

[Place, U. T. (1996). Linguistic behaviourism as a philosophy of empirical science. In W. O'Donohue, & R. Kitchener (Eds.), *The Philosophy of Psychology* (Chapter 9, pp. 126-140). Sage.
doi:10.4135/9781446279168.n9]

LINGUISTIC BEHAVIORISM AS A PHILOSOPHY OF EMPIRICAL SCIENCE

Ullin T. Place

INTRODUCTION

B. F. Skinner (1969; 1974) used to maintain that his radical behaviorism is a philosophy of science. It is a philosophy of science, however, which is restricted in its application to the science of psychology conceived as the empirical and experimental study of the behavior of living organisms. I shall argue in this chapter that what I call 'linguistic behaviorism' is a philosophy of science which has application to every empirical science from physics to sociology. This claim rests on three premises:

1. *Philosophy* is the scientific study of the relation between language and the environmental reality it represents - the metaphilosophical thesis.
2. *Science* is the systematic attempt to increase the scope, generality, accuracy and objectivity of linguistic representations of environmental reality - the metascientific thesis.
3. *Language* is a form of human social behavior which for scientific purposes needs to be studied and explained with the same methods and principles as are used in studying and explaining the other aspects of the instrumental (operant) behavior of free-moving living organisms (animals) - the metalinguistic thesis.

Differences from Other Philosophies of Science

Linguistic behaviorism differs from other approaches to the philosophy of science in maintaining

- that the philosophy of science is a linguistic enquiry, an investigation of scientific language using the technique known as 'conceptual analysis', and
- that conceptual analysis and hence, the philosophy of science, considered as the application of conceptual analysis to scientific language, is an empirical sociolinguistic investigation of the norms or conventions governing the construction of intelligible sentences in natural language (Place 1992b). [p. 127]

Differences from Other Behaviorist Approaches to Language

It differs from other behaviorist approaches to language such as that of Skinner (1957), in that

- it treats the response of the listener/reader to verbal stimuli as of equal importance to, if not greater importance than the verbal behavior of the speaker/writer,
- it identifies the sentence rather than the word as the functional unit of language, the unit which must be complete or whose completion must be predictable in order to be effective in controlling the behavior of the listener.
- it accepts and takes as axiomatic Chomsky's (1957) observation that sentences are seldom repeated word for word, and are *constructed anew on each occasion of utterance*,¹

¹ It should be emphasized that this construction is a matter of combining a ready-made and oft-repeated function or verb phrase with one or more equally ready-made and oft-repeated arguments or noun phrases, rather than a matter of assembling the sentence from its individual constituent words.

- it accepts and takes as axiomatic Chomsky's claim that *linguistic competence* consists in the speaker's ability to construct and the listener's ability to construe indefinitely many sentences which are novel in the sense that the speaker has never previously constructed and the listener has never previously encountered that precise string of words before,
- it also accepts and takes as axiomatic Chomsky's further claim that novel sentences are made intelligible to the listener by their conformity to the *rules* (or 'conventions', as I prefer to say) governing the way words are combined together to form such sentences in the natural language in current use.

Differences from Other Approaches to Linguistic Theory

Linguistic behaviorism differs from other approaches within the science of linguistics such as that of Chomsky

- by its endorsement of the traditional *empiricist* thesis that linguistic competence is a skill which the child learns initially and fundamentally on the proverbial 'mother's knee', but secondly and more significantly, as far as conformity to group norms are concerned, from interaction with the peer group,
- by its insistence that linguistic competence is acquired by the same process of *contingency-shaping* (error-correction) as is observed in the acquisition of motor skills by pre-linguistic organisms (animals and pre-linguistic human infants), and
- by the contention that the rules of syntax and semantics to which a speaker's sentence must conform if it is to be intelligible to the listener are embodied, not as a kind of computer program in the brains of each party, but as a set of *social conventions* which govern the *error-correcting practices of a linguistic community*.

SIGNS, CONTINGENCIES AND NOVEL SENTENCES

The linguistic behaviorist account of the relation between sentences and the environmental reality they depict begins with the concept of a *sign*. A sign is a type of stimulus event which, when it impinges on the sensorium of a living organism (the sign recipient), *orientates* the behavioral dispositions of that organism in a manner appropriate to an encounter with a particular type of *contingency*. A contingency is a relation, in most cases of causal dependence, in some cases of causal independence, whereby behaving in a certain way under certain antecedent conditions has or is liable to have a certain type of consequence. Most signs acquire the property of orientating the behavior of the organism towards an encounter with a particular contingency by virtue of having been associated with that sequence of events either, in the case of an innate behavioral disposition, in the history of the species or, in the case of an acquired disposition, in the course of the learning history of the individual concerned. It is the unique property of a *sentence* that it functions as a sign which can orientate the behavior of a competent listener towards an encounter with a contingency the like of which neither speaker nor listener nor the ancestors from which they derive their genes need ever have encountered in their own case.

As a consequence of this ability to orientate the behavior of the listener towards an encounter with contingencies the like of which he or she need have had no previous personal experience, the speaker is in a position to give instructions which will immediately induce the listener to do things she has never done before. As Goldiamond (1966) has pointed out, a pre-linguistic organism, however intelligent, can be induced to perform such novel behavior only through a long process of progressive behavior-shaping. Not only does the ability to construct and construe novel sentences enhance the speaker's ability to control the behavior of the listener. It also enables the listener to receive from the speaker information about contingencies operating in the environment of which she (the listener) need have had no personal experience and of whose existence she would otherwise have been totally ignorant.

CONTINGENCY SEMANTICS: A PICTURE THEORY OF THE MEANING OF NOVEL SENTENCES

These remarkable properties of sentences are explained within linguistic behaviorism by invoking a version of Wittgenstein's (1921/1971) "picture theory" of sentence meaning which I have referred to in the past (Place 1983; 1992a) as "behavioral contingency semantics" but which I am now inclined to call plain "contingency

semantics". According to this theory a sentence acquires the property of orientating the behavior of the listener towards the impending presence of a contingency of a particular kind by virtue of an *isomorphism* between the structure and content of the sentence and the structure and content of one or more of the *situations* of which the contingency consists.

Sentences, like other signs, orientate the behavior of the listener/reader towards a complete contingency - antecedent condition, behavior and consequence. Some (compound) sentences, to use Skinner's (1957; 1966/1988) term, "specify" all three of the "terms" of which the contingency consists. An example of this is the sentence - *If the baby cries* (antecedent), *give it a bottle* (behavior) *and it will go back to sleep* (consequence). This sentence is a compound of three *atomic sentences* each of which specifies or depicts a different situation (event or state of affairs) corresponding to the three terms of the contingency (antecedent condition, behavior and consequence). But you don't need to specify all three terms in order to orientate the behavior of the listener/reader towards the contingency. In an appropriate context any one of these atomic sentences, the declarative *The baby is crying*, the imperative *Give the baby a bottle* or the optative *I wish that baby would stop crying and go back to sleep*, can serve to alert the listener to that contingency. The same function can be performed by a compound conditional sentence or "rule", in Skinner's (1966) sense of that word, which combines two atomic sentences. Thus the 'prescriptive rule' - *If the baby cries, give it a bottle* - consists of two such sentences one of which specifies the antecedent condition and the other the behavior to be performed under that condition; while the two sentences composing the 'descriptive rule' - *If you give it a bottle, it will go back to sleep* - specify the behavior and its consequence.

The reason why such incomplete specifications of the contingency for which the sentence, nevertheless, acts as a sign have their effect is presumably because the unspecified parts of the contingency have been so frequently encountered in the past that the response to that part of the contingency has become automatic as a consequence of the process of contingency-shaping and, thus, requires no specification in words. A typical example is the case of a request where the aversive social consequences of failure to comply are likely to be the same whatever the nature of the request and are likely to have been experienced so often in the past that no verbal specification of them is needed outside the early years of the parent-child relationship (*Mummy will be cross if you do that again*). Needless to say, it is only in the case of those parts of the contingency which *are* specified that the novel sentence can act as a sign for novelty on the side of the contingency.

The smallest unit which a sentence can specify, the segment of environmental reality which is specified by an *atomic sentence*, is the contingency term (antecedent condition, behavior to be performed, or consequence to be expected). A contingency term is what Barwise and Perry (1983) call "a situation." A situation in this sense is either

- an *event* whereby a change occurs at or over time in the properties of something and/or in its relations to other things, or
- a *state of affairs* whereby the properties of something and/or its relations with other things remain unchanged over a period time.

Substituting Barwise and Perry's term "situation" for Russell's (1918-1919/1956) term "fact" in this version of the Picture Theory has a number of advantages:

1. It avoids the systematic ambiguity of the term 'fact' as between
 - a true particular (existentially quantified) proposition,
 - the event or state of affairs (situation) which such a proposition describes and whose occurrence or existence makes the proposition true. [p. 129]
2. It avoids the implication that there is one and only one uniquely correct way of carving up reality into the facts of which it consists.
3. It allows us to recognize that events and states of affairs *qua* species of situation are segments of spatio-temporal reality both of which involve the properties and relations between concrete particulars (Aristotle's "substances") and which differ only in that in the case of a state of affairs the properties and relations remain constant over a period of time, whereas in the case of an event they change either at (instantaneous event) or over time (process).

4. It allows us to draw a distinction between the situation which a sentence, any sentence, depicts and the *actual* situation to which, as I would say unlike Frege,² a true declarative sentence refers (*bedeuten*) and whose existence makes it true. What a sentence *depicts* is not an actual situation, but a *range of possible situations*, any one of which, if it exists, will constitute the referent and truthmaker of a declarative, or, if it is brought into existence by the listener, will constitute compliance with an imperative.

THE INTENSIONALITY OF THE DEPICTED SITUATION AND THE CORRESPONDENCE THEORY OF TRUTH

The advantage of defining the situation depicted by a sentence intensionally, as a range of possible situations one of which may or may not actually exist, rather than extensionally as one that actually does so, is that the theory of sentence semantics is no longer restricted, as is Tarski's (1930-1/1936/1956) truth conditional theory, to declarative sentences. On this view imperatives depict situations just as declaratives do. In both cases the situation depicted is a range of possible situations which may or may not correspond to one which actually exists now, has existed in the past or will exist in the future. The difference is that, in the case of an imperative, a situation corresponding to that depicted comes into existence if and when the listener complies with it; whereas, in the case of a declarative, a situation corresponding to that depicted by the sentence exists at the time specified by the tense of the verb, if and only if the sentence is true.

Both the relation between the sentence and the range of possible situations it depicts and the relation between the range of possible situations depicted by the sentence and the actual situation which exists if an imperative is complied with or a declarative is true are relations of isomorphism or correspondence.³ The term 'isomorphism' is more appropriate as a description of the former relation in that there is nothing in the situation depicted which is not contained in the sentence that depicts it. The term 'correspondence' is more appropriate as a description of the latter relation in that any actual situation will have many other properties and involve many other relations beside those mentioned in the sentence. In both cases, however, there is a parallel between the structure and content of the situation depicted by the sentence and, on the one hand, the structure and content of the sentence itself, and, on the other, the structure and content of those parts of the actual situation which are mentioned in the sentence.

THE FUNCTION AND ARGUMENT ANALYSIS OF SENTENCES AND ITS ONTOLOGICAL CONSEQUENCES

The idea that the structure of the sentence mirrors the structure of the segment of environmental reality it depicts is one that goes back to Aristotle's notion that his subject and predicate analysis of the sentence mirrors a reality composed of substances or property-bearing entities and the properties they bear.

In the light of Frege's (1879/1960) critique of the subject-predicate analysis of sentences that analysis is replaced within contingency semantics by his function and argument analysis. In a simple atomic sentence such as *The cat is on the mat* or *Ascitel de Bulmer purchased Marton of King Henry I* (Whellan 1859) the functions *is on/is under* and *purchased/sold* generate respectively two and three⁴ *argument places* which in order to complete the sentence must be filled by singular terms designating a substance in Aristotle's sense of that term.

When incorporated into the picture theory of meaning, this more sophisticated analysis of the sentence allows the analysis of the situation which the sentence depicts to include changes in and persistence of complex *relations* between as many discrete substances as there are argument places in the sentence. It is no

² According to Frege, the referent (*Bedeutung*) of a sentence is its truth value. For an exposition and discussion of this aspect of Frege's thought, see Dummett (1973), pp. 180-186.

³ Since, as Brentano (1973, p. 272) points out, you cannot have a relation one of whose terms does not exist, it should be emphasized that the phrase "range of possible situations which a sentence depicts" refers to a dispositional orientation which is induced in a listener who understands the sentence and which is confirmed if it subsequently transpires that a situation falling within that range of possible situations either already exists, has come into existence or has existed in the past within the range of times and places indicated in the sentence.

⁴ In discussing the *Ascitel de Bulmer* example in 'Behavioral contingency semantics and the correspondence theory of truth' (Place 1992a), I point out that there are another three argument places potentially generated by the function *purchase/sold* which specify the price paid, the place where and the date on which the transaction took place, making a total of six argument places. But although they are filled by singular terms, those singular terms do not straightforwardly designate particular substances, as do those occupying the three 'substantive' argument places, those occupied in the example by *Ascitel de Bulmer*, *Marton* and *King Henry I*.

longer confined, as was the traditional analysis, to changes in and persistence of the properties of a single substance. [p. 130]

THE EPISTEMOLOGICAL PROBLEM AS A PROBLEM IN LINGUISTIC COMMUNICATION

The repudiation of truth conditional semantics in order to give imperatives an equal status to that of declaratives within the picture theory of meaning should not be taken to imply any inclination to undervalue the importance of truth as a property of declarative information-providing sentences. For the colossal advantages which accrue to an organism that is able both to convey and receive this kind of information about otherwise inaccessible aspects of its environment a price has to be paid. The ability to receive information from other speakers and writers about contingencies whose existence and precise nature she is in no position to check exposes the listener to the danger of being *mised* by deliberate lies and other more innocent forms of misinformation supplied by others.

Despite the central role played by the argument from sense-perceptual illusion in the induction of skeptical doubts about the truth of our common sense beliefs, the fact of the matter is that our senses very seldom deceive us; and when they do, it is seldom, if ever, for very long. That this should be so is hardly surprising when you consider the millions of years that our sensory apparatus and the capacity to learn sensory discriminations have had to evolve and adapt to life on this planet, since our remote ancestors first acquired the ability to respond to sensory stimulation. The epistemological problem is not a problem for pre-linguistic organisms. It arises only when the listener's ability to respond to novel sentences gives to the speaker the power to mislead, and thus presents the listener with the problem of discriminating between those items of information which are true, which accurately depict the way things really are out there, and those which do not, which are false and hence dangerously misleading.

PROPOSITIONS AS THE BEARERS TRUTH

Consonant with, if not a corollary of, the view that the problem of distinguishing between the true and the false arises only in the context of linguistic communication is the thesis that *propositions*, the bearers of truth and falsity, are purely linguistic entities closely related to, but not identical with the sentences which, as we say, 'express' them. As I put it in a recent article

The English sentence *All men are mortal* expresses the same proposition or thought as its equivalent in other natural languages, and as other equivalent English sentences, such as *Everybody dies sooner or later* or *In the long run we're all dead*. Moreover, there is no reason to prefer any one of these sentences as a more apt or accurate way of expressing the proposition than any of the others. (Place 1991, p. 272)

In other words the concept of a proposition respects the principle to which, as we have seen, Chomsky has drawn attention whereby sentences are seldom repeated word for word, and are constructed anew on each occasion of utterance. Not only does the speaker invariably construct a new and slightly different sentence, when reporting what another speaker has said or written, she does the same when repeating what she herself has said on the same or on a previous occasion.

All these sentences constitute different ways of 'saying the same thing.' All of them, if they are declarative, have the same truth conditions. If one of them is true, they all are. If one of them is false, they all are. All of them, if they are declarative, 'express the same proposition.' A proposition is not a particular sentence. It is rather

an 'intensional' or 'modal' class, that is to say, a class which includes possible instances as well as actual ones. This intensional or modal class comprises all possible sentence utterances in any natural language that now exists, may have existed in the past or may exist in the future whose common feature is that they are all indicative sentences, all have the same truth conditions and all identify the objects, states of affairs or events to which they refer in the same or corresponding ways." (Place 1991, p. 273)

ANALYTIC AND SYNTHETIC TRUTH

To say that a proposition is true is to say that any proposition which contradicts it, conflicts with the linguistic conventions governing the use of sentences expressing that proposition for descriptive purposes. In other words, given the semantic and syntactic conventions of the language only a declarative sentence expressing that proposition will do as a description of the situation which the proposition describes. True propositions however, are of two different kinds. On the one hand there are true propositions which are

- *universal* in the sense that the description applies to *any* instance of a kind whether or not any such instance exists (this would *exclude* empirical generalizations)⁵, [p. 131]
- *analytic* in the sense that the application of the description is guaranteed by the relevant linguistic conventions regardless of whether or not a situation answering to the description actually exists,
- *a priori* in the sense that no observation is required in order to determine whether or not the proposition is true, and
- *necessary* in the sense that given the relevant linguistic conventions any denial of the proposition would be self-contradictory.

On the other hand, there are true propositions which are

- *particular*, in the sense that they apply to a particular instance or a finite class of particulars (as in the case of an empirical generalization).
- *synthetic*, in the sense that the proposition asserts the existence of something over and above what is implicit in the description given,
- *a posteriori* in the sense that some kind of observational evidence is required in order to determine whether or not the proposition is true, and
- *contingent* in the sense that the relevant linguistic conventions do not make it self-contradictory to deny that the proposition is true.

The view that the universal/particular, analytic/synthetic, *a priori/a posteriori* and necessary/contingent distinctions are both co-extensive and intensionally equivalent runs counter to so much currently accepted wisdom in contemporary philosophy that some discussion is called for of two well-known counter-examples:

1. Quine's (1951/1980) example of a proposition which is universally quantified, yet arguably synthetic, true *a posteriori* and contingent: *Any creature with a heart has kidneys*.
2. the proposition *Two is the only even prime* which is arguably analytic, true *a priori* and necessary, but nevertheless existentially quantified and particular.

In the case of the first of these examples there are two distinct interpretations of the sentence which are possible depending on the criteria used to identify a heart and a kidney. Where the heart and kidneys are identified purely by their structural or anatomical characteristics, their external shape, their internal arrangement and their relation to other organs such as the blood vessels and the gills or lungs as the case may be, the sentence *Any creature with a heart has kidneys* is an empirical generalization which records the fact that no instance has been observed of an intact living creature which has a heart by these criteria, but lacks kidneys. This is no exception to our rule, since an empirical generalization summarizing the results of observation is not a universal proposition in the relevant sense. On the other hand, if the criteria for identifying hearts and kidneys are functional rather than structural, the meaning of those terms becomes inseparable from the function of the organs they stand for within the circulatory system as a whole. Using these criteria the proposition is genuinely universal; but it is also analytic, in that if what looked like a heart did not form part of a functioning system which includes a device for cleaning the blood of impurities (i.e. at least one kidney) it would not qualify as a heart. If that is correct then it also follows that the truth of the

⁵ I first drew attention to the phenomenon whereby sentences which invariably turn out true become analytic because of a change in the conventions of the language whereby the situation depicted by the sentence becomes a criterion for the application of the terms it contains in my discussion of the *His table is an old packing case* example in 'Is consciousness a brain process?' (Place, 1956, p.46). For a more recent exposition of this view, together with a defence of the analytic/synthetic distinction against well known Quinean objections (Quine 1951/1980) see Place (1991).

proposition has been decided *a priori* in advance of observation and is necessary in that its denial would involve a theoretical contradiction.

The claim that *Two is the only even prime number* is a particular proposition rests on the assumption that numbers are abstract objects and that this proposition mentions only one of them, namely the number two. The alternative view sees numbers as universals which exist only in so far as instances of them exist. This interpretation makes *Two is the only even prime* a universal proposition in the relevant sense. That it is also analytic is clear from the fact that its truth can be deduced *a priori* from the definitions of an even number and a prime number, which also makes it necessary in that to deny it would contradict one or the other of those definitions.

As we shall see later, it is an implication of this view that the universal law statements of empirical science are analytic, true *a priori* and necessary. But it is also an implication that they only are so by virtue of current linguistic convention within the scientific community; and that may well change in the light of future empirical research. The fact that such laws have to fit the results of empirical research does not undermine either the claim that they are analytic, in the sense of being made true by the prevailing conventions for the use of the words involved, and true *a priori*, in the sense that, given [p. 132] those conventions, they remain true however subsequent research turns out. If subsequent research were to reveal cases of what by all other criteria is water which do not have the chemical composition H₂O, we would doubtless be compelled to give up the convention whereby only samples with that chemical composition are so classified. But given that the convention *has* been adopted, as shown by the fact that samples which do not have that composition are rejected as cases of water, such evidence would not falsify the hypothesis that water has the chemical composition H₂O, as it would have done before the convention was incorporated into the language and practice of science. Once the convention is in place, we either have to accept that what is not H₂O is not water or, if exceptions are repeatedly encountered, devise a new convention.

THE RELATIVITY OF SYNTHETIC TRUTH TO SEMANTIC AND SYNTACTIC CONVENTION

An important feature of this version of the picture theory of meaning is the claim that it is not only analytic propositions whose truth depends on the semantic and syntactic conventions governing the context and structure of the sentences which express them. A synthetic proposition only depicts the situation it does depict by virtue of the semantic and syntactic conventions governing the content and structure of the sentences which express it.

This has two consequences. In the first place it means that there are no cases where we can straightforwardly observe a correspondence between a situation that exists and the situation depicted by a sentence. It might be supposed that a simple observation sentence like *There is a table here in front of me* would be such a case. But the correspondence between that sentence and the reality it purports to depict is uncertain, not because of traditional skeptical doubts concerning the very remote possibility that I might be suffering a hallucination, but because, in the absence of confirmation from other competent speakers of English, there is no assurance that that is the correct description of the situation according to the semantic and syntactic conventions of that language. Given that confirmation, however, not only do we exclude the already remote possibility that what we think we are confronted with is some sort of hallucination, we now have a declarative sentence which could only fail to constitute an accurate linguistic depiction of the situation confronting us in the extremely unlikely case where our fellow observers are engaged in a complex conspiracy to persuade us either that we are suffering from a hallucination or that the English sentence *There is a table here in front of me* has a different meaning from that which it actually has by virtue of the conventions of the language, a contingency which, if it were realized, would rapidly lead to a breakdown in the conditions necessary for interpersonal linguistic communication.⁶

OBJECTIVE OBSERVATION SENTENCES AS THE ANCHORS OF EMPIRICAL KNOWLEDGE

These objective observation sentences whose accuracy as a description of the state of affairs confronting them is agreed by a number of observers all of whom are competent speakers of the language or code in use

⁶ For a more extensive presentation of this argument and that of the following section see Place (1993).

amongst them, are just the kind of incontrovertible empirical, synthetic and contingent propositions which according to the intuitions of the epistemic foundationalist are needed as an anchor or foundation for empirical knowledge. Without such an anchor, I contend, there is no way that we can be assured that a system of propositions, however internally coherent it may be, actually corresponds to the extra-linguistic reality it purports to depict. Moreover this empirical anchor is far superior to the private sensation protocols which have been cast in that role by traditional empiricist epistemologies. For, however salient my experience of what I call 'my pain' may be, how can I be certain that this is really what they call 'pain' in English, when I can't feel what you call 'pain' and you can't feel what I call 'pain'? I can only be satisfied on this point by observing that what you call 'pain' in your case has the same kind of publicly observable causes and the same kind of publicly observable behavioral effects as what I call 'pain' in my case.

PRIMITIVE SUGGESTIBILITY AND THE DISCRIMINATION OF MISINFORMATION

Objective observation sentences are at best only an anchor attaching our linguistically formulated beliefs to the reality they purport to depict. That this is so becomes clear when we reflect that the primary function of the ability to construct and [p. 133] construe novel sentences is not to describe features of the current stimulus environment of a number of competent speakers and listeners. It is rather, as we have seen, to induce the listener to do things she has never done before and convey information to her about aspects of the environment to which she would otherwise have no access.

It is difficult to exaggerate the advantage which the ability to communicate this kind of novel information gives to the human species. Nevertheless, it is an advantage for which a price has to be paid, the danger of being deceived, either deliberately or involuntarily, by misinformation supplied by others.

The need to detect the lies and other false statements supplied by others is underlined by some evidence reviewed by Clark Hull in his book *Hypnosis and Suggestibility* (Hull, 1933, pp. 83-85). This evidence suggests that, in order to understand the novel sentences it encounters in the speech of others, a child must begin by acquiring

a primitive habit tendency (of responding directly to verbal stimulations) which is useful in most situations but maladaptive ... if a person responds positively and indiscriminately to all suggestions made by others, [in which case] he is likely to be taken advantage of by his associates in that the energies needed for his own welfare will be diverted to that of those giving the suggestions. (Hull, 1933, p. 85)

Holism and Cognitive Dissonance

Having acquired the initial propensity to accept as true everything that it is told by others, the child gradually learns to avoid these maladaptive consequences by discriminating between those statements made by others which demand further scrutiny and those that can be allowed to go through 'on the nod', as the saying goes. After rising steadily up to the age of eight, as the child gradually acquires what Hull calls "a working knowledge of the language," suggestibility, as measured by the postural suggestibility test, begins to decline, and continues to do so into adolescence.

But what does the child have to go on in making this discrimination? Clearly it does not do it by tracing every statement back to its source in observation. To do that would take far too long, even in those cases where it could be done, would be impossible in the case of statements about the past and other unobservables, and defeats the object of the exercise which is precisely to get information from others to which one has no observational access oneself.

Since it is only in a minority of cases that its primitive tendency to accept everything it is told as true will let it down, what the child needs to do is to find some feature that will distinguish the odd piece of misinformation from the bulk of correct information which it can accept without further question.

For this purpose the only principle on which we can ultimately rely is the principle of the *indivisibility of truth* or '*holism*,' as it is sometimes called. This is the principle according to which every true proposition must be consistent with every other true proposition. It is a straightforward consequence of the law of non-contradiction whereby, if *p* is true, *not p* must be false and *vice versa*. It follows from this law that if *q* entails *not p*, *p* and *q* cannot both be true. Either one is true and the other false or both are false. It follows from this that in building up a stock of beliefs about the world on which to base one's action, one should be made uncomfortable by any apparent contradiction or "cognitive dissonance," as Leon Festinger (1957) calls it,

within one's existing belief system and endeavor to ensure that any such contradiction is ironed out, before the relevant beliefs are accepted as reliably true. The effect of this endeavor should be to ensure that by and large an individual's beliefs will constitute a coherent system and, provided most of constituent beliefs are true, will thereby constitute a body of knowledge whose reliability will be confirmed by its overall utility as a guide to action (the pragmatic principle) and its conformity to the opinions of others (Wittgenstein's, 1953, "agreement in judgments").

Given such a coherent body of beliefs whose overall correspondence with reality is guaranteed by its consistent reliability as a guide to action, the individual, whether child or adult, has a standard against which to evaluate any new piece of putative information presented to it by another speaker. If there is no obvious dissonance or contradiction between the new item and the existing stock, it can be allowed to go through on the nod. Only when a contradiction or dissonance is detected between the new item and the existing stock will alarm bells ring and all the armory of logical argument be brought to bear in order either to justify the new item's rejection or find some way of resolving the contradiction and incorporating the new item into the system. [p. 134]

Building a coherent body of propositions representing environmental contingencies, anchored to reality by objective observation and confirmed by its utility as a guide to action is not just a strategy designed to resolve the epistemological problem as it confronts the individual. It is a cooperative social process in which every member of the linguistic community is involved in the process of adding to, correcting and transmitting what Binswanger (1947) has called the "*Mitwelt*," the body of coherent and validated knowledge and belief that is the shared property of that community. It is a process however, which before the advent of what we now call 'science' proceeds by an unselfconscious process of progressive behavioral-shaping. This process ensures that where adequate evidence is available to the unaided human sensorium and contingencies are ones which are of importance for the survival and welfare of the individual and the social group, the linguistic specification of those contingencies within the system of common sense practical belief will accurately represent the actual contingencies that obtain.

Commonsense Knowledge and Supernatural Belief

Where the ability to predict the contingencies is vital, but the evidence on which to base such prediction is lacking, beliefs and practices based on those beliefs develop within the linguistic community which, while they are not contradicted by the available evidence, postulate 'supernatural' contingencies whose formulation is not shaped by experience of the actual contingencies involved as are the beliefs that constitute the body of practical common sense knowledge. Since they are not constrained by the actual contingencies involved, such supernatural belief systems tend to vary from one social group to another. Moreover, in a world in which law and morality does not extend to interactions between members of different social groups, sanctions based on the fear of supernatural retribution become an essential part of intertribal trade. In these circumstances differences between groups in their supernatural beliefs are a serious barrier to such trade.

THE ORIGINS OF PHILOSOPHY AND SCIENCE

Philosophy, in the Western tradition at least, began in Ancient Greece as an attempt to resolve the problem of differences in supernatural belief as it presented itself in the circumstances of the Greek colonies in Asia Minor and elsewhere. Cities like Miletus where Greek philosophy first appeared lived by trading with peoples of other faiths amongst whom they had settled, but on whom, unlike a conqueror, they were unable to impose their own belief system by force. Instead, they sought to resolve the problem by the method of argument and debate, in a manner which did not prejudge the issue as to who was right and who was wrong. As time went on, part of philosophy developed into what we now call 'science' as it was gradually realized that such debates could sometimes be resolved by systematically subjecting the propositions in question to the kind of systematic shaping by the actual contingencies to which the practical belief of common sense knowledge are subjected in the natural course of events. This is the experimental method.

Science and the Problem of Universals

Using the method of systematic observation and experiment allows the replacement of supernatural belief with the knowledge that results from shaping by rigorous exposure to the actual contingencies. Systematic observation and experiment, however, are not by themselves sufficient to yield the new ways of understanding the universe which are the characteristic products of scientific research. What is also needed is a re-structuring of the concepts that are used to classify the particulars we encounter in the world around us as instances of the different universals or kinds of thing.

The dependence of knowledge on a pre-existing ability on the part of the organism to classify features of its environment into instances of the same and different kinds is not confined to scientific knowledge, nor, indeed, to propositional knowledge generally. It is an implication of Darwin's theory of evolution by variation and natural selection that the survival and reproduction of complex free-moving living organisms, animals in other words, depends on their ability to change the spatial relations between themselves and other objects, including other organisms of the same and of different species, and so bring about the conditions necessary for that survival and reproduction. In order to do that, the organism requires a system, its nervous system, whose function is to match output both to the current stimulus input, and to the organism's current state of deprivation with respect to conditions required for its survival and successful reproduction. [p. 135]

Matching behavior to the conditions required for survival and reproduction is the function of the motivational/emotional part of the system. Matching behavior to current stimulus input is the function of the sensory/cognitive part of the system. The sensory/cognitive system cannot perform its function successfully without the ability to group inputs together in such a way that every actual and possible member of the class or category so formed is a reliable indicator of the presence of a particular contingency, an environmental situation in which a particular behavioral strategy or set of such strategies is going to succeed. In other words the survival and reproduction of an organism of this kind depends crucially on its having a conceptual scheme, a conceptual scheme moreover, which reliably predicts the actual behavior-consequence relations operating in the organism's environment.

Whether it is built into the organism's genetic constitution or acquired by some process of abstraction learning or, as seems most likely, develops through some combination of the two, this Darwinian perspective predicts that an organism's conceptual scheme will follow what Skinner (1938 p. 33) calls "the natural lines of fracture along which behavior and environment actually break."

Some recent evidence (Catania, Shimoff and Matthews 1989), however, suggests that once contingencies are specified by a linguistic formula or rule, the precise matching of expectations to the actual contingency which is characteristic of the contingency-shaped behavior of pre-linguistic organisms disappears. There are three possible explanations of this phenomena. One explanation proposes that where, as in these experiments, the contingency-specification is supplied by the experimenter, the contingencies controlling the subject's behavior are those involving the supply of social reinforcement by the experimenter, rather than those involved in the task itself. Another is that the expectation that is set up by a sentence is much more open and, consequently, less easily disconfirmed than one based only on previous encounters with the actual contingency. A third is that the consequences of failing to adapt behavior to minor changes in the contingency are not drastic enough for those changes to impress themselves on the behavior and prompt a reconsideration of how the contingency should be specified. Whatever the reason, there is evidently a connection between this insensitivity of a verbal specification to disconfirmation by subsequent experience of the actual contingency and the ease with which supernatural explanations which are reinforced by the verbal community can survive what in other circumstances would be regarded as manifest disconfirmations.

But outside the domain of the supernatural, where the interest of the community is to ensure an *exact* correspondence between the linguistic specification and the actual contingency, we can be more satisfied that "the natural lines of fracture" are being followed, and that practical common sense knowledge is what it purports to be, genuine knowledge of the contingencies it depicts. However, this accurate following of "the natural lines of fracture" extends only as far as the immediate concerns of human beings and the evidence available to the unaided human sensorium. The function of science is to extend the kind of verbally and mathematically formulated knowledge that can yield precise and accurate predictions of outcome into areas, such as the causes of disease and natural disaster, where traditionally only supernatural explanations and ritual practices have been available. In order to do this, many of the time-honored conceptual boundaries of common sense are redrawn with the result that sentences like *whales are fishes* which once expressed propositions which were analytic, true *a priori* and necessary cease to do so, while sentences like *Water is*

H₂O which were once synthetic, true *a posteriori* and contingent become analytic, true *a priori* and necessary.

From Contingencies to Causation

The concepts of common sense and those of science have it in common that they both group together things that have the same kinds of cause or same kinds of effect. They differ in that the causal relations which define the boundaries of the concepts of common sense are anthropocentric in the sense that they are viewed as contingencies confronting a human agent. By contrast the causal relations which define the boundaries of the concepts of science are viewed, in Spinoza's phrase, *sub specie aeternitatis*, as they are in themselves, regardless of how they impinge on human affairs.⁷ To take an obvious example, the common sense concept of 'animal' excludes human beings. In science *homo sapiens* is just one amongst many species of free-moving living organism. Needless to say, this scientific repudiation of anthropocentrism does not extend to the technological exploitation of the scientific discoveries which the adoption of the objective standpoint makes possible. [p. 136]

EMPIRICAL SCIENCE AS THE STUDY OF BEHAVIOR

It might be supposed that in moving away from anthropocentrism towards a more objective perspective the scientific attitude would require the abandonment of the concept of the three-term contingency with the behavior (of a living organism) as its middle term in favor of some less specifically biological and action-orientated conception of the causal relation. From the standpoint of linguistic behaviorism it is accepted that the concept of behavior in traditional behaviorism in which its application is restricted to the molar aspects of the behavior of living organisms is too narrowly parochial to satisfy the kind of universality and objectivity which the scientific attitude demands. The remedy, however, is not to abandon the concept of behavior, but to follow what is already a widespread linguistic practice in all branches of science and recognize that it is not just whole living organisms who behave. So do their constituent parts; and so does every entity in the universe which interacts causally with some other entity. Following that usage allows us to say that every empirical science uses the methods of systematic objective observation, measurement, recording and, wherever possible, experimental manipulation in order to study the behavior of some variety or kind of concrete particular or body extended in three dimensions of space and one of time.

THE CAUSAL RELATION

In studying behavior in this general sense, the scientist is studying causation, the causal action of one thing on another. Moreover, it is because and in so far as they behave in the same way, because and in so far as the same consequences follow when the same causes impinge, that we can be sure that our scientific conceptual scheme follows Skinner's "natural lines of fracture." It follows that without an understanding of the causal relation, we cannot hope to understand the scientific enterprise.

Viewed from the standpoint of linguistic behaviorism a proper understanding of the causal relation requires acceptance of the following (analytic) principles.

1. Causation is the relation between situations (events and/or states of affairs). It is not and should not be represented as a relation between propositions (such as the relation of material implication 'if *p* then *q*')
2. Causation is primarily a relation between particular actually existing situations.
3. Nevertheless all causal relations have two aspects:
 - a categorical aspect whereby two causally related situations are juxtaposed in space-time, and
 - a modal aspect which links the causally related situations to other possible situations which might have existed, if circumstances had been different.
4. Causes are always multiple. The belief in a single cause has more to do with the human urge to pin the blame for what has happened on a single scapegoat than it has with any reality.
5. The causes of a state of affairs are all themselves states of affairs, all of which exist so long as their effect exists.

⁷ I owe this Spinozistic conception of science to my old friend and former colleague, Professor J. J. C. Smart. See his *Our Place in the Universe* (Smart 1989) p. 111.

6. All but one of the causes of an event are states of affairs (standing conditions) which are in position before the event occurs and persist at least until it begins to do so.

7. Every event has a single triggering event which, when combined with the standing conditions, completes the set conditions which are jointly *sufficient* for the coming about of the effect. The onset of the effect event coincides with occurrence or termination of the triggering event.

8. In its categorical aspect, every causal relation involves some kind of direct or indirect contact between at least two concrete particulars, the causal agent and the causal patient.

9. The *causal agent* is the concrete particular ('substance' in Aristotle's sense) whose continued direct or indirect contact with the causal patient maintains the effect, where the effect is a state of affairs, or whose coming into direct or indirect contact with the causal patient triggers the effect, where the effect is an event.

10. The *causal patient* is the concrete particular the persistence of or change in whose properties and relations with other things constitutes the effect.⁸

11. In its modal aspect, to say that the existence or occurrence of one situation is a *cause* or causally necessary condition for the occurrence or existence of another independently existing situation (its *effect*) is to say that, other things being as they were, if the cause had not existed or occurred, the effect would not exist or have occurred as and when it does or did (the *causal counterfactual*).

12. Since we can never observe what would exist or would have occurred if the situation had been different from that which actually existed or occurred, we can only establish the truth of this causal counterfactual by deducing it from some kind of law statement.

13. A law statement which 'supports' a causal counterfactual is a statement to the effect that, *if at any time* during a period which includes the duration or moment of onset of the effect all other relevant conditions are as they were when the effect actually existed or occurred and a situation of the cause type existed or occurred, a situation of the effect type would exist or occur or would have a high probability of existing or occurring.

14. Law statements in this sense are of three kinds

- individual law statements which describe the dispositional properties of particular individuals (e.g., *this piece of glass is particularly brittle*).
- universal law statements which describe the dispositional properties of things of a kind (e.g., *glass is brittle*)
- scientific law statements which describe in quantitative terms the causal relation between the dispositional properties of things of a kind and the effect they produce (e.g. Ohm's Law).

15. Individual law statements, though universally quantified over (restricted periods of) time, are synthetic, determined as true or false by observation (*a posteriori*) and contingent. Universal law statements and scientific law statements, if true and generally accepted as such, are analytic, true *a priori* and necessary. If something proves not to have the dispositional properties which are conventionally and analytically ascribed to things of the kind of which it has hitherto been taken to be an instance, we conclude, not that the universal law statement is false, but that the individual in question has been misclassified.

16. The analyticity of scientific law statements, the fact that they are made true *a priori* by linguistic convention within the scientific community, explains the phenomenon of the scientific revolution as described by Kuhn (1962) whereby difficulties in describing observations in terms of the existing conventionally established conceptual scheme or "paradigm" leads eventually to its replacement by another set of conventions which because of the change in conceptual boundaries are 'incommensurable' with those of the previously dominant paradigm.

17. The linguistic conventions which make scientific law statements analytic survive only in so far as they facilitate the formulation of individual law statements describing the dispositional properties of concrete particulars which, despite their universal quantification over restricted periods of time, are synthetic, true, if they are true, *a posteriori* and contingent.

18. Since causes are always multiple, the individual law statements which support causal counterfactuals are true only in so far as they contain a *ceteris paribus* clause stipulating that a situation of the cause type will be effective, only if all other causes which together are jointly sufficient for the coming about or existence of a situation of the effect type are in place.

19. It follows from this that the only way to determine the truth of an individual law statement, and hence the truth of the causal counterfactuals it supports, is to use what Mill (1843) calls the method of "concomitant variation", in other words, the experimental method. This is the procedure whereby each 'variable' whose causal efficacy is suspected is systematically varied while all other factors whose causal efficacy in relation to the 'dependent variable' or effect in question is suspected are held as far as possible constant. Any change that occurs in the dependent variable under these

⁸ Since in every causal interaction both parties are changed as a consequence, the distinction between the causal agent and the causal patient is a matter of which of the two is changed most (the patient) and which comes off relatively unscathed (the agent). In a case where the changes are more or less equal, as when a cube of salt is dissolved in a bowl of water, it is a matter of which effect, the disappearance of the cube or the water's becoming salty, is of interest to the speaker. I am indebted to Professor C. B. Martin of the University of Calgary for this point.

conditions and fails to occur in its absence can then be attributed with some confidence to the only 'independent variable' whose value has been changed.

20. This method concomitant variation relies, in order to validate the conclusions based upon it, on the assumption that like causes produce like effects. Though requiring some qualification to allow for those phenomena which are subject to restricted random variation, the principle that like causes invariably produce like effects is an analytic principle which differs from the laws of empirical science in that its analyticity, *a priori* truth determination and necessity is not simply a matter of existing linguistic conventions within the scientific community, conventions which are liable to change in the light of the results of future empirical research. *This* convention, like the arithmetical conventions which make *Two is the only even prime number* an analytic truth, is one that could not conceivably be other than it is. This is partly because if like causes did not produce like effects, no free moving living [p. 138] organism that relies on its brain to select an output appropriate to current input could survive and reproduce. Its brain could never anticipate what outcome is probable, given the current input. But it is also because, if like causes did not produce like effects, no ordered universe could have emerged from the primeval chaos.

The Ontological Independence of Dispositional Properties from Their Structural Basis

Based on this account of causation, Linguistic Behaviorism has a distinctive view on the issue of micro-reductive explanation. This takes as its starting point the view that a dispositional property depends for its existence on some feature or set of features of the structure of the entity whose property it is. This is to reject H. H. Price's claim that

There is no *a priori* necessity for supposing that *all* dispositional properties must have a 'categorical basis'. In particular, there may be mental dispositions which are ultimate. (Price, 1953, p. 322, quoted by Armstrong, 1968, p. 86)

However, the present view differs from that of Armstrong (1968) who likewise rejects Price's claim, in that the principle that every dispositional property must have its "categorical basis" is seen as a special case of the (analytic) principle whereby there are no situations (events or states of affairs) for which some kind of causal story cannot be told. In other words, the relation between a dispositional state and its "categorical basis" is a causal relation. But if that is so, the dispositional state and its "categorical basis" must, in Hume's words, be "distinct existences", not one and the same thing, as proposed by Armstrong (1968, pp. 85-88).

Another consequence of the view that a disposition depends causally on its "categorical basis" is that the "categorical basis" cannot be purely categorical. For, as we have seen, every causal relation has both

a categorical aspect whereby two causally related situations are juxtaposed in space and time, and, ... a modal aspect whereby the causally related situations which might have existed, if circumstances had been different. (above p. 136)

In other words, the structural features which give an entity a dispositional property must include dispositional properties of the structure alongside its categorical spatio-temporal features.

These relationships can be illustrated by the example of the sharpness of a knife or needle. The adjective 'sharp' is systematically ambiguous as between the disposition to cut or pierce soft objects on which the property bearer impinges and those features of the property bearer, the fineness of its edge or point and the hardness/rigidity of the material of which it is composed, which give it that dispositional property. Once that ambiguity is recognized, however, it becomes apparent that the relation between the dispositional property and the features which give it that property is a causal relation, and that of the two causes of the disposition one, the fineness of the edge or point, is categorical, while the other, the hardness or rigidity of the material, is modal or dispositional.

Considered as a dispositional property, the sharpness of something such as a knife or needle is remarkable in that the structural features on which its existence depends are features of the *macrostructure* of the property bearer, and are, consequently, accessible to our common sense understanding of the matter. In most other cases, for example in the case of the dispositional property of hardness/rigidity on which the existence of the dispositional property of sharpness in part depends, the existence of the dispositional property depends on categorical and modal features of the *microstructure* which are accessible only to scientific scrutiny and understanding. Indeed, so successful has been the strategy of searching in the microstructure for a basis for the dispositional properties distinctive of natural kinds that it is often seen as

the hallmark of the scientific enterprise. So much so that it has become very difficult to get a hearing for behaviorists such as B. F. Skinner who have insisted that the scientific study of the environmental conditions governing the acquisition of the molar behavioral dispositions of living organisms should precede and be conducted independently of the study of the microstructural basis of those dispositions in the brain. Yet if, as is argued here, the relation between a dispositional property and its microstructural basis is a causal relation between "distinct existences", that is precisely the strategy which is demanded by the experimental method, the method of concomitant variation. For unless the environmental factors can be held constant or their effect on the resultant behavioral dispositions allowed for, there can be little hope of disentangling the [p. 139] complex microstructural changes in the brain by which those effects are mediated

REFERENCES

- Armstrong, D. M. (1968) *A Materialist Theory of the Mind*. London: Routledge and Kegan Paul.
- Barwise, J. and Perry, J. (1983) *Situations and Attitudes*. Cambridge, Massachusetts: M.I.T. Press.
- Binswanger, L. (1947) *Ausgewählte Vorträge und Aufsätze*. Bern: Francke.
- Brentano, F. 1874/1911/1973: *Psychologie vom empirischen Standpunkt*. Leipzig: Duncker u. Humblot. Second Edition, Oskar Kraus (ed.) Leipzig: Felix Meinert. English translation as *Psychology from an Empirical Standpoint*. L. L. McAlister (ed.) London: Routledge & Kegan Paul.
- Catania, A. C., Shimoff, E. and Matthews, B. A. (1989) An experimental analysis of rule-governed behavior. In S. C. Hayes (Ed.) *Rule-Governed Behavior: Cognition, Contingencies and Instructional Control*. New York: Plenum Press, pp. 119-150.
- Chomsky, N. (1957) *Syntactic Structures*. 's Gravenhage: Mouton.
- Dummett, M. (1973) *Frege: Philosophy of Language*. London: Duckworth.
- Festinger, L. (1957) *Cognitive Dissonance*, Stanford, CA: Stanford University Press.
- Frege, G. (1879/1960) *Begriffsschrift*. English translation P. T. Geach. In P. T. Geach & M. Black (eds.) *Translations from the Philosophical Writings of Gottlob Frege*, 2nd. Ed. Oxford: Blackwell, 1960.
- Goldiamond, I. (1966) Perception, language and conceptualization rules. In B. Kleinmuntz (Ed.) *Problem Solving: Research, Method and Theory*. New York: Wiley, Chapter 8, pp. 183-224.
- Hull, C. L. (1933) *Hypnosis and Suggestibility*. New York: Century.
- Kuhn, T. S. (1962) *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.
- Mill, J. S. (1843) *A System of Logic, Rationative and Inductive, being a Connected View of the Principles of Evidence and the Methods of Scientific Investigation*. London: J. W. Parker.
- Place, U. T. (1956) [Is consciousness a brain process?](#) *British Journal of Psychology* **47**, 44-50.
- Place, U. T. (1983) [Skinner's Verbal Behavior IV - how to improve Part IV, Skinner's account of syntax](#). *Behaviorism*, **11**, 163-186.
- Place, U. T. (1991) [On the social relativity of truth and the analytic/synthetic distinction](#). *Human Studies*, **14**, 265-285.
- Place, U. T. (1992a) [Behavioral contingency semantics and the correspondence theory of truth](#). In L. J. and S. C. Hayes (Eds.) *Understanding Verbal Relations*. Reno, Nevada: Context Press, Chapter 9, pp. 135-151.
- Place, U. T. (1992b) [The role of the ethnomethodological experiment in the empirical investigation of social norms, and its application to conceptual analysis](#). *Philosophy of the Social Sciences* **22**, 461-474.
- Place, U. T. (1993) [A radical behaviorist methodology for the empirical investigation of private events](#). *Behavior and Philosophy*, **20**, 25-35.
- Price, H.H. (1953) *Thinking and Experience*. London: Hutchinson.
- Quine, W. v. O. (1951/1980) Two dogmas of empiricism. *The Philosophical Review*, **LX**, 20-43. Reprinted in W. v. O. Quine, *From a Logical Point of View*. Cambridge, MA: Harvard University Press, Fourth Printing, pp. 20-46.
- Russell, B. (1918-1919/1956) The Philosophy of logical atomism. *The Monist* **xxviii**: 495, 1919, 527, **xxxix**: 32-63, 190-222, 345-380. In B. Russell *Logic and Knowledge, Essays 1901-1950*. R. C. Marshall (ed.) London: Allen and Unwin, 1956.
- Skinner, B. F. (1938) *The Behavior of Organisms*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1957) *Verbal Behavior*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1966/1988) An operant analysis of problem solving. In B. Kleinmuntz (ed.) *Problem Solving: Research, Method and Theory*. New York: Wiley. Reprinted with revisions and peer commentary in A. C. Catania and S. Harnad (eds.), *The Selection of Behavior. The Operant Behaviorism of B. F. Skinner: Comments and Consequences*. Cambridge: Cambridge University Press, pp. 218-236.
- Skinner, B. F. (1969) *Contingencies of Reinforcement*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1974) *About Behaviorism*. New York: Knopf.
- Skinner, B. F. (1989) The behavior of the listener. In S. C. Hayes (ed.) *Rule-Governed Behavior: Cognition, Contingencies and Instructional Control*. New York: Plenum, pp. 85-96.
- Smart, J. J. C. (1989) *Our Place in the Universe*. Oxford: Blackwell.

- Tarski, A. 1930-1/1936/1956: O pojeciu prawdy w odniesieniu do sformalizowanych nauk dedukcyjnych (On the notion of truth in reference to formalized deductive sciences), *Ruch Filozoficzny* **xii**. Revised version in German translation as 'Der Wahrheitsbegriff in den formalisierten Sprachen' *Studia Philosophica* **1**: 261-405. English translation of the German text by J. H. Woodger as 'The concept of truth in formalized languages.' In *Logic, Semantics, Metamathematics: Papers from 1923 to 1938*. Oxford: Clarendon Press, pp. 152-278.
- Whellan, T. & Co. (1859) *History and Topography of the City of York and the North Riding of Yorkshire (Volume II)*. Beverley: John Green.
- Wittgenstein, L. (1921/1971) *Tractatus logico-philosophicus Annalen der Naturphilosophie. Tractatus Logico-Philosophicus* with second English translation by D. F. Pears and B. F. McGuinness, Second Edition, London: Routledge and Kegan Paul.
- Wittgenstein, L. (1953) *Philosophical Investigations*. English Translation by G. E. M. Anscombe. Oxford: Blackwell.