Worlds in Contrast

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1. Comparison as a basic mental operation

Comparison is a type of mental operation which is presumed to be exploited in our perceiving and understanding of the world. It might be simply explained as an action in which two entities are matched with respect to their common feature and judged either the same or different. The same process is also assumed to be widely performed in our interpretation of discourse. One such case is when the interpreter notices the presence of logically opposite propositions in the same text. On some occasions they are explicitly realized as sentences in the text and on other occasions they are implicit and must be inferred in various ways by the interpreter. Identifying them in the text somehow, he is also postulating the two possible worlds in which each proposition is accommodated. Unless the two worlds are established, the logically opposite propositions cause contradiction and he cannot find the whole text consistent. The process in which he recovers the two possible worlds and the logically opposite propositions from the text might be described as the following comparative operation:

The world X and the world Y negatively compare with respect to the proposition p: in the world X, p is true, whereas in the world Y, not-p is true.

The notion of the world in which a proposition is asserted is based on the view that propositions can be assigned their truth value only when they are asserted in some possible worlds.[1] Therefore, the logically opposite propositions — whether they are realized as sentences or inferred from the sentences in the text — are necessarily evoked with some specification of the worlds in which they are (presumed to be) asserted. Although this approach towards

the analysis of discourse is closely related to the syntactic or semantic study of negation inasmuch as the logically opposite sentences or propositions must be clearly defined, it is beyond or different from such kinds of study in that the emphasis is placed on the contrast between the worlds as well as the oppositeness of the sentences. It might be possible to pick a sentence out of some text at random and make up another sentence which is contradictory or contrary to it. This made-up sentence, however, is totally a logical product and does not play any particular role in the development of the text since it is not asserted there. The logical opposition with which we are concerned here is that between two propositions which are asserted or taken to be asserted in contrasting worlds of the same text. These points will be more graphically explained with some examples in the following section.

2. World-defining factors

In this section are presented some examples of the text in which we could presume the mental process of comparison to be in operation. It is easy to negate (1)a and get its logical opposite (1)b:

(1) a   We stopped working at teatime.
     b   We didn't stop working at teatime.

As was mentioned in the previous section, however, we are not concerned with this type of negation: the two sentences are not functioning in the same text. Instead, we are interested in the opposition between the two implicit propositions which are retrievable from (1)a:

(1) a'   We were working (up to teatime).
     a''   We were not working (during / after teatime).

We could regard the divisions of time shown in the parentheses as the worlds in which each proposition is asserted. The two propositions are functioning together for the interpretation of (1)a. We can usually see similar kinds of contrast between two spatiotemporal worlds underlying so-called change-of-state

verbs such as *stop*. (2)a is another example which shows a case of implicit negation:

(2) a The party was awful, and I wished I had never gone to it.

    b I didn't go to the party (in a hypothetical world).

    c I went to the party (in the real world／in reality).

In (2)a the contrast between two worlds is based on modality. The logically opposite propositions and the worlds in which they are asserted are shown in (2)b and (2)c. In (3)a the opposite propositions are more explicit:

(3) a Whereas Tom believes that their father is still alive, Mary believes that he has long been dead.

    b Their father is alive (in Tom's belief).

    c Their father is not alive (in Mary's belief).

In (3)a, the worlds in contrast are different beliefs of two persons *Tom* and *Mary*. The contrast in this case, therefore, has interpersonal quality and the persons to whom each proposition is ascribed represent the possible worlds.

    Seeing a person as a kind of world has a great significance since any proposition can ultimately be attributed to the encoder or the speaker of the text. In other words, the specification of the world in which a proposition is asserted always includes the encoder as one of its most general factors. This might be shown by rewriting (2)b and (2)c as follows:

(2) b' I didn't go to the party (in the hypothetical world perceived in my mind).

    c' I went to the party (in reality perceived in my mind).[2]

Furthermore, if we extract the temporal concept of the past tense from the propositions of (2)b' and (2)c' as another factor specifying the worlds, we now attain the worlds defined with respect to three factors:

   (2) b'' I don't go to the party (in the past in the hypothetical world per-
        ceived in my mind).
      c'' I go to the party (in the past in reality perceived in my mind).

Thus, the worlds which are compared in our interpretation of each example
seem to differ in the degree of their specification. In this essay, I refer to the
factors which specify the worlds as **world-defining factors**. Although there ap-
pear to be several of them which play the most basic role in the context-
ualization of the sentence, for the moment, I cannot tell either how many
such factors should be posited in order to explain various patterns of compari-
son or how systematically they interact with each other in the construction
of the world. It is unlikely that the set of all world-defining factors are rele-
vant in each case to the specification of the world as in the manner shown in
(2) b'' and (2) c''. It is more plausible to think that the number of factors nec-
essary to see the contrast and the degree of the specification of the worlds
vary from context to context.

3. The comparative structures

    From the various examples in the previous section, we know that the
kind of mental operation we are talking about is related to a very wide range
of grammatical and discourse units. Sometimes, it is related to our under-
standing of a single lexeme such as *stop*, and on other occasions, it incorpo-
rates even the speaker of the sentence as a factor of contrasting worlds. For
instance, see the following conversation between two persons:

   (4) A : You're wrong.
      B : I'm not !

In this case, the operation includes as the world-defining factors the partici-
pants of the conversation or their different ways of perceiving the fact.
    Heterogeneous as the units we are dealing with may be, we can express,
in every case, the contrast being made as that between the two **comparative
structures** shown below as (5)a and (5)b :

(5) (World-defining　(Assertional　(Propositional
　　　　element)　　　element)　　　　element)
　a.　In the world X　　it is true　　　　p
　b.　In the world Y　　it is true　　　not-p

These structures reflect our principle that a proposition can be asserted (or given some truth value) only in some specific world or context. The assertional elements of the structures function as the link between the other two elements just as the copula *be* between the subject and the subject complement. Just as we say a predicate is "affirmed" of the subject, we say a proposition is "asserted" in the world. In (5)a, for instance, the proposition p is asserted in the world X, whereas in (5)b, not-p is asserted in the world Y.

We also have a case where a proposition is "denied" in the world, just as a predicate is denied of a subject. It might be expressed in the structure below:

(6) (World-defining　(Assertional　(Propositional
　　　　element)　　　element)　　　　element)
　　In the world Y　　it isn't true　　　p

This structure means that no link can be established between the proposition p and the world Y. The relationship between (5)b and (6) corresponds to that between **predicate term negation** (e.g. Mary is unhappy) and **predicate denial** (e.g. Mary isn't happy) for a sentence (e.g. Mary is happy).

An important point to be noted is that the three elements are determined case by case according to the on-going context. Unlike grammatical structures of the sentence, the comparative structure comes into operation only when the interpreter tries to compare the two sentences in order to recognize some meaningful contrast between them. The context-dependent features of the comparative structures might be better understood in the following examples. (7) was made up for this purpose:

(7)　I remember it was raining in Osaka.

If (7) is uttered, on its own, simply to report the fact, there might be no necessity for the interpreter to analyze it in terms of the three elements. If it is followed by (8), however, the comparative structure comes into operation:

(8)   But according to my diary it was fine there.

Now we have the two worlds, *my memory* and *my diary*, to be compared with respect to the proposition *it was raining in Osaka*. However, (7) is analyzed differently if it is followed by (9) instead of (8):

(9)   Usually it doesn't rain there, you know.

Here, the opposite propositions might be regarded as tenseless, and the worlds in contrast might be represented by some duration of time in the past and much longer duration of time including the time of utterance and future. Thus, the same sentence might be analyzed differently with respect to the three elements, and the degree of their specification also differs from context to context.

It is possible that the interpreter finds it difficult to identify what should be compared without enough contextual knowledge. For example in (10), the interpreter might not be able to see any meaningful contrast or might be totally perplexed:

(10)   I remember that it was raining in Osaka. Tom wrote in his diary that it wasn't raining in Kyoto.

His frustration will disappear when he finds that it was, actually, preceded by other sentences as in (11):

(11)   I want you all to find out in which cities in Japan we had rain on that day. I remember it was raining in Osaka. Tom wrote in his diary that it wasn't raining in Kyoto. Now, go on.

Thus, the comparative structures are totally context-dependent. This does not mean that we cannot say anything concrete about them. There appear to be several linguistic phenomena which play an essential role in this type of operation. For instance, there are many lexical items which seem to contribute to the establishment of contrasting worlds in discourse. By means of observing how they behave in this respect, it might be possible to define some systematic relationship between possible or impossible pairs of worlds which are established in this basic mental process. In the rest of this essay, I will attempt to define some types of such regularity.

4．Factive verbs

When we recognize opposite propositions in the same text, we need to establish two different worlds. For this purpose, the different sources of the propositions often play an important role as the world-defining factors. In (3), for example, *Tom* and *Mary* were the factors to distinguish between two beliefs. Under a certain condition, however, the personal factor is not strong enough to distinguish the worlds by itself. This point might be seen in (12):

(12) a ＊ Whereas Tom *knows* that their father is still alive, Mary *knows* that he has long been dead.

    b ＊ Tom *was aware* that Mary was at the party. On the other hand, Henry *realized* that Mary wasn't at the party.

    c ＊ Tom *is glad* that Mary has got the job. But she has not got the job.

    d ＊ Though Tom's father *is proud* that his son passed the exam, Tom *knows* he didn't pass it.

These sentences all include so-called factive verbs, which are italicized. This type of verb presupposes the truth of its complement clause unless a specific discourse context overrides this presuppositional inference. The change in the subject of the matrix sentence is not enough to override it. In the sentences in (12), we have the logically opposite propositions asserted only in one world, that is, in reality perceived by the speaker of the sentences. This is the cause

for the contradiction, and hence the anomaly of the sentences.

5. A logical constraint on possible pairs of worlds

There is a logical restriction on possible pairs of worlds to be contrasted in the operation: if the logical relationship of entailment holds between the two worlds, they cannot stand as the contrasting worlds in the comparative operation with which we are concerned. Two examples of this restriction are shown below :

(13) a � It is certain that she was at the party, but it is possible that she wasn't there.

b � I think Mary will be at the party, but I know she won't.

These sentences are logically anomalous because the two worlds in contrast are in the relationship of entailment: the world represented by *certainty* entails that represented by *possibility*, and *my knowledge* entails *my thought*. This type of relationship is based on the notion of linguistic scales which has been discussed in various works by such scholars as Horn (1973), Gazder (1979) and Levinson (1983). A linguistic scale consists of a set of contrastive expressions which can be arranged in a linear order by degree of semantic strength. One example is that of quantitative expressions: $<all, most, many, some, a few>$. If the speaker asserts a sentence including an item from the scale, the sentence unidirectionally entails the sentences including the less informative or semantically weaker items. (14)a, for example, entails (14)b and (14)c, and (14)b entails (14)c:

(14) a   All of the girls went to the concert.

b   Many of the girls went to the concert.

c   Some of the girls went to the concert.

The anomaly of the sentences in (13) can be explained by presuming the linguistic scales: $<certain\ that\ p,\ probable\ that\ p,\ possible\ that\ p>$ and $<a\ knows\ that\ p,\ a\ thinks\ that\ p>$. Unlike the case of *my knowledge* and *my thought*,

entailment does not hold between *my knowledge* and *somebody else' thought*. Therefore, we can see a consistent contrast between the two worlds in (15):

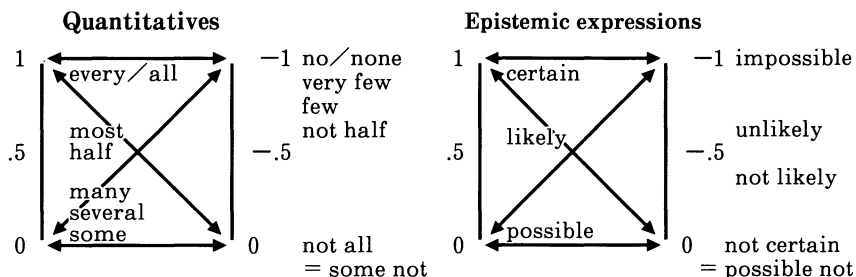(15)　Tom thinks Mary will be at the party, but I know that she won't.

So far, so good. We notice, however, that the things are not so simple when we see the sentences in (16):

(16) a　The supermarket is probably closed by now, but it's possible that it's still open. (LDCE)

　　b　It's possible that they will win, but judging by their recent perform-ances, it doesn't seem very probable. (LDCE)

In spite of the two items of the linguistic scale <*probable, possible*> in the sentences, there is no contradiction here. To understand this situation, we have to think about another dimension of linguistic scales. For this purpose, I will refer to Horn's theory on scalar predication below, though admittedly it is going to be a lengthy summary.

　　Horn (1989: 237, 324-325) explicates the quantitative and epistemic scales in terms of the traditional square of opposition as shown below:

Figure 1

	Quantitatives	Epistemic expressions

Quantitatives

1　every／all　　　−1　no／none / very few / few

.5　most / half　　−.5　not half

0　many / several / some　　0　not all = some not

Epistemic expressions

1　certain　　−1　impossible

.5　likely　　−.5　unlikely / not likely

0　possible　　0　not certain = possible not

To take the quantitative scale as an example, the diagonal relationships between *every／all* and *not all*, and between *some* and *no／none* are referred to as **contradictory**. Between the two items of these vertices holds **the law of contradiction**: they cannot be true simultaneously. Another law called **the law of excluded middle** also holds between them, and it prevents them from being false simultaneously. The latter law distinguishes this type of opposition from another type of opposition called **contrary**. It is represented by the upper horizontal line between *every／all* and *no／none*. Although the two items cannot be true at the same time just as those of the contradictory opposition cannot, they can be false simultaneously: if five men out of 10 are at the party, the two sentences *all men were at the party* and *no men were at the party* are both false. There is still another type of opposition referred to as **subcontrary**, which is represented by the lower horizontal line of the square between *some* and *some not／not all*. It is different from the other two types of opposition in that the two vertices can both be true at the same time, though they cannot both be false. The two vertical lines between *every／all* and *some*, and between *no／none* and *not all／some not* represent the unilateral entailment relationship: *all* entails *some* and *no* entails *not all*, but not vice versa. The same characteristics apply to the square of epistemic expressions.

On the vertical lines of the squares, various quantitative and epistemic expressions can be located according to the degree of their semantic strength. The order of each item on the scales can be determined by means of several diagnostic tests.[3] One of them is to use a syntactic frame *Pi if not Pj* (where *Pi* and *Pj* are items on the scale):

(17) possible if not likely   ＊likely if not possible

   likely if not certain   ＊certain if not likely

   unlikely if not impossible ＊impossible if not unlikely

   uncertain if not unlikely ＊unlikely if not uncertain

             (Horn, ibid: 235)

(17) shows that in the well-formed frames, *Pi* is "weaker" than *Pj* and located

lower on the vertical sides of the epistemic square in Figure 1.

　　The positive items on the left vertical side of the square and the negative items on the right side cannot be combined as can be seen in ⒅:

　⒅　＊possible if not unlikely
　　　＊unlikely if not certain

For this reason, we can assume that there is one scale defined by the positive items and one by their negative items rather than assuming a single scale comprising both positive and negative items.

　　Thus, we can define the positive epistemic scale ＜certain, likely (probable), possible＞ and the corresponding negative scale ＜impossible, unlikely (improbable), uncertain＞. The parallelism of these scales can be elucidated by assigning the values ranging from 0 to +1 to the items on the positive scale and those ranging from 0 to −1 to the items on the negative scale. For any positive item P, the sum of its scalar value and that of its inner negation (P not) directly across from it will always be 0. The important point to be noted here is that if P is assigned the value which is equal to or less than .5, it is the subcontrary of its inner negation (P not), while if P is greater than .5, it is the contrary of its inner negation.

　　As was mentioned in the explanation of the four sides of the square, subcontrary opposition holds between the two vertices which can both be true at the same time. This fact is illustrated in ⒆:

　⒆　It's possible that he will win and possible that he won't.

⒆ shows great significance in what I have been describing. One of the characteristics that I have taken for granted about the comparative operation is that two different worlds are compared with respect to one proposition. Here, however, we do not have any specifiable worlds in contrast. Similarly, in ⒇, it is not possible to specify two contrasting worlds, either:

(20) a.　He is allowed to go to the party but also allowed not to do so.

　　b.　It is legal for people over 18 to buy alcohol. But, of course, it is legal for them not to do so.

Horn refers to the items of this property as **tolerant**, while those with the value greater than .5 as **intolerant**, adopting the terminology of Löbner (1985). All I can say about such sentences as (19) and (20) is that there are some cases where the presence of opposite propositions does not necessitate the specification of two different worlds for the text to be consistent. It seems that in these cases only the presence of alternative worlds is implied by the contradictory propositions but their quality has not been specified at all. The comparative operation relevant to such cases seems to be different from that which we have discussed so far.

　　The value assigned to the items on the scale is also essential to our understanding of the quality of the problem we confronted in (16), which is shown again below. In (16), the entailment relationship based on the linguistic scale <*probable, possible*> does not seem to hold:

(16) a　The supermarket is probably closed by now, but it's possible that it's still open. (LDCE)

　　b　It's possible that they will win, but judging by their recent performances, it doesn't seem very probable. (LDCE)

To solve the problem, we have to understand the relationship between the two terms, *possible* and *probable*, in terms of their values assigned on the scale. In contrast to (19), which includes the tolerant item *possible*, (21) shows that a sentence including *probable* cannot be consistent with another which includes its inner negation *probable not* as shown below:

(21) ＊　The supermarket is probably closed by now, but it's probable that it's still open.

This means that *probable* is intolerant. What we are dealing with in (16) is the

compatibility of a tolerant item with an intolerant item. Like *probable, certain* is intolerant. However, as opposed to (16), a sentence including it is incompatible with another sentence including *possible* :

(22) ＊　The supermarket is certainly closed by now, but it's possible that it's still open.

What is inferred from these sentences is that there is a certain limit on the value of the intolerant items which are compatible with some tolerant item.

　The reason why both vertices of subcontrary opposition can simultaneously be true would be better explained in terms of the quantitative scale. For instance, if we are talking about a group made up of 10 members and say that some of them are male, the rest of them — in the ordinary understanding of the sentence, 7 or 8 people — can be either male or female. Therefore, to affirm that some of these are not male does not cause any contradiction. Since all the tolerant terms have the value not greater than .5 or not more than 5 members in our example, to say something about the members denoted by any tolerant term always leaves enough number of members to be denoted by another tolerant term. (16) might be interpreted in a similar manner. Imagine 10 worlds in 6 of which the supermarket is closed. If the 6 worlds are denoted by *probably*, we still have 4 unspecified worlds which are enough to be denoted by *possible*.[4]

　The relationship between the values of two terms thus understood, it is no wonder an intolerant term is compatible with a tolerant term as long as the use of the former leaves enough value to be denoted by the latter. The relationship between the values of two terms is a kind of inverse relation : the more value an intolerant term denotes, the less value the tolerant term is left to denote. In other words, they can coexist as long as the sum of their absolute values is not more than 1. This point seems to be supported by the sentences in (23) :

(23) a. It's fifty-fifty that he'll win and fifty-fifty that he won't.

b. It's almost certain that she'll be elected, but there is still an out-
side chance that she won't.

c. She may pass but the odds are she'll fail.

Similarly, in (16), the sum of the values of the two terms, *possible* and *prob-
able,* is less than 1 and, therefore, they are compatible. Thus, we could reach
the conclusion: in general, in the comparative operation at issue, two worlds
cannot coexist if entailment holds between them. However. as in (16), two
worlds established by two epistemic expressions are compatible as long as the
sum of their absolute values on the scale is equal to or less than 1.

6. Establishment of the world by means of metalinguistic negation

The comparative operation that we have been discussing has been expli-
cated as matching the two worlds in which logically opposite propositions
are asserted. In Section 3, the operation was explained as matching the two
comparative structures below:

(5) (World-defining element)	(Assertional element)	(Propositional element)
a. In the world X	it is true	p
b. In the world Y	it is true	not-p

In (5)b, the negative operator *not* is treated as part of the propositional ele-
ment: the truth of not-p is asserted in the world Y. This type of use of the op-
erator corresponds to that referred to as **descriptive negation** in Horn (1989:
363). It is an ordinary truth-functional type of negation. As was mentioned
in Section 3, however, there is another non-truth-functional type which is re-
ferred to as **metalinguistic negation**.[5] One of its function is to object to a pre-
vious utterance on any grounds whatever, including the conventional or
conversational implicata it potentially induces. It is "a way for the speakers
to announce their unwillingness to assert something in a given way, or to ac-
cept another's assertion of it in that way" (ibid: 375). Its application is so

vast, even including the correction of phonetic aspects of the preceding utter-
ance,[6] that it is difficult to show it symbolically. Its main function, how-
ever, might be described in the form of our comparative structure shown in
(6):

(6) (World-defining　　　(Assertional　　(Propositional
　　　　　　element)　　　　　element)　　　　element)
　　　In the world Y　　　it isn't true　　　　p

In contrast to (5)b, the negative operator is included in the assertional ele-
ment of the structure so as to reflect the speaker's unwillingness to assert p
in the world Y. While in (5)b the truth of not-p is asserted, in (6) the truth of
p is denied. An example of this type of negation can be seen in ⒇:

⒇ A :　Tom was a good soldier.
　　B :　I don't think so／ It isn't true.

B's utterance is expressed in the form of our comparative structure as fol-
lows:

⒇　　In B's thought, it isn't true that Tom was a good soldier.

What should be noted, however, is that in normal understanding of the text,
the interpreter of ⒇ is inclined to understand B's utterance not as ⒇ but as
⒇:

⒇　　In B's thought, it is true that Tom was not a good soldier.

In ⒇ the negative operator has been "shifted" from the assertional element,
of which component it was in ⒇, to the propositional element of the struc-
ture. As a result, ⒇ is understood as the contrast between two different
worlds in which logically opposite propositions are asserted. That is the type
of contrast we have been discussing:

(27)   In A's thought it is true that Tom was a good soldier.
       In B's thought it is true that Tom was not a good soldier.

The shift of the negative operator form the assertional element to the
propositional element corresponds to the phenomenon variously known as
"transposition of not, not-hopping, negative transportation, Neg-Raising"
and so on (Horn, 1989: 312). It is explicated as one of the ways in which the
literal meaning of the sentence is informatively strengthened by means of
some pragmatic rules. In order to understand the meaning of the informa-
tional strengthening, the list of sentences in (28) might be useful:

(28) a.   I don't believe the performance was inspired.
     b.   I do not believe the performance was inspired.
     c.   I believe the performance wasn't inspired.
     d.   I believe the performance was not inspired.
     e.   I believe the performance was uninspired.
     f.   I believe the performance was dull.

In (28), from a to f, the scope of negation gradually becomes narrower, and in-
versely, the speaker is more committed to asserting the negative quality of
the performance. Neg-Raising is explained as the strengthening of (28)a or b to
(28)c or d. The fact that the latter entails the former also affirms that
strengthening is taking place. The phenomenon of Neg-Raising is ascribed to
some conversational principle: if the literal meaning of the original sentence
is too general and not informative enough in the situation, it is properly
strengthened.

    What Neg-Raising means in our view on the contrast of worlds is obvi-
ous: when metalinguistic negation occurs and its negative operator goes
through Neg-Raising, we can pragmatically establish the contrasting worlds
in which logically opposite propositions are asserted. It follows that we have
to define the cases where Neg-Raising takes place. There has been a vast
amount of study on this topic, and below I will briefly review Horn's (ibid:
308-330).

In Horn's theory, candidates for Neg-Raising are defined in terms of his quantitative and pragmatic scales which were introduced in relation to Figure 1. In the square of epistemic expressions, *possible, likely* and *certain* are shown as examples on the scale with their negative counterparts on the negative scale. Among these, only *likely* allows Neg-Raising. One necessary condition for neg-raisers is that they include the speaker's uncertainty about the proposition expressed. Thus, factives and implicatives, which are given some great value on the scale and are called **strong scalars**, cannot induce Neg-Raising since their meaning is that the speaker is certain about the truth of their complements. For this reason, *certain* is excluded from the candidates: *it's certain that p* entails *p*. The group of terms represented by *possible* are given some value not greater than .5 on the scale. They are referred to as **weak scalars** or, as was explained in the previous section, tolerant terms, by virtue of their compatibility with their inner negations. Though they include the speaker's uncertainty as part of their meaning, their external negations do entail the negation of their complement: *it's not possible that p*, for example, entails *not-p*. It follows that "we must evidently inspect each pair of the form $<P(p), \sim P(p)>$ and determine if an entailment is derivable from either member: if so, P is scratched from the roll of prospective neg-raisers" (ibid: 326). Now, the only possible candidates for neg-raisers are those represented by *likely*. They are referred to as **intolerant weak scalars** and are given some value a little greater than .5 on the scale. Because of their value on the scale, the difference between their external／contradictory negation (e.g., *not likely*) and NR reading (e.g., *likely not*) is relatively small. It is this closeness of the two readings which makes them potential neg-raisers. Intolerant weak scalars are instantiated by such terms as: *think, believe, imagine, seem, look like, be probable, want, intend, be supposed to, should* (See Horn, 1989: 323 for a more comprehensive list). When these terms are seen as neg-raisers, they are taken to establish the world in which *not-p* is asserted.

It should be noted that the phenomenon of Neg-Raising testifies Horn's claim that contrary negation tends to be maximized in natural language. The contradictory negation between *believe p* and *not believe p* or between *be probable p* and *be not probable p* is strengthened to the contrary negation between

believe p and *believe not-p* or between *be probable p* and *be probable not-p*. This strengthening process might be shown in the following diagram :

Figure 2
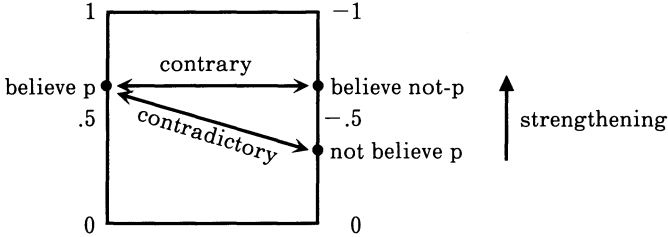
7. Strong scalars and weak scalars

In the previous section, we have seen that intolerant weak scalars are pragmatically strengthened in metalinguistic negation and regarded as one of the main sources of establishing the world in which *not-p* is asserted, as well as their descriptive negation. Here we go on to investigate how strong scalars such as *certain* and weak scalars represented by *allow* behave in this respect. The sentences in (29) are presented for this purpose :

(29) a   I think he will go to the party, but it's not certain.

    b   I wish he would come, but it's certain that he won't.

In (29)a we see a case of metalinguistic negation, and in (29)b a case of descriptive negation. This might be shown in our comparative structures as follows :

(29) a'   In my thought, it is true that he will go to the party.

        In the world of certainty, it isn't true that he will go to the party.

    b'   In my wish, it is true that he will come.

        In the world of certainty, it is true that he won't come.

Things look fairly simple here : with strong scalars, as we saw in the previous section, Neg-Raising does not occur. Only in (29)b, we have the logically

opposite propositions asserted in two contrasting worlds. The different kinds of comparison between (29)a and (29)b might be better understood in rewriting them as follows:

(29) a''　He will go to the party in my thought but not in the world of certainty.

b''　In my wish he will come, whereas in the world of certainty he won't.

The point is that in (29)a'', one of the worlds is denied as unrelated to the proposition and the correct one is chosen, whereas in (29)b'' the opposite propositions are asserted in two worlds. The frame *not x but y*, or *y but not x* is a typical signal of denial and correction, which are the main function of metalinguistic negation. To sum up, the descriptive negation of a strong scalar (e.g., *certain not*) establishes the world in which a negative proposition is asserted, whereas its metalinguistic negation (e.g., *not certain*) does not.

　　With weak scalars, things look more complicated. *Allow* is an example of a weak scalar:

(30) a　I want to go to the party, but I'm not allowed to.

b?　I'll go to the party though I'm allowed not to.

c　I'll go to the party though I don't have to.

(30)a is taken to be an example of metalinguistic negation which shows that the proposition *I'll go to the party* is true in the speaker's desire but not in what he is allowed to do. (30)b, on the other hand, includes the negative operator in the propositional element and is regarded as the case where the speaker asserts *not-p* in the world. However, it is at least abnormal compared with (30)c which seems to be its logical equivalent. The reason for the abnormality of (30)b is considered to be its small informational value. As was discussed earlier in (20), *allow* is a tolerant term of which value on the scale is smaller than .5: between *allow* and *allow not* holds the subcontrary relationship. This means that *allow not-p* is compatible with *allow p* and the former is not

more informative than the latter in spite of the presence of the negative opera-
tor. The preferable expression (30)c, on the other hand, includes *have to* which
is a strong scalar with its value close to 1 and its contradictory negation *not
have to* seems to have the same value as *allow not*.[7] We might be able to pre-
sume that if the descriptive negation of a weak scalar has the same value as
the contradictory negation of some strong scalar, the latter is preferred. This
hypothesis might be illustrated in the following diagram :

Figure 3
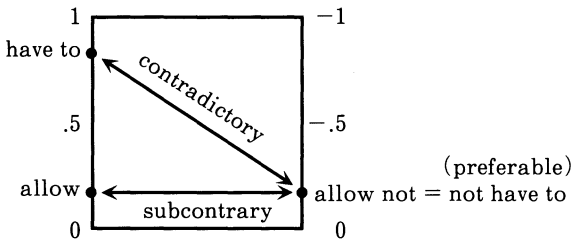
The assumption about the preferable expression seems to be supported by the
following examples :

(31) a? I've decided to pay that money though it is legal not to do so.
　　b　I've decided to pay that money though it is not compulsory to do
　　　so.
(32) a? I want to go to the party, but it's possible that I won't.
　　b　I want to go to the party, but I'm not sure I will.

In these pairs, b is more preferable than a. As in the cases of *allow* and *allow
not*, they might be shown in the diagrams below :

Figure 4
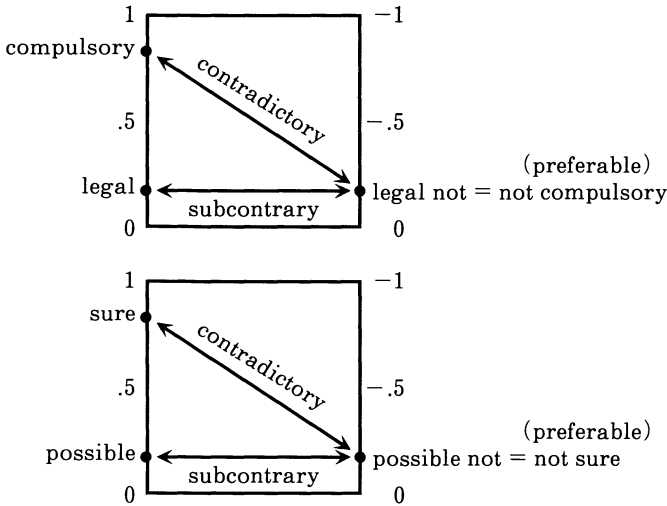
This preference for contradictory negation over subcontrary negation appears to be another piece of evidence for Horn's claim about the following tendency found in natural language:

(33)　Subcontrary negation tends to be minimized in natural language.

(Horn, ibid., 330)

The descriptive negation of weak scalars realized as *allow not p*, *legal not p*, *possible not p* and so on cannot be seen as a perfect device for establishing the world in which *not-p* is asserted. It implies also the logical opposite *p*. Consequently, as we saw in relation to (19) and (20), we are left with opposite propositions compatible in one world. This might be the reason for the little informational value of this type of negation. Instead of it, the contradictory negation of a strong scalar is preferred. The contradictory negation such as *not have to* cannot be true at the same time with *have to*, and in this sense, more informative than *allow not*. Finally, it should be added that given the principle stated in (33) and Horn's other claim that contrary negation tends to be maximized in natural language, which was mentioned at the end of the

previous section, we might also be able to attain a view on contradictory nega-
tion: the preference of contradictory negation over subcontrary negation in
the manner presented in this section seems to mean that we can see contradic-
tory negation as a link between contrary negation and subcontrary negation.

8. Conclusion

In this essay, an attempt has been made to understand the relationship be-
tween two possible worlds in which the logically opposite propositions, p and
not-p, are respectively asserted. This contrast between the worlds was ex-
plained as a result of a type of mental operation which identifies in the dis-
course the two comparative structures symbolically described as follows:

(5) (World-defining   (Assertional   (Propositional
            element)   element)   element)
   a. In the world X   it is true   p
   b. In the world Y   it is true   not-p

As the worlds related to this operation are various in their quality — with the
spatiotemporal, modal, and interpersonal factors being only three of their
possible defining factors — it appears to be a lost cause to attempt to define
all the expectable pairs of worlds. Instead, it would be more rewarding to
search for some general conditions for the relationship between them. In this
essay, several of such conditions or restrictions have been defined, mainly
with respect to the contrast of the worlds which are established by epistemic
or modal expressions. Below is their summary with the number of the section
in which they were dealt with:

The comparative structures can be identified only in appropriate situations
where the meaning of comparison is contextually clear.   (Section 3)
The proposition p expressed in the complement clause of a factive verb, such
as, *know*, *be aware* and *realize*, is presupposed regardless of its subject. For
this reason, only the replacement of the subject is not enough to attain the
world in which *not-p* is asserted: *a knows p* and *b knows not-p* are

incompatible.   (Section 4)
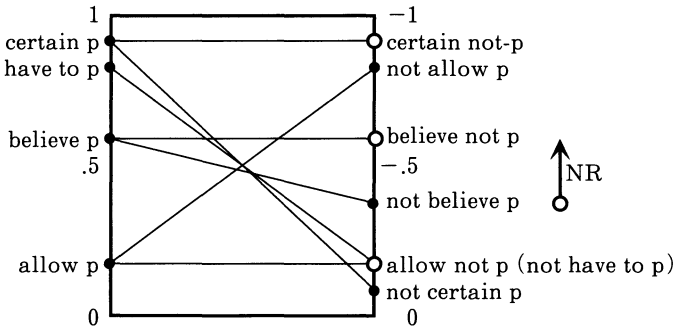
In general, if entailment holds between two worlds and in one of them the proposition p is asserted, *not-p* cannot be asserted in the other: *a knows p* and *a thinks not-p* are incompatible. However, if the entailment is between the worlds established by two epistemic terms such as *probable* and *possible*, the proposition *not-p* can be asserted as long as the sum of the absolute values of these terms on the epistemic scale is equal to or less than 1: *probable p* and *possible not-p* are compatible.   (Section 5)

The metalinguistic negation of an intolerant weak scalar (e.g., *not believe*), is pragmaticaly strengthened so that it is equal to its descriptive negation (e.g., *believe not*) in its value on the scale. By virtue of this quality, it is a resource for establishing the world in which *not-p* is asserted as well as the descriptive negation.   (Section 6)

Whereas the descriptive negation of a strong scalar (e.g., *certain not*) is a resource for establishing the world in which the proposition *not-p* is asserted, that of a weak scalar (e.g., *allow not*) is less useful in this respect because of its small informational value. The latter is often replaced by another term (e.g., *not have to*) which is the metaliguistic negation of its positive counterpart (e.g. *have to*).   (Section 7)

The following diagram is intended to show the result of our investigation into the three types of scalars with respect to their ability to function as the world in which *not-p* is asserted. (The circles on the scale indicate this ability.)

Figure 5

```
        1                                    −1
certain p ●────────────────────○ certain not-p
have to p ●                    ● not allow p

believe p ●────────────────────○ believe not p
       .5                      − .5                    ↑
                               ● not believe p         │ NR
                                                        ○
  allow p ●────────────────────○ allow not p (not have to p)
                               ● not certain p
        0                          0
```

This diagram shows that *certain not-p, believe not-p* and *not believe p* in its NR reading are located above − .5 on the scale and are the contraries of their positive counterparts. They are in accordance with the principle that contrary negation is maximized in natural language. On the other hand, *allow not p* is located below − .5, that is, in the range of subcontrary. Because of its small epistemic value, it is often replaced by the contradictory *not have to p*. This phenomenon is in accordance with the principle that subcontrary negation tends to be minimized in natural language.

Notes

1. This view is based on what Levinson (1983: 20) states about the difference between the notions of sentence and utterance:

> ...it is not sentences but rather utterances that make any definite statements, and thus can sensibly be assigned truth conditions. ...truth conditions must be assigned to utterances, i.e. sentences with their associated contexts of utterance, not to sentences alone (or if one likes, truth conditions include context conditions).

Sentences in this quotation roughly corresponds to what I refer to as propositions, while context conditions correspond to possible worlds. In the present essay, however, some sentential information such as

spatiotemporal meanings, tense, modality and so on might be regarded as part of the context condition or the defining factors of possible worlds.

2. In (2), the speaker or encoder of the sentence and the person to whom the propositions are ascribed to are one and the same. In (3), however, this is not the case. To be exact, the world in which the proposition is asserted in (3) might be expressed as *in the speaker's understanding of Tom's／ Mary's belief.*

3. Other sentence frames used for the same purpose are as follows:

　　　Pi, ｜or／and possibly｜ even Pj
　　　Pj, or at least Pi
　　　not even Pi, ｜let alone／much less｜ Pj
　　　Pi, ｜indeed／in fact／ and what's more｜ Pj
　　　not only Pi but Pj

4. We might be able to say that in (16), actually, there is no breaching of the entailment restriction. If we are concerned with only the 6 worlds denoted by *probable* in our example of ten worlds with no attention paid to the other four worlds, it is at least logically correct to use *possible* to denote these 6 worlds, though it is too weak a term to denote this number of worlds. In this case, what is true in the worlds denoted by *probable* is necessarily true in the worlds denoted by *possible*, and the entailment relationship holds between them.

5. The function of metalinguistic negation we are now concerned with is explicated as denying the link between the world-defining element and the propositional element p (See Section 3). It is distinguished from that of descriptive negation which is explicated as asserting the relationship between the world-defining element and the propositional element not-p. A similar contrast can be observed on a different level. The propositional element not-p is classified into two types of negation: predicate denial and predicate term negation. For instance, *Mary isn't happy* is the predicate denial and *Mary is unhappy* (*not-happy*) is the predicate term

negation of their positive sentence *Mary is happy*. In the former, the relationship between the subject and its predicate is denied, whereas in the latter, the relationship between them is affirmed. It is essential to notice that both the relationship between metalinguistic negation and descriptive negation, and that between predicate denial and predicate term negation, are explained as that between contradictory negation and contrary negation:

(contradictory)	(contrary)
metalinguistic negation	descriptive negation
predicate denial	predicate term negation

This relationship between each type of negation can be seen by comparing the following sentences:

(a) I believe that Mary is happy.
(b) I don't believe that Mary is happy. (metalinguistic negation)
(c) I believe that Mary is not happy. (descriptive negation)
(d) Mary is happy
(e) Mary isn't happy. (predicate denial)
(f) Mary is unhappy. (predicate term negation)

(a) and (b) can be neither true nor false simulataneously, whereas (a) and (c) cannot be true simultaneously but can be false at the same time. (c) unilaterally entails (b). Similarly, (d) and (e) can be neither true nor false simutaneously, whereas (d) and (f) cannot be true simultaneously but can be false at the same time. (f) unilaterally entails (e).

6. In the sentence below, for instance, negation is not truth-functional, but correcting the phonetic aspect of the preceding utterance:

He didn't call the [pólis], he called the [polís].

(Horn, 1989:371)

7. *Needn't* might be another item which has the same function as *not have to* in this respect.

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