

## Frame Semantic Control of the Coordinate Structure Constraint

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When Ross first discovered the coordinate structure constraint twenty years ago, he almost immediately discovered a case where it fails. It is a well-known case in which extraction is possible from the second conjunct in (1).

(1) What did Harry go to the store and buy?

Goldsmith (1985) cites the converse case, in which extraction is possible in the first conjunct of (2).

(2) How much can you drink and still stay sober?

In an attempt to save the coordinate structure constraint, I observed that the *and* in (1) is not a simple conjunction and that the semantic relation between the two clauses is the relation that holds between a main clause and a purpose clause (see Ross, 1986, p. 103). I proposed that (1) was not a true conjunction syntactically, but that, (in the spirit of the generative semantics of the day) its syntax followed its semantics, and that it functioned essentially like the sentence *What did John go to the store to buy?*

Goldsmith, also attempting to save the coordinate structure constraint, argues similarly that the semantic relationship between the two clauses is like that between a main clause and an adversative clause as in *How much can you drink while still staying sober?* Goldsmith suggests that the semantic relationship between the clauses forces a "reanalysis" so that the syntactic properties of the sentence accord with its semantic properties. Though different in detail, Goldsmith's analysis was very much in the same spirit as mine.

I now believe that Goldsmith and I were both right in our insights concerning the correlation of syntax and semantics, but wrong in our impulse to save the coordinate structure constraint. I will argue that, in (1) and (2), *and* is a true conjunction and that there is a true coordinate structure. Extractability, rather than being a purely syntactic matter, depends upon the framing (in Fillmore's sense) of the sentence in context. As a consequence, it will follow that the coordinate structure constraint, as a pure syntactic constraint, does not exist. Thus, syntactic solutions, say, of the sort provided in GPSG using slash categories cannot work (see Gazdar et al, 1985). Moreover, any theory of syntax that requires that the coordinate structure constraint exist in the syntax is simply incorrect.

The argument has two parts:

(I) I will show that across-the-board extraction of the sort requiring true conjuncts occurs with the so-called *in order to* and *despite* senses of *and*, and that there is no purely syntactic coordinate structure constraint.

(II) I will argue that the data can only be accounted for by a frame semantics (in Fillmore's sense).

In 1966, when Ross and I worked together on the constraints that he reported on in his dissertation, we came upon sentences like (1) above. In our haste to explain them away, we failed to apply the most basic test that any first-year syntax student learns to apply -- iteration. We simply never checked to see whether multiple across-the-board extractions were possible for such cases. As it turns out,

they exist. Here are a couple of examples:

- (3) What did he go to the store, buy, load in his car, drive home, and unload?
- (4) How many courses can you take for credit, still remain sane, and get all A's in?

In (3) across-the-board extraction is applying in the second, third, and fifth conjuncts. In (4) it applies in the first and third conjuncts. The very existence of across-the-board extraction in such cases shows that true conjunction is required, as does the occurrence of final *and* preceded by a comma-intonation sequence. Thus, these sentences have no possible analyses with simple *in order to* and *despite* adverbials. Yet the phenomena are the same as in (1) and (2).

Before we proceed, it is worth looking at a number of such sentences, just to get a sense of the robustness of the phenomenon.

- (5) Sam is not the sort of guy you can just sit there and listen to.
- (6) Sam is not the sort of guy you can just sit there, listen to, and stay calm.
- (7) Sam is not the sort of guy you can just sit there, listen to, and not want to punch in the nose.
- (8) This is the kind of brandy that you can sip after dinner, watch tv for a while, sip some more of, work a bit, finish off, go to bed, and still feel fine in the morning.
- (9) I went to the toy store, bought, came home, wrapped up, and put under the Christmas tree one of the nicest little laser death-ray kits I've ever seen.

The phenomenon occurs with (at least) questions, relative clauses, and right-node-raising. The extraction patterns are:

- In (5): Extraction from second of two VPs.  
In (6): Extraction from second of three VPs.  
In (7): Extraction from second and third of three VPs.  
In (8): Extraction from first, third, and fifth of seven VPs.  
In (9): Extraction from second, fourth, and fifth of five VPs.

In purely syntactic terms, just about any kind of extraction pattern is possible with VP conjunctions of this kind. In short, there is no general coordinate structure constraint.

I would like to suggest that such cases make sense within a cognitive semantics. What is involved is a notion of a "natural course of events" -- which is to be characterized not in terms of truth-conditional semantics, but rather in terms of a Fillmorean frame semantics, which is defined within the general theory of cognitive semantics. The examples cited above involve two kinds of cases of what people view as natural courses of events. Let us refer to these as "scenarios". For example, in (1), going to the store and buying something is a natural, and expected, course of events. Let us refer to this as a scenario of Type A, in which the sequence of events fits normal conventionalized expectations. In (2), however, drinking a lot and staying sober is a course of events that is counter to conventionalized expectation. Let us refer to such cases as scenarios of Type B, in which a conventionalized expectation is violated.

Scenarios of Type A have different extraction constraints than scenarios of Type B.

The Final Conjunct Constraint: Only scenarios of Type B permit there to be no extraction from the final conjunct.

This accounts for the difference in meaning between cases (1) and (2). In (1), which has a type A scenario, there is extraction from the final conjunct. In (2), which has a type B scenario, there is no extraction from the final conjunct. This permits us to account for the following minimal pair:

(10) What kind of herbs can you eat and not get cancer?

(11) What forms of cancer can you eat herbs and not get?

These sentences have opposite implications. (10) implies that eating herbs would lead to getting cancer. (11), on the other hand, implies that eating herbs can lead to not getting cancer. In (10), the conventionally expected course of events ends after the extraction in the first clause; the second clause (not getting cancer) therefore does not form an expected course of events with the first clause (eating herbs). In (11), the final extraction indicates that the first clause (eating herbs) forms an expected course of events with the second clause (not getting cancer).

The sentence in (3)

(3) What did he go to the store, buy, load in his car, drive home, and unload?

is an example of a pure A-scenario, in which the expected course of events is followed and there is an extraction from the final conjunct. But in addition to pure type A and type B scenarios, there are also mixed scenarios, in which type B and type A scenarios occur in sequence. The sentence in (4) is such an AB sequence, in which the second conjunct is the last part of a B-scenario and the first part of an A-scenario.

(4) How many courses can you take for credit, still stay sane, and get all A's in?

The first two conjuncts work like the pure B-scenario in (12).

(12) How many courses can you take for credit and still stay sane?

Here the conventional expectation is that taking a lot of courses for credit would not lead to sanity. It is a pure B-scenario, with no extraction from the final conjunct. The sentence in (13) is an instance of a pure A-scenario.

(13) That's a bunch of courses that you can crack the books now and then and get all A's in.

The sentence in (4) combines both scenarios, with the final extraction being an extraction from the final conjunct of an A-scenario.

Let us now turn to a case where a failure of extraction from the last conjunct of an A-scenario leads to ill-formedness. Consider the A-scenario in (14).

(14) He ate 26 spring rolls and felt satisfied.

Extraction from the first conjunct alone leads to illformedness as in (15):

(15) \*How big a meal did he eat and feel satisfied?

However, if the conjunction is structured by a B-scenario, extraction from the first conjunct is fine.

(16) How small a meal can you eat and feel satisfied?

Here there is a conventional expectation that if you eat a small meal, you will not feel satisfied.

Let us now turn to the details of A-scenarios. An A-scenario is more than merely a "course of events". It can include states -- background states (or "settings") and resultant states. In (5), for example,

(5) He's not the sorta guy you can just sit there and listen to.

"sit there" designates a background state for an A-scenario. In (17),

(17) Which courses did he take for credit, work hard, and feel satisfied with?

"feel satisfied with" designates a resultant state. Such states combine with courses of events in forming A-scenarios.

A-scenarios can also include conjuncts that designate changes. For example, in (3),

(3) What did he go to the store, buy, load in his car, drive home, and unload?

"go to the store", and "drive home" designate changes of location. Conjuncts indicating changes or maintenance of a state, time or location can be added relatively freely to A-scenarios without requiring extraction. Thus, in a sentence like (18),

(18) What problem did he sit there for a while, start thinking about, get bored, and give up on?

the two conjuncts without extraction are a background state ("sit there for a while" and a change of state ("get bored"). Thus, one might be tempted to propose that the conjuncts with no extraction in A-scenarios are exactly those indicating background states, changes of state, or maintenance of state. Although these are common, they are by no means the only kinds of conjuncts with no extraction. Consider (19).

(19) Which bill did he grab a pen, write to his congressman, and criticize him for voting for?

Here, *grab a pen* and *write to his congressman* do not designate either a background state, or a change of state, or the maintenance of a state. They are simply actions that form part of an A-scenario. Similarly in (20),

(20) Who did he pick up the phone and call?

*pick up the phone* is an action in an A-scenario leading up to the conjunct in which the extraction occurs. So far as I know, there is no way to characterize exactly which conjuncts allow extraction by looking only at the semantics of the conjuncts in themselves, and without taking into account the roles of the conjuncts in scenarios.

I do not want to give the impression that scenarios are completely well-understood, though they have been studied for more than a decade in various traditions -- frame semantics, AI, cognitive psychology and cognitive anthropology. In particular, the relationship between scenarios and their syntactic realizations has by no means been worked out. For example, B-scenarios seem on the whole to be better at structuring hypothetical rather than realized situations, and hence to prefer modals. Thus, *How much CAN he drink and still stay sober?* is better than *\*How much DID he drink and still stay sober?*. In general, scenario-based coordinate structures show a great many constraints that have not been looked at in detail. As might be expected, the constraints are complex and come from three sources: the constraints on the scenarios themselves, the interactions between two or more scenarios (cf. (4) above), and constraints on the syntactic realizations of

the scenarios. One of the nice things about this is that what had been considered a relatively dead area of research now becomes an interesting area, not merely for syntactic study but also for the study of the nature of conceptual scenarios and their possibilities for combination and linguistic realization.

### A Third Scenario Type

Peter Farley has brought to my attention a third scenario type: the cause-result scenario, which we will refer to as Type C. Farley was in a Greek restaurant and was referring to the Near Eastern drink, kefir. He caught himself saying the following sentence:

(20a) That's the stuff that the guys in the Caucasus drink and live to be a hundred.

This sentence shows extraction from the initial conjunct, like the Type B sentences discussed above, but it does not have a Type B semantics. That is, (20a) does not mean that the residents of the Caucasus live to be a hundred *despite* drinking kefir; it means that they live that long *because* they drink kefir.

To take another example (supplied by William Eilfort),

(20b) That's the kind of firecracker that I set off and scared the neighbors.

Again there is extraction from only the first conjunct, and the relation between the conjuncts is that of cause and result.

There is, of course, a difference between a natural course of events and a cause together with its result. Thus, going to the store and buying something is a natural course of events, but the buying is not *caused* by going to the store. Thus, (1) is not an instance of a cause-result scenario, while (20a) is. Corresponding to this difference, there is a difference in extractability, since A-scenarios require extraction from the final conjunct while C-scenarios do not.

### Some Implications

Before we proceed, let us consider the implications of the cases we have discussed so far. It should be clear that *the coordinate structure constraint simply does not exist as a purely syntactic phenomenon*. It is just not true that if you extract an element from one conjunct, you must extract it from all of them. So far as VP conjunctions are concerned, extraction is permitted from any or all conjuncts *so far as syntax alone is concerned*. Autonomous syntax cannot account for which extractions are permissible and which are not. The best that an autonomous syntactic theory can do is to give up on the coordinate structure constraint altogether, and generate as grammatical sentences all of what used to be considered violations of the constraint. It would then have to filter out the ill-formed sentences as semantic or pragmatic violations making use of scenarios much like those we have proposed.

For example, classical GPSG would probably have to be changed in the following way:

- (a) Adjust the mechanism for passing down slash categories so that they can be passed down into any or all conjuncts.

- (b) For conjunctions with gaps, allow only those that fit one of our proposed scenarios to be generated by the grammar as a whole.
- (c) Give up on the philosophical commitment to traditional realism of the sort of model-theoretic semantics proposed by Barwise and Perry and by Montague. That is, give up on truth-conditional semantics and move to a cognitive semantics and something like an experiential realism (see Lakoff, 1986).

The reason for (c) is this: Traditional realism of the Barwise-Perry and Montague variety requires that the world be structured independently of any minds -- human or otherwise. Their model-theoretic semantics thus does not take into account features peculiar to human cognition. Scenarios are, however, cognitive in nature. They are humanly-constructed holistic organizations of states and events. Model-theory with a philosophical commitment to traditional realism cannot distinguish what human beings consider natural sequences of events (like going to the store and buying something) from random sequences (like going to the store and scratching your leg). A model theory with such a philosophical commitment could, thus, not explain the difference *What did he go to the store and buy?* and *\*What did he go to the store and scratch?*

But traditional realism is not merely philosophical window-dressing. It cannot be abandoned lightly. One cannot simply say *Keep model-theoretical semantics as it is, but let the models be mental models*. The reason, as David Lewis (1972) and Hilary Putnam (1981) have observed, is that meaning is not merely in the head. It has to be grounded in reality of some sort. In Lakoff (1986), I proposed a cognitive model-theory along with an alternative version of realism. But, because it takes cognition seriously, it is of a very different character than traditional model-theory. In particular, it requires that meaning be based on understanding, not truth (see also Fillmore, 1985).

#### Other Consequences

It should be pointed out that the option of keeping the coordinate structure constraint and adding a semantic or pragmatic filter is not available. The reason, of course, is that the coordinate structure constraint rules out these cases as ungrammatical and no semantic or pragmatic filter can make an ungrammatical sentence into a grammatical one.

The sentences we have been discussing also cannot reasonably be treated as performance errors. They are not mistakes. They are normal and follow general principles. If the coordinate structure constraint is to be retained as a principle of autonomous syntax, then the only option would appear to be to treat such sentences as "ungrammatical but acceptable", that is, as ungrammatical sentences that are usable in certain situations. But if this alternative is taken, virtually any counterexample can be explained away in this fashion and the theory becomes vacuous.

Incidentally, the government-and-binding tactic of reanalysis is also impossible. The reason is that there is nothing for these constructions to be reanalyzed as. Only conjunctions permit across-the-board extraction. There can be no reanalysis if there is no construction that exists independently and shows the given extraction pattern. One might think that parasitic gaps might show such a pattern, but as we shall show below in the appendix, they do not.

## Principles of Predication

I have claimed that there is no coordinate structure constraint that can be stated in terms of autonomous syntax. But what about all the evidence *for* a coordinate structure constraint? The examples are real enough. Sentences like (21) and (22) are ill-formed.

(21) \*Who did John hit Bill and kick?

(22) \*Who did John hit and kick Sam?

Examples (21) - (22) are the usual kind of examples cited in support of the coordinate structure constraint. How do they differ from the kind of sentences discussed above, for example, (1) - (9)?

Let us begin by considering the simple case of (23).

(23) Who did John hit?

In (23), "John hit \_\_\_" is a propositional function (that is, a proposition with a slot open) that is predicated of "who". The same is true in all of the so-called "extractions". Instead of using the old transformational terms "extraction" and "extracted element", let us speak instead of an "isolated element" (e.g., an initial WH-constituent) and "a structure expressing a propositional function". In place of extractions, we now have a semantic condition on constructions of a certain type:

The Predication Condition: In a construction consisting of an isolated element and a structure expressing a propositional function, the propositional function is predicated of the referent of the isolated element.

There is, of course, nothing new about this condition. Any adequate account of semantics must meet it.

Let us now consider what goes wrong in (21) and (22). In (21), the propositional function is (with an adjustment for tense) "John hit Bill and kicked \_\_\_". This is to be predicated of "who". But the first conjunct, "hit Bill" is irrelevant; it does not enter into the predication. Similarly in (22). The propositional function (again with adjustment for tense) is "John hit \_\_\_ and kicked Sam", which is to be predicated of "who". But the second conjunct, "kicked Sam" is irrelevant. One way to understand the classic cases of the coordinate structure constraint is to say that irrelevant conjuncts cannot be predicated of anything.

There is, of course, no known way of characterizing relevance in truth-conditional semantics. So far as truth-conditional semantics is concerned, there is no reason to exclude "John hit Bill and kicked \_\_\_" as a possible predication. It is only from a cognitive perspective that the first conjunct is irrelevant. In cognitive semantics, the problem of relevance can be approached naturally in terms of Fillmorean frames. The scenarios described above are instances of such frames.

If one thinks of long-distance dependencies semantically in terms of predication rather than in terms of a syntactic condition, the facts discussed above make sense. In a human conceptual system, there are constraints on what a relevant predication is. Those constraints are to be stated in terms of conditions on cognitive models, of which scenarios are a special case. Here are examples of what such constraints on predication might be like:

(I) A simple propositional function is a predication.

- (II) If each member of a conjunction of predications can be predicated of an element, then the entire conjunction can be predicated of that element.
- (III) A conjunction of predications not meeting (II) is a predication if it is structured by a type A or B scenario. In a type A scenario, the final conjunct must be predicated of the same elements as the conjoined predication.

Both constraints are intuitively natural, except for the final-conjunct condition, which one would like to see predicted from more general considerations. I do not know whether this precise formulation will work for all cases, or whether it will have to be extended or generalized. But it is a place to start.

(I) - (III) are cognitive conditions that have syntactic consequences. The point is that this aspect of syntax is based on principles of cognitive organization, and not on autonomous syntactic principles that make no mention of meaning or non-syntactic aspects of cognition.

This does not mean that there are no syntactic conditions restricting the predication of conjoined structures. It may turn out that conditions like those discussed by Williams (1978) may have to be stated in syntactic terms. That would not be surprising, nor would it contradict the analysis given here. In fact, within Grammatical Construction Theory (Lakoff, 1986, case study 3), it is normal to have direct pairings of semantic and syntactic conditions within a grammar.

### Some Consequences

Let us now turn to a more detailed discussion of principles (I) - (III). In a simple case of predication, namely (I), a simple propositional function can be predicated of some element. Principle II projects *from simple propositional functions to conjoined propositional functions*. Principle III places constraints on those conjoined propositional functions. Principle II thus permits cases like:

- (24) What kind of a sandwich did John make and Mary eat?

This contains the predication consisting of a conjunction of the propositional functions "John made \_\_\_" and "Mary ate \_\_\_".

(II) rules out two classes of cases. The first class includes cases like (25).

- (25) \*What kind of a sandwich did John make and eat an apple?

In (25), there is a conjunction of the propositional functions: "\_\_\_ make \_\_\_" and "\_\_\_ eat an apple". The sentence contains a verb phrase conjunction with "John" as subject. "John" therefore must fill the first argument place of each propositional function. Since the second propositional function has only one empty argument place, (II) is not met.

(II) also rules out cases like the following:

- (26) \*That's the apple that Bill made a sandwich and John ate.

This is ruled out because it does not even contain a conjunction of propositional functions. The first conjunct expresses a full proposition ("Bill made a sandwich") and not a propositional function. Thus it is not even a candidate for (II).

Note that we are assuming that predication is recursively specified, beginning with simple propositional functions and building up to compound ones by principles such as II and III. It is the recursive nature of the process -- going from simple propositional functions to compounds of propositional functions -- that rules out



sentences like (26). Conjunctions of full propositions and propositional functions are not generated as possible predications by the recursive principles.

### Other Predication Principles

The idea that "extraction constraints" are to be accounted for by predication principles is not new. Ross and I entertained such an idea briefly in 1966 when we were collaborating in the development of generative semantics. I believe that our rejection of it at that time was premature.

Predication principles differ in two major ways from extraction constraints. First, they are part of the conventional cognitive semantic principles on which the syntax of the language is based. Certain of these principles are universal; others are language-particular.

Second, instead of viewing the phenomenon negatively as the imposition of *constraints* on movement rules or on long-distance dependencies, predication principles embody a positive approach. The idea is to ask which long-distance dependencies do occur, rather than which ones do not occur.

Let us consider some highly tentative examples of how such principles might be formulated. We will start with a definition:

Definition: A conceptual structure is *saturated* if all of its argument-places are filled; it is *unsaturated* if any of its argument-places are unfilled.

Each argument position in a conceptual structure is constrained by conditions on what can fill that argument position. For example, the second argument place of "believe" can be filled by a proposition. Thus, in "John believes Sam ate a sandwich," the proposition "Sam ate a sandwich" fills the second argument-place of "believe". Propositions are saturated; they have no unfilled argument places. Now suppose we want to form the question *What did John believe Sam ate?*, in which "John believe Sam ate \_\_\_" is predicated of "what". Here the second argument place of "believe" is filled by the propositional function "Sam ate \_\_\_". To permit this, we can extend the condition on the second argument place of "believe" from propositions (which are saturated) to propositional functions (which are unsaturated). This can be achieved by a principle of the following form:

(IV) If a saturated conceptual structure of type T can fill an argument place, then the corresponding unsaturated structure can fill it.

(IV) is a predication principle schema; a specification of what type T is will yield a predication principle that will extend the range of possible predications. For example, if we let T be a simple proposition, then we get (IV') as a special case of (IV):

(IV') If a simple proposition can fill an argument place, then a simple propositional function can.

(IV') will permit not only questions out of complements like "What did John believe Sam ate?" but will also reply recursively to yield questions like "What did Sid say John believed Sam ate?"

Similarly, suppose we let T in (IV) be an expression of quantity, such as "a quart of milk". The resulting instance of schema IV will permit unsaturated expressions of quantity like "a quart of \_\_\_" to fill argument places. This will permit questions like *What did Millie drink a quart of?*

We can now generalize condition II above, restating it as (II'):

- (II') If an argument-place can be filled by an unsaturated conceptual structure of a given type, it can be filled by a conjunction of unsaturated structures of that type.

This is more general since it is about conceptual structures, not just about predications. All predications are conceptual structures, but not vice versa. Thus, an unsaturated quantity expression like "a quart of \_\_\_" expresses a conceptual structure that delimits a quantity, but which is not, in itself, a predication, since supplying it with an argument does not yield a proposition. (II') will characterize conjunctions of two such unsaturated expressions, for example, "a quart of \_\_\_ and a gallon of \_\_\_". But (II') will not characterize a conjunction of a saturated and an unsaturated quantity expression such as "a quart of milk and a gallon of \_\_\_". This would explain why we can get (29) but not (30).

(29) What did John buy a quart of and a gallon of?

(30) \*What did John buy a quart of milk and a gallon of?

Cases like *\*What did John drink and milk?* and *\*What did John drink milk and?* would be ruled out on independent grounds, since *and* cannot occur without a following conjunct and can occur without a preceding conjunct only in sentence-initial position in the appropriate kinds of discourses. This is simply a constraint on the syntax of *and*.

Ross and I considered such a solution in brainstorming sessions in 1966 and rejected it, for what in retrospect was not at all a good reason (see below). An essentially identical proposal was, however, arrived at independently by Gundel and published in her dissertation (Gundel, 1977, p. 74). Gundel's extremely insightful discussion is set within a general exploration of topicality and predication and their role in linguistic theory.

One of the many directions of research being pursued in grammatical construction theory is the precise formulation of predication principles. Our goal is to account for long-distance dependencies not by negatively-stated constraints on the syntax, but by positively-stated predication principles.

Those familiar with Generalized Phrase-Structure Grammar will have observed at this point that such principles can be viewed as corresponding to the semantic versions of GPSG rules that introduce slash categories. An unsaturated conceptual structure is a conceptual structure with something missing; a slash category is a syntactic constituent with something missing. The difference, however, is nontrivial. Classical GPSG has an autonomous syntax, and it requires it for important reasons having to do with its claims concerning generative power and its use of model-theoretic semantics. Thus, GPSG cannot have semantic or pragmatic conditions on its introduction of slash categories in the syntax. For this reason, the classical theory of GPSG cannot account for the examples discussed above. My guess is that GPSG would have to be changed along the lines of conditions (a), (b), and (c) above.

There is, however, a real similarity between the treatment of long-distance dependencies by predication principles in Grammatical Construction Theory and by slash categories in GPSG. From our point of view, there is something right about slash categories, but for technical reasons they cannot be made to work for the above cases in classical GPSG. What is right about slash categories is that the principles governing their distribution correspond roughly to predication

principles. What is wrong about them is that the classical GPSG principles cannot make reference to frame-semantic scenarios. This can be accommodated in GPSG by making the changes proposed above, and by giving up its philosophical commitment to a traditional realism and to a truth-conditional rather than a cognitive semantics.

#### A Historical Footnote

I mentioned above that Ross and I considered a solution along the lines of predication principles in 1966, when we first discussed movement constraints. We rejected it for a reason, and it is somewhat poignant at this point in history to look back at what that reason was. We rejected it because of the following kinds of cases.

- (31) He mixed a gallon of water with a quart of oil.
- (32) He mixed a gallon of water and a quart of oil.
- (33) What did he mix a gallon of water with a quart of?
- (34) \*What did he mix a gallon of water and a quart of?
- (35) What did he mix a gallon of and a quart of?

In those days we were assuming a structural semantics of the Katz-Fodor variety in which identity of meaning was defined as identity of truth conditions and two sentences with the same meaning had the same semantic structure. Since the truth of (31) entailed the truth of (32) and conversely, they had to have the same semantic structure, and hence there was no way of providing a semantically-based condition on predication that would distinguish (33) from (34). But within cognitive semantics, meaning is not based on truth, but on understanding, and (31) and (32) are understood in different ways. Consider what is involved in mixing. There is a resultant state in which a collection of two or more things occur in a mixed state. But there are two kinds of common scenarios for reaching such a state: asymmetric and symmetric. In an asymmetric scenario, the two things being mixed do not play exactly the same roles. One may be more important or more prominent than the other. Or one may be held fixed while the other is moved relative to it. The backgrounded NP in an asymmetric scenario is marked with *with*, as in (31). The two NPs in such a sentence denote the two things being mixed, and they do so *with reference to the portion of the scenario indicating the asymmetry*. On the other hand, in sentences like (32), the conjoined NP denotes the things as they occur mixed *in their final state*. Since such final states occur in both asymmetric and symmetric mixing scenarios, such sentences are, therefore, neutral with respect to symmetry or asymmetry. It is for this reason that the truth conditions of (31) and (32) can come out the same, even though the sentences are understood somewhat differently.

A lot less was known in 1966. That was two years before presuppositions came into the linguistic literature, two years before linguists found out about possible world semantics, a year before Montague wrote his first grammar fragment, a year before Grice's Harvard lectures on implicatures, and long before the development of cognitive semantics and the advent of serious nontransformational grammars. We had the right intuition, but there was no way that we could make it work at the time.

Ross and I had the fundamental counterexample to the coordinate structure constraint at our finger tips, but given the theories of the day, we sought to explain it away rather than pursue it. We even understood that what was involved in example (1) was a natural course of events. But since there was at the time no cognitive semantics framework to allow us to make semantic sense of such a notion, and since there was no grammatical construction theory to allow us to incorporate it into a grammar, we did not pursue the idea. We believed in transformational grammar and we wanted the coordinate structure constraint to be a true syntactic constraint.

Many researchers in the field still want to believe that language is independent of the rest of cognition. It is just not true. Framing is part of our general conceptual apparatus. It plays a causal role in determining what we can predicate of what, and thereby it plays a causal role in determining which coordinate structures speakers find well-formed.

## Appendix

At the conference at which this paper was presented, the following counterproposal was suggested by Polly Jacobson:

- Keep the coordinate structure constraint in the syntax.
- Keep the explanations that Goldsmith and I proposed for (1) and (2).
- Analyze other single-gap coordinate sentences as containing an adverbial clause.
- Analyze multiple-gap sentences like (3), (4), (6)-(13), etc. as not being true conjunctions, but rather as sentences with a sequence of adverbial subordinate clauses. The noninitial gaps in these clauses would all be parasitic gaps.

Although Jacobson did not elaborate on her proposal, we can get the flavor of it by considering pairs like:

- (i) How much can John drink and not get drunk?
- (ii) How much can John drink without getting drunk?

The single-gap coordinate structure in (i) would be analyzed as having the syntactic structure of (ii).

Under Jacobson's proposal, a sentence like (iii) which has three conjuncts and two gaps would presumably be analyzed as having a main clause and two subordinate clauses with a parasitic gap in the first subordinate clause, as in (iv):

- (iii) How many men can she date at once, not commit herself to, and not get into difficulties?
- (iv) How many men can she date at once without committing herself to, while not getting into difficulties?

I believe that such an analysis presents so many problems as to be untenable. Let us consider what they are.

## Problem 1

Many speakers do not find parasitic gap sentences grammatical at all, but find (3), (4), (6) - (13), etc. impeccable. Since the latter sentences *are* parasitic gap sentences under the Jacobson proposal, there would be no way of accounting for the idiolects of such speakers.

#### Problem 2

Jacobson's proposal cannot handle the contrast between (15) and (16), which would have the same syntactic structures under her proposal:

(15) \*How big a meal did he eat and feel satisfied?

(16) How small a meal can you eat and feel satisfied?

Nor could Jacobson's proposal account for the difference in meaning between (10) and (11):

(10) What kind of herbs can you eat and not get cancer?

(11) What forms of cancer can you eat herbs and not get?

These are not the kinds of contrasts that a purely syntactic solution like Jacobson's can account for.

#### Problem 3

Some kinds of conjunctions cannot be paraphrased by sequences of existing subordinate clauses. For example, consider sentences with natural courses of events such as (3), (8), and (9):

(3) What did he go to the store, buy, load in his car, drive home and unload?

(8) This is the kind of brandy that you can sip after dinner, watch tv for a while, sip some more of, work a bit, finish off, go to bed, and still feel fine in the morning.

(9) I went to the toy store, bought, came home, wrapped up, and put under the Christmas tree one of the nicest little laser death-ray kits I've ever seen.

Such sentences cannot be paraphrased by existing subordinate clause sequences, since English has no subordinating conjunction which indicates the next term in a sequence of events. At the very least, Jacobson would have to postulate an abstract subordinating conjunction with this meaning.

#### Problem 4

Jacobson's proposal would still need to be augmented with a theory of scenarios of the sort I have proposed, since it could not predict exactly where gaps could and could not occur in sentences like those considered above. Thus it is not an alternative to the frame-semantic analysis. Its only function is to save the coordinate structure constraint as a purely syntactic constraint.

#### Problem 5

Jacobson's proposal would require that there be extraction from subordinate clauses that do not allow extraction. Thus,

(v) Who did he sit there and listen to?

would presumably have to be analyzed as have a structure like

(vi) \*Who did he sit there while listening to?

Subordinate clauses like those in (vi) do not permit extraction. Sentence (v) cannot contain a parasitic gap, since there is nothing for it to be parasitic on. Thus Jacobson's proposal fails for all sentences like (v).

#### Problem 6

This difficulty is compounded in the case of multiple gaps, as in (7).

(7) Sam is not the kind of guy you can just sit there, listen to, and not want to punch in the nose.

Here there are gaps in the second and third clauses, which are both subordinate clauses that do not permit extraction. On her analysis, (7) would have to have the structure of (vii):

(vii) \*Sam is not the kind of guy you can just sit there while listening to without wanting to punch in the nose.

Here the second gap would have to be parasitic on the first gap, but the first gap has nothing to be parasitic on and cannot occur in such a subordinate clause.

This problem can be compounded still further, since an indefinitely large number of gaps is possible:

(viii) What did he go to the closet, take out, try on, put back, and take out again?

#### Problem 7

In general, parasitic gaps in subordinate clauses are not possible where there is a gapless clause intervening between the clause with the gap and the element that that gap is parasitic on. Consider (ix).

(ix) How many courses can you take for credit, still remain sane, and not get bad grades in?

Under Jacobson's proposal, this would have to have the structure of a sentence like (x):

(x) \*How many courses can you take for credit while still remaining sane without getting bad grades in?

In (x) there is an intervening gapless clause "while still remaining sane" before the clause with the parasitic gap "without getting bad grades in". At least in my speech, parasitic gaps are not permitted in such contexts. Since (ix) would have the same structure as (x) under Jacobson's proposal, that proposal could not account for the well-formedness of (ix) given the ill-formedness of (x).

#### Problem 8

Just to get her proposal off the ground, Jacobson would require an arbitrary rule of some sort to account for the discrepancy between the conjunctive form of these sentences and their supposed subordinate structures. Such a rule would be without any independent motivation and would be hypothesized just for the

purpose of keeping the coordinate structure constraint.

### Conclusion

These considerations, taken together, provide overwhelming arguments against Jacobson's proposal.

### Acknowledgements

This paper was conceived during a discussion with John Goldsmith about examples like (2), and I am grateful to him for his assistance in thinking through these issues. I would also like to thank Claudia Brugman, William Eilfort, Michele Emanatian, Peter Farley, Charles Fillmore, Kiki Nikifouridou, Eve Sweetser, and Arnold Zwicky for their insights in discussing various issues. This research was supported in part by a grant from the Sloan Foundation to the University of California at Berkeley.

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