we have an argument—to be assessed for validity—we construct the counter set, which forms the trunk of our tableau. As the tableau develops, we
see that the one-word quantifiers turn up in shorter sentences where our new rules apply. Remember that the simple quantifier rules are restricted to sentences that have a single one-word quantifier and that are grammatically simple—Noun Phrase followed by Verb Phrase. The negation rules apply to the negations of those sentences, whether they occur naturally formulated in the original sentences, or they arise as the tableau unfolds.

\[
\begin{align*}
\text{Someone will pull a knife} & \rightarrow \text{everyone will be drawn in} \\
\text{Tony will be drawn in} & \rightarrow \text{no one will stop the fight} \\
\sqrt{\text{Bernardo will kill someone}} & \lor \text{someone will stop the fight} \\
\sqrt{(\text{Tony will be drawn in}} & \lor \text{Bernardo will be drawn in}) \rightarrow \\
& (\text{Maria will be heartbroken} \lor \text{no one will get hurt}) \\
\sqrt{\neg (\text{Riff will pull a knife} \rightarrow \text{Maria will be heartbroken})} \\
\text{Riff will pull a knife} \\
\neg \text{Maria will be heartbroken}
\end{align*}
\]
A few remarks will clarify the workings of the tableau. It is a peculiarity of the sentences in the counter set that in every case the rule-governed connectives have wider scope than the quantifiers. But the appropriate rules for connectives break these sentences down ultimately to simple sentences where the simple quantifier rules do apply. The "everyone"-rule and the "no one"-rule have been applied quite selectively, always with the aim of closing branches. Thus "¬ Riff will pull a knife" was spawned by "No one will pull a knife." Though lots of other instances were permitted by the "no one"-rule, this is the one that conflicts with "Riff will pull a knife" in the trunk. By contrast the "someone"-rule was applied to "Bernardo will kill someone" once and for all as soon as that simple sentence appeared. The rule introduced Alex, who was unmentioned in the tableau till that point. Alex is mentioned again at the lower right, where from "no one will get hurt" we get "¬ Alex will get hurt." This latter sentence makes no sense in concert with "Bernardo will kill Alex" higher in the path. Thus the path closes.

Finally, notice a short-cut that has been taken. In §31 we recognized that "No one will stop the fight" is the natural expression for the negation of "Someone will stop the fight." Since no situation is possible with respect to which both of these are true, the branch on the (center) right has been closed. A long route to the same effect would be to introduce a new neutral name via the "someone"-rule ("Bo will stop the fight") and then take that instance of the "no one"-sentence ("¬ Bo will stop the fight") and finally close the branch, which as a whole is unintelligible. It was this long route that we took in first introducing the "no one"-rule.
Since all of the paths have closed, the tableau shows that the counter set is inconsistent. Some readers might be surprised at the verdict of valid that our tableau has rendered. Perhaps to your ear the conclusion of argument (1) does not follow from its premises. Note that the conclusion does not mean that Maria will be heartbroken over Riff having pulled a knife, or even because Riff pulled a knife. From the given premises those conclusions indeed do not follow. Consistently with them, perhaps Maria doesn't know whether he will pull a knife, or afterward, whether he did. Rather the conclusion just means what it says, that if indeed Riff does pull a knife, Maria will be heartbroken for some reason or other.

Having seen our new rules in action, let’s return to some cases that give rise to issues of logical scope. At the end of §31 we saw that in the sentence,

Everyone was restrained by either Tony or Riff,

the one-word quantifier "everyone" has wide logical scope. What this means is that we cannot apply the rule for "\(\lor\)" requiring either a situation in which everyone is restrained by Tony or a situation in which everyone is restrained by Riff. But we cannot apply the "everyone"-rule either since the sentence is not grammatically simple. The methods we have developed so far do not apply to this sentence.

On the other hand, the following argument has the active-voice sentence as its first premise; we decided that here "or" can be assigned wide logical scope.

Either Tony or Riff restrained everyone.

There was someone Riff did not restrain.

Tony restrained himself.

What this means is that not only is the premise syntactically derived from the underlying sentence, "Either Tony restrained everyone, or Riff restrained everyone," but it has the same meaning and thus the same logical force. Thus as we construct the counter set, we introduce the rule-governed connective "\(\lor\)" into the first sentence.

As for the second premise, it illustrates a common transformation that introduces a so-called dummy subject "there." The effect is to insure that "someone" has wide logical scope, which might not be clear with "Riff did not restrain someone." We mark this in the tableau by leaving the "not" in the Verb Phrase of the second premise rather than introducing the rule-governed "\(-\)." The
upshot is that the "someone"-rule applies directly, introducing the neutral name "Alex"; the rule has been applied before any branching.

\[
\begin{align*}
\checkmark & \text{ Tony restrained everyone } \quad \checkmark & \text{ Riff restrained everyone } \\
\checkmark & \text{ Riff did not restrain someone } \quad \neg & \text{ Tony restrained himself } \\
& \quad \text{ Riff did not restrain Alex } \\
\text{ Tony restrained everyone } & \text{ Riff restrained everyone } \\
\text{ Tony restrained Tony } & \text{ Riff restrained Alex } \\
\end{align*}
\]

Note that it is the designator "Tony" that has been used with the "everyone"-rule to get the sentence "Tony restrained Tony" on the lower left. Of course the latter sentence conflicts with the earlier \(\neg \text{ Tony restrained himself.}\) This example emphasizes the license to bring any designator whatsoever into the "everyone"-rule, so long as it has already occurred in the tableau. When we say that Tony restrained everyone, we mean everyone in the universe of discourse, which obviously includes Tony himself. We often speak carelessly even though we have readily available a precise formulation that says what we might have wanted:

Tony restrained everyone but himself.

This means something different, namely that Tony restrained everyone other than Tony himself, that is to say, everyone who was not Tony. Making use of the relation of identity, we will be able to handle this different proposition in tableaux in Chapter IX. In the meantime, the conclusion of the argument does follow from its premises as written. The first of them does not say everyone but himself!

A second argument also illustrates some tricky cases with "not." Recall that sentence (8) of §31 ("Someone did not want to fight") is not the negation of (31.9) ("Someone wanted to fight"). In the first premise the dummy subject "there" emphasizes this, so we remember that "someone" in the subordinate clause has wider scope than "not."
If there was someone who did not want to fight, then everyone wanted to go home.
Not everyone wanted to fight.

Bernardo wanted to go home.

Thus again, as we construct the counter set, we do not introduce the rule-governed "→" in the subordinate clause of the first premise (i.e., the clause to the left of the "→"). On the other hand, "not" in the second premise does have wide scope, so we have the negation of an "everyone"-sentence, and for the first time we can see the rule for that combination in action.

\[
\text{Someone did not want to fight} \rightarrow \\
\text{everyone wanted to go home}
\]

\[
\sqrt{\neg \text{Everyone wanted to fight}}
\]

\[
\neg \text{Bernardo wanted to go home}
\]

\[
\neg \text{Alex wanted to fight}
\]

\[
\sqrt{\neg \text{Someone did not want to fight}}
\]

\[
\text{Everyone wanted to go home}
\]

\[
\text{No one did not want to fight}
\]

\[
\neg \text{Bernardo wanted to go home}
\]

\[
\neg \text{Alex did not want to fight}
\]

Since we don't have two of "→," we do not apply the "→→" rule on the top of the left branch of the tableau, but rather the negation rule for "someone." With (10) and (11) of §31, we also saw that "No one did not want to fight" is not the negation of "No one wanted to fight"; "no one" has wide logical scope in both of them. Thus the last entry in the left branch is spawned by the "no one"-rule. We need not apply the "→→" rule at the bottom of the left branch because it is clear that the last entry conflicts with "→ Alex wanted to fight" in the same path.
It is a crucial feature of our application of the simple quantifier rules that we do not apply them to sentences where the quantifier falls within the scope of another logical word. Thus where we have,

(1) Tony didn't fight with everyone,

we don't apply the "everyone"-rule, getting,

(2) Tony didn't fight with Bernardo.

Instead we recognize that (1) means,

It is not true that Tony fought with everyone,

and apply the negation rule for "everyone." And where we have,

(3) If everyone is drawn in, then no one will stop the fight,

we don't apply the "everyone"-rule, getting,

If Bernardo is drawn in, then no one will stop the fight.

Rather we apply the rule for "→," getting a branching structure with,

→ everyone will be drawn in,

on the left.

In both of these cases the logical scope of "everyone" is narrow, within the scope of another logical element. What that means in the construction of a tableau is that the "everyone"-rule does not apply, but rather some other rule applies, the one that is appropriate to the logical element that does have wide scope. Thus it is that the tableau rules bring out and confirm the real nature of the notion of logical scope introduced in §31. The question of logical scope is the question of which tableau rule to apply. We do not have a thoroughgoing grammatical account of logical scope, but we are working with enough cases to become adept at calibrating logical scope correctly and picking the appropriate rule.

There is another one-word quantifier in English whose logic differs from anything we have seen. Let's approach it by looking first at a sentence similar to (3).

(4) If everyone shoots, the police will come.

Here again "everyone" has narrow scope, and it is the "→" rule that applies in a tableau. Now let's contrast (4) with,
§34: "Anyone," Quantifier Scope, and Anaphoric Pronouns

(5) If anyone shoots, the police will come.

What specifically is the difference between these two sentences? Only that "anyone" has replaced "everyone." What difference does that make? "Everyone" is a universalizing word, ranging over the entire universe of discourse. But so it seems is "anyone," as is emphasized by adding "whoever":

If anyone whoever shoots, the police will come.

The answer as to the difference is one that we can understand only with this notion of logical scope that we have been carefully nurturing. "Anyone" is in fact universalizing, like "everyone," but the difference is that "anyone" automatically has wide logical scope. Thus, given that sentence (5) is true with respect to the situation in West Side Story, each of the following sentences is also true with respect to that situation.

(6) If Riff shoots, the police will come.
If Bernardo shoots, the police will come.
If Bernardo's sister shoots, the police will come.
If the Shark who loves Maria shoots, the police will come.
If he shoots, the police will come.

Precisely what was forbidden in the case of (4)—because there the quantifier "everyone" has narrow logical scope—should be licensed in the case of (5)—because "anyone" takes wide logical scope willy-nilly.

We have explained the difference between (4) and (5) in terms of the differing logical scope of the two universalizing quantifiers. This explanation can be tested against (1) above, in contrast with,

(7) Tony didn't fight with anyone.

Whereas (1) is true with respect to West Side Story, sentence (2), which has a well-chosen designator in place of "everyone," is not true with respect to that same situation. This bears witness to our prohibition on applying the "everyone" rule to (1). But now consider a way of making sentence (7) true, the way of Maria's hopes. With respect to such a situation, sentence (2) indeed is true. Any other designator in place of "anyone" would also result in a sentence true with respect to Maria's hopes. Thus here also "anyone" has wide logical scope, despite the presence of the negating "didn't" in (7). With this confirmation in hand, we are led to formulate a rule for
"anyone." Because "anyone" forces wide logical scope, this rule, unlike the earlier rules for one-word quantifiers, applies directly to complex sentences in which "anyone" occurs.

**Simple Rule for "Anyone":** If in any path of a tableau there occurs a sentence with the single one-word quantifier "anyone," do not apply the rule for another connective. Instead, you may append to any branch below that occurrence the result of replacing "anyone" with any designator that already appears in the tableau. Do not check off the sentence with "anyone."

We have already seen this rule in action. Presuming that the designators were already available in a tableau, the "anyone"-rule would permit us to append any of the sentences listed at (6) to a path in which (5) occurred. And it would permit us to append sentence (2) to a path in which (7) occurred. For an even more striking and useful application of the "anyone" rule, consider the following argument.

\[
\begin{align*}
&\text{If anyone killed Riff, he answered to Tony.} \\
&\text{Bernardo killed Riff.} \\
&\text{Bernardo answered to Tony.}
\end{align*}
\]

It should be obvious that the argument is valid, but let's construct a tableau for it to see how the "anyone"-rule works in it.

\[
\begin{align*}
\text{Anyone killed Riff} \rightarrow & \text{ he answered to Tony} \\
\text{Bernardo killed Riff} & \\
\rightarrow & \text{ Bernardo answered to Tony}
\end{align*}
\]

\[
\begin{align*}
\text{Bernardo killed Riff} \rightarrow & \text{ he (Bernardo) answered to Tony} \\
\rightarrow & \text{ Bernardo killed Riff} & \text{ he (Bernardo) answered to Tony}
\end{align*}
\]

Just as we expected, the tableau closed, showing that the counter set is inconsistent and thus that the argument indeed is valid. But pay special attention to the application of the "anyone"-rule in the tableau, which used the designator "Bernardo." In the resulting sentence (here with the rule-governed \(\rightarrow\) spelled out),
If Bernardo killed Riff, he answered to Tony, something wonderful has happened. Who does the pronoun "he" in the main clause refer to? Of course it refers to Bernardo. But what kind of pronoun is it? It's not an indexical pronoun, one that depends on the context for the salience of Bernardo. Bernardo is no more salient than Riff, who is lying on the asphalt mortally injured. No, it's an anaphoric pronoun, reaching back for its reference to the occurrence of "Bernardo" in the subordinate clause. But now consider the sentence,

If anyone kills Riff, he will answer to Tony,

from which (with a change of tense) sentence (8) was derived by means of the "anyone"-rule. Who does the same pronoun "he" refer to in (9)? Again to Bernardo? Not in particular. It could as well refer to Chino. In fact, though it also is an anaphoric pronoun, it is an anaphoric pronoun of a special kind. The pronoun "he" reaches back to "anyone," but since "anyone" is not a designator, the pronoun doesn't inherit any reference from that quantifier word. Instead this anaphoric pronoun awaits the application of the "anyone"-rule. Upon the replacement of "anyone" with a designator, "he" will refer to whoever that designator refers to. In fact, upon reflection it is clear that instead of (9), we should have,

If anyone kills Riff, he or she will answer to Tony,

because the instance,

If Anita kills Riff, she will answer to Tony,

is true with respect to the situation in *West Side Story* just as much as (8) is.

The propriety of a gender-neutral pronoun in (10) provides yet another confirmation of our principle that "anyone" forces wide logical scope. Suppose we flouted this principle and treated the "if" in (10) as having wide logical scope. That would lead us to apply the "→"-rule. On the left we would have,

\[ \text{Anyone will kill Riff}, \]

which seems okay. And on the right we would have,

\[ \text{He or she will answer to Tony.} \]

But that simple sentence does not contribute to describing a situation at all. Who is "he or she"? Without an antecedent designator, the gender-neutral anaphoric pronoun simply dangles. What is needed is a prior application of the "anyone"-rule, providing a designator to
serve as antecedent to the anaphor. When the "if"-clause is subsequently torn away, that designator can simply replace the anaphoric "he or she."

We have found that the "anyone"-rule together with the magic of natural-language anaphora gives the tableau technique a quite remarkable range. We will finish the chapter with one last example from our by-now familiar musical. In their bravado, the Jets sing,

"HERE COME THE JETS
LIKE A BAT OUT OF HELL—
SOMEONE GETS IN OUR WAY,
SOMEONE DON'T FEEL SO WELL!"

There is an inference here; the penultimate line provides the reason for the last one. But the inference has a suppressed premise. The premise that is needed can well be expressed with an "anyone"-sentence,

If anyone gets in the way of the Jets, he or she will (subsequently) not feel so well.

At the risk of ruining the musical fun—perhaps to be repaid by some logical fun—let's use our simple quantifier rules to show that the inference is a valid one.

\[
\begin{array}{c}
\checkmark \text{Someone will get in our (the Jets') way} \\
\text{Anyone gets in the way of the Jets} \rightarrow \text{he or she will not feel so well} \\
\checkmark \neg \text{Someone will not feel so well} \\
\text{No one will not feel so well} \\
\text{Alex will get in the Jets' way} \\
\text{Alex gets in the way of the Jets} \rightarrow \text{he or she (Alex) will not feel so well} \\
\neg \text{Alex will get in the way of the Jets} \quad \text{Alex will not feel so well} \\
\end{array}
\]
Such a tableau marks the triumph of the special anaphoric function of "he or she" with "anyone." We don't even know who Alex is, or whether Alex is a he or a she. But the anaphor stands ready to inherit a reference to Alex and thereby to work in concert with the "someone"-rule. The tableau shows that "Someone don't feel so well," follows deductively from "Someone gets in our way," together with the suppressed "anyone"-premise. It establishes the validity of the inference implicit in the bragging chant of the Jets.

That final tableau also foreshadows an elaboration of our simple quantifier rules that will lift the restriction to one-word quantifiers. In the chapter to come we will see how to handle at least some of the complex and varied quantifier expressions of English. And we will see how to handle wide-scope occurrences of our simple quantifiers as they showed up in §31. The essential device to see us through will be the special kind of anaphoric pronoun we have just encountered.

Exercises for Chapter VIII

1. Identify the constituent quantifier expressions in the following articles of the Declaration of the Rights of Man and of the Citizen. Which of them are one-word quantifiers?

A2. The aim of every political association is the preservation of the natural and imprescriptible rights of man. . .

A4. Liberty consists in being able to do anything that does not harm others: thus, the exercise of the natural rights of every man has no bounds other than those that ensure to all other members of society the enjoyment of the same rights. . .

A5. The Law has the right to forbid only actions that are injurious to society. Nothing that is not forbidden by Law may be hindered, and no one may be compelled to do what the Law does not ordain.

A6. The Law is the expression of the general will. . . All citizens, being equal in its eyes, shall be equally eligible to all high offices, public positions, and employments. . .
A16. Any society in which no provision is made for guaranteeing rights or for the separation of powers, has no Constitution.

2. For each of the following sentences, identify the rule that could be directly applied to the sentence in a tableau. If none of the rules can be applied, say so.
   a. Someone opened the door.
   b. Everybody knows herself.
   c. Everybody is either male or female.
   d. Someone is bald and snub-nosed.
   e. Nobody saw the Big Bang.
   f. Some are born great, some achieve greatness, and some have greatness thrust upon them.
   g. God created everybody, or else God created nobody.
   h. If no one comes to her party, Mary will despise everyone.
   i. If it rains, no one will come to Mary's party.
   j. If everybody knows the answer, then the instructor will be surprised.
   k. If anybody knows the answer, then the instructor will be happy.
   l. If anybody knows the answer, she should speak up.

3. As if in a tableau, apply the simple quantifier rules exhaustively to the following set of sentences. (Seven additional sentences will be spawned.) Is the resulting set of sentences a consistent set?
   - God loves everyone.
   - Someone does not love Abraham.
   - Nobody loves himself.

4. Show that the validity of this argument depends on the logical scope given to "everyone" in the ambiguous third premise.

   The alarm was rung only if someone was awake.
   If the alarm was not rung, then the fire trapped everyone.
   Everyone was not awake.

   Someone was trapped by the fire.
Determine whether the following arguments are valid by checking the consistency of their counter sets, using tableaux.

5.

Either everyone will walk or everyone will ride with Ned.
If Martha walks, she will arrive with Otto.
If Martha rides with Ned, she will arrive with him.

Martha will arrive with someone.

6.

Someone will be captured only if the ambush is effective.
The ambush will be effective only if no one makes a noise.
Not everyone will be quiet.

The ringleader will not be captured.

7.

If anyone is found out cheating, then everyone will be penalized.
If anyone cheats, he or she will be found out.

If George cheats, Martha will be penalized.

8.

If anyone is desperate, he or she will shoot.
If anyone shoots, everyone will be afraid.
If anyone is afraid, he or she will run.
If everyone runs, everyone will be hurt.

Someone will be desperate.

George will be hurt.

9. Can you think of an exception to the "anyone"-rule? That is to say, can you think of a sentence with the single one-word quantifier "anyone" that is true with respect to some situation that you could describe, where the sentence that results from replacing "anyone" with a relevant designator is not true with respect to that same situation?