

Entailment in Meaning
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ABSTRACT

The paper aims at shedding light on the most important aspects of entailment. The term 'entailment' was originally derived from logic into linguistics. It refers to a semantic relation between a pair of sentences.

It has been concluded that the logical nature of entailment did not disappear when entailment became a linguistic concept. It has also been concluded that pragmatics makes its positive interference with entailment. The two sentences that entail each other are supposed to be synonymous to each other. However, This cannot always be the case when the two sentences are uttered in different contexts of situation to serve different pragmatic purposes.

Introduction

The truth relation, that an adequate semantic theory must explain, is entailment. Entailment is also considered to be the most central truth relation in semantics. It is a type of semantic dependence that holds between one sentence and another. One sentence can entail another one when the truth of the first guarantees the truth of the second. Moreover, the falsity of the second guarantees the falsity of the first. For example:

- 1- The stick is too short. entails
- 2- The stick is not long enough. entails
- 3- The cloth is purple. entails
- 4- The cloth has a colour.

It is clear that (1) and (3), if true, guarantee the truth of (2) and (4) respectively; and the falsity of (2) and (4) guarantees the falsity of (1) and (3) respectively.

The present paper aims at shedding light on the most important aspects of this essential semantic concept. It mainly represents a theoretical review of literature related to the concept in question. In the major number of the references consulted, the authors have always tried to talk about entailment in relation to other linguistic concepts in general and semantic concepts in particular. The writer has avoided this type of presentation because the genuine aim of this paper is to give a full and clear exposition of entailment for its own sake.

One exception of this avoidance lies in the third section in which the application of entailment in semantics, in relation to three other concepts, has been discussed.

SECTION ONE WHAT ENTAILMENT IS

The term 'entailment' was derived from formal logic. Now it is used as part of the study of semantics. Entailment can be defined as 'a relation between a pair of sentences such that the truth of the second sentence necessarily follows from the truth of the first...' (Crystal, 1985 : 109). Akmajian et al (1977 : 231) agree with this definition. They also add that the falsity of the second sentence follows from the falsity of the first one. For example :

- 5- A : The earth goes round the sun. entails
B : The earth moves.

The entailments of a declarative sentence can be the set of propositions "that can be inferred from it in isolation from any context" and that must be true whenever the sentence itself is true. The entailment of a certain sentence expresses part of its semantic analysis ... (Smith and Willson, 1979:150-151).

It is said that A entails B only when B is derived from A. It is also said that the proposition expressed by A entails the proposition expressed by B. Thus, entailment is a relation between a proposition and its counterparts (van Dijk, 1977:23-28).

Ayer (1971:80) agrees with van Dijk (1977:23). He also adds that a proposition C is said to be derived from a proposition D when the denial of C contradicts the assertion of D.

Bates (1976:20) believes that the entailed meaning forms one part of the information available in a given sentence. The other parts being the asserted meaning and the presupposed meaning⁽¹⁾.

The asserted meaning of a sentence helps the reader to deduce a certain information. For example:

- 6- Ann has a brother.
Our knowledge of the meaning of the word "brother" enables us to construct the paraphrase:
7- Ann has a male sibling.
Both (6) and (7) above make the same assertions because the negation of (6).
8- Ann does not have a brother.
Requires the negation of (7):

9- Ann does not have a male sibling.

Bates (ibid:21) formalizes the discussion above in the following way:

T (6) → T (7) }⁽²⁾
 T (6) → F (7) } Assertion

In addition to the information that is deduced by the asserted meaning, one can deduce further information by the entailed meaning such as:

10- Ann's parents had more than one child.

Sentences (6) and (10) assert different propositions because even if sentence (6) is false, sentence (9) can still be true. For example, Ann may have twelve sisters even though she has no brothers. Thus, we can say that the truth of sentence (10) is entailed by the truth of sentence (6), but not asserted by (6).

Accordingly, in a given sentence, if Y is entailed by a sentence X, then Y is true if X is true, but Y is not necessarily affected if X is false.

SECTION TWO THE DERIVING MECHANISMS OF ENTAILMENT

Smith and Wilson (1979:159-160) proposed certain mechanisms to obtain the set of entailments of a sentence. One may perform an operation on the surface structure of a sentence to get the entailments of that sentence. For example, in sentence (11).

11- John stole three horses.

We can make a substitution by an appropriate indefinite phrase⁽³⁾, such as 'someone', 'something', 'do something' for each constituent of the surface structure of (11).

12- A : Someone stole three horses.

B : John did something to three horses.

C : John stole some number of horses.

D : John stole three things.

E : John stole something.

F : John did something.

G : Something happened.

The above are all entailments of (11) Which are obtained by substituting indefinite phrases for the constituents of (11). Smith and Wilson (Ibid) call these entailments 'the grammatically specified entailments' of a

sentence . These entailments play an important role in the semantic analysis and pragmatic interpretation of the sentence.

To consider the set of entailments, we can see that (12) A is obtained by substituting the indefinite phase "someone" for the noun phase "John". (12) B substitutes the indefinite phase "did something to" for the verb "stole". (12) C substitutes the indefinite phase "some number of" for the quantifier "three". (12) D substitutes the indefinite phase "thing" for "horses". (12) E substitutes the indefinite phase "something" for the noun phase "three horses". (12) F substitutes the indefinite phase "did something" for "stole three horses". (12) G substitutes the indefinite phase "something happened" for the sentence "John stole three horses".

Thus, each one of the entailments in (12) is the result of a substitution operation on the surface syntactic structure of (11).

However, there is the question of how can we decide which is the suitable indefinite phase to substitute for a given surface constituent? For example, how did we decide that "some number of" was the suitable indefinite phase to substitute for the quantifier "three"? Smith and Wilson (ibid :160) produce a rough answer to this question which they consider to be an untrivial one . The statement in (11), with stress on 'three', would be an acceptable answer to the following:

(13) How many horses did John steal?

The question above is semantically connected to

(12) John stole some number of horses.

Any acceptable answer to (13) must itself entail (12) C since (12) C, in some sense, specifies the range of acceptable answers to (13). Therefore, (11), which entails (12) C is an acceptable answer to (13).

This shows that determining the suitable range of indefinite phrases to associate with a given sentence is obtained by considering the range of questions to which it would be an acceptable answer. These questions themselves are semantically connected to sentences containing the suitable indefinite phrase for substitution, as (13) is semantically related to (12) C.

In the same way, (11) with stress on "John" would be an acceptable answer to (14) A which is itself semantically related to (14).

(14) A: Who stole three horses?

B: Someone stole three horses.

SECTION THREE ENTAILMENT IN MEANING

Synonymy is a major term in semantics which refers to a type of sense relation between lexical items that have relatively the same meaning. Synonymy occurs between / among items when these items are close enough in meaning that a choice can be made between them in some context (Smith and Wilson, 1979: 152).

If two sentences have exactly the same set of entailments or entail each other, they are synonymous. For example, (15) and (16) are synonymous since they entail each other.

(15) John and Mary are twins.

(16) Mary and John are twins. (Ibid)

Contradiction, like, synonymy, is a term in semantics which refers to a type of sense relation between lexical items. But the lexical items here display oppositeness in meaning. When a sentence entails the negation of another sentence, the two sentences are said to be contradictories. Thus, (17) and (18) are contradictories.

(17) No one has led a perfect life.

(18) Someone has led a perfect life.

Similarly, a single sentence is a contradiction when it has contradictory entailments. For example :

(19) ? I have no brothers, but my elder brother is tall.

(20) A: I have no brothers.

B: I have a brother.

Entailment interereres in the propositional analysis of sentences by the concept of contradiction. A sentence may be analytic or analytically true if its denial entails contradiction⁽⁴⁾. For example :

(21) A spinster is a woman.

(22) A spinster is not a woman.

Intuitively speaking, (22) is a contradiction. If we look at it from the point of view of our definition above, we need to look at the entailments of this denial.

As far as our definition is concerned, if (22) is a denial, it must carry contradictory entailment.

(23) An unmarried woman is not a woman.

It is fairly easy to see that (23) entails (22); whenever (22) is true, (23) must also be true. Thus, by the definition of entailment, it follows that (22) entails (23). Then, by the definition of analyticity (21) is analytic.

Another interference of entailment in meaning is in the notion of ambiguity⁽⁵⁾. It is possible to say that the denial of an ambiguous sentence entails non-contradictory results. For example,

(24) I felt myself

We can put a denial for this sentence in this way:

(25) I felt myself, but I didn't feel myself.

This denial, in its turn, entails a non-contradictory result in relation to the ambiguous sentence. These entailments are as follows:

(26) I felt the way I normally do.

(27) I did not run my hands over myself.

Thus, as far as our definition is concerned, sentence (24) is an ambiguous one (ibid :153-154).

Entailment can be defined in terms of hyponymy. It is possible for one assertion to entail another if the two assertions differ only in the substitution of a hyponymy for a superordinate term. For example :

(28) The secretary is a man. Entails

(29) The secretary is an adult.

(Leech, 1974: 104)

Leech (ibid:147) puts down a rule of entailment in relation to hyponymy. The rule state that:

[A] relation of entailment arises between two assertions whenever ... an argument or a predicate in one assertion is hyponymy to an argument or predicate in the other.

It is worth saying here that the term "argument" refers to "any NOUN PHRASE POSITION within a sentence "whether subject, object or anything else (Crystal, 1985 :22). The term 'predicate'⁽⁶⁾ refers to the obligatory elements of a sentence other than the subject. For example, the sentence 'Jhon kicked the ball' is seen as subject (John)+predicate construction (ibid:241).

Following the rule of entailment in relation to hyponymy, we can say that sentence (30) entails (31):

- (30) I saw a boy . entails
 (31) I saw a child .

The only difference between these statements is that one of the arguments in (30) (the object) is hyponymous to the corresponding argument of (31). The predicates of two statements can also be hyponymous. For example:

- (32) Mikle stole a horse. Entails
 (33) Mikle took a horse.

The word 'stole' is a hyponymy of 'took' just as 'boy' is a hyponymy of 'child' (Leech, 1974:137).

In relation to hyponymy, entailment works in two different directions, i.e. whether the assertions are of specific or general meaning. For example:

- (34) The children were eating apples . entails
 (35) The children were eating fruit

In the example above, the assertion containing the hyponym entails the one with a superordinate, i.e. a movement from specific to general. In example (36):

- (36) Children are naughty . entails
 (37) Boys are naughty.

Entailment works for hyponymy of argument; 'children' and 'boy' are co-hyponyms of the superordinate term 'humans' (Ibid).

These rules of entailment are, in fact, wider and more powerful in their application than they seem to be. Leech (Ibid :138-139) has mentioned two separate points to show this fact :

1- These rules apply to all type of predication⁽⁷⁾

- a- No – place predication. For example :
 (38) Freeze ! entails
 (39) Don't move !

- b- One – place predication . For example :
- (40) This paint is scarlet. Entails
 - (41) This paint is red .
- c- Two – place predication. For example :
- (42) Living creatures need gas. Entails
 - (43) Humans need oxygen .
- 2- These rules of entailment apply no matter what the order of elements come in.
- (44) Children like presents. Entails
 - (45) Presents please boys.
- 3- The relation of hyponymy is not restricted to single words . It can also hold between a word and a phrase or between a phrase and a phrase. Therefore, the entailment rule can be applied to cases where the difference between the two assertions is marked by the addition of a single word or a phrase rather than substituting one word for another . For example :
- (46) A: Albert is lean , melancholy, poetry – loving barigadier. entails
 - B: Albert is a melancholy barigadier . entails
 - C: Albert is a barigadier. entails
 - D: Albert is an army officer .
- 4- The rules of entailment apply in a transitive way as follows:
"If X entails Y and Y entails Z, then X entails Z"
- (47) X: Boys ran down the street. entails
 - Y: Boys went down the street.
 - Y: Boys went down the street. entails
 - Z: Children went down the street.
 - X: Boys ran down the street. entails
 - Z: Children went down the street.

It is clear that the rules of entailment are wider and more powerful than they seem to be. In addition , they provide us with an adequate analysis of predications into arguments and predicates.

SECTION FOUR ADVANTAGES OF ENTAILMENT FOR LINGUISTICS

If the meaning of a sentence is considered to be the set of propositions it entails, there will be certain advantages for linguistics (Smith and Wilson, 1979:151):

- 1- It is possible to know the reason behind the fact that when a speaker utters a sentence , he commits himself to a large number of propositions, i.e. to the truth of every thing it entails. He cannot assert the sentence and deny one of its entailments.
- 2- The concept of entailment is well advanced within philosophy and logic . Thus, if the linguists take over this concept, much of their work will be done for them. All what remains for the linguists to do is to establish certain rules that relate the sentences of natural language to the semantic sets of entailment.
- 3- The concept of entailment provides definitions for essential semantic terms and relations which any grammar should be able to construct. Using the basic definition of entailment is a guide for providing definitions for many fundamental semantic terms within the semantic component of grammar.

SECTION FIVE PROBLEMS OF ENTAILMENT

In spite of the importance and advantages that entailment has, there are slight problems that one may face when dealing with the concept in question. Before pointing these problems out, it is important to say that they do not affect the usefulness of entailment for linguistics in general and semantics in particular.

It has already been mentioned in section three that the sentences, which have the same set of entailments, are considered to be synonymous. However , there are cases where two sentences share the same entailments, but are not synonymous. For example :

- (48) Jáne spoke to Alex.
(49) Jane spoke to Aléx.

These sentences share the following entailments:

- (50) Someone spoke to Alex.
(51) Jane spoke to Someone.

However, these entailments play different pragmatic roles when (48) and (49) are uttered in context. Sentences, that are true in exactly the same set of contexts, can also be appropriate to other different contexts (Smith and Wilson, 1979:154).

It is worth mentioning here that the above claim does not prove that (48) and (49) are semantically distinct. In stead, we can say that the two sentences that share the same set of entailments can behave differently when uttered in context.

It is clear that the theory of entailment raises a problem in that it does not take account of the fact that certain of the entailments of a sentence can be appropriate to context different from the one in which the sentence is uttered.

Another problem that the theory of entailment raises is that it confuses the logical inference of a sentence with the rules of semantics. As mentioned above, the entailment of a sentence forms part of its meaning. However, there are many propositions, which are intuitively felt not to be part of its meaning. For example:

(52) Bloomfield was a linguist.

(53) Bloomfiel was a linguist and Hardy was a novelist.

We can see that (52) entails (53). According to the theory of entailment, the meaning of (53) is included in the meaning of (52). Intuitively speaking, this is wrong. In stead, the meaning of (52) is included in the meaning of (53) and not the reverse (ibid: 156).

Thus, it is clear that one has to distinguish between the rules of logical entailment in general and the rules of semantic entailment in particular. Accordingly, a distinction has to be made between semantic and logical rules. In this way, there may be logical entailments that are not obtained by the application of any semantic rule. It is by logical rule, rather than by semantic rule, that (53) is obtained from (52) (ibid: 170).

This argument comes with the result that (53) does not from part of the semantic analysis of (52) even if one may be obtained from the other by logical rule.

CONCLUSION

Entailment is related to semantics and semantics is one level of linguistics. Then, entailment is related to linguistics. In fact, entailment is derived from logic into linguistics. However, the scientific nature of linguistics could not dominate the intuitive features that logic left on entailment. Intuition and logic are always there to guide entailment toward its aims. The logical nature of entailment did not dissolve when entailment became a linguistic concept. This belief is clear when the confusion between the semantic rules and logical rules of entailment has made a problem. The matter is settled when a sharp line of demarcation has been drawn between the rules of semantics and those of logic.⁽⁸⁾

In addition to logic, pragmatics makes its positive interference with semantics concerning entailment. We have already seen in section three that the two sentences that have the same set of entailments or entail each other are synonymous. In section five we have found that the statement above is not always true. There appeared to be instances in which such two sentences are not synonymous. When they are uttered in different context of situation to serve different pragmatic purposes. This reminds us of Wittgenstein's famous slogan: "meaning is use."⁽⁹⁾ Utterances⁽¹⁰⁾ can have meaning and explicability according to the situation and activities in which they are used.

NOTES

- 1- The presupposed meaning requires that if the sentence A is false, the sentence B must be false. For example:
 - He has quitted smoking.
 - Presupposes that.
 - He has smoked.
- 2- The double – shafted arrow symbolizes entailment. The letter T symbolizes the word 'truth' and the letter F symbolizes the word 'Falsity'.
- 3- The term 'phrase' is used here regardless of the difference between a phrase, which does not contain a finite verb, and a clause, which contains a finite verb.
- 4- An analytic sentence 'is one whose grammatical form and lexical meaning make it necessarily true' (Crystal, 1985:16).
- 5- A sentence is said to be ambiguous when it has more than one distinct meaning (Crystal, 1985:15).
- 6- Though the two terms; 'predicate' and 'predication' are interrelated, there is a crucial difference between them. On the one hand, 'predicate' is the semantic correlate of the term 'verb'. On the other hand, 'predication' is the semantic correlate of the term 'sentence' (Leech, 1974:135).

BIBLIOGRAPHY

Akmajian, A. et al (1997) Linguistics : An Introduction to Language and Communication New York : MIT press.

Ayer, A. J. (1971) Language : Truth and Logic London : C. Nichollas and Company L. T. D.

Bates, E. (1979) Language & Context New York : Academic Press.

Clark, H. H. & Clark, E. V. (1977) Psychology & Language New York : Harcourt Brace Jovanovich, INC.

Crystal, D. (1985) A Dictionary of Linguistics & Phonetics New York : Basil Blackwell Ltd.

Van Dijk, T. A. (1977) Text & Context; Exploration in the Semantics and Pragmatics of Discourse London : Longmen.

Leech, G. (1974) Semantics. London : Penguin .

Lévinson, S. (1983) Pragmatics Cambridge: Cambridge University Press.

Lyons, J. (1981) Language and Linguistics London: Oxford University Press.

Palmer, F. R. (1981) Semantics Cambridge: Cambridge University Press.

Smith, N. & Wilson, D. (1979) Modern Linguistics The Results of Chomskv's Revolution London : Penguin.

NOTES

- 1- The presupposed meaning requires that in the sentence A is false the sentence B is false. For example:
• He has written something.
• The president has died.
He has written the ...
- 2- Recently, emphasis is contrasted with presupposition.
- 3- The double-headed symbolizes contrast, the letter T symbolizes the word "and" and the letter F symbolizes the word "or". The letter H symbolizes the difference between a finite verb and a finite verb and a clause, which contains a finite verb.
- 4- An aphoristic sentence is one whose grammatical form and lexical meaning are identical. (Crystal, 1981, p. 102).
- 5- A sentence is aphoristic when it has more than one meaning. For example:
• Though the egg is broken, the chicken is still alive.
• The relationship between them. On the one hand, the relationship is a relationship of the term "egg". On the other hand, the relationship is a relationship of the term "chicken". (Crystal, 1981, p. 102).