The Order of Prepositional Phrases

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1. Introduction

Modifiers in general and prepositional modifiers in particular were often considered to be adjuncts to some functional projection above the VP (be it vP or TP). This would prohibit any syntactic base order among themselves. If some rigid ordering was found, this was usually attributed to some semantic property.

This view changed radically with the publishing of (Cinque 1999). In this book Cinque showed that certain types of adverbial modifiers namely adverbs, auxiliaries and modifying affixes of agglutinating languages obey strict ordering restrictions among themselves. A large sample of data from very different languages revealed that this order is universal:

Sentence modifying adverbs can be subdivided in a finite group of classes which obey a strict order relation among themselves. I give here the labels of these classes together with a typical representative:

<table>
<thead>
<tr>
<th>Class Description</th>
<th>Typical Representative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moodspeech act</td>
<td>frankly</td>
</tr>
<tr>
<td>Moodevaluative</td>
<td>fortunately</td>
</tr>
<tr>
<td>Moodevidential</td>
<td>allegedly</td>
</tr>
<tr>
<td>Modepistemic</td>
<td>probably</td>
</tr>
<tr>
<td>T (Past)</td>
<td>once</td>
</tr>
<tr>
<td>T (Future)</td>
<td>then</td>
</tr>
<tr>
<td>Moodirrealis</td>
<td>perhaps</td>
</tr>
<tr>
<td>Modnecessity</td>
<td>necessarily</td>
</tr>
<tr>
<td>Modpossibility</td>
<td>possibly</td>
</tr>
<tr>
<td>Modvolition</td>
<td>willingly</td>
</tr>
</tbody>
</table>

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Affixes in agglutinating languages, if realised as suffixes, obeyed the exact reversed order. If found as prefixes they are either in the original (direct) order, or in very rare cases such as Navajo, in reversed order.

Auxiliaries which serve the purpose of these affixes in fusional languages such as English, show up in direct order.

In order to give an explanation to these facts Cinque proposed a syntactic hierarchy of functional projections between CP and VP. This was in fact an extension of the Split-Infl theory of (Pollock 1989). Auxiliaries and Affixes representing modifiers are sitting in the heads of the respective projections, while their specifiers host the adverbs (AdvP).

In subsequent work (Cinque 2001) he showed that the above proposal could be extended to certain modals, the so called restructuring verbs.
In my dissertation I wanted to see whether it was possible to apply the idea of a rigid hierarchy to prepositional phrases which modify the VP. In order to verify this I had to find a suitable subdivision of PPs in classes, and then test whether there could be found an ordering relation among them.

This work presents syntactic tests and their results together with certain statistical control methods, which might find application in other fields of linguistic research.

2. Thematic Roles as PP classes

Given their semantic content, thematic roles seemed to be the natural candidate for a subdivision of these modifying prepositional phrases into suitable classes. Two members of the same class cannot be added without a syntactic coordinator if referring to different entities:

(1) I decorated the box with a spray can and (with) a paint brush.

(2) *decorated the box with a spray can with a paint brush.

"with a spray can" and "with a paint brush" are both bearers of the same thematic role (instrumental). There is no semantic reason which prohibits having two instruments in the same sentence as example (1) shows. Nevertheless, without a coordinator the sentence becomes ungrammatical. Since coordination is a syntactic device, I conclude that the thematic roles constitute syntactic classes.

Some sentences with two locative or temporal PPs which seem at first sight to be counterexamples, instead turn out to reinforce the analysis:

(3) I met John in Italy in Venice.

(4) I met John in Venice in Italy.

(5) I met John on Thursday at 8 o'clock.

In none of the cases the two PPs refer to different referents. In (3) "in Venice" is a specification of the location and can be considered a modifier of the PP "in Italy" while
in (4) "in Italy" is a specification of "Venice" (the Venice in Italy, not the one in California). In (5) "at 8 o'clock" is a modification of "on Thursday". If I want to express having met John in two different places or at two different times I again have to use coordination.

(6) I met John in Paris *(and) in Venice.

(7) I met John on Thursday *(and) on Friday.

Using the above considerations as guidelines I stipulated in a first approach the following thematic roles as classes:

2.1. Benefactive

The Benefactive introduces a participant who benefits from the action done by the actor. In German the preposition is always "für".

für seine Frau        for his wife
für seinen Chef       for his boss

2.2. Comitative

Comitatives add a person, which share the role of the subject. If the subject is an agent, they are semantically also agents. But these additional agents are not introduced via coordination, but by means of a prepositional modifier. The accompanying preposition is in many languages the same as the one introducing instruments. In German this is "mit", in Russian "s", in English "with" and in Italian "con". I do not think this is sheer coincidence, but for the moment I have no explanation for it. The syntactic tests show clearly that its position is much higher than the one of the instrument.

mit einem Kollegen       with a colleague
2.3. Evidential

This group of prepositional modifiers adds the source of the proposition. This can be a person, but legends, stories and rumours can also be stated. German has two adpositions, which introduce them, "nach" and "gemäß". Both can be used as prepositions or postpositions. "Nach" is more common with non human DPs. "Gemäß" as a preposition can have either a genitive or a dative complement; as postposition it always follows a dative DP.

- einem Zeugen gemäß: according to a witness
- gemäß eines Zeugen: according to a witness
- nach einer alten Legende: according to an old legend
- einer alten Legende nach: according to an old legend

2.4. Goal

This is a special kind of directional modifier which adds the goal of a movement. Since in many languages Goals are introduced by the same prepositions as Locatives, Directionals and Locatives are often grouped together. In English you have to add the particle "-to" to some of the locative prepositions: "into", "onto", others like "under" are ambiguous. The preposition "to" by itself is only directional. In German, all locative prepositions can be used in directional goal modifiers. Additionally, there exists "nach"

- nach Hamburg: to Hamburg

2.5. Instrumental

This thematic role determines the instrument, the tool, which was used in order to commit the action. In German this role is exclusively realised by the preposition "mit".

- mit einem Schraubenzieher: with a screwdriver

Since the same preposition is used with Comitatives and Means, they are often confused with each other. I am not sure whether Means and Instrumentals take different positions.
But Comitatives and Instrumentals have rather different semantics and occupy distinct positions.

2.6. Locative

This maybe the most common, in any case the most described thematic role. It determines the place where the action occurs. This is usually done by relating the event to an object, described by a DP. A great variety of prepositions make this relation explicit.

<table>
<thead>
<tr>
<th>German</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>in Venedig</td>
<td>in Venice</td>
</tr>
<tr>
<td>hinter der Schule</td>
<td>behind the school</td>
</tr>
<tr>
<td>vor der Schule</td>
<td>in front of the school</td>
</tr>
<tr>
<td>neben der Schule</td>
<td>beside the school</td>
</tr>
<tr>
<td>auf dem Tisch</td>
<td>on the table</td>
</tr>
<tr>
<td>unter dem Tisch</td>
<td>under the table</td>
</tr>
<tr>
<td>über dem Tisch</td>
<td>above the table</td>
</tr>
</tbody>
</table>

2.7. Malefactive

This modifier adds an opponent, an obstacle to the proposition, a person or a (weather) condition which wants to block the action. Malefactives can also introduce a rival. Principal preposition in German is "gegen"

<table>
<thead>
<tr>
<th>German</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>gegen das schlechte Wetter</td>
<td>against the bad weather</td>
</tr>
<tr>
<td>gegen seinen Erzkonkurrenten</td>
<td>against his arch-rival</td>
</tr>
</tbody>
</table>
2.8. Manner

This maybe the most problematic group. Prepositional modifiers determine the manner in which a certain action was done. Frequently used prepositions introducing this theme role are "mit" and "auf". Speed modifiers are very often subsumed under this category. Since Cinque establishes frequentative and celerative adverbs as separate classes in his hierarchy, I was careful to use only certain expressions. In order to be always in the same class, I constructed examples with PPs of the following type.

auf besondere Art und Weise  in a special way

If taken in a broader sense, you would find examples such as:

mit Vorsicht       carefully
mit hoher Geschwindigkeit  with high speed

2.9. Matter

With this somehow artificial term, I named a group of modifiers that give the topic of a talk, the subject of research or a book. In German it is used with the preposition "über"

über Mathematik      about mathematics

2.10. Means of Transportation

Cars, public busses, bicycles, airplanes are all examples of instruments, which can be used for movement. It is not clear whether this thematic role has to be distinguished from Instrumentals. But since verbs of movement have particular behaviour, I decided to make this distinction. The results showed, that Instrumentals and Means PPs are close neighbours, if separate at all. In German as in many other languages, they share the same preposition "mit". In English, Means modifiers are often introduced by "by".

mit dem Bus       by bus
mit einem Ferrari      with a Ferrari
2.11. Path

In addition to source and goal of a journey we can name a place, which has been passed by. In German, the preposition "über" introduces the place, sometimes you find "durch".

über Mainz        through Mainz
durch Mainz       through Mainz

2.12. Reason

This role determines the reason or motive a certain action was done. Typical prepositions are "wegen" and "aus":

wegen einer Krankheit    because of illness
aus Angst        because of fear

Reason modifiers are more sensitive to scope effects than most of the other types. There is a big difference between "Vincent painted because of the splendid light in Provins" and " Vincent paint in Provins because of the splendid light". The second sentence is indicating that Vincent went to Provins to paint, because of the splendid light there; this shows, that the reason modifier takes into its scope the Locative. In the first sentence the reason modifier only takes the nuclear event – Vincent paints – into its scope. The fact that the act of Vincent painting because of the splendid light takes place in Provins is just an additional information.

2.13. Source

Source modifiers specify the origin of a movement. They belong to the group of Directionals and are also related to Locatives. In many languages, combinations of a preposition like "from" and locative preposition are used together to form something like "from under". Standard German does not allow for this construction, but several dialects have it ("von unter der Brücke"). Source modifiers are usually introduced by "von".

von München       from Munich
2.14. Temporal

These expressions determine the time interval in which the actual event takes place. It could be a year, a month, a certain day, an hour etc. The preposition in German is either "an"/"am" (with day), "um" (with time) or "in"/"im" (with month, year, season):

- am Sonntag (on) sunday
- am gestrigen Tag yesterday
- um 14 Uhr at 2 pm
- im Dezember in December
- im Jahre 1492 in 1492
- im Herbst in autumn

3. Syntactic Test

As a next step I had to check for ordering restrictions. But unfortunately there is no strict rigid surface order as the following examples show.

(8) Canova sculpted with marble in Venice.

(9) Canova sculpted in Venice with marble.

(10) Leonardo worked for Sforza in Milan.

(11) Leonardo worked in Milan for Sforza.

In the sentences (8) and (9) the thematic roles of Instrumental and Locative are reversed, but both sentences are grammatical. The same is valid for the Benefactive and Locative in the sentences (10) and (11). If there is a base ordering among thematic roles then movement must have produced (at least) one of the orders of each pair. Therefore, the next step was to look for syntactic tests which are sensitive for movement. Since German is my mother language I concentrated on this language, especially on the German Mittelfeld.
3.1. Quantifier Scope

The first test exploits the fact that sentences with two operators, where the lower has moved across the higher, exhibit scope ambiguity. I used sentences with two PPs in which one contains a universal quantifier and the other an existential. If the lower operator never crosses the higher we expect sentences with only one interpretation, the one with the higher operator taking scope over the lower:

$$\forall x \ ( \exists y \ )$$

or

$$\exists x \ ( \forall y \ )$$

In case of movement, however, we find scope ambiguity. Two interpretations are available, one with the moved element taking scope over the other and another interpretation with the originally higher one over the trace:

$$\exists x_i \ ( \forall y \ t_i )$$

$$\exists x_i \ \forall y \ ( t_i )$$

or

$$\forall x_i \ ( \exists y \ t_i )$$

$$\forall x_i \ \exists y \ ( t_i )$$

The ambiguity is often explained in terms of optional reconstruction. If two different thematic roles were base inserted in different but fixed positions, this test should give us in one order only one interpretation while in the other an obvious ambiguity.

Applying this test to the pair of matter PP and temporal PP results in a clear contrast. I evaluated two couplets of sentences. Each couplet retains the order of the operators but reverses the thematic roles. In the first couplet the existential operator comes first, in the second couplet the universal operator is in front.

3.1.1. Matter – Temporal

(12) Tony hat an mindesten einem Tag über jede Massenvernichtungswaffe gesprochen.

Tony has on at least one day about every mass destruction weapon spoken
Tony spoke about every mass destruction weapon on at least one day.

(13) Tony hat an mindesten einem Tag über jede Massenvernichtungswaffe gesprochen.
∃(time) ∀(matter)
?? ∀(matter) ∃(time)

(14) Tony hat über mindestens eine Massenvernichtungswaffe an jedem Tag gesprochen.
∃(matter) ∀(time)
∀(time) ∃(matter)

(15) Tony hat über jede Massenvernichtungswaffe an mindesten einem Tag gesprochen.
∀(matter) ∃(time)
∃(time) ∀(matter)

(16) Tony hat an jedem Tag über mindestens eine Massenvernichtungswaffe gesprochen.
∀(time) ∃(matter)
*∃(matter) ∀(time)

The prevalent interpretation of (13) is that there is at least one special day on which Tony spoke about every mass destruction weapon. The reversed scope interpretation, that for every weapon there is at least one day on which he spoke about it— but not necessarily the same day for every weapon is nearly excluded.

In (14) however we get both interpretations: 1) that there is a special weapon about which Tony spoke every day and 2) that he spoke every day about at least one weapon, but not necessarily the same one each day. From this we can conclude, that (13) represents the base order: Temporal is higher generated than Matter, while in (14) the lower Matter PP is moved across the (original) higher Temporal.

The contrast in the second couplet with the universal operator both times coming first is even sharper. In (16) the reversed scope interpretation is totally excluded, while in (15) both interpretations are available.

Note also that, for me, the reverse interpretation in both, (14) and (15) is prevalent, which I indicated with bold face.
So far this seems to be a convincing result, but before continuing let's have a look on another pair:

3.1.2. Temporal - Locative

(17) Georg hat an mindestens einem Tag in jedem Sandkasten Krieg gespielt.
George has on at least one day in every sand box war played
'George played war in every sandbox on at least one day.'

(18) George hat an mindestens einem Tag in jedem Sandkasten Krieg gespielt.
∃ (time) ∀ (place)
∀ (place) ∃ (time)

(19) Georg hat in mindestens einem Sandkasten an jedem Tag Krieg gespielt.
∃ (place) ∀ (time)
∀ (time) ∃ (place)

Here in both cases I get scope ambiguity. (18) could mean that there was a special day on which George played war in every sand box. But it could also mean that for each sand box there was at least one day in which he played in it.

(19) reveals the analogous ambiguity. I get the interpretation that there is at least one sand box in which George played war every day and that there is for each day at least one (maybe different) sand box in which he played.

Does this mean that Locatives and Temporals belong to the same class? Let's look to the couplet with the universal quantifier coming first. This time I get a clearer asymmetry.

(20) Georg hat in jedem Sandkasten an mindestens einem Tag Krieg gespielt.
∀(place) ∃ (time)
∃ (time) ∀ (place)

(21) Georg hat an jedem Tag in mindestens einem Sandkasten Krieg gespielt.
∀ (time) ∃ (place)
?? ∃ (place) ∀ (time)

This time I get a clearer contrast. Only (20) is clearly ambiguous. In (21) the reverse scope interpretation is much less available than the direct scope interpretation, though not totally excluded.
The fact that in some couplets only one order gives rise to scope ambiguity and in others there is only some asymmetry, raises the question of the validity of the test. In order to get a significant result I had to take some precautions:

1. I tested all possible combinations (91) of the thematic roles. For each pair of thematic roles I compared two couplets, one with the existential quantifier always to the left and thematic roles exchanged and the other with the universal quantifier to the left. This should show, whether the resulting hierarchy is transitive.

2. I had to give a precise definition of "asymmetry". Each judgement was furnished with an evaluation. I concentrated on the comparison of the pairs. An interpretation got a "**" if it was not available at all (e.g. reverse scope interpretation in (16)). If the reverse scope interpretation was only marginally available it was furnished with "??" (e.g. (13) and (21)). If I got only an asymmetry in availability (meaning in both sentences of a couplet the reverse scope is available but in one of them less available) I gave the less available interpretation a "?". I assigned a number to each of the symbols: "?" evaluates to "1", "??" to "2" and "**" to "3"

In some of the cases the reverse scope interpretation was prevalent ( (14) and (15)). These interpretations were indicated with bold face. The equivalent number in this case is "1", otherwise "0".

Summarizing symbols and numbers:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Numeric Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>?</td>
<td>Reverse scope interpretation available, but more marked than the reverse scope in the partner sentence of the same couplet</td>
<td>1</td>
</tr>
<tr>
<td>??</td>
<td>Reverse scope interpretation marginally available</td>
<td>2</td>
</tr>
<tr>
<td>*</td>
<td>Reverse scope interpretation not available</td>
<td>3</td>
</tr>
<tr>
<td>bold</td>
<td>Reverse scope prevalent</td>
<td>1</td>
</tr>
</tbody>
</table>
In order to quantify the judgement I assigned a number to each pair of thematic roles. It is the sum of the elements of a quadrupel of numbers which consist of:
1. The number of question marks in the first couplet of (the one with the existential operator in front), counting the "*" as "3".
2. The number of question marks in the second couplet (the one with the universal operator in front).
3. The number "1", if in the first couple in one of the sentences the reverse scope interpretation was salient, otherwise "0".
4. The number "1", if in the second couple in one of the sentences the reverse scope interpretation was salient, otherwise "0".
The resulting number is the sum of these four numbers. In the previous examples we get:

For the pair Matter – Temporal:
\[
\text{Result(QS)}: (2,3,1,1) \Sigma = 7 \text{ Temporal > Matter}
\]

For the pair Temporal – Locative:
\[
\text{Result(QS)}: (0,2,0,0) \Sigma = 2 \text{ Temporal > Locative}
\]

### 3.2. Informational Focus

A well known property of the German Mittelfeld is the fact that among two constituents the one behind can always bear informational focus, i.e. be understood as answer to a constituent question, while the one in front can bear it only when base generated higher. (Lenerz 1977). This works especially well for indirect and direct objects. Take the following base sentence:

(22) Ich habe dem Kassierer das Geld gegeben.

I have (the cashier)+DAT the money given

'I gave the money to the cashier.'

If we question the indirect object, sentences with two possible word orders are acceptable answers:

(23) Wem hast du das Geld gegeben?

'To whom did you give the money?'
(24) Ich habe dem Kassierer das Geld gegeben.

(25) Ich habe das Geld dem Kassierer gegeben.

If, however, the direct object is questioned, only the word order with the direct object following the indirect is acceptable as an answer.

(26) Was hast du dem Kassierer gegeben?

'What did you give to the cashier?'

(27) Ich habe dem Kassierer das Geld gegeben.

(28) ?? Ich habe das Geld dem Kassierer gegeben.

The indirect object with informational focus can be positioned before or after the direct object; therefore we take it to be higher generated.

If PPs realising different thematic roles were base generated in different position this test should give rise to an asymmetry amongst the two possible orders.

I start with a base sentence having a Benefactive and a Temporal:

(29) Donald hat am Dienstag für Georg gelogen.

Donald has on Tuesday for George lied

'Donald lied for George on Tuesday.'

If I question the Temporal I get two possible answers:

(30) Wann hat Donald für Georg gelogen?

Donald hat für Georg am Dienstag gelogen.

Donald hat am Dienstag für Georg gelogen.

But if I question the Benefactive, putting it in front of the Temporal becomes odd:

(31) Für wen hat Donald am Dienstag gelogen?

Donald hat am Dienstag für Georg gelogen.

?? Donald hat für Georg am Dienstag gelogen.
In analogy to the above example we can deduce that Temporals are base generated higher than Benefactives. 

As in the case of the Quantifier Scope Test the results were not always clear cut yes/no distinctions, although an asymmetry was always detectable. Again I quantified the judgements. If it was not possible to have the questioned constituent in front, a sentence was marked by a "*". If it was only marginally possible it got a "??". If there was just an asymmetry; i.e. the positioning of the questioned element in front of the other was possible but less acceptable than in the partner pair, I gave it a "?".

The evaluation of a pair of thematic roles consists of a pair of numbers and their sum. The first element of the pair equals to the number of question marks, again counting the "*" as "3". The second element of the pair equals to "1" if the focussed element is preferred in first position (marked in the sentences in bold face). Summing up the two numbers gives the strength of the judgement. In the above example we get:

**Result(IF)** (2,1) Σ = 3 Temporal > Benefactive

### 3.3. Pair List Reading

This test is another application of scope ambiguity, this time between an interrogative operator and an universal quantifier (proposed by (May 1988) see also (Bruening 2001)).

If the interrogative is generated above the quantifier and moves up to the left periphery, it always has the quantifier in its C-command. It allows only one possible answer containing the universal quantifier:

(32) **Who read all the books?**

    John read all the books.

But if the interrogative is base generated below the quantifier and moves across it to its surface position, we get scope ambiguity. In the first case the wh-element is interpreted as taking scope over the quantifier, as in the above case. We expect only one simple answer:
(33) Which book did all the boys read?
All the boys read "The Minimalist Program"

In the second case, the quantifier is interpreted as taking scope over the trace of the interrogative. Now the answer is a list of pairs:

(34) Which book did all the boys read?₂
Bob read "Aspects",
Bill read "Barriers" and
John read "The Minimalist Program".

Applying this test to modifying PPs gave even clearer results than the other two tests. If we take the combination of Comitative and Temporal and question the Comitative we get two types of answers. A simple one with the universal quantifier and a list of pairs:

Mit welchem Freund hat Georg in jedem Jahr Krieg gespielt?
With which friend did George play war every year?

Georg hat in jedem Jahr mit Tony Krieg gespielt.
George played war with Tony every year.

Georg hat 2002 mit Tony und Gerhard gespielt,
2003 mit Tony und José
2004 mit Tony und Silvio.
George played with Tony and Gerhard in 2002, with Tony and José on 2003 and with Tony and Silvio in 2004.

If the Temporal becomes the wh-element and the Comitative has the universal quantifier, the pair list reading becomes unavailable:

Wann hat Georg mit jedem Freund Krieg gespielt?
When did Georg play war with every friend?

George played war with every friend in 2002.
4. The Results

During the research four questions became relevant:

1. Do all three tests result in a linear order?
2. Do all three tests give the same result?
3. What exactly is the resulting order?
4. Does the weighting give some clue?

4.1. Do all three tests result in a linear order?

A relation ">" is resulting in a linear order if it is

a) *transitive*
   
   If $A > B$ and $B > C$ then $A > C$

b) *antisymmetric*
   
   If $A > B$ then not $(B > A)$

c) *total*
   
   For all possible pairs $(A, B)$ there is a relation between them so that either $A > B$ or $B > A$.

All three test resulted in nearly perfect linear order. The only deviations were:

Deviations from Transitivity:

Only the Pair List Reading Test gave a slight deviation from transitivity. It gave

- Means of Transport > Malefactive
- Malefactive > Instrumental
- Means of Transport = Instrumental
**Deviations from Antisymmetry:**

There were few cases where there could not be detected an asymmetry between two thematic roles.

In the Quantifier Scope Test:

\[ \text{Path} = \text{Means of Transport} \]

In the Informational Focus Test:

\[ \text{Instrumental} = \text{Path} \]
\[ \text{Instrumental} = \text{Means of Transport} \]

In the Pair List Reading Test:

\[ \text{Instrumental} = \text{Means of Transport} \text{ (see also above)} \]

All these deviations concern the same low part of (Path / Means of Transport / Instrumental). This could indicate that they do not really constitute different thematic roles but occupy the same position. Semantically, Means of Transport and Instrumental are quite similar.

**Deviations from Totality:**

Matter and Means of Transport are not compatible. Means of Transport needs a motion verb which seems to be incompatible with a Matter modifier. Furthermore, there is a problem of having a Goal and a Means of Transport modifier together. In this case, motion verbs tend to take the Goal as a (selected) complement. I wanted to avoid mixing complements with modifiers. So this is not a real incompatibility of thematic roles.

All together, the above deviations can be reduced to few cases which can be explained by model of a hierarchy of functional projections above VP.
4.2. Do all test give the same results?

I give you here the resulting orders of the single tests:

<table>
<thead>
<tr>
<th>QS</th>
<th>PLR</th>
<th>IF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evidential</td>
<td>Evidential</td>
<td>Evidential</td>
</tr>
<tr>
<td>Temporal</td>
<td>Temporal</td>
<td>Temporal</td>
</tr>
<tr>
<td>Locative</td>
<td>Locative</td>
<td>Locative</td>
</tr>
<tr>
<td>Comitative</td>
<td>Comitative</td>
<td>Comitative</td>
</tr>
<tr>
<td>Benefactive</td>
<td>Benefactive</td>
<td>Benefactive</td>
</tr>
<tr>
<td>Reason</td>
<td>Reason</td>
<td>Reason</td>
</tr>
<tr>
<td>Source</td>
<td>Source</td>
<td>Source</td>
</tr>
<tr>
<td>Goal</td>
<td>Goal</td>
<td>Goal</td>
</tr>
<tr>
<td>Malefactive</td>
<td>Malefactive</td>
<td>Malefactive</td>
</tr>
<tr>
<td>Path/Means</td>
<td>Instrumental/Means</td>
<td>Instrumental/Means</td>
</tr>
<tr>
<td>Instrumental</td>
<td>Path</td>
<td>Path/Instrumental</td>
</tr>
<tr>
<td>Matter</td>
<td>Matter</td>
<td>Matter</td>
</tr>
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<td>Manner</td>
<td>Manner</td>
<td>Manner</td>
</tr>
</tbody>
</table>

As can be seen all three tests give the same order, again with the exception of the region of Path / Means of Transport / Instrumental. Therefore, I would answer the question with a clear yes.

This leads directly to the answer of the third question.

4.3. What exactly is the resulting order?

Evidential > Temporal > Locative > Comitative > Benefactive > Reason > Source > Goal > Malefactive > Instrumental/Means/Path > Matter > Manner

4.4. Does the weighting give some clue?

The most surprising result was the observation that the judgement about the asymmetry was stronger the further away two elements in the hierarchy were. The evaluation number can be interpreted as a measurement of distance. The thematic roles cannot be
grouped into classes where members of the same class behave less asymmetrically with respect to the test and members of different classes have sharper distinction. The sharpness of the judgement increases gradually with the distance. This becomes clear when taking the average over all distances from the lowest element Manner. It is defined by:

\[ n_{Ave}(TR1) = \frac{\sum n_{TR2}(Distance(TR2, TR_{Ref}) - Distance(TR2, TR1))}{n_{hits}} \]

The average distance of a certain thematic role TR1 is evaluated by taking for each other thematic role TR2 the distance of this role to Manner (TR_{REF}) minus the distance between TR1 and TR2 and summing all up. The interesting finding is that this results in exactly the same hierarchy as revealed by the individual tests. An interpretation of this effect can be achieved if we assume that in order to scramble a lower PP across a higher there are (at least) two different derivations, one in order to reverse scope and another for focus effects. The above tests detect always for only one effect, either scope or focus. If movements existed only for scope reasons, the Quantifier Scope and Pair List Reading Tests would give sharp yes or no results. But there can be additional movements for focus reasons as can be seen for the Informational Focus Test. This explains, the remaining interpretations of the reverse kind.

The fact, that the sharpness of the judgement increases with the distance indicates that the "scrambled" PP has to do more work, it has to move around all intervening functional projection. This in turn shows that these intervening projections always exist, even if not represented overtly in the pronounced string.

A few remarks to the validity of this hierarchy. When doing the test I tried carefully to avoid seeing in the data what I expected, especially when having evaluated a pair of thematic roles with another test. Of course the judgements especially between neighbours can be subtle. But the order between one thematic role and the one following its direct neighbour in the above hierarchy seems to me very clear.
References