How Connectives Evolve in Natural Language

R. E. Jennings
Simon Fraser University
British Columbia, Canada

1 The Compositional Facts

Some weak version of the compositionality thesis is true of natural languages. On whatever account we give of meaning, the meaning of a sentence has something to do with the meanings of its component vocabulary together with its syntax. But everyone accepts that the connection between the two is a little murky. Which meanings elements of component vocabulary have must sometimes be gathered from an apprehension of syntax in the prosodic presentation. (Consider the difference between

1.1. What is this thing called love?

and

1.2. What is this thing called, love?)

Sometimes, prosodic clues having been missed, the determining syntactic judgement depends upon the comparative plausibility of the alternative construals, as in

1.3. I’ll have breakfast only if we are short of food.

Again, one might have thought that whatever such semantic problems arise arise in connection with notional vocabulary, that insofar as compositional problems arise for what is called logical vocabulary, they must arise through insufficiently marked syntax, that the semantics being fixed, ambiguities must be ambiguities of scope. But even that modest view cannot survive attention to human speech. We might read

1.4. It will be useful or it will be harmful

as a disjunction. But we would not give a disjunctive reading to

1.5. It could be useful or it could be harmful (Gilbert 1976, 187)

except under very unusual contextual pressure, and then we would be at a loss how to take the significance of the disjunction. Similarly,

1.6. The indictment was wrongly drawn or I could have flogged the man. (Hare 1946, 170)
In fact there is something unrealistically hypothetical and *ut nunc* about the usual basis for claims of compositionality. Some such principle is claimed to be required to explain our capacity to produce novel constructions in speech production and understand them in the speech of others. This may be so, but the fact is that in the course of a day, we neither produce nor process that many constructions, novel or otherwise. More importantly, such composition as does go on must in fact be an agent of meaning change. Else how, for example, did the word *internecine* come to have anything essentially to do with matters within a family, or *specious* anything essentially to do with spuriousness?

That notional meanings undergo changes is hardly news, though the details of these changes probably deserve more philosophical study and interest than they naturally excite. I confess that the general question has not yet crumpled my own lapels. What does seems to me to be fraught with deep consequences for our understanding of human intellectuality is this:

*All the connective vocabulary of any natural language has descended from lexical vocabulary, in most cases, from the vocabulary of temporal, spatial and other physical relationships.*

Thus, for example, the English *or* is a contraction of *other* (meaning *second*, as in *every other day*); *and* descends from the vocabulary of spatial boundary, *but* from *butan* meaning *outside*, if from the language of *doubt*. Much of the vocabulary retains non-logical physical uses (*since, then, therefore, yet, for, as*); some such as *or* has evolved a distinct morphology that has masked its provenance. That fact has philosophical significance beyond the trivial remarking of etymologies. If we think that every meaning is the meaning of something, then we will conclude from this that at least all naturally occurring logical meanings descend from non-logical meanings, and that human intellectual capacities that reveal themselves in propositionally expressed reasoning have their roots in the natural physical propensities of human and pre-human organisms.

As a topic of study, the descent of connective vocabulary from its physical forbears is called *logicalization*, in imitation of the related topic that linguists call *grammaticalization*, the process by which lexical vocabulary acquires functional uses (as the *have* and *will* auxiliaries in English tense structure, –*abo* and –*ibo* endings of Latin past and future verbs, and so on.) Logicalization, in being confined to connective vocabulary, is narrower in scope than grammaticalization, but it is also more protracted as a temporal development, since for much of the vocabulary, connective meanings continue to multiply, even post logicalization. Moreover, these diversities are, on the face of things, sufficiently systematic that any theory of logicalization with pretensions to completeness had better provide the means of explaining them. Now there is sufficient justification for a study of logicalization in its showing us things about our languages that we did
not know. The promise that, if it gets matters approximately right, its theoretical framework might shed light upon the origins of language, ought to earn it passive tolerance. But it will have more immediate philosophical cash value also, for if a plausible theory of logicalization individuates multiple meanings of connectives in virtue of its assigning them distinct causal histories, then the theory is at least a serious competitor with the Gricean theory that connectives have only one meaning, and that the apparent diversity is attributable to conversational implicatures. It will at any rate have provided an argument where Grice has provided none. For the sake of its immediate relevance to that familiar philosophical material I have chosen the topic of dualization as the main illustration of the theory.

2 Example: Dualization

Many connectives seem to acquire dual pairs of meanings, in something like the usual formal meaning of dual. Thus for example or has uses (in fact, comparatively rare) that are disjunction-like

2.1. Either Smith attended the meeting or Smith was not invited to the meeting. (Copi 1979, 37)

but also uses that are conjunction-like

2.2. There was scotch or vodka or crème de menthe. (Pym 1978, 143)

2.3. It might work or it might not. (Bingham 1955, 118)

But too has both conjunction-like uses

2.4. . . . the confidence trick is the work of man, but the want-of-confidence trick is the work of the devil. (Forster 1910, 41)

and disjunction-like

2.5. There was no vacant spot but it had to serve as a classroom. (Waugh 1919, 67)

Other, less familiar, kinds of dualities occur. For example, for sometimes means something like because

2.6. I thought of Kate, who would have nothing to look forward to, not even in twenty years’ time, for if I was found guilty I did not visualize a reprieve (Bingham 1952, 234)

and sometimes something like in spite of the fact that

2.7. I am not a very bad play-fellow . . . for all I am so much bigger. (Hunt 1840, 40)

And, besides its more usual conjunctive uses, has had conditional uses:

2.8. Nay, and you go conjuring, I’ll be gone (Marlowe, Faustus X, 76)
Though retains both conjunction-like

2.9. Though his face wore habitually an aggressive expression, it battled with a contrary expression of vacancy (Barnard 1990, 166)

and conditional-like uses

2.10. Though they sink through the sea they shall rise again (“And death shall have no dominion” (Thomas 1952))

That any has both universal-like and existential-like uses is evident from the ambiguous anaphora of

2.11. If any young person touches my whisky, I’ll know it

the it of which might have its reference made explicit by that that y.p. has touched my whisky or by that some young person has touched my whisky. Many other examples present themselves; some of them will be presented below.

3 The Evolutionary representation of meaning

To speak of dualization is to suggest that in each case one of the two meanings is both the temporal successor and in some way the consequence of the other. If a theory of meaning is to explain how the uses of one kind brings about uses of the other, it had better be explicit about what it takes a meaning to be, and it had better treat meanings as physical types. It is natural to put the fact of logicalization in evolutionary terms: logical meanings of connective vocabulary have evolved from non-logical meanings of ancestral vocabulary. The exploitation of evolutionary language requires further that meanings be treated as species. The question, species of what? would seem to admit of either of two kinds of answer: one that locates meanings on the speaker side of linguistic transactions, and one that locates it on the interpretive side. In general, both are parts of the reproductive cycle of meanings, since interpretations prompt uses which then occasion interpretations. But if the adopted framework is to enable us to say how meanings first emerged, then the matter had better be settled in favour of the interpretational stages. In fact, as I have sorted things, a meaning is a species of inferential effects, that is, effects that are available to the processes involved in the production of speech. It will do no harm to think of them, in the main, as species of inferences, provided that we think of inference in roughly its proof-theoretic sense, as licensed (or, if we make a mistake, unlicensed) processing. With the notion of species I have taken the habitual liberties of a formalist, and defined the term suitably to my purpose. I take a species to be the union of a set of populations temporally ordered by a relationship of engendering, later populations being engendered by earlier ones. Biological species also have incidental properties that we may expect meanings to share. First, a species is a non-classical set:
we will not expect that a meaning will partition the domain of discourse into the set of inferential effects that are elements of that meaning and the set that are not. Second, we will expect every member of a species to have ancestors that are not members of it. Third, we will expect the members of a species to have common morphological features.

The role of this idiom is of course not intended to be such that every correct explanation must have explicit recourse to it, but it does implicitly accept that correct explanations must be couchable in it. For the rest it is just a kind of conceptual map intended to maintain among other things a certain scale of inquiry. The question of scale is an important one, for I am not the first to propose the use of biological language in this domain. Some have suggested that a language might be regarded as a species of which idiolects are the members. I’m sure a map of that scale might be useful for some purposes, but I do not myself see how to tease useful causal explanations from it. The scale ought to tell us where else to rummage in biological theory for suitable language for our own account. Even in biology we are free to speak of species of organisms or species of DNA, and we can hardly speak of the one without speaking of the other, for in biological evolution of DNA we speak not only of the engendering of DNA with distinct components, but also of the engendering of DNA by changes through which old components acquire new significance in the development of the organism.

. . . during protein synthesis the reading of the genetic code starts from one end of the protein template and occurs in consecutive blocks of three bases. As a result, if a deletion or insertion occurs, the reading frame is completely upset. (Watson 1965, 291)

This is the scale at which any such theory must be applied to yield useful explanations of the evolved diversity of connective-meanings. Connectives have meanings (which is to say, they occasion inferential effects) as they occur in sentences. Sentences, like polypeptide chains, have a syntax, the construing of which determines the inferential effects of the connective. The construal is cued in part by prosodic and punctuational features that are dependent for their effect upon the presence and order of particular vocabulary and sentence length, as the weak interactions in protein synthesis depend for their effect upon the presence, orientation and alignment of molecules and the spatial constrictions of the nucleus. I do not want to make too much of these parallels. They are not an a priori wish-list of the hobby-equestrian. Although they are suggested by actual successes of the theory, I mention them here only to make clear the scale at which the theory is to be applied: that corresponding to the scale of cellular biology.

4 How connective meanings evolve

In fact the greater part of the logicalization story requires no such fine-grained theoretical framework for its telling. But it is worth summarizing a few elements of the story to set the later
part in a more general context. The list I give is by no means exhaustive. None of the requirements listed applies to all vocabulary, and all of them apply to vocabulary beyond the illustrations given.

### 4.1 Schematization

Physical adjectives and prepositions must lose their capacity to occasion highly particular inferences independently of context. For example the now almost extinct preposition *but* (‘but the house’) must come to depend upon highly specific contexts to prompt a reading as *outside*. It is a fair presumption that much of this work is done just by use. If we consider its *usative* extension, that is, the set of pairs of things of which it has historically been claimed that the one is *but* the other, that relation grows with every composition in which the word occurs, eventually including subrelations of non-geographical outsideness (social, conceptual, circumstantial, and so on).

### 4.2 Propositionalization

A thoroughly schematized relative adjective or preposition readily takes *that*-clauses. So we get such constructions as

4.1. ... fine ladies, who yet are really not so handsome generally as I used to take them to be, but that they are finely dressed (Pepys 1662-10-03)

4.2. ... not but that I am very well received (1662-10-03)

but also *for that, unless that, since that, without that* and so on. In some cases, we are taken only an ellipsis (of *that*) away from having a propositionalized sentence element.

### 4.3 Trivialization

Vocabulary (such as *as, so, how, the way, as well as, hardly, too*) that is naturally many-valued or continuously-valued, acquire specifically two-valued uses. Thus we get such constructions as

4.3. *How* Antonia could contemplate killing him was beyond belief (Lovesay 1989, 138)

4.4. I don’t like *the way* she helps other women but not her own sister.

4.5. ... he filled it up with his things, stacks and stacks of canvasses and frames *as well as* brushes and jars and dirty paint rags. (Rendell 1993, 152)
4.4 The Servian shift

I have named this shift to acknowledge an observation made by Servius, the fourth century Virgil scholar and grammarian: *Omne verbum, quum desinit esse quod est, migrat in adverbium* (Every word, when it ceases to be what it is, betakes itself among the adverbs.) It is the tendency for adjectives to acquire roles in which they act as adverbs, then adsentences and finally acquire *epiphrastic* uses, modifying sayings:

4.6. He was still
   He was still sitting at midday
   Someone was still killed (Bingham 1955, 179)
   Still, he did consent to sit

Much of the vocabulary that we think of conventionally as *logical* has epiphrastic uses that represent at least collateral developments along the Servian axis.

4.7. . . . he, Dr. Sowden, prospective snapper-off of life-support systems and generous dispenser of terminal tranquillizers, felt guilty. Or responsible. Or resentful. Or something. (Hill 1984, 18)

4.8. He gestured toward whisky on the table. ‘Pour your own. Or there’s beer in the fridge.’ (Symons 1973, 157)

In the case of *if* there are those (for example, Dorothy Edgington, 1990) who claim that its main uses are epiphrastic, but the inferential transparency of *and* actually delayed for a time its official elevation from punctuator to logical word.

Theoretic Auspices

When these epiphrastic uses are brought under the auspices of truth-conditionalist theories and attendant theoretic attitudes, these independent epiphrastic uses tend to be submerged. Punctuated multiple sayings with rightness conditions are treated as single sayings for which truth conditions must be sought.¹

4.5 Semantic Ecology: Diathesis

Biological species are relatively hardy through weather changes, but climatic changes can bring about changes. For meanings, short-term variability of contexts of use are like changes of weather. Long-term extensional enlargement is more like a gradual change of climate, eventual yielding more catastrophic background changes in the conditions of use that suggest abrupt

¹. This should not be construed as even a partial account of the emergence of truth-conditional *or* in English. But it represents as good a guess as any as to how disjunctive vocabulary emerged in ancestral human languages.
climatic changes. And as for biological species, sudden climatic changes can play a diathetic role, reducing the resistance of the species to other influences. So for example, the gradual schematizing of *but* eventually yields propositional uses that are susceptible to the changes that bring about the ME uses of the word. The fashionable ellipsis of *that*, represented a climate change by which relative adverbs and prepositions acquired the syntactic plumage and the susceptibilities of conjunctions. As a second example, it is worth mentioning that emerging meanings have knock-on effects for other vocabulary. Thus the emergence of new meanings of one piece of vocabulary constitutes a change of climate for meanings of others. Words that have shared earlier environments will tend to come to share later ones. *But* and *only* provide good examples of the phenomenon. We cannot be sure, but the development of adversative *but* seems to be implicated in this way in the emergence of the minutive uses of *but*. The progression may be illustrated, if not fully explained, by the substitutability of *only* for *but* in a wide range of adversative uses yielding a presumption of substitutability of *but* for *only* more generally. Consider, in this light, the trio: *She is not three, but two / She is not three, only two / She is but two*. The accustomed substitution of *but* for *only* yields epiphrastic uses of *only*

4.9. I would help you. Only I can’t stand up.

and others at first more puzzling:

4.10. Only for him the body might not have been found for days. (Crofts 1939. 103)

5 Mutations

5.1 Metanalysis

Jespersen (1922) introduced the term *metanalysis* as a label for a phenomenon in the process of word-formation.

> Each child has to find out for himself, in hearing the connected speech of other people, where one word ends and the next one begins, or what belongs to the kernel and what to the ending of a word, etc. In most cases he will arrive at the same analysis as the former generation, but now and then he will put the boundaries in another place than formerly, and the new analysis may become general. (174)

Thus we have *an umpire* from *a numpire*, *an apron* from *a naperon*, *a nickname* from *an ickname* and so on. In such cases the mutation comes about through a misapprehension of the divisions between words. Jespersen is rather vague in the matter of how such a mutated form survives, but we can note here at least the prime condition for such a survival, that the discrepancy between speakers and audience in alternating roles should go for a time undetected, and therefore that it should make no or sufficiently little difference in the satisfaction-conditions...
of sentences in which the discrepancy occurs. And of course, as the difference is undetected, the metanalytic population has a chance to become established.\(^2\)

New connective meanings are also produced by something akin to metanalysis but occurring at the level of syntax. The process is so strikingly like the phenomenon of molecular biology, that the new meanings are properly thought of as mutations of the old.

### 5.2 Dualization by scope-evasion

An historical example first. Logic texts, correctly, tell their readers to represent *unless*-constructions by disjunctions or by equivalent conditional constructions. But historically *unless* is a contraction of a longer phrase *on (a condition) less than that*, so that its meaning might be expected to be something akin to *without*. I do such-and-such on a condition less than that blah-blah if and only if I do such-and-such without it’s being the case that blah-blah. But the originating *unless*-constructions never occurred except within the scope of a negative, and was read (or, as we might say, *processed*) as though the negation attached only to the first component sentence. Since the satisfaction-conditions of the whole remained those of a long-scope negation on a *without* reading, the *unless* was, in effect, processed as though it had been an *or*, and passed with that reading into negation-free environments.

In the case of *unless*, the primary conjunctive reading has been lost, but for some other logicalized and prelogicalized vocabulary, both the original meaning and the dualized mutation persist. *Without* is an example. Contrast the sentences

5.1. She’ll die without help

and

5.2. She’ll die without betraying her lover

We naturally read the first as meaning that *if* she receives no help, she’ll die. But we read the second as meaning that she’ll die, *and* will *not* have betrayed her lover. The second represents the historically primary meaning of *without*; the second a dualized mutation. But note that if we rewrite the former as

5.3. She won’t live without help

we could give the *without* either reading provided that the scope of the negation is suitably fixed. For reasons that should now be apparent, I have called this development *scope evasion*. Both

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2. Canadian English furnishes an charming example of metanalysis. The drawing up of a writ is a constitutionally dictated preliminary to the holding of an election. The *draw up* of the formulaic announcement has been heard as *drop*, with the result that it is now standard usage to speak of the Prime Minister as *in course of dropping the writ* or as having *finally dropped the writ*. The absurdity of the construction is evidently sufficiently masked by the presumption of antique obscurity that attends parliamentary language generally.
negations and modals are implicated in the observed cases. But modals seem to have played the more important role in the dualization of *but*. In this case, it is the conjunctive uses that emerge as the dualized mutations of the disjunctive ones. The point is best seen by considering a transitional example

5.4. This stagnation of our manufacturing trade would have put the people there to much greater difficulties, but that the master-workmen, clothiers and others . . . kept on making their goods . . . (Defoe 1722, 251)

Simply consider on the one hand the approximate equivalence of two readings: one with long-scope *would have* and short-scope disjunctive *but*, the other with short-scope *would have* and long-scope conjunctive *but*, and on the other the relative ease with which the sentence would elicit the latter reading upon ellipsis of *that*.

### 5.3 The stages of mutation

I have given a few examples of what appears to have been a relatively common development in the evolution of English connectives. In most of the cases I have examined, there seem to be five discernible stages in the generation of dualized meanings by mutation. I summarize them here. In the following, population A of language users overlaps the later population B.

1. At stage one is the initiating scope misapprehension (by members of population B), typically involving negative and modal sentence elements (in the speech of population A), with the resulting combination of approximately correct (or at least indetectably incorrect) apprehension of satisfaction conditions on the one hand and undetected incorrect processing of syntax on the other, that forces an incorrect (or at least novel) apprehension of connective meaning.

2. At stage two, the novel meaning in the B use of the connective is nurtured by the fact of its uses coinciding in satisfaction conditions with A uses. Since at this stage the new meaning may be thought of as lying beneath the old, I have called it the *succubinal* stage.

3. At stage three, the connective in its novel meaning appears in environments in which it is not hidden by the older one. But there is a sufficient B population that the use is not corrected, and members of the A population read it as satisfaction conditions seem to dictate. I call this the *migratory* stage.
4. At the fourth stage, the B meaning is sufficiently established that when the connective occurs in the environments that spawned the new meaning, it is ambiguous as between A and B readings. I call this the *ambiguity* stage.

5. At the fifth stage, the ambiguity is removed by a marking of the new meaning either prosodically or by the addition of elements that cue the B reading where it is wanted. This is the marking stage. Thus we have *for all, just any* and so on.

Such markings are evidence of mutated meanings, but even with explicit markings some such meanings are never quite independent of the environments that spawn them. Thus universal *any* favours negative polarity and modal environments, and so on.

**5.4 A final example: Dualized *If***

As I final illustration, we should notice that *English* has a dualized *if*. The diathetic condition that rendered propositional *if* susceptible of this kind of mutation seems to have been the difficulty in English of negation-placement in *if*-constructions, and possibly the obscurity of satisfaction conditions for conditionals, an obscurity inherited by their denials. In general, dualized *if* can be marked by *even*, but it is as frequently marked only prosodically. The A *if*, we think of conveniently as the *sufficiency if*. The B *if* we can label the *insufficiency if*. The two following examples illustrate them in that order. Contrast

5.5. If he wins the lottery, he’ll be Miserable
(Winning will make him miserable)

with

5.6. If he wins the LOTTERY, he’ll be miserable
(Winning won’t cure his misery)

Even in their material representation, the two are distinct, the material representative of the latter being deductively stronger than that of the former. That is:

\[ \neg (\alpha \rightarrow \neg \beta) \models_{pl} \alpha \rightarrow \beta \]

but

\[ \alpha \rightarrow \beta \not\models_{pl} \neg (\alpha \rightarrow \neg \beta). \]
The conjectured origin of this *if* is the misapprehended scope of a negation placed in the main clause as if in

\[\text{5.7. I wouldn’t do that, if the QUEEN (herself) asked me.} \]
\[(\text{Her asking me would be insufficient})\]

a short-scope sufficiency *if* with long-scope negation (*n’t*) is read as a short-scope negation with long-scope *if*. The satisfaction-conditions being kept constant, the *if* must be given an insufficiency reading.

The dualized, insufficiency *if* (sometimes marked as *even if*, sometimes only prosodically) has, from a formal point of view, the appearance of a sort of hybrid. Since English sufficiency conditionals distribute conjunctively over a disjunctive *if*-clause, a negated conditional ought to be read as a disjunction. But insufficiency conditionals also distribute conjunctively over disjunctive *if*-clauses. So, for example,

\[\text{5.8. If the King OR the queen asked me I wouldn’t do it} \]

will be read as

\[\text{5.9. If the K. asked I wouldn’t, and if the Q. asked I wouldn’t} \]

but does not commit us to:

\[\text{5.10. If the King AND the queen asked me I wouldn’t do it} \]

since though they might be insufficient severally, their requests might be jointly sufficient. So dualized *if* is left-downward non-monotonic.

### 6 Concluding Remarks

As may be imagined, this area of study is one in which many details must find their proper places. So short a presentation as this can be no more than a scratch-and-sniff sampling of a few illustrative cases. I have hinted at a small part of the story for English, and said nothing of other languages, where the story will almost certainly differ and where a comparative study might reveal a good deal. I suspect that for much of the connective vocabulary of any language, that is how to understand it; truth-conditional semantics even supplemented by theories of implicature is not. I suspect as well that new puzzles of translation arise out of the facts of logicalization. Again, though the connection can hardly be explained here, my own interests in the study of logicalization are inseparable from interests in automated model-based diagnostics for industrial and medical applications. Finally, it is worth exposing a strengthening conviction that a causal theoretical framework that successfully explains how logicalization works is plausible as a good framework within which to ask other questions: how ethical language has evolved from non-
ethical language, how psychological language has evolved from non-psychological language, and questions concerning the earliest developments of language itself. If meanings are causal relationships, they are causal relationships that themselves have causal histories. Some of these histories we have just glimpsed. But not all causal relationships are meanings, and all of those that are have ancestors that are not. So the question about the emergence of language is this: how did those that are not engender those that are?

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**Contents**

1 The Compositional Facts ............................................................... 1  
2 Example: Dualization ................................................................. 3  
3 The Evolutionary representation of meaning ...................................... 4  
4 How connective meanings evolve .................................................. 5  
   4.1 Schematization ........................................................................ 6  
   4.2 Propositionalization ............................................................... 6  
   4.3 Trivialization .......................................................................... 6  
   4.4 The Servian shift ................................................................. 7  
   Theoretic Auspices ...................................................................... 7  
   4.5 Semantic Ecology: Diathesis ..................................................... 7  
5 Mutations .................................................................................... 8  
   5.1 Metanalysis ........................................................................... 8  
   5.2 Dualization by scope-evasion ................................................. 9  
   5.3 The stages of mutation ......................................................... 10  
   5.4 A final example: Dualized *If* ............................................. 11  
6 Concluding Remarks .................................................................... 12