TBTA Tutorial Lesson 6:
Clitic Rules and Constituent Movement Rules

(video: TBTA-6A Clitic Rules)
(video: TBTA-6B Movement Rules)

6.0 Introduction

Hopefully by now you have a good understanding of the target lexicon, lexical spellout rules, the spellout rules in the synthesizing grammar, phrase structure rules, feature copying rules, and find/replace rules. Your lexical spellout rules generate lists of lexical forms. Then your synthesizing grammar spellout rules instruct TBTA when to use words from those lists. The synthesizing grammar spellout rules also build target words in specific contexts. When TBTA has finished executing your synthesizing grammar spellout rules, all of your target words should be present in the text and in their final form. None of the rules executed after the spellout rules are able to add anything new to the text except clitics and pronouns.

In this lesson we're going to learn about two more types of rules in TBTA's synthesizing grammar: clitic rules and constituent movement rules. A clitic is a bound morpheme that functions at the phrasal level. The best example of a clitic in English is the *'s* that signals possession as in *The new neighbor's house is being painted*. The clitic *'s* attaches to the end of the NP and modifies the entire phrase *the new neighbor*. Constituent movement rules are used to either move a constituent from one location in a sentence to another location in the same sentence, or to delete a constituent. The constituents that are moved or deleted may be words, phrases, or entire clauses.

6.1 Clitic Rules

Let's begin by writing a clitic rule. Go to Noun Phrases 1:11 which produces *John cut the fish with a knife.* We're going to make up some examples of clitics because English only has one. In many languages morphological case is marked with clitics, so let's write a rule that will add the clitic *nom* to the end of all agent NPs in order to signal nominative case. Clitics that attach to the end of their phrases are called postclitics. Look at the templates in Grammar Wizard and double click the template that adds a postclitic. For the clitic enter **nom**, then push the Tab key and enter **Case** for the tag. Push the Tab key again and double click on noun phrases. You'll see a new clitic rule like that shown below in Figure 6-1.
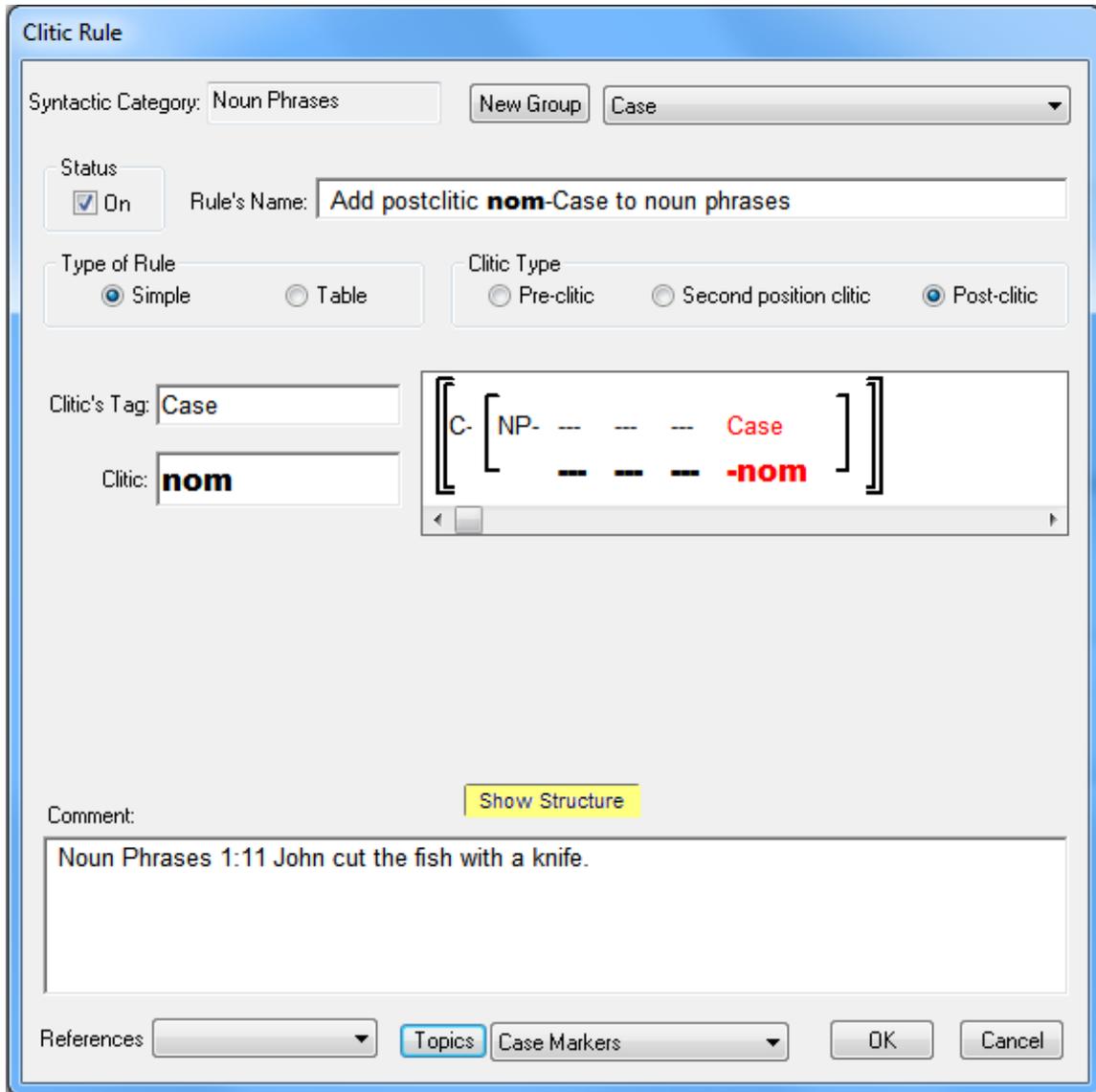
Clitic Rule

Syntactic Category: Noun Phrases   New Group   Case

Status
☑ On   Rule's Name: Add postclitic **nom**-Case to noun phrases

Type of Rule
◉ Simple   ○ Table

Clitic Type
○ Pre-clitic   ○ Second position clitic   ◉ Post-clitic

Clitic's Tag: Case

Clitic: **nom**

C- [NP- ---   ---   ---   Case
          --- --- ---   **-nom**]

Show Structure

Comment:
Noun Phrases 1:11 John cut the fish with a knife.

References   Topics Case Markers   OK   Cancel

Figure 6-1. A Clitic Rule

Add a new group called **Case** and a new grammar topic called **Case Markers**. Because you specified that this clitic is a postclitic, the rule will attach the clitic to the end of the phrase. You can see this illustrated in the rule's structure where Case and *nom* are both shown in red and are placed after the arbitrary constituents represented by the three dashes in the NP. Change the clitic type to preclitic by clicking the Pre-clitic radio button at the top of the rule, and you'll see the clitic move to the beginning of the phrase. Then change the type to 'Second position clitic' and you'll see that the clitic will attach to the end of the first word in the phrase. The leading or trailing dash associated with the clitic indicates the direction in which the clitic will attach. These three positions are where all languages attach their clitics. Change this clitic back to a postclitic and save the rule. Test this rule at Noun Phrases 1:11. Link CUT, FISH and KNIFE to target words and then click the Generate button. Modify your clause phrase structure

rule so that Instrumental NPs follow Patient NPs and precede the period. Generate the verse again and you should see *Johnnom cut the fishnom a swordnom*. Right now the clitic is being attached to all noun phrases. Let's modify the rule so that it only applies to Agent NPs. Open the rule in the grammar tree, and then click on the opening NP phrase boundary in the clitic structure. The features dialog will appear, and you'll see the features associated with NPs; select 'Most Agent-like' under 'Semantic Role.' Change the rule's name to "Add post-clitic *nom*-Case to Agent noun phrases," and save the rule. Then generate the verse again. This time you'll see *Johnnom cut the fish a sword*. If you click the 'Show Morphemes' check box located a little to the right of the Generate button, you'll see the label associated with the clitic.

Let's write another clitic rule that will add a preclitic *with* to all Instrumental NPs. Use Grammar Wizard and again specify Case as the label for this clitic. Be sure to specify the features on the NP. Your final rule should look like the one shown below in Figure 6-2.
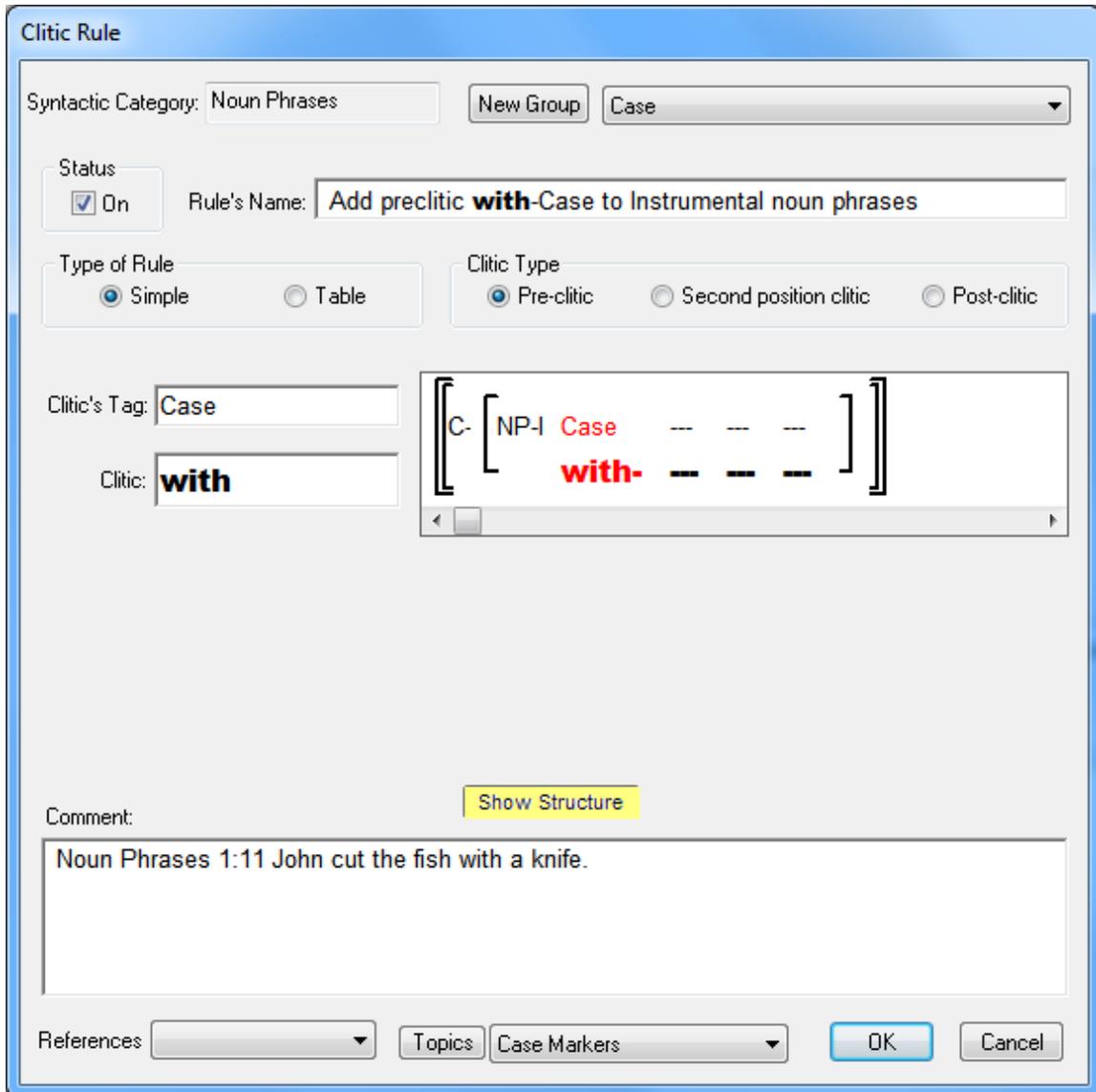
Figure 6-2. Clitic Rule for Instrumental NPs

Generate the text again and you should see *Johnnom cut the fish witha knife*. So this rule inserted the clitic *with* at the beginning of the instrumental NP.

Let's write another clitic rule for Patient NPs that will mark them for accusative case. Use Grammar Wizard to write a clitic rule that will insert a second position clitic into Patient NPs; use **acc** for the clitic and **Case** for the tag. Generate the verse and you'll see *Johnnom cut theacc fish witha knife*. As you can see, this clitic was attached to the end of the first word in the phrase. So you now have examples of all three types of clitics: preclitics, second position clitics, and postclitics.

In the tutorial that described spellout rules, we found that many similar simple spellout rules may be combined into a single table spellout rule. The same is true for clitic rules – many similar clitics may be put into a table clitic rule. Open your clitic rule that adds the clitic *nom* to all agent NPs. You can convert

that simple clitic rule to a table rule by clicking the radio button labeled Table. You'll then see a table with one row and one column. Build the table just like you did for the spellout rules. The table should contain three clitics: **nom**, **with**, and **acc**, so there should be one row and three columns. Your completed table clitic rule should look like the one shown in Figure 6-3. Be sure to remove the Agent specification from the NP in the structure that shows the clitic.
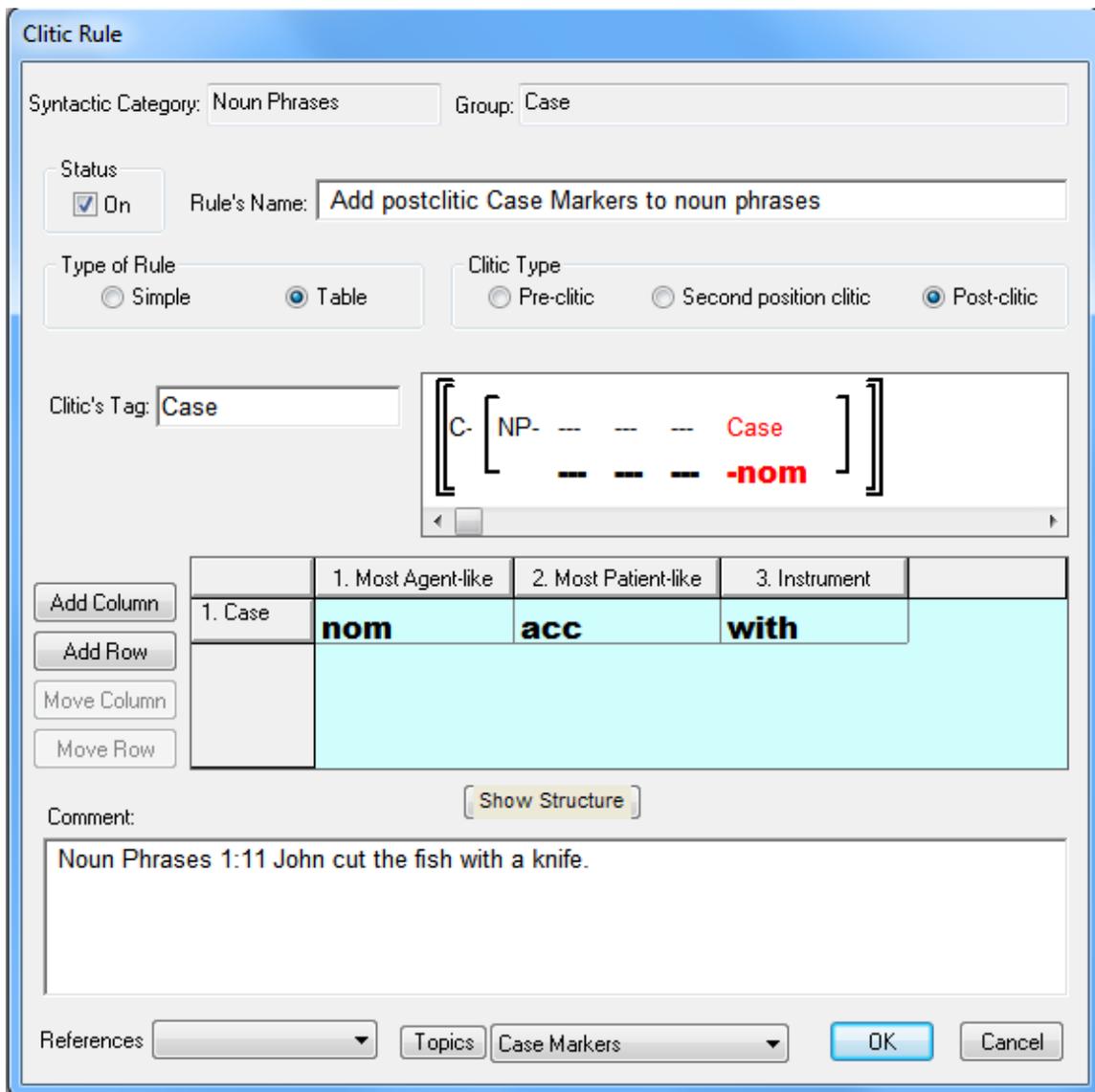

Figure 6-3. Table Clitic Rule

For the single row, you may enter a name without specifying any features. Turn off your other clitic rules and generate Noun Phrases 1:11 again. This time you should see *Johnnom cut the fishacc a knifewith*. Open the rule again and change the clitic type to Pre-Clitic. Then generate the verse again and you'll see *NomJohn cut accthe fish witha knife*. Change the rule again so that it inserts

second position clitics and generate the verse. Then put the rule back so that it inserts preclitics.

Note that for preclitics and postclitics, you could easily achieve the same result by using spellout rules to insert the morphemes as words into a phrase, and you could then modify your phrase structure rules to position these words at the beginning or end of the phrase. But if your language uses clitics, you should use clitic rules in order to keep your grammar linguistically accurate.

There may be times when you want a spellout rule to insert a word that will ultimately attach to another word. If that's the case, just add a leading or trailing dash when specifying the word in the spellout rule. For example, let's write a spellout rule for noun phrases that will insert the word *inst* with a tag of Case for all Instrumental NPs. We'll then modify our first NP phrase structure rule to position words labeled Case at the end of the NP. Let's make the word *inst* attach to the word that precedes it by putting a dash ('-') at the beginning as shown in the spellout rule below. Note that Grammar Wizard won't let you insert the dash; you'll need to do that yourself in the spellout rule.
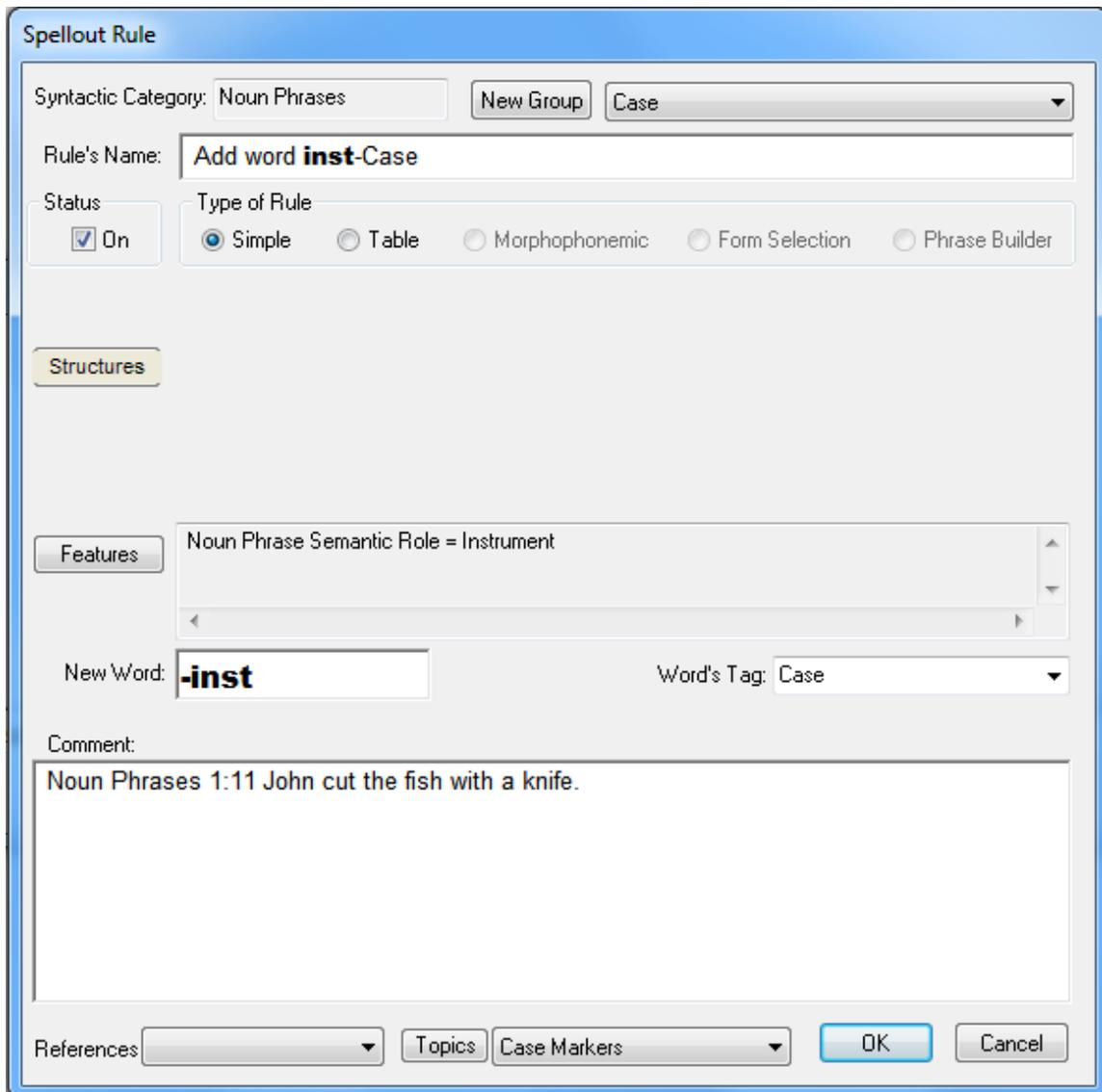
Spellout Rule

Syntactic Category: Noun Phrases   New Group   Case

Rule's Name: Add word **inst**-Case

Status
☑ On

Type of Rule
◉ Simple   ○ Table   ○ Morphophonemic   ○ Form Selection   ○ Phrase Builder

Structures

Features   Noun Phrase Semantic Role = Instrument

New Word: -inst   **Word's Tag:** Case

Comment:
Noun Phrases 1:11 John cut the fish with a knife.

References   Topics   Case Markers   OK   Cancel

Figure 6-4. Spellout Rule for NPs that inserts a Word that Attaches

After saving the rule shown above and modifying the NP phrase structure rule so that words labeled Case follow the noun, generate the verse. You should see *NomJohn cut accthe fish witha knifeinst*. The word *inst* will be attached to the word that precedes it because there's a leading dash before *inst* in the spellout rule. When the spellout rule is executed, TBTA will insert the word *-inst* into the phrase, and it will be a separate word. Then the phrase structure rule will position the word at the end of the phrase as you've specified. Then after all of the phrase structure rules and word morphophonemic rules have been executed, TBTA will attach all of the words that begin with dashes to the words that precede them, and it will attach all of the words that end with dashes to the words that follow them. So if a word begins with a dash, it will be attached to the word that precedes it; if a word ends with a dash, it will be attached to the word that follows it.

Using a leading or trailing dash in your spellout rules can be very helpful if you have a word that includes many morphemes. For example, suppose your verbs have numerous suffixes and it's difficult to order the spellout rules properly so that all the suffixes will be in the correct order. Rather than writing spellout rules that add suffixes to the verb stem, you may want to write spellout rules that add words that begin with dashes. Then your phrase structure rule can properly order these words. Then the words will be attached to one another appropriately after the phrase structure rules and word morphophonemic rules have been executed.

6.2 Constituent Movement Rules

As mentioned above, constituent movement rules have two main purposes: to either move a constituent or delete a constituent. Depending on which linguistic model you choose, there may be occasions where you'll generate a constituent in one location, but you'll ultimately want that constituent to be positioned in another location. For example, in English Yes-No questions, whenever the verb is past tense, we insert the Auxiliary *did* as in *Did John read a book*? The spellout rule that inserts *did* will place it in the VP, but in yes-no questions you'll want that auxiliary to be placed at the beginning of the clause. If you don't yet have a spellout rule that inserts *did* for past tense verbs in yes-no questions, enter the rule and test it with Clauses 1:100. Note that the Time value on the verb is Earlier Today in this verse. Also note that when entering this spellout rule, you need to specify that the clause has an Illocutionary Force value of Yes-No Interrogative. To specify clausal features for this spellout rule, click on the Features button and then click on the Clause button in the lower left corner of the features dialog. After you've completed this rule, it should look like the rule in Figure 6-5.

Figure 6-5. Spellout Rule that adds *did* for Past Tense Yes-No Questions

Generate Clauses 1:100 (you can turn off all of your clitic rules now). You'll see that the spellout rule inserted the Auxiliary *did* into the VP. So the result is *John did read a book?*

In English yes-no questions, this Auxiliary must be moved from the verb phrase to the beginning of the sentence. Phrase structure rules order constituents within phrases and within clauses; they aren't able to move constituents from one phrase to another. Therefore we need a constituent movement rule that will move the Tense Auxiliary from the verb phrase to the clause. Then the clause phrase structure rule will be able to position the Tense Auxiliary at the beginning of the sentence. To build a constituent movement rule that moves a constituent, double click on the first constituent movement rule template in Grammar Wizard. The prompting box will then be loaded with all of the constituents that are able to be moved. Scroll down and you'll see 'Tense

Auxiliary in verb phrases'. Select this option, and then specify clauses as the destination. In the rule's dialog, enter a new group called Questions, and for the grammar topic select Questions. Now we need to specify that this rule should only apply to yes-no questions. Click the Features button and you'll see that it remains depressed indicating that you're ready to specify features. Click on the opening clause boundary in the input structure and you'll see the clause features dialog. Select Yes-No Interrogative in the Illocutionary Force column, and close the features dialog. Your rule should now look like the one shown below in Figure 6-6.
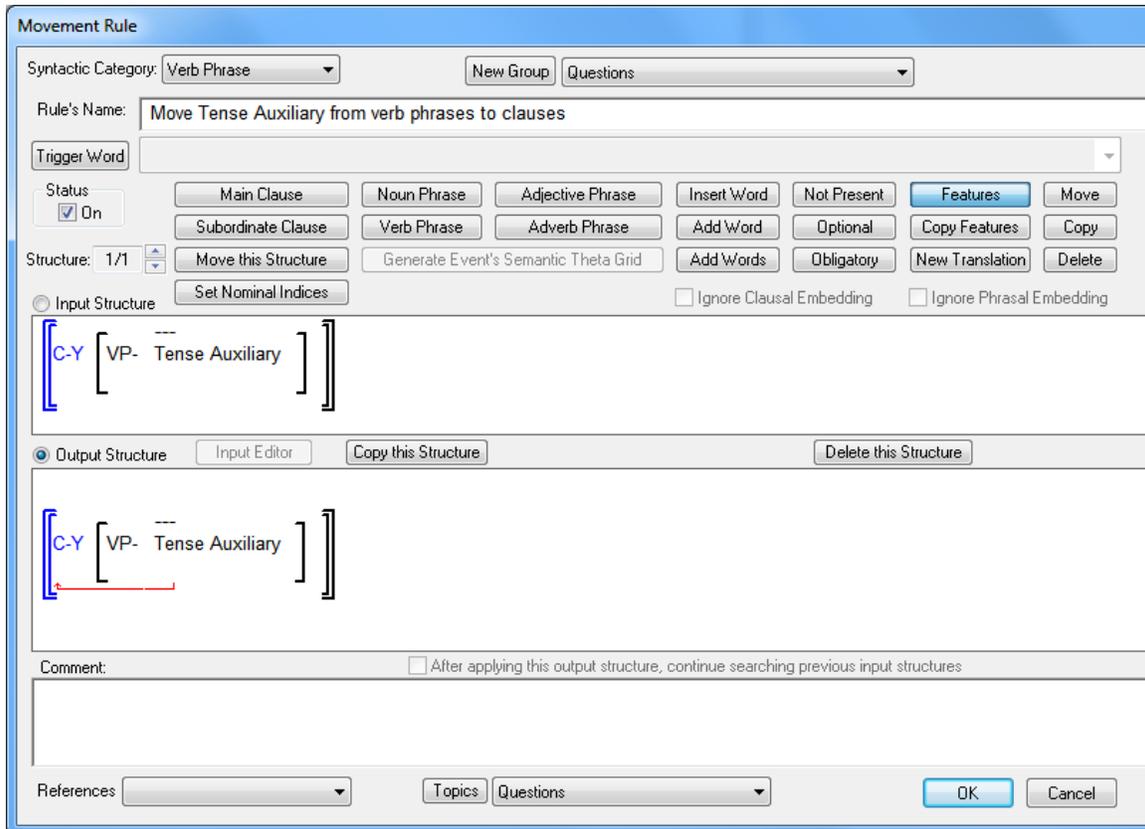

Figure 6-6. Constituent Movement Rule

After closing the features dialog, rest the cursor on the opening clause bracket in either the input structure or the output structure. You'll see a popup explaining the feature you just set. Save the rule and you'll be prompted to modify the clause phrase structure rule. Answer Yes, and in the clause PSR you'll see that the Tense Auxiliary label has been inserted at the top of the tree in the phrase structure rule. This is where we want it, so you can save the phrase structure rule without moving Tense Auxiliary. Now push the Generate button and you should see *Did John read a book?* If you rest the cursor on *did* in the large window, you'll see a popup showing that *did* was inserted by a spellout rule, moved by the constituent movement rule, and then positioned by the clause phrase structure rule.

There will be times when you'll want your constituent movement rules to look at a structure that's more complex than Grammar Wizard is able to build. For example, look at Clauses 1:99 which produces *Which bood did Mary want John to read?*. If you rest the cursor on the features under BOOK, you'll see that its Participant Tracking is Interrogative. In this sentence we need the NP containing BOOK to be moved from the subordinate clause to the main clause. This structure is too complex for Grammar Wizard to build, so we'll write this rule ourselves. First link MARY to *Mary* and WANT to *want*. Then modify your spellout rule for nouns that inserts Articles so that it will insert *which* if the noun's Participant Tracking is Interrogative. Then modify your clause phrase structure rule so that it includes Patient clauses and positions them before the period. To do this, you need to insert a new constituent into your clause PSR, and it will be a clause. Then specify that the clause's Type must be Patient. Your grammar should now be generating *Mary want John read which book?* We're now ready to write a constituent movement rule that will move the NP containing the question word from the subordinate clause to the main clause.

When a NP contains a noun with a Participant Tracking value of Interrogative, we want the movement rule to move the entire NP to the beginning of the clause, even if the NP is embedded in a complement clause. In the grammar tree, open the Constituent Movement rules node and you'll see the group called "Questions" that we entered for the previous movement rule. To enter a new rule into this group, double click on the group name. You'll then see a small dialog asking you to select a semantic category that will trigger the execution of this rule. Since this rule will look for nouns with a Participant Tracking value of Interrogative, select Nouns from the dropdown and click OK. You'll then see an empty constituent movement rule. Enter a name for the rule such as **Move NPs with Question words from Object Complements to Matrix Clause**. We need to build the structure ourselves, so let's begin by inserting a NP into the rule. To do this, click on the Noun Phrase button near the top of the rule. You'll see that the button is highlighted indicating that you're ready to insert a NP. Then click on the input structure anywhere between the opening and closing clause brackets. After you click, you'll see the opening bracket for an NP inserted. The system is now waiting for you to specify where the closing NP bracket should be inserted, so again click on the input structure somewhere after the opening NP bracket and before the closing clause bracket. You'll then see the closing NP bracket inserted. Now let's insert a noun into the NP. To do this, click on the button labeled Insert Word, and then click on the input structure anywhere between the opening phrase boundary and the closing phrase boundary. You'll then see a dialog asking you to select a word. This dialog gives you the ability to specify a particular target word, but in this case we just want to insert a noun, so select Nouns in the syntactic category dropdown. If we wanted this rule to be triggered by a particular noun, we would select that noun in the lower dropdown. But we want this rule to be triggered by all nouns that are tagged as interrogative, so leave the lower drop down blank. Click the OK button and you'll see that a noun has been inserted into the NP in the input structure. Click on the Features button and then click on the Noun in the input structure.

Specify that the noun must have a Participant Tracking value of Interrogative. We now need to put this NP into an object complement because in Clauses 1:99, the interrogative noun is in an NP which is in an object complement. Click on the Subordinate Clause button and you'll see that it remains depressed indicating that you're ready to insert a subordinate clause. Click anywhere in the input structure before the opening NP boundary and you'll see that an opening subordinate clause boundary is inserted into the input structure. Then click again on the input structure somewhere after the closing phrase boundary and before the closing clause boundary. You'll then see that a closing subordinate clause boundary is inserted into the structure. Now click on the Features button again and specify that the main clause needs to be a Content Interrogative, and the subordinate clause Type needs to be Patient. When specifying the features for the subordinate clause, be sure that you set Type to Patient, and not Topic NP to Patient. You've now finished specifying the input structure so click on the radio button labeled Output Structure. You'll then see the input structure copied to the output structure.

In the output structure you need to specify which constituent you want to move. To do this, click on the button labeled Move, and you'll see that it's highlighted indicating that you're ready to specify what should be moved. We want this rule to move the entire NP, so in the output structure click on the NP's opening phrase boundary. You'll then see the highlighted button's label change to Insert, indicating that you're ready to specify where this NP should be inserted. We want this NP to be inserted into the main clause, so click on the opening bracket of the main clause. You'll then see a red arrow going from the NP to the main clause boundary. Complete this rule by assigning it to the grammar topic Questions. Your completed rule should look like the one shown below in figure 6-7.
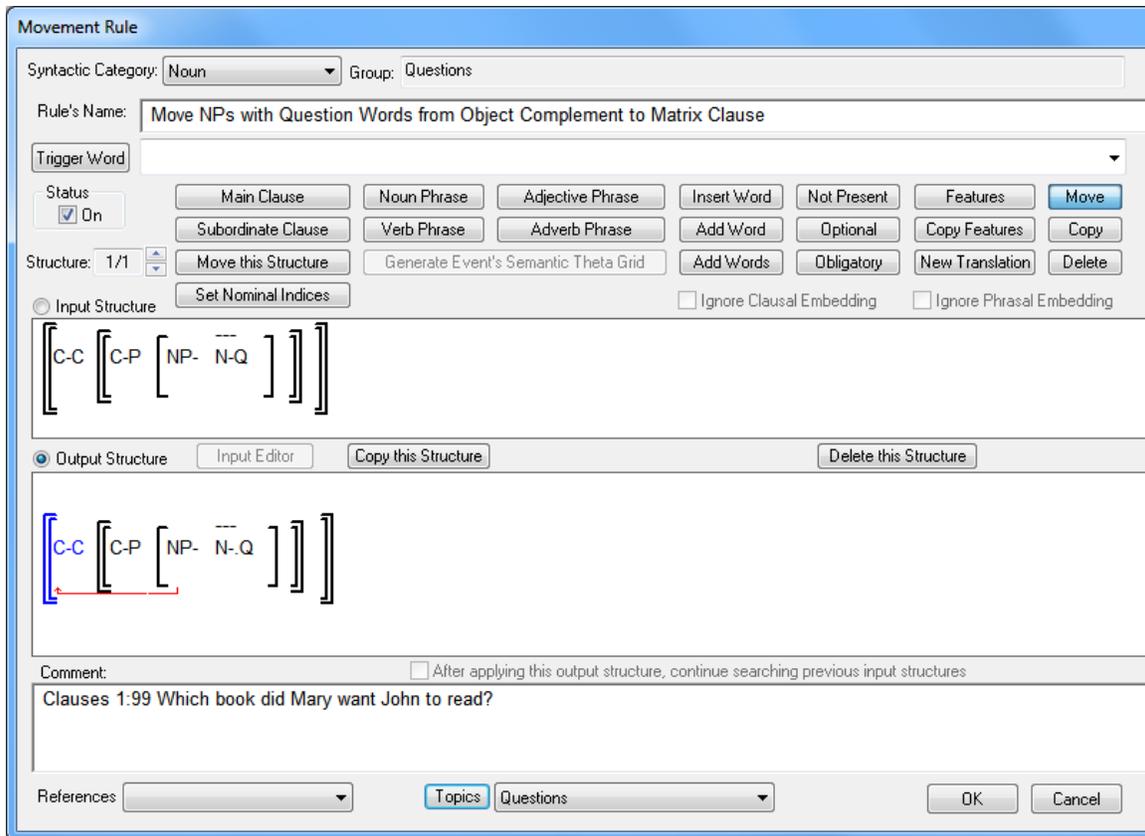
Figure 6-7. Constituent Movement Rule moving NP with Question Word

Test this rule by generating Clauses 1:99. You should now see *Mary want which book John read?* The constituent movement rule successfully moved the specified NP from the subordinate clause to the main clause, but we still have more work to do.

In the text that we just generated, we want the NP with the question word to be placed at the beginning of the clause. To do this, open your clause phrase structure rule. Click the button labeled Insert New Constituent. From the dropdown, select Noun Phrases. Whenever you select a phrase from this dropdown, you'll see two buttons appear immediately to the right of the dropdown. The button labeled Phrase is currently depressed indicating that you're looking at phrase features. Click the button labeled Head Word and you'll see the features for nouns because the head word in a NP is a noun. You may now select the Interrogative value under Participant Tracking. Click the OK button and you'll see that a NP with an Interrogative noun has been inserted at the top of the tree. Your modified phrase structure rule should now look like that shown in Figure 6-8.
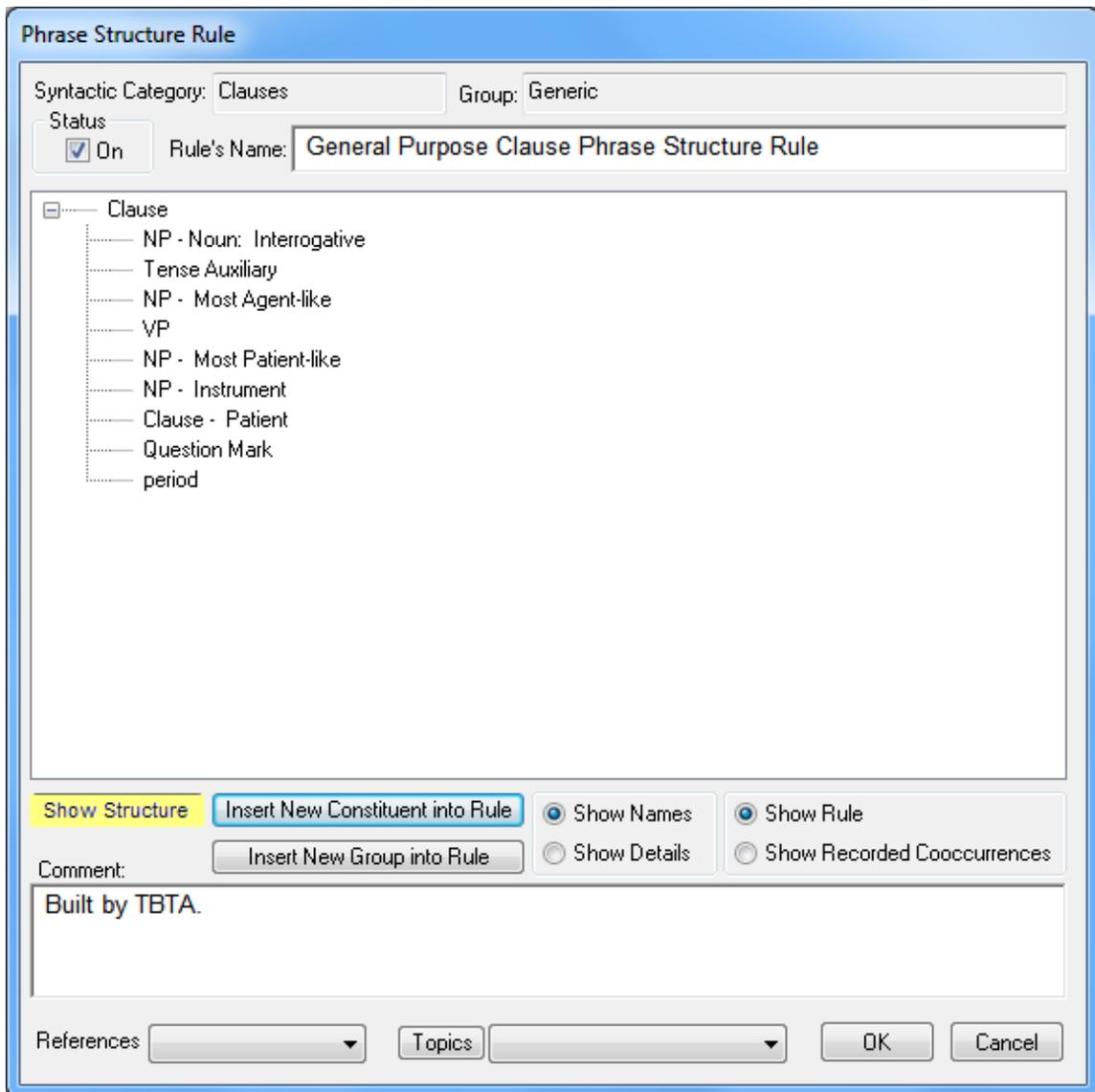
Figure 6-8. Phrase Structure Rule with an NP that uses Head Word Features

Save your modified phrase structure rule and generate the verse again. You'll now see *Which book Mary want John read?* So the movement rule moved the phrase containing *which book* to the main clause, and then the clause PSR positioned this phrase at the beginning of the sentence. This verse still needs a lot of work, but we'll save that for later.

Constituent movement rules are also able to delete constituents from sentences. For example, let's write a rule that will delete subject noun phrases from imperatives. Go to Clauses 1:90 which generates *Read a book*. Since we still haven't generated grammatical relations from semantic roles, we'll write a rule that will delete all Agent NPs from clauses that have an Illocutionary Force of Imperative.   Use Grammar Wizard and double click on the entry labeled "Constituent Movement Rule: delete." You'll see a new prompting box with all of the constituents that can be deleted. Scroll down in this new prompting box and

double click on Noun Phrases from Clauses. You'll then see the movement rule dialog. Change the rule's name to something more descriptive such as 'Delete Agent noun phrases from Imperatives'. For the group name, enter **Imperatives**. Set the features in the input structure so that the NP's semantic role is Agent, and the clause's illocutionary force is Imperative. Your new rule should look like the one shown below in Figure 6-9.
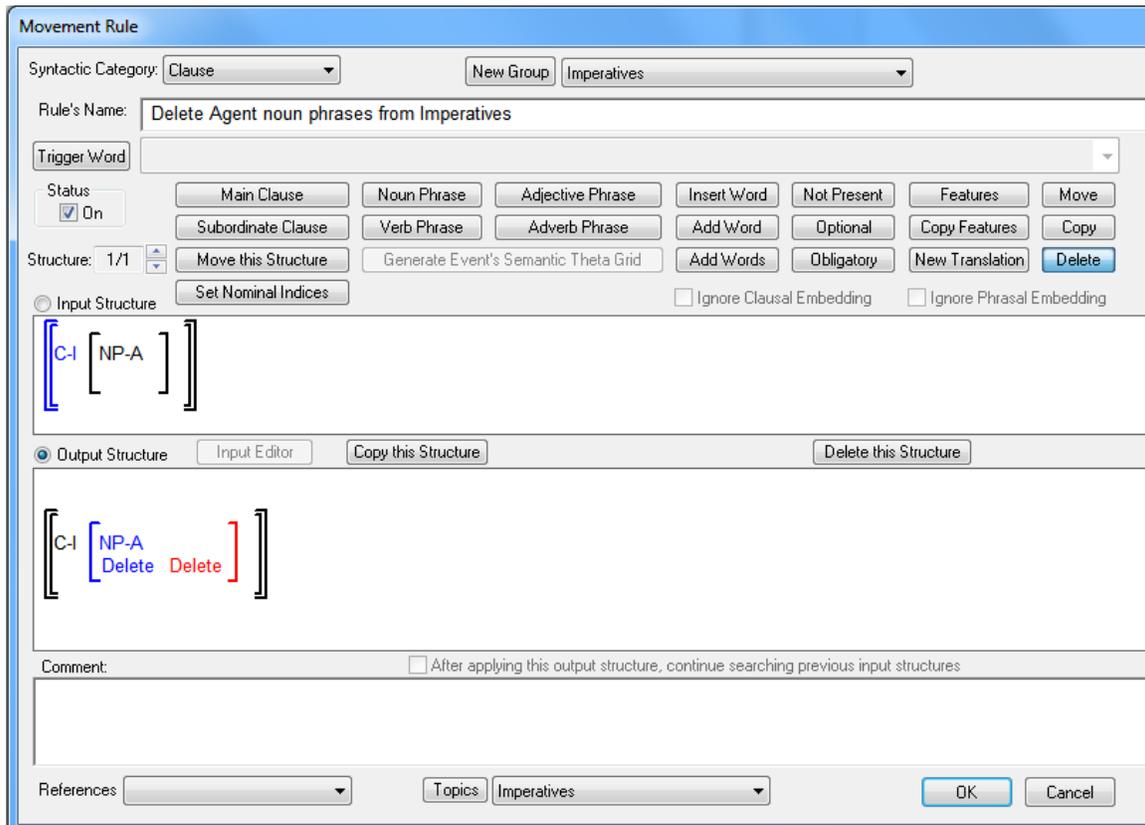

Figure 6-9. Constituent Movement Rule that Deletes a NP

Save this rule and generate Clauses 1:90. You should see *Read a book*. If you rest the cursor on the opening clause bracket in the large window, the popup will tell you that *John* was deleted by the rule we just wrote. Whenever a constituent is deleted from a clause, the popup for the opening clause boundary will tell you which rule deleted the constituent.

6.3 Conclusions

In this lesson you've learned four key points: 1) how to use clitic rules, 2) how to use spellout rules to make words attach to one another, 3) how to use constituent movement rules, and 4) how to specify phrases by their head word's features in phrase structure rules. As was mentioned above, using spellout rules to insert morphemes as individual words is very convenient. If a spellout rule inserts a word that begins or ends with a dash, then the appropriate phrase structure rule will position that word correctly, but then the word will be attached

because it begins or ends with a dash. You can use this technique whenever a particular word has many affixes, and it's difficult to order the spellout rules in such a way that all the affixes are positioned correctly.