Quine's Concept of Stimulus Meaning

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This paper will be divided into five parts. First I shall recall that, in order to be recognized as a human sentence a sign or a string of signs must be independent. The second part will state Quine’s definition of stimulus-meaning, which seems to agree with the requirement of independence. The three last parts will inquire into the three components of the stimulus-meaning: the verbal behaviors of assent and dissent (third part), the referred stimulation (fourth part) and, finally, the spoken or heard sentences.

I

The criterion of independence

There are many differences between what the anthropologists have christened “call systems” in connection with ape’s and man’s language. One of them, the independence on displacement challenges the rightness of any behavioristic explanation of language. The gibbons are reported to utter, for example, a call saying: “There is food here and now”, but they would not refer to a source of food, if it were not under their sensorial control. Their “call system” is said to be dependent on lacking displacement. According to von Fritsch, bees use an independent symbolism, since their dance is able to denote a source of sugar which may be found as far as some miles from their hive. But other main characteristics of a human language: duality, productivity, social transmission for instance are wanting, so we can forget the insects. In any case, from any theory that accounts for human language we shall require that it warrants the independence of its sentence-signs.

II

Quine’s definition

The criterion of independence is a challenge for every behavioristic theory, because it claims that the condition for emitting or understanding a referring word be eventually absent. The theory has thus to seek for some substitute of the absent condition and the explanatory value of the theory will depend on the relevance of the chosen substitute.

There are clearly wrong choices. We might, for instance, be tempted to construct the linguistic signs like conditioned signals. Hearing a word would correspond to a conditioned stimulus (dog’s hearing the bell) and perceiving the thing to the absolute stimulus (dog’s receiving the meal). Conditioning is transferring a reaction (dog’s salivating) from the absolute to the conditioned stimulus. Now we would observe the same transfer from the thing to the word.
"Suppose, Russell says\(^1\), you are with a man who suddenly says 'fox' because he sees a fox and suppose that, though you hear him, you do not see the fox. What actually happens to you as a result of your understanding the word fox? You look about you, but this you would have done if he had said wolf or zebra. You may have an image of a fox. But what, from the observer's standpoint, shows your understanding of the word is that you behave (within limits) as you would have done if you have seen the fox. Generally, when you hear an object-word which you understand, your behavior is, up to a point, that which the object itself would have carried. This may occur without any (mental) intermediary, by the ordinary rule, of conditioned reflexes, since the word has become associated with the object".

As Skinner\(^2\) remarked, we do not behave toward foxes as we behave toward the word foxes, and, as Russell himself acknowledges it, different words result in the same behavior. But there is another difficulty. In order that a conditioned reflex be stable, we have to reinforce it and there is reinforcement only if the conditioned reaction is immediately followed by the absolute stimulus. Consequently, it is impossible that we understand words by a process of conditioning, since, otherwise, the understanding would be inhibited as soon as the word were used when the referred thing is absent and the human language would be a priori denied its independence.

In Russell's schema, therefore, the reinforcers of the conditioning are not only the reference of the words—a child learns how to pronounce a word when he is wanting its reference—but also social and even verbal behaviors like applause\(^3\), signs of agreement, laughter and so on. He adds that names are quickly suggested by the "thought" of the reference, i.e. in abscutia rei. So his theory totters between two different interpretations of the reinforcer. Were this reinforcer a reference, the conditioning would be destroyed, when the reference is only "thought". We are thus bound to accept as the only possible reinforcers the social expressions of agreement and disagreement, what Quine calls assent and dissent.

Let us call S the sentence-word (Russell's object-term), the referred thing or stimulation (which it would be here irrelevant to distinguish) and a and d the assent and the dissent. Instead of the simple schema S followed by \(a\), we have the more complicated pattern: S uttered in presence of followed by a \(\sigma\)

\[
\begin{array}{c}
S \\
\downarrow \\
\sigma \\
\downarrow \\
a
\end{array}
\]

The last schema shows the necessarily two-sided character of every linguistic unit and we can, with de Saussure\(^4\), call sign the whole of the association between a signifier S and a signified \(\sigma\). But the sign can become stable only if two conditions are fulfilled. First, the society must not change its dispositions to confirm the conventional ties between words and objects. Because language is so vitally important to its own existence, a society, at least in the span of time
which defines a synchronic language-state, cannot change its signs, which "are fixed, not free, with respect to the linguistic community that uses them". Secondly, the clause of independence must explicitly occur, which is not the case even with our modified schema.

Russell made a mistake, Skinner said, by interpreting the association between signifier and signified as a conditioned reflex. The intentional and voluntary aspect of the human speech would then be lost. But our enlarged schema allows us to give up the too narrow theory of conditioning. We can, with Skinner, recognize three elements in a verbal behavior. S is a verbal response, a a discriminative stimulus and a a reinforcer. The verbal behavior may be compared with the operand behavior of a rat, which, moving spontaneously in its box, happens to press a lever, receives a pellet of food, and then presses it in order to get gratifications. The conditioned reflex explained a causal behavior, the concept of operand covers the final behavior too, since to want something is only to repeat an act which has been followed by a pleasure.

Let us now see whether there is any relation between the new interpretation of the schema in terms of operand behavior and the way to independence. A jungle-linguist, helped by an informant, completely ignorant of English, tries to compile a dictionary of short elementary sentences belonging to the type: 'It is raining', 'A rabbit', 'Red' and so on. When listening to his informant, he makes guesses concerning the signified stimulations. Then he utters the sentences, when the guessed stimulations are present. This verbal operand behavior is reinforced or extracted by the assent or the dissent of the informant, according as the association made between the sentence and the stimulation is accepted or rejected (a third possibility, namely that the informant gives neither assent nor dissent being by no means excluded). Suppose now a theory that would incorporate in the meaning of a sentence the wrong associations as followed by dissent. The possible absence of the reference, that is the required independence of the linguistic sign could perhaps be accounted for. That gives its philosophical importance to Quine's following definition: "A stimulation σ belongs to the affirmative stimulus meaning of a sentence S for a given speaker if and only if there is a stimulation σ' such that if the speaker were given σ' then were asked S, then were given σ, and then asked S again, he would dissent the first time and assent the second. We may define the negative stimulus meaning similarly with 'assent' and 'dissent' interchanged, and then define the stimulus meaning as the ordered pair of the two".

We shall now analyze the three components of the definition: assent and dissent, the contrary stimulations, the sentence.

III
Assent and dissent

Quine's definition can be expressed in three formulas:

1) \[ \sigma \in S(+) = (\sigma') [(\sigma \bowtie S - d) \cdot (\neg \sigma \bowtie S - a)] \]

2) \[ \sigma \in S(-1) = (\sigma') [(\sigma' \bowtie s - a) \cdot (\sigma \bowtie s - d)] \]
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3) $\Sigma s = \langle \Sigma s(+) \Sigma s(-) \rangle$

In the two following parts of this paper, I shall only use the first formula. Its schema can be written:

![Schema](image)

What strikes in it is the absence of any inhibition. The dissent reinforces the association of $S$ with $\partial$ exactly as the assent reinforces its association with $\vartheta$.

This surprising situation will be better understood by comparison with the following "Gedanken-experiment". Rats are running in a box which now has a light above the lever. The light is either red or green. If it is red, the rat which presses the lever receives an electrical shock. With the green light, it is gratified by a pellet of food. According to Quine, pressing the lever would then be a verbal behavior in the sense of having an affirmative stimulus meaning only if the rat could construct the matrix:

<table>
<thead>
<tr>
<th>Pressing the lever</th>
<th>Green light</th>
<th>Red light</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Food</td>
<td>Electrical shock</td>
</tr>
</tbody>
</table>

Such a construction, however, is impossible, because the association "Pressing the lever. Red light" would be extinguished by the electrical shock.

What must then be assent and dissent in order to become both reinforcers of two different associations of the same sentence $S$ now with $\sigma$, now with $\sigma'$? First, they have to retain something from the sensibility in which they originated. This something is their mutual contrariety. Assent and dissent remain like reward and punishment inasmuch as they are mutually exclusive. But, at the same time, they must have been purified and made objective and disinterested, failing which a dissent might not have lost the inhibitory compulsion of the punishment. Such are the two characteristics of the indicative mood. As a reinforcer, the mood has a force, which is the performative force of the assertion. As a reinforcer without inhibition, it must have a force which, in its turn, must become able to be cancelled. In other terms, the mood is an act, which would sometimes be transformed into an operation.

There are, indeed, situations where assent and especially dissent may be reiterated. Suppose, for instance, the jungle-linguist, hearing the occasional sentence $S$, pointing out the stimulation $\sigma'$ and receiving a mistaken assent from an incom-
petent or inattentive partner. The informant would then interfere and emit a dissent of second order to cancel the mistaken one of first order. Now it would be easy to show that, when assent and dissent are so neutralized by becoming objects of second order assents or dissents, they identify themselves with the logical operations of affirmation and negation.

The true nature of the indicative mood, inasmuch as it performs the assent of a given content becomes clearer. The mood as such belongs to a meta-language, while the content, whatever logical quality it acquires and, therefore the operative of affirmation and negation belong all to the object-language.

IV

The contrary stimulations

Through its affirmative stimulus meaning, a given sentence \( S \) says that, according as I perceive \( \sigma \) or \( \sigma' \) when uttering \( S \), my informant will give his assent or his dissent. Being presented with a pattern of blue, he will answer "yes" if I say "Blue" and "no" if I say "Blue" before an instance of red. As the dissent reinforces the sign association between the word "Blue" and the colors which are different from blue, we may consider as equivalent the two sequences: \( \sigma \) followed by \( a \) and \( \sigma' \) followed by \( d \). Inside each sequence, a stimulation always goes with its corresponding mood. So we may interpret their relation by a logical conjunction:

\[
\sigma \cdot a = \sigma' \cdot d \quad (\text{mod } S)
\]

Three consequences follow concerning the nature of \( \sigma \) and \( \sigma' \):

1) Although being atomic an occasional sentence has already the form of a hypothesis: "If \( S \) and \( \sigma \) then \( a' \)", "If \( S \) and \( \sigma' \), then \( d \)." The so-called stimulations then occur only as parts in a complex.

2) Considered in themselves, they are not only perceived when they are perceived. Otherwise they could not become parts of a sign. They must be pondered, that is deprived of their status of reality and transformed into free considerations in which they are only hypothetically handled. In other words, they prefigure the content of the judgment (\( \text{Annahme} \) by Meinong, \( \text{Gedanke} \) by Frege), while assent and dissent stand for the assertion (Meinong's mood or Frege's \( \text{Wahrheitswert} \)).

3) There are no contrary stimulations in Nature. But by classifying together \( \sigma \) followed by \( a \) and \( \sigma \) followed by \( d \), we impart to the stimulations themselves the contrariety which originally belonged only to the behaviors of assent and dissent. This classification implies some process of compensation, which it may be worth explaining by comparison.

Dealing with the Helmholtz-problem: "How spaceless impressions could by their association produce the representation of space?" Poincare answered, the association must be by compensation. Sequences of kinesthetic internal charges annulate sequences of tactile external charges, so that the set of sensorial changes be endowed with the structure of a group, the group of rigid motions...
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defining space. On the same vein, internal dissents compensate external mistaken associations, so that the linguistic signs are endowed with an elementary structure, which is a kind of logical space and defines the affirmative stimulus meaning of a sentence.

As in a Platonic Dialogue, otherness plays the part of not being. We can deal with an absent stimulation, by referring to its present contraries on condition that we compensate them by a dissent. A “thought” stimulation is only another stimulation belonging to the same relevance range and annulled by a dissent. We thus get rid of the positive images, which are replaced by compensated associations.

It seems, however, that another thing is wanting if the thought is to be actual and not only possible. The sequence S in presence of α' followed by d is all right. But is it equivalent to working the absent α? Not at all, since α' excludes α. We must be discontented with the actual situation. In order that α acquires a kind of ghostly presence, the real sequence of compensation is not enough, and, although we perceive S, α' and d, we must maintain, despite and against the whole empirical evidence, an excluded assent which calls forth the absent stimulation. The actual thought reverses the order of the stimulus meaning in the excluded sequence. The counter-factual ascent is first given; the thought stimulation follows.

This reflexion is different from Quine's scheme. Analyzing what he calls "egocentric propositional attitudes"9, he went as far as to construct an animal equivalent of the affirmative stimulus meaning, by getting rid of assent and dissents as well as of the sentences themselves.

Suppose we have to describe a cat wanting to be on a roof. We can entirely disperse with sentential idioms and it is enough if, instead of world states corresponding to sentences, we have “a distribution of binary choices (activated vs. quiescent) over the sensory receptors of our target animal"10. The object of the propositional attitude will only be defined by a class or a range of stimulation patterns. “It is,” Quine says, “what I called, in Word and Object, an affirmative stimulus meaning; or let us just say now a stimulus meaning. In Word and Object I talked of stimulus meanings of occasion sentences; the stimulus meaning of ‘It’s raining’ is the range of stimulation patterns that would prompt a speaker of the language to assent to ‘It’s raining’ if asked. And now these same stimulus meaning—these same ranges of stimulation patterns, though not necessarily allocated to sentences—have turned up as objects of the egocentric propositional attitudes for cats and others”11.

Shall we conclude that, regarding the use of symbols, there is only one objective difference between cats and men? Men utter sentences and show compensating behaviors applied to negative stimulations. The affirmative stimulus meaning thus contains a negative part which remains outside of reach for cats. But, since this negative part is responsible for an essential function of the linguistic signs, i.e., their independence, the sole difference is an essential one. Cat's propositional objects are reduced to one pattern of stimulations, where to each sensorial receptor corresponds the assignment of a state (activated vs. quiescent) or a blank when the assignment is irrelevant to cat's
desire. Does such a pattern define a real propositional object? In any case a man would have to construct the full disjunction of possible patterns in the framework of a logical space. These possible worlds are mutually incompatible. While exclusive stimulations cannot occur simultaneously in any sense, a thinking subject will imagine exclusive possible worlds, most of which being thought or desired, as absent, according to the evidence of experience.

V
The sentences

Let us now pay attention to the second term of the stimulus meaning of S, i.e. to its negative stimulus meaning. The schema would be here:

\[
\begin{array}{c|c}
S \oplus & \sigma & \sigma' \\
& \downarrow & \downarrow \\
\down & d & a \\
\end{array}
\]

Exchanging reward and punishment in the conditioning would induce what Pavlov called an experimental neurosis. Similarly, were this new association simply added to the former one, men would be involved in a glaring contradiction, which would destroy the sign. Thus, in order to make compatible the two constituents of the stimulus meaning, we must assume that they may be constructed as equivalent. Now the equivalence which defined the affirmative stimulus meaning and the reward concerning the reiterability of a dissent give us a hint how to construct the new equivalence:

\[
\sigma \cdot a = \sigma' \cdot d = (\sigma \cdot d) \cdot d = (\sigma' \cdot a) \cdot d \quad \text{(mod S)}
\]

The difference between an affirmative and a negative stimulus meaning has a tremendous importance and it radically enhances the contrast between cats and others. On one side there is a compensation of first order; on the other side there are two compensations of second order.

Now the negative stimulus meaning is responsible for a very important trait of the linguistic sign. It means that a sentence word organizes the world of stimulations into determinate categories. A category is a set of stimulatives such that they belong either to the affirmative stimulus meaning or to the negative stimulus meaning of a sentence, i.e. they exclude the cases of irrelevant stimulatives with respect to S which would prompt neither assent nor dissent. But the distribution of the stimulations inside one category or among the different categories is not at all univocally determined in different languages. There are well-known linguistic discrepancies concerning the distribution of the colors over the spectrum or the repartition between inert and living things. As the negative stimulus meaning controls this complementative of categories, the
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naming relation is never only between a word and a stimulation. It is also between a word and a system of stimulations distributed by the play of the contraries over the whole universe. As Quine says, the stimulus synonymity, even at the stage of occasional sentences, does not enjoy "the quality of applicability to all languages." But we can then give an implicit definition of a new kind of signs. Suppose, as it is often the case, a category has been divided into two contrary stimulatives. On such foundations Aristotle's universe was built, its elements being made up with two pairs of opposite qualities: hot/warm, light/heavy. In that case, if the affirmative stimulus meaning of the word $S$ expressing one of the contraries has been given, the affirmative stimulus meaning of the contrary word $S'$ is definable:

$$\Sigma s' (+) = \Sigma s' (-)$$

When the distribution is not by pairs, the situation is only a bit more complex and we have only:

$$\Sigma s_j (+) \subseteq \Sigma s (-)$$

where $S_j$ is the name of one of the contrary qualities. So, Quine's condition of reference, which is bound to the presence of the negative stimulus meaning, plays the same part as the system of values which de Saussure builds in the nature of the linguistic signs. "To consider a sign," he says, "as simply the union of a certain sound with a certain concept is grossly misleading. To define it in this way would isolate the sign from its system; it would mean assuming that one can start from the sign and construct the system by adding them together, when, on the contrary, it is from the independent whole that one must start and through analysis obtain its elements..." A few examples will show clearly that this is true. Modern French mouton can have the same signification as English sheep but not the same value, and this for several reasons, particularly because in speaking of a piece of meat ready to be served on the table, English uses mutton and not sheep. The difference in value between sheep and mutton is due to the fact that sheep has beside it a second sign while the French word does not.

Conclusions

Quine's theory contains all the elements, which are required in order to account for the independence of linguistic signs. It is, however, doubtful whether these elements can be all encompassed in a strictly objective conception of behavior.

Not being was understood as otherness. That means that the opposition between assent and dissent must pervade the stimulations and even the sentences by giving them a contrariety which they do not possess genuinely or naturally. The fact that stimulations are contrary presupposes a process of compensation, which, if represented, defines either thought or desire. If signs are contrary, it involves a similar process at a second level. Assents and dissents are divided into
two classes: There are the operatives, integrated to the content of judgment, and defining its quality; there are the moods belonging to the meta-language. While thought and desire may be questioned as being subjective constructions which are not amenable to objective criteria, the opposition of the signs themselves, which is defined by the negative stimulus meaning, seems to be a prerequisite for a possible linguistic theory. Undoubtedly, oppositions of signs, contrarieties of stimulations and reiterations of dissents remain implicit at the level of occasional sentences, in as much as they are not expressed and constitute what de Saussure called associative relatives. To become explicit behaviors, they must be expanded into syntagmatic solidarities. So, the judgment will express the affirmation or at least the negation and the reasoning will express the difference between object-language and meta-language.

Chomsky, Lorenz, Monod stressed an empiricist dogma which Quine shares with Russell, concerning the continuity between cats and men, as if there were no modification between their genetic learning processes.

The ontological problem of reference vs. meaning corresponds to the phylogenetical problem of empiricism vs. nativism. Quine purges the world from all meanings, but, at the end, he only succeeds by exorcizing the world from the signs too. According to Quine, the full logical space of set theory cannot be reduced to tautologies, and the logical or rather the linguistic space of the elementary sentence, which is contained in its full stimulus meaning cannot be constructed without hypotheses. But who constructs the frame or for whom it is constructed, we do not know. Inaccessible as it is to the animal behavior, the negative stimulus meaning and the negative part of the affirmative stimulus meaning seem to bypass the universe of references.

To sum up, we can paraphrase what Russell said in his Inquiry into Meaning and Truth. “It might be thought obvious that there would be no egocentric particulars in a purely physical world. This, however, is not an exact expression of what is true, partly because in a purely physical world there would be no world at all”. Applied to Quine, the paraphrase would be read: “It might be thought obvious that there would be no meanings in a purely physical world. This, however, is not an exact expression of what is true, because, in a purely physical world, there would be no sentence at all”.

FOOTNOTES
1Inquiry into Meaning and Truth, New York, 1940, p. 82.
2Verbal Behavior, p. 82.
3Russell, p. 80.
5Ibid., p. 71.
8They are both true or false at the same time.
10Ibid., p. 155.
11Ibid., pp. 155-156.
13deSaussure, op. cit., p. 113 and pp. 115-116.