Revista Romaneasca pentru Educatie Multidimensionala

Romanian Journal for Multidimensional Education

ISSN: 2066 – 7329 (print), ISSN: 2067 – 9270 (electronic)

Coverd in: Index Copernicus, Ideas RePeC, EconPapers, Socionet, Ulrich Pro Quest, Cabbel, SSRN, Appreciative Inquery Commons, Journalseek, Scipio, EBSCO

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Revista Romaneasca pentru Educatie Multidimensionala, 2012, Volume 4, Yssue 3, December, pp: 29-47

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http://revistaromaneasca.ro

Published by:

Lumen Publishing House

On behalf of:

Lumen Research Center in Social and Humanistic Sciences

British Philosopher Gilbert Ryle's Perspective on Behaviorism

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Abstract

Published in 1890, William James' manual, The principles of psychology, followed by Psychology (lectures) in 1892, form the foundation of behaviorism. The same year, Animal life and intelligence by C. Lloyd Morgan correlates with James' view, extending it to wildlife. The next step was taken by Lloyd Morgan, with the publication of An introduction to comparative psychology (1894), in which the issue of trial and error learning in animals receives a systematic approach, thus pointing research to a specific area and interpretive apparatus that will ultimately lead to the full crystallization of behaviorism's ideas in the past century. The most prestigious version of behaviorism, that of psychological behaviorism, has strong historical roots; in this way, one can invoke the works of Aristotle (On Nature). Another version of behaviorism, like that suggested by Gilbert Ryle, is logical behaviorism. Long before that, however, classical British empiricists, led by John Locke (1632-1704) and David Hume (1711-1776), used associationist prescriptions to reveal cause-effect coupling in mental phenomena.

Keywords:

Gilbert Ryle, behaviorism, mind/ body, empiricism, hardware/ software

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Introduction

According to classical associationism, intelligent behavior in humans (and even in some mammals) is the product of an activity of associative learning. As a result of associations between pairs of stimuli or perceptual experiences, on one hand, and ideas and thoughts, on the other, human beings and animals learn about the environment and change their way of acting accordingly. Of course, associations allow for the discovery of causal structures. The association is a fairly simple way to acquire knowledge about the relationships between events. Behavioral intelligence marks knowledge of this type. Such a model has fascinated British empiricists, although, in a sense, they should not be labeled as "behavioral": as stated, this line of thinking emerges a century later, in nineteen-century science.

An important precursor of empiricism, Thomas Hobbes (1588-1679) can be considered a phenomenalist as he bases his attempts of explaining mental activity on phenomena rather than essences. Contemporary with Descartes, who develops a concept to be later called "body / mind dualism ', Hobbes leads further the empiricist conception initiated by Francis Bacon. Attempting a synthesis between empiricism and Cartesian rationalism, Hobbes concludes that sensations are the result of imperceptible movements that occur in our body and the mind is nothing but calculation applied to varied sensations. Hobbes's central concept of ontology is that of physicality. Hobbes finds the empirical source of sensation: the outer body or the object that makes an impression on a sense organ or another, as stated in the Leviathan, Part I (*On man*), chapter I (About the senses). The universe is an aggregate of all possible and achievable bodies.

The properties of bodies and the qualitative variety of the material world depend on motion, on a double motion: one internal to the bodies (atoms), the other external, which is acted upon our sensory organs by external objects and phenomena. Inside the mental frame, the British philosopher distinguishes memory (a lasting trace left by perception after repeated requests), imagination (the feeling which gradually weakens over time, producing phantasms) and intellect, the latter being a correlate of imagination through language.

In the same mechanist fashion, Thomas Hobbes explains biological, physiological and even social processes. From the succession

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and chaining of images, our ideas begin to reflect world. Through the association of names that evoke ideas come sentences and from connecting these in turn comes reasoning. For Hobbes, man is, like any other, a material body whose mechanism can be explained by movement. On the same mechanist basis our spiritual life and human knowledge itself are explained.

John Locke is usually regarded as the founder of modern empiricism. In Essay on the human intellect (Locke, 1961:238), although it deals mostly with problems of epistemology, ontological problems are also present. Body and mind are described by their characteristics, the first by solidity and volume and by the possibility of communication through impulse, the second by cogitation and free will: "Our idea of soul, regarded as immaterial spirit is that of a substance that thinks and has the power to put the body in motion, by will or thought." Mind is immaterial, but substantial, and so it is not accidental but has a necessarily determined existence. By using a deistic solution, Locke tries to solve two important problems: the source of movement in nature and the nature of human consciousness: God is invoked as prime mover of the Universe (a "relic" from Aristotle's *On Nature*). God is also the one who "seeds" consciousness in the human being. Thus, from a body / mind perspective, Locke is neither monist nor dualist, remaining somewhere halfway. Divine and natural causality sometimes combine.

Our intellect behaves as a mirror towards things. The equivalent of mirror images of things is, for the intellect, simple ideas. These ideas are, however, are not exact copies of external things. Some of them express intrinsic qualities of things, other express the effects of things on the human mind. Immutable qualities that belong to things are: the volume, the figure, the motion, the repose, the impenetrability and the number. These qualities of things are called primary qualities. But bodies can exert certain influence on our senses, such that they produce representations of heat and light, colors, sounds, smells, tactile sensations, etc.. They are located not in the bodies themselves, but in the mind. Our intellect does not operate only with simple ideas, but combines them and gets complex ideas, which are divided into three classes: modes, substances, relations.

David Hume, the philosopher about whom is said to have awakened Immanuel Kant from the "dogmatic slumber", is the one that

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leads forward these ideas, bringing Locke's empiricism to its last consequences. For Hume, to think something through sensory qualities and to think its existence means different things. Sensations are discontinuous, perceptions try to give continuity, but only imagination (which is based on consistency or coherence of impressions) is able to represent the outer world as continuous and uninterrupted (Hume, 1987).

Therefore, Hume's attempt to build a moral philosophy based on experience and covering human nature ended in failure and skeptical conclusions of knowledge. The philosopher refuses to ask whether there is an objective reality outside consciousness and deals with experience as an experience of consciousness without relating it to the external world.

Consciousness is nothing but a collection of different perceptions, united together by certain relations, which derive from the laws of association of ideas. All perceptions of the spirit can be classified into two categories: impressions and ideas, differing in the degree of vivacity with which they occur in the spirit and make their way into thinking; an idea differs from an impression through its intensity, impressions being more vivid, colorful, accurate in comparison with ideas. If one make an analysis of one's own conscience, that is of what is happening in the spirit, we encounter but a series of impressions, ideas, pleasures, pains, emotions, passions, feelings: consciousness is nothing but the changing of these conditions; the philosopher, though, cannot identify a support for all these things. The conclusion of the Treaty on human nature is that man cannot know the essence of the material or spiritual world, because knowledge is reduced to a succession of ideas in the consciousness, to which habit gives a causal character. Perceptual knowledge cannot certify the existence of God, matter or spirit. In other words, sensory knowledge is not able to elucidate the status of substances such as God (the supreme substance), matter (the substance of the surrounding universe), consciousness or spirit (manifested as a human self).

John Stuart Mill (1806-1873) challenged the theory of David Hume, reducing foreign objects to simple permanent possibilities of perception. To explain a phenomenon is to determine its cause, to explain a law is to reduce it to other known laws. In both cases, one is trapped in the closed circle of the phenomenal world and cannot grasp

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the essence of things perceived. The self is reduced to a permanent possibility of producing feelings that one does not have, but might have. According to Mill, the belief in the permanence of the self is nothing but the belief in the permanent possibility of psychic manifestations, a belief that always accompanies our real feelings.

2. Behaviorism in the twentieth century

For the first modern psychologists there were no differences between "consciousness" and "mind". Psychology was described as a study of the mind and consciousness, even though the affects could not be contained entirely inside either of the two concepts. The introspection method was suitable for the study of consciousness - thus mental investigation methodology allowed for procedures different from those of the natural sciences. With the advent of behaviorism, introspection as a method of investigation, and consciousness, as an object of investigation, were no longer of interest to scientists. Behaviorists believed that the only chance for psychology to become a science was that its data be directly observable and objectively measured.

In Chicago, at the beginning of the last century, a movement emerged within psychology that treats behavior as a subject of study using observation as its only method. This movement, which brings together the natural environment as invariable and introspection as variable, took the name of behaviorism. Claiming that it promotes psychology to the level of objective science, behaviorism seeks to define laws that link stimuli to response and allow derive behavior from stimulus. The first works to consecrate behaviorism are those of JB Watson, Clark Hull, Edward Tolm, with the most prominent representative of the current, being, in the twentieth century, Burrhus Skinner. The geography of perceptive terminology can be used in actual cases with examples from literature reflecting the impact of natural and social environment on the individual's mental representations.

The personal experiences of an individual could be revealed only through introspection and not directly through observation. Thus, the psychology had to deal with public rather than personal events, events which were observable only to the individual experiencing them. Because behaviorists approached phenomena in terms of the subject's verbal response, their excessive interest towards observable behavior made

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them neglect interesting psychological problems such as dreams, meditation, hypnosis, subjective aspects becoming totally irrelevant to them. In the sixth decade, psychologists have gradually begun to acknowledge that some aspects of consciousness were too important to be neglected.

In 1894, C. Lloyd Morgan published *An introduction to comparative psychology* highlighting the idea of learning by trial and error in animals, which strongly influenced the behaviorist current. Scientists were focusing on the comparison between human and animal intelligence in an attempt to separate the two types of behavior. In 1903, Ivan Pavlov, professor of psychology at the Military Medical Academy in St. Petersburg, whose work influenced early behavioral psychologists, receives the Nobel Prize for his research in digestion. This occurs almost simultaneously with the publication of JB Watson's thesis, *Animal Education,* at the University of Chicago. Another notable figure is the psychologist and philosopher James Angell, who significantly influenced early behaviorist psychology with his work Psychology*: an introductory study to the structure and function of human consciousness* (1904).

In 1913, when JB Watson published his study, *Psychology, a behaviorist point of view*, Sigmund Freud inaugurated a different approach, by writing *Totem and Taboo*. The methodological diversification in psychology becomes evident with the emergence of Edmund Husserl's *Ideas - general introduction to pure phenomenology* (1913). At this point, psychologist James Mark Baldwin published a *History of psychology*, following its development from Aristotle to "the present".

Watson's basic idea is that of a "mental geography": although the map is not the territory, its outline on the map leads to objective knowledge and so produces the path from subjective to the objective. Geopolitical imagery can be translated into a system of interpretation with the help of "mental maps". If we ask two persons of close ages but different professions to sketch from memory, on paper, a map of the area where they live, we will be surprised to note the differences; such designs are called, with some ease, "mental maps ". The case of two people living in Paris was studied, a baker and a salesman. While the baker points out the residential areas, some institutions benefiting from its services (hospitals, restaurants) and vaguely outlines the Seine, the commercial agent, a graduate of an institution of higher education, is

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drawing representative areas of Paris. His area of residence, outside the city, is drawn oversized.

In the wider context of the real landscape, we are indirectly aware of an important part of it and perceive directly even less. Our senses not only retrieve information, but also filter some of it. According to its mental processes and intellectual qualities, the individual has a simplified model of reality.

In the theoretical and experimental framework of psychology practiced in the interwar period, behaviorism shares space with other trends. In 1921, Bertrand Russell published one of the most important texts of modern philosophy of mind, *Analysis of mind*. Using ideas from psychological behaviorism and abyssal psychology, Russell gives up the body / mind dualism in favor of neutral monism. It is the year that Ludwig Wittgenstein publishes *Tractatus Logico-Philosophicus*, his only book published during his lifetime. Experimental psychology witnesses a significant development with the emergence of dedicated personality test (projective tests). Psychiatrist Hermann Rorschach is the first to develop the ink stains test for diagnosing personality types and disabled personalities. In this context, psychologist Edward Chace Tolman publishes his article *A new formula for behaviorism* (1922).

Other basic texts on behaviorism include: *A behavioral interpretation of consciousness* (1923) by neurophysiologist Karl Lashley, *Behaviorism* by JB Watson (the first edition appeared in 1924) and *Mind, ego and society: the point of view of a social behaviorist* (1924), an impressive study by George H. Mead.Mead.

Classical associationism is based in its associations on a first layer of introspection entities such as perceptual experience or stimuli, and on a second layer of thoughts and ideas that relate to the first layer. Psychological behaviorism, motivated by experimental interests argues that to understand the origins of behavior, one must refer to experiences with direct reference to stimuli (physical events in the environment), and that references to thoughts or ideas should be modified or even eliminated in favor of references to reactions manifested through direct behavior. Although associationist behaviorism is psychological in nature, it disapproves any reference to mental events.

Human beings themselves resort to such analyzable entities through language, even though these are not recognized by behaviorism.

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From a behaviorist's perspective, the practice of a subjects talking about their moods and introspectively relating to those states is considered as a potentially useful psychological experiment, but does not help us in making assumptions about the physical presence or non-presence of these states. There are different types of psychological causes underlying the introspective reports and, starting from these causes, behaviorists initiate a thorough behavioral analysis.

The assumed task of psychological behaviorism is primarily to specify certain types of association and of understanding behavioral control based on external events. Secondly, to uncover and explain the causal regularities or laws and functional relationships governing the formation of associations. Based on this one can predict behavior change according to environmental changes. The word "conditioned" is commonly used to specify certain types of antecedents in the acquisition of new associations. Animals, for instance, in the so-called "operant conditioning" (with learning experiments) are not forced to pull the lever, instead they acquire elements about the relation between events in their environment: pulling a lever makes food available.

In its historical fundamentals, methodological and analytical behaviorism is influenced by positivism. One of the main objectives of positivism was to unify sciences natural psychology with exact science. Watson wrote :"psychology, from a behaviorist standpoint, is a purely experimental branch of natural science. Its theoretical objective is that of prediction and control..." (Watson, "Psychology as a Behaviorist's View It" in *Psychological Review*, No. 20, 1913:158). The psychologist later restates the idea in Behaviorism (1930): the object of psychology is to predict, given the stimulus, what reaction will take place, or, given a certain reaction, what is the fact or stimulus that caused that reaction.

The features of the behaviorist current

The history of twentieth century science brings to stage three types of behaviorism: psychological, methodological and logical. The psychological behaviorism is the classic one released by William James and C. Lloyd Morgan. The methodological behaviorism is a point of view according to which public behavior is crucial in establishing events and mental states; According to the promoters of this trend, the internal states of the psyche should be excluded from the study of psychology.

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The exclusion could be justified by the fact that a common language for these internal states would be a utopian project. Methodological behaviorism is seen as doomed by many psychologists, considering that psychology cannot abandon the introspective method, which clearly differentiate it from the exact sciences. Logical behaviorism focuses on the meaning of mental verbs and sentences such as 'X believes that p ". Sadness, pain and many other feelings are negative, undirected, diffuse and vague. Some feelings such as "joy" or "wellbeing", are observed more clearly from the point of view of public behavior, especially when directed towards other people, but these induce diffuse and vague states too. In any case, although internal pain is a subjective experience, the person that feels it can learn to associate the word pain to public situations. More than that, one can detect the criteria and techniques by which other people can be made responsive to one's internal states. William J. Earle sees behaviorism as a point of view for which we can put forward a formula such as "X believes that p if and only if ..." where the empty space contains a description of an observable public behavior (Earle, 1999:138-140). In the above formula, X is an intelligent agent and p, a sentence. Moreover, instead of "believes" other mental verbs may appear: "wishes", "expects", "fears", "threatens", etc.

As a doctrine, behaviorism can be subsumed almost entirely in the following sets of requirements, which operate as assumptions: 1) psychology is a science of behavior, not of internal states; 2) behavior can be described and explained without reference to mental events or the development of internal processes; from here the requirement comes to deal with external sources of behavior (in the environment) and not with internal ones (present in the mind); 3) during the development of a psychological theory, if at any time the mental terms or mental events happen to be "dislocated" in descriptions or explanations of behavior, then either: (a) these terms or concepts should be eliminated and replaced by behavioral terms, or (b) it might or must be translated to concepts or behavioral events, etc.

The three sets of assumptions introduce distinct logical requirements. Moreover, taken independently, each one helps to form a type of behaviorism. "Methodological" behaviorism is committed to finding the truth on the path of assumption 1). The "psychological" behaviorism engages on the assumption path 2). "Analytical"

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behaviorism (referred sometimes as "philosophical" or "logical") is committed to an assumption similar to that of section 3), that is to describe true mental events by using terms or propositions consisting of behavioral concepts. The translation to behaviorist language does not represent only a possibility for the behaviorist, but also an obligation: this way a major disambiguation of logical concepts takes place, thus facilitating the application of all empirical methods.

Logical behaviorism moderates the flow of „internal states of mind" by stating that we learn to use the words of a public language using criteria and rules that are under the scrutiny of linguistic community members. In other terms, private language is a logical impossibility, like the private-ostensive definition, because language is based on public or social situations. Private-ostensive definition would indicate a situation like "by pain I understand what I feel now." Ostensive are those indications that lead to the defined object. Of course, "what I feel now," contains few indications for the interlocutor, from here resulting that the "definition" is devoid of content. Not the same thing is happening when we say "let's go for picnic" – the indicated space is well defined by ostensive-public definitions.

There are scholars that introduce other classifications of behaviorism. Georges Rey classifies behaviorism in methodological, analytical and radical, the last term being used by Rey to describe the psychological behaviorism of Skinner Burrhus (Rey, 1997:96). Indeed, giving up techniques specific to psychology for it to become a natural science is a radical attitude, which affects the whole of the interdisciplinary research. Skinner uses the term "radical behaviorism" to describe philosophical concepts in relation to behaviorism, employing a working program in social and human sciences, leading to the combination, from another perspective, of the three types of behaviorism (methodological, analytical and psychological).

There are several reasons for the attractiveness of behaviorism, reasons that are also attractive for a thinker such as Gilbert Ryle. The first is epistemic in nature. There are enough prerogatives to enounce, through a statement in the third person, that an animal or a person is in a certain mental state, that, for instance the animal or person has a certain belief or tendency to act, based on observable behavior variables. Moreover, it can be argued that a certain behavior justifies the attribution

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of a belief and can be fixed as prior to belief. If, for instance, we look at how people use the terms and concepts of mental health, such as "belief", "desire", pre-conditions of use may occur inseparably related to behavioral tendencies in certain circumstances. If the attributed mental state has a special link with the behavior, it is tempting to say that the mentality consists only of behavioral tendencies.

The second reason can be expressed as follows: there is a big difference between mental traits considered native (already represented in the "cerebral structure") and those conditioned by association with behavioral codes. Mental traits tend to have a strong nativist bias. This is true even if there is nothing inherently nativist about mental content. From the outside we assume that the mind has at birth a set of internal procedures, represented in the brain, for processing rules and procedures and these are "dislocated" during learning or during the acquisition of new responses (Fodor, 1981:257-316). It is the argument of Jerry Fodor inside a nativist current whose initiator is Noam Chomsky.

The third reason for resorting to behaviorism, at least in the popular version, is related to a mistrust towards relating to the inner psyche, to the mental or to the accreditation of "inner information" as causes of behavior. This distancing, being pushed to disregard is supported in the works of Skinner. At this point, a common attitude of psychologists and logicians is becoming obvious, Gilbert Ryle being included in the second category.

Philosophical behaviorism

Wilfred Sellars (1912-1989) notes that a thinker can be labeled as behaviorist, vaguely or in terms of attitude, if he or she insists on confirming hypotheses about psychological events in terms of behavioral criteria. A behaviorist is a theorist of psychology who demands proof. For such a person, there is no difference between two cognitive states of mind unless there is a difference between behavioral variables associated with each state. From here to turning behaviorism into a whole doctrine is a long way, but this has already been walked.

Although distinct, logical, methodological, psychological and analytical behaviorism have common features. Burrhus Skinner, in his radical behaviorism combines all three forms. It aims to establish possible analytic structures of behavior in terms of mental paraphrase

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when they cannot be eliminated from explanatory discourse. In *Behavioral verbs* (1957), and in other works, Skinner tries to show that mental terms can be given behavioral interpretations. In *About behaviorism* (1974), he states that when mental terminology cannot be removed, it might still be "translated into behavior." Radical behaviorism strictly studies the behavior of the human and animal bodies, and not the internal process procedures. So it is a form of methodological behaviorism. Finally, radical behaviorism understands behavior as a reflection of the effects of repeated stimuli, which means that it is a form of psychological behaviorism. Thus one can talk, in the case of Skinner, about a complete behaviorist doctrine.

Behaviorism of one kind or another has been a popular research program and methodological engagement in socio-human sciences since the second decade of the twentieth century, at least until the beginning of the "cognitive revolution" (in the 70s). In addition to Gilbert Ryle and Ludwig Wittgenstein, who manifested a clear sympathy for behaviorism, other philosophers concerned with adjacent fields are Rudolf Carnap, Hempel and Georg O. Willard Quine. The first attempts to translate psychology in the language of physics; the second undertakes, in 1949, a logical analysis of psychology. Hempel affirms that all intelligible psychological statements, are translatable into statements which do not use psychological concepts, but only for the physical concepts of behavior. The unintelligible ones cannot be classified inside scientific language.

Finally, Quine approaches language and scientific language which can be categorized as behavioral (Quine, 1960:77). He argues that the notion of mental or psychological activity disregards scientific reasons which have their origins in the discourse as communicative activity. To discuss in a scientifically disciplined manner about the meaning of a sentence, one must refer to a stimulus to express the so-called "meanings-stimuli".

After the 70s, behaviorism has lost power and influence. Psychologists and scientists generally become free of complexes when faced with the "internal data of the psyche" and accept new models of information processing. Cognition science develops based on a comparing the psyche with computer software, which means that, increasingly, the psyche is represented by a black or gray box model. The

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black box stands for non-algorithmic activities (or for which the algorithm is of no interest) whilst the gray box stands for partially algorithmic activities. Once the localization of the control signal in the brain achieved, outstanding models of different physical processes have introduced "cognitive demons", represented by black boxes. Laboratory work done in the fields of cognitive psychology and ethology required methods in which behavior data is irrelevant to the study of both animals and people in their natural or social environment. The traditional attitude of relative indifference to neuroscience and of reverence towards events occurring in the subject's environment was abandoned in favor of direct techniques of brain study as the only way for behavior understanding.

But behaviorism has not completely left the scene of scientific events, although was a staunch contester of neuroscience. Robust elements of behaviorism survived the therapies and laboratory animal study based on theories of learning. The influence of behaviorism declined primarily because of the declining of the idea that behavior can be explained without reference to non-behavioral mental events (cognitive, representational or interpretive). According to this thesis, the behavior can be explained only by reference to functional elements related linked or in co-variation with the environment or with other individuals. Thus, it depends on the history of the subject's medium of interaction. For Skinner, neurophysiologic and neurobiological conditions, support or implement these functional relationships. But these do not serve as exits from the system or independent sources of behavior. Behavior cannot be accounted for during its remaining inside [an animal]; finally, we must turn to forces operating on the organism, without which we could not understand it. If there is no weak link in the chain of causality, such that the second (neurological) element is adequately determined in relation to the first (environmental stimulus) and to the third (behavior) then the causal chain does not break. Is what Burrhus Frederic Skinner says himself. Validation of information about the second element of the chain sheds light on behavior, but that respective variable cannot change by itself: the external behavior variable is a function.

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Gilbert Ryle and the behaviorist current.

Ryle's critics agree that his analysis is not very convincing in terms of the elements of conscious experience such as sensations, perceptions, representations or thoughts that occur routinely. Identity theory is trying to defend, given the weaknesses of behaviorism, without turning to dualism, the status of mental states as relevant causal moments for behavior. Australian psychologist and philosopher U.T. Place's thesis is that the elements of conscious experience are identical with the processes and states of the brain. The identity thesis becomes popular and is the most debated thesis of the 60s.

Gilbert Ryle invokes behaviorism at the very end of the book that propelled him as a critic of dualism, *The Concept of Mind* (Ryle, 1949:327-330), after reviewing some unfulfilled aspects of twentieth century's psychology program. The above cited logical behaviorism version proposed by Gilbert Ryle in his book it seems to E.J. Lowe (Lowe, 2000:50) sophisticated enough, without the author trying to justify his claim. It is possible that this sophistication is due to the difficulty of meeting the rigors of a formal expression of the form 'X believes that p "applied to the description of behavior. Complications are amplified when instead of "believe" one uses other mental verbs to be translated to physical or behavioral verbs. In Ryle's view, between descriptions of mental and bodily states, correlating and not opposing elements must be found, in a spirit of a "body" = "psychic" identity that requires the study of observable physical reactions as well as that of the ways in which the psyche gets bodily dispositions or expressions. The British philosopher primarily considers the corporeality of the spirit.

It is important that, on this occasion, Gilbert Ryle reopens the discussion of body / mental identity theory as part of a very ambitious philosophical strategy: to present in a single concept matter and spirit. There are many theories of identity in mathematics and logic, which means that: there is the language of theory a predicative symbol of 2^{nd} order, say P, called equality. We agree to write t = u instead of P (t, u). Of course, among the axioms of a equality theory there must be some that imply the existence of the following theorems:

(1) Predicate P has the properties of an equivalence relation (reflexivity, symmetry, transitivity);

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(2) $\forall u_1 ... \forall u_n \forall v_1 ... \forall v_n (u_1 = v_1 \wedge ... \wedge u_n = v_n) \supset f(u_1, ..., u_n) = f(v_1, ..., v_n))$, for any functional symbol f of order $n > 0$; (3) $\forall u_1 ... \forall u_n \forall v_1 ... \forall v_n (u_1 = v_1 \wedge ... \wedge u_n = v_n) \supset R(u_1, ..., u_n) = R(v_1, ..., v_n))$ for any predicative symbol R of order $n > 0$.

The comment on Leibniz's principle of identity (if a = b, then P (a) = P (b) for any predicate P) remains open and coincides with the tR property (considered for a single variable). The inverse relation, that is a = b, since P (a) = P (b) is called by Leibniz 'the principle of the indiscernible", not being always valid for a function. The equality, far from being a trivial equivalence, meets several criteria that make it apt to "attack" formally the material identity. The two principles of identity and of the indiscernible, indicates that theories with equality are at least of the first degree (with quantifier for individual variables), but, most often, of the second degree (with quantifier for sets). Thus, calculating predicates could be a minimal model for a "finer" representation of reality.

More than a quarter of a millennium ago, Leibniz applied the identity theory to build a body / mind parallel, in the sense that monads (the body entelechies endowed with psyche), although isolated from each other, are like windows to the divine spirit. Will makes them turn towards this spirit and to recognize each other; on the other hand, the divinity, in its wisdom, "matches" at birth the physical clocks of the body and psyche such that the two entities mutually recognize. One finds here an evocative comparison with the origin of a God made universe which is left to "work" by virtue of a causality that we today are qualifying as mechanistic. In that era, the scientist could conceive a God as a brilliant watchmaker.

Of course, an issue which was always of interest, regarding the human destiny, was if body and mind are consubstantial or not. The answer provided by scientific theories covered three options: yes, no and undecided. From this perspective, the psyche is seen either as a matter (by eliminative materialists) or spirit (by gnostics) or as an entity outside the matter / spirit coupling (the agnostic). There are philosophers who leave the problem unresolved, such as the undecided John Locke. Those who recognize the matter / spirit interaction inside the body / psyche problem can be called dualists. In the latter case it is called interaction dualism. Interaction dualists refer most often to the impossibility of

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separation between body and psyche. But accepting separation leads to the mind / body parallelism (an old concept, advocated by Leibniz in his *Monadology*, but reiterated in recent decades) towards a extreme dualism if between the two entities is admitted an accidental connection.

Body and mind are composed of matter, energy and information. The matter-energy-information model is put forward today in various fields and the researcher in the social and human sciences is required to overcome inconsistencies resulting from poor correlation between broad concepts, having categorical value and those specific to a certain field. For instance there are about 110 chemical elements, but what are the features that distinguish the biochemical from the chemicals?

In a Boolean calculation with concepts, the identity "S ≡ E" extends only over a world made of matter and energy so the only valid relations are "substance ≡ substance" and "energy ≡ energy "; in the syllogistic calculation an existential assumption on the concepts is introduced and that adds to the world described above, in black and white, the "gray" nuance (marked in Venn diagrams with an asterisk, being either "substance" or "energy"). The existential assumption also applies to notions ("there is energy"), and the relations between them (no "uncreated energy" in science, although there are uncreated energies and forces in religion). Considerations of this kind are preparing a broader discussion of mind philosophy trends around an equality theory in which we could accept that "S ≡ E", if S and E describe the same aspect of reality, where S = "substance" and is = "energy". The interpretation is an intensive aspect (not extensive) of the "body = psychic" relation and it will make possible a discussion on how a theory can be based on a notion of axiomatic theory of sets. The widest conceivable relation of identity is: S ≡ E≡ I, and the weaker relations are S ≡ E, E ≡ I, S ≡ I, when one accepts the identity of only two terms out of three.

In Boolean logic (two truth-values), the equivalence relation (simplified, reflexive, symmetric and transitive identity) determines an initial partitioning of formulations, partitioning leading to a Boolean algebra structure. In micro particle physics, the game of symmetry, reflexivity and transitivity leads to "populating" a world very different from that of the macromolecular. In this world, the "bit" (an alternative between two states) does not have a stable value ("active" or "passive") but "remembers" two, even opposing, states. Thus, it is not surprising to

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see the interventions around the Identity Principle, which, as stated on another occasion, are rather meta-logical than logical, the same way as, at a moment in the history of knowledge (seventeenth and eighteenth centuries), the non-contradiction principle and the principle of sufficient reason were an unavoidable teleological regulation, as pointed out by Leibniz.

Behaviorists have brought up again the body / mind discussion. Burrhus Skinner conceived this problem in a polemic against neuroscience. For him, neuroscientists, identify more or less the physical organisms underlying the processes with their interaction environment. For many critics of behaviorism it seems clear that, at a minimum, the emergence of human characteristics and behavior (especially human) does not depend, first, on the repetition of a consolidating activity, although it is a factor, but on the learning environment with its history and its representation method. That the environment is represented by me, for me, in-forms or constrains the functional relations between my action environment and myself. It does not matter, for example, how consistent I was in the act of eating ice cream and how often I repeated it from one day to another; such a history does not matter if I do not see a potential stimulus in the ice cream, if I do not get the pleasure of enjoying an ice cream or want to hide the fact that my ice cream was provided by someone else. My conditioning through the history of an event is less important than my "genuine" behavior in the environment or than the learning history I represented or interpreted.

Although undecided in the body / psyche problem, by denying dualism, behaviorists are especially inclined to describe the body, and not the spiritual side (with the exception made, of course, by Skinner's radical behaviorism, with the assumption of a social "narrative imagination"). The delimitation of his conception from behaviorism, made by Gilbert Ryle at the end of *The Concept of Mind* (cf. Ryle, ch. Tenth century), is supported by the British philosopher primarily by the idea that he did not accede to a mechanistic causality, resulting from the study of the stimulus-response relation.

On the other hand, it is very difficult to separate Ryle from behaviorism as long as his "logical maps" are similar to the "mental maps" of J. Watson. Ryle's grip on key behavioral polemical themes should also be considered: free will, body / mind separation and the

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homunculi problem. In an article suggestively named *Philosophy, Geography and Logical Dilemmas*, (Meyer (ed.), 1993:9-15) René Meyer tries to capture the whole of Ryle's work, attempt in which the logical geography is crucial. Although his mental maps are not limited to the spatial element, as it happens with behaviorists, but, crucially, introduce a temporal factor and a long-term intervention of reason, we should not forget that the logic diagrams can be represented not only in algebraic or arithmetic form but geometric as well. We might even have coloring suggestions: white for true, black for false and gray for undecided. Or, why not, to describe truth and falsehood one can use complementary colors: yellow and blue, for example. But the similarities end here, because it is difficult to represent both the sequences and the antecedents of reasoning on logical maps (Meyer (ed.), 1993:9-15).

Calling Ryle a behaviorist remains a real problem: it hangs between a positive response and a doubtful one. In the terms of the British philosopher, it would be a categorical error, as William Lyons notes (Lyons, 1980:197-198). For Ryle addresses the essential question: "what is the correct logical form or the category of concept X?", trying to give an answer like "a disposition is causing a behavior P, and not an internal mental process", or: "the behavioral occurrence arose under such provision behavioral or an adjacent one". Let us remember that behaviorists ask the question: "what is causing my behavior in the X manner?". And from here the possible responses: "environment Y" or "the probabilistic calculation of my behavior in environment Y that produces the most credible results".

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