# Construction Trees Revisited (and Reversed)

Seeing how handy a decent grasp of sentence construction can be when translating complex English sentences – in terms of properly understanding scope and the main connective – we note here how simple it is to recover the construction tree for any formal sentence, even one whose construction we did not witness.

Recovering the construction tree for a formal sentence is just a matter of 'un-building' that sentence – **performing the construction process in reverse**. Since construction began with atoms and used three molecule-building rules, 'un-building' uses those same rules in reverse as *molecule-dissolving* procedures leading back to the original atoms.

For example, we can use the three molecular rules *in reverse* to figure out the construction tree for the following formal sentence.

$$((P \wedge Q) \vee \sim R)$$

Being a molecular sentence, this sentence as a whole must have been the output of one of the three molecular rules. The **left-most symbol** is a reliable clue as to which rule that was. Here the left-most symbol is a left parenthesis, which only comes from Rules 3 and 4. (Rule 2, for negations, would leave a tilde as left-most symbol.) The whole sentence is therefore either a conjunction from Rule 3, or a disjunction from Rule 4.

As a matter of fact this sentence is a **disjunction**, the product of Rule 4.

> 4. If ● and ▲ are formal sentences, then **(**● $\vee$ ▲**)** is a formal sentence.

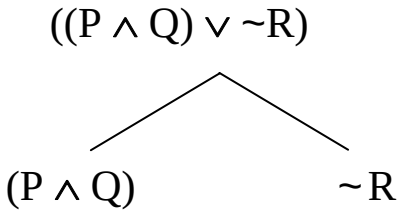
Being a disjunction, its **main connective** is a **vel** – the very vel which brought those parentheses with it.

$$\mathbf{(}(P \wedge Q) \underline{\vee} \sim R\mathbf{)}$$

From this **output** we work back to the two **inputs** by applying Rule 4 in reverse. Since Rule 4 *adds* a vel and outer parentheses, Rule 4 in reverse *removes* a vel and outer parentheses.

> **Rule 4 in Reverse**: remove a vel, and the outermost pair of parentheses.

This leads us back to the two sentences forming the **scope** of the vel.



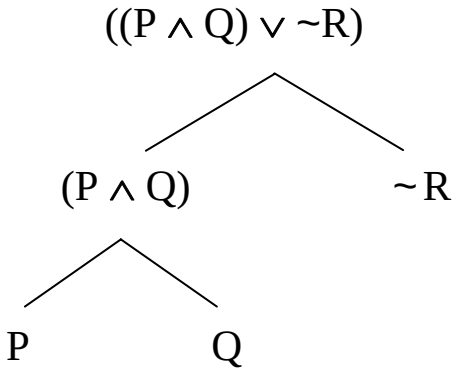

The left part, "(P ∧ Q)," is a smaller molecule with a wedge as it main connective. This is the product of Rule 3, the conjunction rule.

> 3. If ● and ▲ are formal sentences, then **(●** ∧ **▲)** is a formal sentence.

Rule 3 in Reverse **removes** a wedge and outer parentheses.

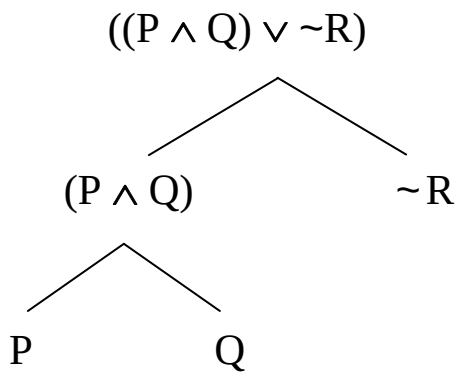
> **Rule 3, in Reverse**: remove the outermost pair of parentheses, and take a conjunction sign from between the two parts.

This traces back to to the left and right part of this conjunction – the two sentences forming the scope of the wedge.




Since "P" and "Q" are atoms, they cannot be 'un-built' by any molecular rule in reverse.

But "~R," on the right of the tree, is a molecule susceptible to disassembly.



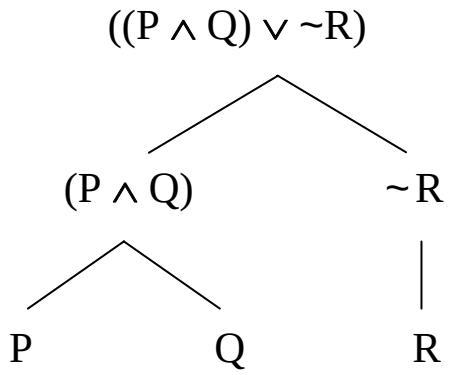

"~R" has a tilde as its left-most symbol. It's a negation, built by Rule 2.

2. If ● is a formal sentence, then ~● is a formal sentence.

Rule 2 in Reverse *removes* a tilde from the left.

**Rule 2 In Reverse**: remove a tilde from the left of the sentence.

Applying Rule 2 in reverse leads back to the original input of Rule 2: the **scope** sentence of the tilde, "R".



This illustrates the general strategy for recovering the construction tree for any formal sentence: break down the sentence using the three molecular rules in reverse, until only atomic sentences (sentence letters) remain.

> **Rule 2, In Reverse**: remove a tilde from the left of the sentence.
>
> **Rule 3, in Reverse**: remove a wedge, and the outermost pair of parentheses.
>
> **Rule 4, in Reverse**: remove a vel, and the outermost pair of parentheses.

Recovering the construction trees for formal sentence turns out to be essential to the later truth table test of validity. But quite apart from issues of validity, understanding how a formal sentence's construction helps make clear that sentence's *logical meaning* –whether, for instance, it's asserting a negation of a disjunction, or a disjunction of negations. And that is crucial for proper translation from English to Formalese.