

A PLEA FOR METHODOLOGICAL DUALISM AND A MULTI-EXPLANATION FRAMEWORK IN PSYCHOLOGY

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ABSTRACT: At present there is no explanation for the mind/brain relationship; it is hard to conceive mentalistic explanations in terms of mechanistic explanations, where mechanistic explanations refer to explanations common in the sciences such as neurophysiological and computational, and mentalistic explanations are based on the individual's inner world such as will, belief, intention, and purpose. It is also difficult to provide a comprehensive explanation of behavior and its components by an appeal to mechanistic explanations only. It therefore it makes sense to develop a new methodological approach, Methodological Dualism, which leads to the construction of a Multi-Explanation Framework for developing specific psychological theories. This approach is not based on the usual attempt to reduce mental processes to neurophysiological processes. On the contrary, it addresses behavior by means of multiple explanations (mechanistic and mentalistic) which are not reducible to each other but still satisfy the methodological requirements for scientific explanation. This approach offers a deeper understanding of behavior than that provided by mechanistic explanations alone.

Key words: methodology, explanation, philosophy of science, mind, and of psychology

Introduction

Whatever our mental functioning may be, there seems to be no serious reason to believe that it is explainable by our physics and chemistry. (Putnam, 1975, p. 297)

AUTHOR'S NOTE: This paper is dedicated to my teacher, the late Professor Yeshayahu Leibowitz, who confronted me with the mind/body problem as early as my first year of studies in the Psychology Department at the Hebrew University in Jerusalem. In a public debate between him and student representatives of the Psychology Department on whether psychology is a science like the natural sciences, Professor Leibowitz argued that it is not: contrary to phenomena dealt with by the natural sciences, the phenomenon of his toothache was subjective, and no one apart from himself could feel it. Since then I have never ceased thinking about this problem.

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We have been trying for a long time to solve the mind–body problem. It has stubbornly resisted our best efforts. The mystery persists. I think the time has come to admit candidly that we cannot resolve the mystery. (McGinn, 1989, p. 349)

To be brutally honest, scientists do not yet have even the remotest idea of how visual experiences—or indeed any other kinds of experiences—arise from physical events in the brain. (Palmer, 1999, p. 618)

The reason the mind–body problem does not go away, despite our being clear about the options in responding to it, is because of the constant battle between common sense, which favors the view that the mental is a basic feature of reality, and the pull to see it as an authoritative deliverance of science that this is not so. We find ourselves constantly pulled between these two poles, unable to see our minds as nothing over and above the physical, unwilling to see the universe as containing anything not explicable in terms of its basic, apparently non-mental, constituents. (Ludwig, 2003, pp. 29-31)

Even if we accept the familiar idea that minds are somehow dependent on brains, we have no clear idea of the nature of this dependence. The mental–physical relation appears utterly mysterious. (Heil, 2003, p. 217)

The problem of consciousness is completely intractable. We will never understand consciousness in the deeply satisfying way we’ve come to expect from our sciences. (Dietrich & Hardcastle, 2005, p. 1, opening sentence)

These six quotations indicate that many important investigators in psychology and philosophy of science and the mind believe that we are still incapable of understanding the mind by means of the brain, and consciousness (our private conscious experiences such as will, belief, thoughts, feelings, and images) by means of neurophysiological–computational processes occurring in the brain. That is, at present we possess no explanation for the complex mind/brain problem. In saying this I make no final determination but only suggest that to date no one has succeeded in explaining conscious mental states and processes by physical and neurophysiological concepts (e.g., Bayne, 2009; Palmer, 1999; Rakover, 1990, 1997, 2007). We still have no “Mind/Brain Theory” detailing the mechanism whereby neurophysiological activity in the brain creates or acquires consciousness, akin to the accepted theories in science. These, for example, are physical theories to explain the transformations of energy (associated with potential and kinetic energy, friction and heat, magnetism and electricity, mass and energy) or how matter changes from one kind to another, such as the theory of how hydrogen and oxygen join to form water, and how water can be broken down (by electrolysis) into these gases. I agree with McCauley and Bechtel (2001) that if indeed it were possible to reduce a psychological theory to a neurophysiological theory one could forgo psychological concepts altogether, since behavior would be explained through the theories prevailing in the sciences—but this is not how matters stand at present.

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In view of this situation, I propose that there is apparently much sense in developing a relatively new approach, called Methodological Dualism, which is not based on the usual attempt to reduce mental processes to neurophysiological processes. On the contrary, the present approach attempts to circumvent the ontological mind/body problem and the debate on dualism vs. monism by focusing attention on the following methodological question: Given that behavior is based on many different processes (e.g., neurophysiological, cognitive, and mental) how is it possible to provide a coherent and comprehensive explanation for such behavior? The answer proposed here is to improve the explanatory ability of a psychological theory to account for behavior and action by integrating two kinds of explanations. One kind, called mechanistic, includes the explanations common in the sciences (e.g., cognitive–computational, neurophysiological) and the other, called mentalistic, includes the explanations based on one’s mental states and processes (e.g., will, belief, purpose, intention).¹ (Note that I do not propose here that a mentalistic explanation is an alternative to a mechanistic explanation, but that the two kinds of explanation collaborate/cooperate to improve the explanatory capability of a psychological theory.)

The integration of the mechanistic and mentalistic explanations is not merely eclectic (a collection of different explanations) because it is done by following methodological requirements accepted in science.² The integration proceeds in two steps. First, a major aim of Methodological Dualism is to present several arguments that a mentalistic explanation such as the purposive explanation can be viewed as scientific because it fulfills the requirements for scientific explanation. Second, assuming that the first step has been achieved successfully, a theoretical and practical framework, called the Multi-Explanation Framework, is developed. A major aim of this Framework is to provide guidelines for how to construct specific psychological theories founded on the two kinds of explanations—mechanistic and mentalistic. These types of theories are adequate for handling behavior, which involves mental, cognitive, and neurophysiological processes.

¹ The term “explanatory ability” is similar to other terms such as explanatory power and strength of an explanation. Schupbach & Sprenger (2011) suggest that the explanatory power of a hypothesis is based on its ability to increase the degree of expectation for the occurrence of the phenomenon under study. Similarly, the present paper suggests that the ability of a psychological theory (I) to explain one’s action (e.g., going to the movies) is greater than a psychological theory (II), since theory (I) is based on the integration of mentalistic and mechanistic explanations and theory (II) is based only on mechanistic explanation.

² One may wonder if there are accepted methodological requirements in science. While it seems reasonable to suggest that there is no firm set of methodological requirements, it hard to believe that one may characterize scientific methodology by saying “anything goes” (see Feyerabend, 1975). In this paper I take a middle way: there are several methodological requirements that are accepted by most psychologists (e.g., how to carry out observation, suggest a theory or an explanation, or test hypotheses and theories) which are learned in introductory psychology courses (e.g., Rakover, 1990).

The impression that one may obtain from examining the research activity in behavior is that nearly all current psychological theories are based only on mechanistic explanations (e.g., by providing cognitive and neurophysiological accounts for behavior). Nonetheless, as will become clear later (especially in the next section), most behaviors and actions are comprised of different components, whose proper understanding requires the use of both mechanistic and mentalistic explanations (i.e., employment of the Multi-Explanation Framework).

In keeping with these introductory comments, the present paper is organized as follows:

The section “A brief review of three mind/brain questions” sets the stage for Methodological Dualism by discussing three important questions: (1) Can the mind be conceived in terms of the brain? (2) Can a mentalistic explanation be reduced to a mechanistic one? (3) Can a behavior as a whole be accounted for by mechanistic explanations only?

The section “Methodological Dualism” outlines the goals of the present approach for dealing appropriately with mechanistic and mentalistic explanations.

The section “A mentalistic–purposive explanation” realizes the above goals by showing that indeed this type of explanation satisfies the methodological requirements of science for providing explanations. This allows the use of purposive accounts as a scientific explanation and developing the Multi-Explanation Framework.

The section “A Multi-Explanation Framework” suggests an outline of this framework as well as guidelines and solutions for its methodological problems and empirical applications.

The closing “Discussion” section points out the contribution of the present approach and the differences between the present approach and those common in psychology.³

³ The present paper is based on my previous one (Rakover, 1997), which was also published in *Behavior and Philosophy*. In comparison to that article, the present one suggests the following main developments. First, an updated review and discussion that emphasize that the mind/body problem has still not been solved scientifically or philosophically. Second, the development of Methodological Dualism, which provides, among other things, methodological reasons to reject conceiving the mentalistic purposive (will/belief) explanation as a scientific law, but advocates accepting it as an explanation scheme that fulfills the scientific requirements for explanation. Third, the development of an argument that shows that while a specific theory based on the Multi-Explanation Framework is tested in a similar way to testing a theory in the sciences, the way of providing explanations by such a theory differs from that used in the sciences. Fourth, the development of systematic guidelines for matching schemes of explanations to behavior and its components by using experimental methods and the principle of “explanation-matching”. The latter deals with the relations between the kind of explanation suggested for a whole behavior and the kinds of explanation suggested for the components of that behavior. Finally, the present approach is briefly compared to several psychological approaches that deal with the issues of mind and consciousness.

A Brief Review of Three Mind/Brain Questions

Can the mind be conceived in terms of the brain? Several researchers have suggested that wide-ranging activity of a neural network that unites various functions in the brain (such as the “global neural workspace”) is a source of consciousness (see Baars, 1988, 2002; Cosmelli, Lachaux, & Thompson, 2007; Dehaene & Naccache, 2001; Kouider, 2009; McGovern & Baars, 2007; Palmer, 1999). However, this proposal is based on a correlation between neurophysiological indexes (e.g., neuroimaging) and expressions of consciousness, and is not a Mind/Brain theory (which describes how neurophysiological activity in the brain creates or acquires consciousness; e.g., Cosmelli, Lachaux, & Thompson, 2007; Miller, 2011). Furthermore, Levine (1983) maintains that there will always be an explanatory gap between mental and neurophysiological states. Similarly, research in cognitive modeling or artificial intelligence has not succeeded in solving the consciousness problem (e.g., McDermott, 2007; Searle, 1980, 1990; Sun & Franklin, 2007). Given these conclusions, it seems reasonable to assume that to date we do not have a Mind/Brain theory (see Kriegel, 2007; Leibowitz, 1982; McGovern & Baars, 2007; Palmer, 1999; Rakover, 1990, 1997, 2007; Rowlands, 2009; Seth, 2009).

Can a mentalistic explanation be reduced to a mechanistic one? One may propose that the purposive (teleological) explanation—David drove to Tel Aviv in order to meet Ruth—can be equivalently expressed as the causal explanation: the thought of meeting Ruth in Tel Aviv caused David to drive there. However, this translation of purposive explanation into a causal one is problematic. First, it is generally assumed that similar causes produce similar effects. However, this does not hold here. Since the goal of meeting Ruth can be achieved in many different ways, it follows that the cause (which is the translation of the goal) results in many different effects. Secondly, while it is generally assumed that the cause and effect are separate and different events, this assumption is not maintained here. David’s will, belief, and action are interconnected. The drive to Tel Aviv is described as a meaningful action that involves David’s will and belief, and similarly a meaningful description of each of these three terms engages the other two (for a discussion of this and related issues see Rakover, 1990, 1997, 2007).

Can the whole behavior be accounted for by mechanistic explanations only? Many empirical studies show that behavioral phenomena deemed explainable mechanistically have not, in fact, received a comprehensive explanation because certain components in these phenomena require a mentalistic explanation. Following Flanagan (1992) I roughly divide research on conscious behavior into two. A number of researchers develop an approach that I shall call “consciousness-dispensability,” which proposes that consciousness has very minor importance in the explanation of behavior (e.g., Bargh, 2007; Bargh & Ferguson, 2000; Bargh & Morsella, 2008; Dijksterhuis & Aarts, 2010; Libet, 1985; Libet, Gleason, Wright, & Pearl, 1983; Nisbett & Wilson, 1977; Roser & Gazzaniga, 2004; Umiltà, 2007; Velmans, 1991; Wenger, 2003; Winkelman & Berridge, 2004). Other researchers developed an approach that I shall call “consciousness-indispensability,” which

proposes that consciousness has weighty importance in explanation (e.g., Baars, 2002; Baumeister, 2008; Baumeister, Vohs, & Funder, 2007; Foxall, 2007, 2008; Funder, 2009; Gollwitzer, 1999; Locke & Latham, 2002; Logan, 1988; McGovern & Baars, 2007; Morsella, 2005; Rakover, 1993, 1996, 2007; Schneider, 2009; Sun & Franklin, 2007). Neither of these approaches seems extreme; the former does not suggest that there is no need at all for consciousness and the latter does not suggest that all behavior is explained by an appeal to mentalistic schemes only. An extreme approach of consciousness-dispensability actually suggests that consciousness is an epiphenomenon and an illusion, while an extreme approach of consciousness-indispensability denies the existence of processes outside consciousness.

The experimental findings of Libet and colleagues seem to support the consciousness-dispensability approach (e.g., Libet, 1985; Libet, Gleason, Wright, & Pearl, 1983). Libet's main finding is based on the measurement of the times of occurrence of three processes: first, a voluntary movement of the wrist (a process marked M); second, introspective reporting of the time when the free will to move the wrist arose (W); and third, measurement by EEG of the cerebral activity associated with voluntary action, called readiness-potential (RP). The results revealed that RP preceded W by approximately 350ms and W preceded M by approximately 150ms. Without discussing the criticism of this work (see Libet, 1985) let us consider Libet's main conclusion: the source for the voluntary action is subconscious, but consciousness has control over the action in the time-span between W and M; for example, the individual has the power of veto over the voluntary action. Similarly, Bechtel (2008) proposed that the major task of mental mechanisms is to regulate and control ongoing activity. Hence, one may propose that the explanation of behavior cannot be mechanistic alone and must also take into account an appeal to the individual's mental states and processes such as will/belief.

Automatic behavior may be viewed as mechanistic (e.g., it occurs without awareness and is stereotypical). However, when automatic behavior fails for some reason (e.g., a typo is made by a skilled typist) or when a change occurs in the surroundings (e.g., a diversion is taken on a familiar route), conscious processes of supervision and control go into action (see Schneider, 2009). Logan (1988) writes:

According to instance theory, automatic processes are used intentionally. Automaticity exploits the autonomy of the retrieval process, harnessing it so that it provides information that is relevant the person's goals. (p. 513)

Based on a thorough review, Baumeister, Masicampo, & Vohs (2011) conclude that conscious processes integrate behavior across time, handle social and cultural information, cope with multiple opposing choices, and interact with unconscious processes.

Foxall (2007, 2008) reached the conclusion that mental processes are important for explaining behavior by analyzing radical behaviorism and intentionality (his 2008 paper is a response to criticisms of the earlier one). He proposed that because radical behaviorism confined itself to explanation of behavior in terms of response–environment relations and avoided the use of

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intentional vocabulary, it encountered great difficulties in accounting for certain aspects of human behavior that demand explanations by appeal to terms that refer to private events such as will and belief. As neither of these two approaches can offer a complete explanatory account of human behavior, Foxall proposed the Intentional Behaviorism approach to integrate radical behaviorism and intentionality. While both Intentional Behaviorism and Methodological Dualism are based on the need to use mental-processes' terms in explaining behavior, they differ in several respects. Intentional Behaviorism proposes that intentional ascriptions represent a unique level of interpretation of behavior that has to be connected to molar behavior analysis and neurophysiology, both of which have to be consistent with an evolutionary framework. In comparison, Methodological Dualism proposes that mentalistic will/belief explanations do fulfill the methodological requirements for scientific explanation, and in consequence a psychological theory has to employ both mechanistic and mentalistic explanations by matching them to behavior and its components.

Thus, it is safe to conclude from this brief review that the answers to the above three questions are negative, yet there is no explanation for the mind/brain relationship; it hard to conceive mentalistic explanations in terms of mechanistic explanations, and it is difficult to provide a comprehensive explanation of behavior and its components by appeal to mechanistic explanations only. These answers highlight the importance of mentalistic explanations in understanding behavior, and set the stage for the development of Methodological Dualism.

Methodological Dualism

Based on the above discussion, the following assumption can be proposed: there are mental processes (such as will, belief, thoughts, and images) which can be employed in mentalistic explanations. Given this, the major goal of Methodological Dualism is to develop three cornerstone ideas for establishing the proposal that a mentalistic explanation (purposive explanation) does meet the methodological requirements for scientific explanation.

First, a distinction is made between a specific explanation and an explanation scheme (model). A scheme (model) of explanation is a general procedure for creating different specific explanations for different specific observations. Only explanation schemes that fulfill the methodological requirements of science are approved and accepted by the scientific community. Here I concentrate on two different schemes of explanation: the D-N model and the purposive scheme.⁴ The

⁴ The literature of the philosophy of science describes several schemes (models) of mechanistic explanation. In addition to the D-N model, Hempel (1965) offered two more models for the explanation of probability phenomena: the deductive-statistical (D-S) model, which is very similar to the D-N model but includes in its assumptions a statistical law and predicts deductively the probability of occurrence of the given phenomenon; and the inductive-statistical (I-S) model, which is like the D-S model but includes in its assumptions a statistical generalization and predicts inductively the probability of the appearance of the phenomenon (the approach of these three models is called the covering-

first scheme, widespread in the natural sciences and also in the social sciences, is the Deductive-Nomological (D-N) model (see Hempel, 1965). It proposes that a specific explanation (prediction, dependent variable) is deduced from a law (theory) together with particular conditions (e.g., independent variables). The D-N model is based on the structure of a logical deduction:

Assumptions: (1) Theory, natural law
 (2) Particular conditions

Conclusion: Prediction, description of the phenomenon under consideration.

Explanation: If the prediction and the observation are in accord, the phenomenon is explained; if not, the phenomenon is not explained and the theory is refuted.

The structure of the D-N model is based on assumptions that have to include at least one true natural law (i.e., a law or a theory firmly anchored to empirical findings and to theoretical arguments) and particular conditions; the conclusion must contain a prediction, a description of the phenomenon deduced from the assumptions (logically, mathematically). Note that the law in itself does not permit the explanation of the phenomenon. The explanation is made possible by the placement of the law in the explanation scheme (see footnote 4).

The second scheme creates specific purposive will/belief explanations, which are widespread in folk psychology (e.g., David drove to Tel Aviv because he wanted to meet Ruth and believed that a drive there would realize his will). Here, I propose to conceive as a mentalistic explanation scheme the procedure for creating specific will/belief explanations—[Will/Belief]: *If X wants G and believes that behavior B will realize her will, then X will perform B.* This is a new proposition, and it is central to the present paper. It immediately gives rise to the following question: Does this explanation scheme satisfy the methodological requirements

law theory. Note that psychologists tended to use relaxed forms of Hempel's models, by setting in their assumptions hypotheses, theories, and empirical generalizations (e.g., Rakover, 1990). Following widespread criticism of Hempel's approach (e.g., it does not consider causal processes and does not deal properly with explanations not based on natural laws) and an extensive discussion of the subject of explanation, several alternative explanation models were proposed for various research fields; these models also encountered much criticism (e.g., Gijsbers, 2007). I do not discuss these alternative models because to do so would go beyond the purpose of the present article. See, for example, the Statistical Relevance (SR) Model (Salmon, 1971), the Causal Mechanical Model (Salmon, 1984), the Unification Model (Kitcher, 1989), the Manipulation Causation-Explanation Approach (Woodward, 2003), the pragmatic explanation model (van Fraassen, 1980), and Mechanism (Bechtel, 2008; Carver, 2001). In addition to will/belief explanations Rakover (1990, 1997, 2007) proposed explanation schemes that handle human behavior such as rule-following (social norms, traffic rules) and emotional behavior (behavior aroused by emotional states).

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for explanation accepted in science? The professional literature can be interpreted as suggesting a negative answer because it takes [Will/Belief] as a scientific law that can be placed in the D-N model. But as we shall see below, the answer is affirmative: I argue that [Will/Belief] does satisfy the accepted methodological requirements of a scientific explanation scheme and not of a scientific law.⁵

Second, a distinction is made between mechanistic and mentalistic explanation schemes. As mentioned above, mechanistic explanations, which are common in the natural and social sciences, can offer explanations for behavior of animals (humans, monkeys, dogs, cats) by appeal to physical, chemical, physiological, genetic, and evolutionary factors, and also to stimulus–response–consequence relations proposed by radical behaviorism (which avoids using mental terms in explanations), and to cognitive-computational processes analogous to the workings of a computer, such as symbolic (classic) models or neural networks (see, e.g., Bechtel, 2008; Foxall, 2007, 2008; Moore, 2007; Rakover, 2007). Mentalistic explanations offer everyday accounts for people’s behavior by appeal to their mental states and processes (such as will, belief). For example, David drove to Tel Aviv in order to meet Ruth. In this case, the public behavior (David drove to Tel Aviv) is explained by an appeal to David’s conscious experience: David’s *will* to meet Ruth and his *belief* that the trip to Tel Aviv would realize his will. Underlying this and other examples is the assumption that the individual is endowed with mental states and processes (will, belief, purpose, intention, thought, emotion, and the like) that are the basis of a mentalistic explanation.

It may be suggested that a major difference between the two kinds of explanation is that mentalistic explanations involve conscious experience whereas mechanistic explanations do not. Based on this, one may propose that with the mechanistic explanation it is easy to explain the actual movement of raising the hand, but hard to explain the meaning of the movement (e.g., a gesture of parting or greeting). By contrast, with the mentalistic explanation it is easy to explain the meaning of the movement of raising the hand, but hard to explain the actual movement (for similar idea see Chater & Oaksford, 1999; Schueler, 2003).

The above distinction between mechanistic and mentalistic explanations is complex and involves four interesting issues that have to do with the methodological status of consciousness (experience, behavior). First, it is relatively easy to propose arguments that mechanistic explanations are based on terms that fulfill the requirements for conducting observations: objectivity (the process of observation should not affect the behavior studied), repeatability (researchers should be able to conduct observations of the behavior studied many times), and

⁵ Several psychologists (e.g., behaviorists) tended to reject the use of explanations based on mental terms because they did not meet certain methodological requirements for making observations (e.g., availability to public observation). This tendency has declined lately, and psychologists use such terms when they research issues such as consciousness (see Discussion and Rakover, 1990, 2007). Furthermore, several attempts have been made to harmonize Radical Behaviorism’s explanations, based on stimulus–response–consequence relations, with intentional explanations based on mental terms (see Foxall, 2007, 2008).

public availability (many researchers should be able to observe the behavior studied). By comparison, it is difficult to propose that a mentalistic explanation such as purposive will/belief is based on terms that can easily satisfy these three requirements. Take, for instance, public availability. It seems clear that David is the only one who can observe his own conscious thoughts. Nonetheless, one may suggest that mental terms fulfill these requirements partially and indirectly (for a discussion see Rakover, 1990). Furthermore, there is an important research program on the possibility that one may share another person's experiences. de Vignemont and Jacob (2012) suggested that certain similarities exist between one's vicarious experiences of pain and another person's real pain. For example, one's own hand automatically freezes when one sees another person's hand being injured; brain activity of one feeling vicarious pain partially overlaps that of another who feels real pain.

Second, in his target article Baum (2011) proposed that private events (e.g., will, belief, thoughts) should not be included as explanatory terms in the science of behavioral analysis.⁶ To support this approach he suggested that even if we have succeeded in developing an "antiprivacy machine"—a "mind-reader" device—we will never be sure that this machine can transform a person's thought into a public sentence since the validity of that sentence is dependent on the testimony of the person under investigation. Baum (2011, p. 190) writes: ". . .even if an antiprivacy machine were invented, the machine would always be subordinate to the testimony of the person being interrogated." For example, the prosecutor presented the jury with the following thought transformation produced by the antiprivacy machine (which is connected to the suspect's head): "I murdered Mr. McCoy"; but the suspect said: "I had no such thought! Your device is good for nothing." Based on a similar scenario, Baum concluded that the antiprivacy machine fails to solve the problem of private behavior. I have two qualifications to make. First, since the antiprivacy machine is such a marvelous invention, the prosecutor had no problem showing the jury, with a tiny smile, the following thought transformation: "Oh my God, they can't believe that piece of metal trash on my head! I am going to deny that I had that thought about murdering Mr. McCoy." Second, one can test the ability of the antiprivacy machine by employing the usual experimental procedures for evaluating any psychological instrument and obtain its degree of accuracy and range of error (for similar ideas see Marr, 2011). Palmer (2011) would probably suggest that the sentences about Mr. McCoy's murder and its denial could be investigated and explained as two behavioral responses.

Third, "functionalism" is a philosophical approach that attempts to capture mental states (will, belief, thoughts, pain, and fear) in such a way that will allow their scientific investigation. While there are many different versions of functionalism (e.g., Polger, 2004), the main idea is this: It suggests viewing mental

⁶ The discussion of Baum's (2011) approach, the Molar View of Behavior, which deals with the issue of private events (e.g., will, belief, thoughts) and the interesting debate that is raised in the Radical Behaviorism literature, are beyond the present paper's scope: see *The Behavior Analyst*, 34(2).

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states in terms of the causal role, the function they play in the cognitive system. That is, a mental state is defined as a state that connects input (stimulus) to output (response), it is connected to other mental states, and it can be realized by different materials that satisfy the function of that mental state. Kim (1996, p. 75) writes, “. . . psychological concepts are like concepts of artifacts. . . . The concept of engine is specified by a job description of the mechanisms that can execute the job.” An actual engine’s mechanism can be activated by gasoline, electricity, or steam. The idea that a mental state can be realized by different neurophysiological substances (fear is realized differently in humans, dogs, cats, and rats) and by other materials such as silicon is called “multiple-realization”. Multiple-realization means that the relation between a mental state and a brain state is not one-to-one, as proposed by the Mind/Body identity theory, but one-to-many. Functionalism has sparked a wide-ranging dispute (see Kim, 1996, Polger, 2004). A major objection is that the goal of capturing a mental state by specifying its function is not achieved. One famous argument that supports this objection is the thought experiment, the “Chinese room”, proposed by Searle (1980). Briefly, Searle, who did not understand Chinese, undertook to perform all the operations of a very sophisticated computer for processing the Chinese language. He obtained certain signs (questions in Chinese) through an aperture in one side of a room, performed the appropriate operations on them (which followed that computer program), and sent out the results (answers in Chinese) through another aperture in the other side of a room. While the answers were perfectly correct, Searle himself declared that he did not understand a word in Chinese. That is, rules of performance per se cannot attribute meanings to the physical signs on which they are operated. The computer does not understand the meanings of the Chinese language and has no mental states equivalent to those of a human being. Even if two systems (Searle and the computer) are functionally the same, their inner states are different.

Fourth, in several interesting cases behavior is accounted for (at least partially) by appeal to will, belief, and intention that may be classified as unconscious (e.g., psychoanalytic motivation, actions such as riding a bicycle and playing the piano, implicit learning and memory, and innate information for acquiring a language). The study of the consciousness-intentionality relation has aroused an ongoing debate (e.g., are they distinct?; see Bayne, 2009; Horgan & Tienson, 2002; Rakover, 1993, 2007). Consider, however, the following example: David traveled by train from town A to B to meet Ruth. On the train he read a novel and his intention to meet Ruth was never in his consciousness (his intention was unconscious). When he reached town B the idea to meet Ruth reappeared. Clearly, if the intention to meet Ruth were not to re-enter his consciousness David would be bewildered—what am I doing here? Furthermore, if he were told that Ruth had to leave town B unexpectedly, David would immediately try to catch the train back to town A.

These issues show that the attempts to handle consciousness mechanistically are problematic (see also the previous section). By contrast, the present approach assumes that consciousness is very important for understanding behavior. It attempts to encompass mental states scientifically by showing that mentalistic

explanations fulfill the scientific requirements for explanation and by developing a special framework, the Multi-Explanation Framework, for matching mechanistic and mentalistic explanations to behavior and its components (see below).

Third, a justification is developed for conceiving the mentalistic scheme [Will/Belief] scientifically: it is revealed that [Will/Belief] fulfills the requirements of the scientific methodology for providing explanations. Although it is very difficult to reduce a mentalistic explanation to a mechanistic explanation, it is discovered here that the scientific requirements for explanation are wide enough to encompass the mentalistic explanation scheme [Will/Belief] too. Hence, according to the scientific game-rules, mentalistic explanations are methodologically suitable.

The next section presents arguments that support the proposal that [Will/Belief] (a) meets the methodological requirements for scientific explanation, and (b) cannot be conceived of as similar to a law in the sciences.

A Mentalistic-Purposive Explanation Scheme

Does a mentalistic-purposive explanation scheme, [Will/Belief] (which creates specific teleological explanations), meet the requirements of scientific methodology for explanation? To answer, it is necessary to clarify the characteristics of explanation schemes common in science and to discover the extent that these characteristics also apply to [Will/Belief]. The examination shows that this mentalistic explanation scheme does indeed maintain the scientific characteristics.

Based on the literature on explanation, I propose that an explanation scheme has four major characteristics (see Hempel, 1965; Lipton, 1992, 2001; Psillos, 2002; Rakover, 1990, 1997; Salmon, 1989; van Fraassen, 1980; Woodward, 2002). I add a fifth, namely “Empirical Irrelevance,” on which I shall elaborate.

(1) *General procedure*: An explanation scheme is a general procedure whereby the researcher proposes specific explanations for specific phenomena. This property exists also in the mentalistic teleological explanation. For example, the specific explanation—David waves his hand to bid Ruth farewell—is a specific instance of [Will/Belief].

(2) *Causes and reasons*: The explanation model in the natural sciences assumes that one of the components of the explanation for a phenomenon is associated with a general law, a theory, a process, or a certain mechanism that proposes causes for the phenomenon’s occurrence. Analogously, regarding a human’s or an animal’s behavior, the explanation is accomplished by an appeal to internal mental processes that explain it or give reasons for it. David waved his hand because he wanted to bid Ruth farewell and he believed that a wave of the hand would realize this wish.

(3) *Rationality*: In the natural sciences an explanation scheme creates from one sort of information another sort of information (which describes the phenomenon under study) by means of rules of deduction, mathematics, and probability. Thus, the occurrence of the studied phenomenon is expected because it is predicted on the basis of specific information and rational rules. Likewise in the

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case of the teleological explanation: if David wishes to bid Ruth farewell and he believes that waving his hand is the proper response for realizing this wish, it will only be rational for David to wave his hand. Justification for this expectation—that the waving response will take place—is not based on logic, on statistical probability, or on the necessity that derives from a natural law. Rather, it is based on practical reasoning, on the considered opinion of the individual who takes into account, among other things, his ability, the physical and social conditions to which he is subject, and the significance of realizing his will (see Millgram, 2001; Newell, 1981; Samuels, Stich, & Faucher, 2004; Schueler, 2003; von Wright, 1971).⁷

(4) *Empiricism*: The specific explanation generated by the explanation scheme (model) must be attached to reality. This enables an empirical test of the theory, the law, or the mechanism that the explanation model uses (e.g., the D-N model). This requirement is also realized for the mentalistic explanation. For example, there is no problem in testing empirically the explanation that David waved his hand as a sign of his wishing to take leave of Ruth. Since David is acquainted with Ruth, he will recognize (choose correctly) her photo out of ten different photos, and Ruth will recognize David's photo as well, will confirm that she saw David waving the hand to say goodbye, and also that she waved back.

(5) *Empirical irrelevance*: To use the D-N model, one has to set in the model's assumptions various hypotheses, theories, or laws (laws of the movement of bodies, laws in electricity or electromagnetism, theories or laws in biology, and the like) and the relevant particular conditions, and derive from them specific predictions. This model, then, is an explanation storehouse for diverse hypotheses, theories, and laws from many and varied fields of research. Similarly, one may suggest that the confirmation/refutation of a hypothesis (theory or law), which is done by the familiar Hypothetico-Deductive (H-D) method, is a storehouse for empirical testing of diverse hypotheses. These properties underlie the present characteristic: Empirical Irrelevance.

These properties suggest that observations do not empirically confirm/disconfirm the explanation model and the method of testing, but the hypothesis itself. That is, methodologically, the empirical observations are not relevant to the explanation scheme and the method of testing. If observations were relevant for the hypothesis, the explanation scheme, and the method of testing, then one discordant observation (negative empirical result) would refute, in

⁷ Practical reasoning is a special kind of rational inference that provides reasons for performing actions and is different from the rules of logic, probability, and theory of making decisions (see Millgram, 2001; Schueler, 2003). Behavior is considered rational if it accords with the rules of inference such as logical and probabilistic. Nevertheless, many researchers maintain that practical inferences and will/belief explanations are rational (e.g., Newell, 1981; von Wright, 1971; see also Samuels, Stich, & Faucher, 2004). Newell (1981) interconnected the individual's knowledge, goals, and actions by means of the principle of rationality: If an agent has knowledge that one of its actions will lead to one of its goals, then the agent will select that action (p. 8).

addition to the hypothesis, the explanation scheme and the method of testing. No hypotheses could then be tested.

Does the Empirical Irrelevance characteristic also apply to [Will/Belief]? In my opinion the answer is affirmative. Consider the following hypothesis: David wants to meet Ruth in Tel Aviv and believes that a bus ride will realize his wish. Hence, a specific prediction may be proposed that David will travel to Tel Aviv. But David does not travel to Tel Aviv. According to the present characteristic, what was refuted is the specific hypothesis and not the scientific method of testing or the teleological explanation scheme whereby the specific hypothesis was generated. The reason for this is similar to what was stated above: the teleological explanation scheme continues to produce specific teleological explanations, specific hypotheses that deal with other behaviors of David (and of other people). Otherwise, it would not be possible to put any teleological hypothesis to an empirical test because in principle one negative result is sufficient to refute the specific hypothesis, the method of testing, and the teleological explanation scheme that created the present specific explanation.

In light of this discussion, the similarities and differences between the mechanistic and mentalistic explanation schemes can be portrayed in the following way: the D-N model is a general deductive mechanistic scheme (procedure) for generating various specific explanations. It relates to different laws or theories, which are confirmed or refuted by the deduction of a specific prediction that is compared to empirical observations. These observations are not relevant to the mechanistic explanation scheme or the method of testing themselves.

The purposive explanation scheme [Will/Belief] is a general explanation scheme for generating various specific teleological explanations. It is not built on deductive logic but on practical reasoning. It does not relate to different laws or theories (as the D-N model does); instead, it connects an individual's mental states of will and belief to her/his behavior. Empirical observations confirm or refute specific predictions, which are based on one's particular purposive behavior generated by [Will/Belief]. These observations are not relevant to the mentalistic scheme or the method of testing themselves.

Hence, it is safe to suggest that despite the differences between the two explanation schemes, the mentalistic–purposive (teleological) explanation scheme does satisfy the five criteria for a proper explanation in the sciences. A similar idea to the present conclusion that [Will/Belief] is a scientific scheme, a model for providing specific teleological explanations, was proposed by von Wright (1971):

Practical reasoning is of great importance to the explanation and understanding of action. It is a tenet of the present work that the practical syllogism provides the sciences of man with something long missing from their methodology: an explanation model in its own right which is a definite alternative to the subsumption-theoretic covering law. Broadly speaking, what the subsumption-theoretic model is to causal explanation in the natural sciences, the practical syllogism is to teleological explanation and explanation in history and social sciences. (p. 27)

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The question that arises here is whether the present interpretation of [Will/Belief] is the only one. Several researchers have formulated a purposive explanation, a will/belief explanation, in a way appropriate for a law in the natural sciences (e.g., Churchland, 1988; Horgan & Woodward, 1985; Rosenberg, 1988). I cannot accept this interpretation for the following reasons.

First, if the Empirical Irrelevance characteristic holds, then [Will/Belief], conceived as an explanation scheme, is not empirically testable, whereas all laws, theories, and hypotheses are empirically testable. Therefore, [Will/Belief] may not be conceived of as a kind of scientific law. Contrary to Churchland (1988), who maintains that folk psychology is unchanging because it is fundamentally bad science whose fate is to disappear from the book of science just as popular theories about ghosts disappeared, I argue, in accordance with Empirical Irrelevance, that [Will/Belief], as an important part of folk theory, is irrefutable, not because folk theory is bad science but because [Will/Belief] is a mentalistic scheme for generating various specific explanations and it is not affected by empirical results.

Secondly, [Will/Belief] does not seem to uphold two criteria of scientific laws (see Swartz 1985; Weinert, 1995; Woodward, 2000, 2003). In addition to these, I offer another one: the criterion of “unit equivalency” (see Rakover, 2002).

A. Counterfactual situations: [Will/Belief] cannot support an event that has not happened yet, since performance of a person’s intention depends on a large number of factors such as her psychological condition and her physical and social circumstances. So it transpires that without holding all these factors constant (without adding *ceteris paribus*), [Will/Belief] is spurious. This applies also to Woodward’s (2000, 2003) suggestion that in the special sciences (e.g., economics or psychology) talking about laws in the accepted sense in physics is pointless; instead, one should talk about stable empirical generalizations, invariance, and unchanging generalizations. As an empirical generalization [Will/Belief] is unstable and influenced by many variables.

B. Explanatory support: A scientific law or theory has an explanatory support that stems from its being coherently interwoven (logically, mathematically, and conceptually) in a broad empirical–theoretical framework and relevant technological developments. [Will/Belief] has no such explanatory support as, for example, the Newtonian theory does; one’s action is not deduced from one’s will/belief, and the theoretical–empirical and technological threads woven into [Will/Belief] are not of the same sort as that physical law or theory.

C. Unit equivalency: Physical laws and theories uphold the requirement that I call “unit equivalency” (see Rakover 1997, 2002), whereas psychological theories usually do not. (The present requirement corresponds to Dimensional Analysis used in the sciences for checking the correctness of equations.) Unit equivalency requires that the combination of measurement units on one side of the equation of the law or theory must be identical to the combination of measurement units on the other side. To clarify this requirement, let us consider Galileo’s famous law of free fall of bodies: $d = 1/2gt^2$, where d signifies distance, t time, and g acceleration of the body caused by gravitation.

Since d is measured in units of distance (meters), the expression gt^2 must also be measured in units of distance. And indeed, a simple algebraic calculation shows that this is the case: $\text{meter} = [\text{meter}/\text{time}^2] \text{time}^2$.

Does [Will/Belief] satisfy this requirement? Is the combination of measurement units on one side of the equation $\text{Action} = f(\text{Will}, \text{Belief})$ equivalent to the combination of measurement units on the other side of the equation? The answer is negative. The combination of measurement units common in psychology for concepts of will and belief (usually measured by verbal report) is not identical to the combination of the measurement units of the term action (usually measured by frequency of response, reaction time, and the like). Nevertheless, certain interpretations for the coefficients of the equation $\text{Action} = f(\text{Will}, \text{Belief})$ may be suggested so that the present requirement for unit equivalency is satisfied. However, this possibility is no more than ad hoc, since in psychology the interpretations and estimations of coefficients (as in regression) change from situation to situation. This in no way parallels the interpretations and estimations of the coefficients common in the sciences, which are invariant and universal.

Thus, a good justification has been presented for treating [Will/Belief] as a scheme of scientific explanation: it maintains the methodological properties of an explanation scheme accepted in science and not of a scientific law or an empirical generalization. This sets the stage for the development of the Multi-Explanation Framework discussed in the next section.

Multi-Explanation Framework

The Multi-Explanation Framework is not a specific theory in a specific psychological area, but is a framework that allows one to develop a specific theory in a specific area of psychology. It suggests guidelines and procedures on how to construct coherently a specific theory based on two kinds of explanations (mechanistic or mentalistic) and how to test it empirically. Although most of current psychological theories are based on mechanistic explanations, nearly all behaviors need to be accounted for by appeal to both mechanistic and mentalistic explanations. This view is upheld by the foregoing discussion of the Mind/Body problems. In addition, I shall corroborate it with two examples illustrating the importance of mentalistic explanations for behavior understanding. The first is from Plato's *Phaedo* (1998)⁸. Socrates argues that although it is true to say that without his body (bones and muscles) he would not be sitting in the prison, it is not true to say that because of this he has been imprisoned. The real reasons for his imprisonment are that the people of Athens found him guilty in atheism and corruption of the youth, and that he, Socrates himself, decided to accept their verdict. Hence, according to Plato, mentalistic explanations are needed for understanding behavior. The second example is from current everyday life. David goes to the restaurant because he *wants* to eat and *believes* that in the restaurant he be able to realize his *will*, when a large part of his actions (walking, eating) are

⁸ I thank Professor Danny Algom for calling my attention to this philosophical masterpiece.

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automatic and mechanistic. Hence, while an efficient account for David's behavior requires the use of both kinds of explanation, most current psychological theories miss an important explanatory factor: the mentalistic one.

The Multi-Explanation Framework is based on a particular relationship between explanation schemes (mechanistic and mentalistic) and behavior. While there are many behaviors that can be accounted for satisfactorily by appeal to mechanistic explanations, many behaviors and their components need to be approached by both mechanistic and mentalistic explanations. In these cases certain components of behavior and their organization in that behavior require the use of mentalistic explanations (for details see below; similarly, Foxall, 2007, 2008, pointed out that there are certain kinds of behavior which are hard to handle explanatorily by radical behaviorism and require account by appeal to intentional terms).

In the natural sciences an explanation model or scheme employs various laws or theories to suggest explanations for various specific phenomena. By contrast, a Multi-Explanation Framework posits that behavior has to be understood by appeal to a theory that employs several explanation schemes coherently—mechanistic and mentalistic. While the natural sciences and the present framework differ methodologically in providing explanation, they do not differ in the methodology of empirical testing of a theory.

The coherence of the Multi-Explanation Framework is reached by matching appropriately the explanation schemes to the behavior and its components by means of several guidelines and procedures to be detailed below. These are of great importance because the scheme/behavior match guides the researcher on how to develop a specific theory to explain the phenomenon under study. One important procedure for matching behavior and explanation schemes provided by the Multi-Explanation Framework is the principle of "explanation-matching": it deals with the relation between proposing a mechanistic or mentalistic explanation for a behavior as a whole, and proposing an appropriate explanation (mechanistic or mentalistic) for the components of this behavior.

The Multi-Explanation Framework is discussed here from the following three viewpoints.

(A) Empirical Testing and Explanation Providing

My proposition here is as follows. A specific theory based on the Multi-Explanation Framework is tested as in the natural sciences (by the H-D method). However, the way such a theory proposes explanations for behavior is not similar to that in the natural sciences. To explicate this, I will examine the well known operation of a flashlight. How does this device work? To answer, we perform the following analysis:

1. Decomposition into parts—we take the flashlight apart as follows: switch, battery, electrical lead, and bulb.
2. Explanation of each part—the explanation for each part is based essentially on different laws in physics of electricity, heat, and light. All of these explanations

are based on known physical theories and are employed by mechanistic explanation schemes.

3. Explanation of the interaction between the parts—we explain the connection between the different parts as a process of *energy transformation*: chemical energy, which is transformed into electrical energy, which is transformed into heat, which emits light. This process can be calculated with precision and explained by the appropriate mechanistic laws and theories.

The *empirical test* of the theoretical explanations for this phenomenon is made by the H-D method. For example, it is possible to calculate the intensity of an electrical current, the heat in the electrical resistance, and the intensity of the light produced by the flashlight. These calculations can be compared with empirical observations and the degree of match between them can be measured.

Is a theory based on the Multi-Explanation Framework tested similarly? The answer is affirmative. The testing method is indifferent to the kind of theory the researcher uses to explain the experimental results. As long as a prediction can be derived from a given theory in a given experimental condition, and as long as the prediction can be compared with the observation, the H-D method can be used.

However, how *an explanation* is given by a theory based on the Multi-Explanation Framework differs from how an explanation is given in the sciences. To clarify this, we shall take another look at the flashlight's operation. The explanation is based on the use of several physical theories whose common property is that they offer mechanistic explanations. This property, among other things, enables the attainment of a uniform explanation for the entire system through *energy transformation* (i.e., through the laws of transformation). These laws allow a precise calculation of empirically measurable results so that we are able to know exactly the amount of current that will pass from the battery to the filament in the bulb, hence the amount of heat and light created in it.

This procedure does not work with a Multi-Explanation Framework. As mentioned in the introduction, we still do not know how mental processes interact with neurophysiological processes or how consciousness emerges from the brain. In short, we still do not possess a Mind/Brain theory. Therefore, it is advisable to employ both kinds of explanations—mechanistic and mentalistic.

(B) Fitting the Explanation Scheme to Behavior

As we saw, the explanation of the flashlight's operation is based on its disassembly into parts, an explanation of the operation of each part by the appropriate mechanistic theory, and an explanation of the interaction between these parts through calculation of *transformation of energy*. A similar procedure is needed when one proposes an explanation for behavior by the Multi-Explanation Framework. However, in this case the decomposition of behavior into its components and fitting the appropriate mechanistic or mentalistic explanations to these components are very difficult and involve several steps. First, one determines whether the studied behavior matches mechanistic or mentalistic explanation schemes. Then one chooses from several explanation schemes the particular one

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that fits the studied behavior and its components (see footnote 4). I call the matching pair explanation/behavior (or explanation/behavioral component) the “explanation-unit”. Finally, one organizes coherently the explanation-units in the specific theory (which is based on the Multi-Explanation Framework) developed for the studied behavior.

How, then, does one perform these steps and fit explanations to behavior and its components? Because the answer depends on many factors (associated with theoretical and empirical knowledge), a general solution to this issue cannot be proposed. Accordingly, I shall describe in brief two important indicators suggesting when the explanation of a given behavior will be achieved with the aid of a mechanistic explanation scheme and when with the aid of a mentalistic scheme.

(I) Indicator by Empirical Research. Numerous studies discuss the following questions. Is one capable of being aware of the five events connected to one’s own behavior: presentation of information (verbal, visual, and the like), responding to this information, the mechanism that produces the response, the purpose of the response, and the result of the response? Can one control (initiate, change, stop) these five events? The answers to these questions may guide the researcher in the choice of the proper explanation (mechanistic or mentalistic). Let us consider few examples.

In many cases the individual is not aware of, nor controls, the five foregoing events or the larger part of them. They are associated with chemical, neurophysiological processes in our brain and our body and are accounted for mechanistically (see Morsella, 2005; Palmer, 1999; Rakover, 1983).

A number of cases are characterized by cognitive impenetrability (Pylyshyn, 1984): if a given behavior is not affected by a change in the individual’s goals, beliefs, desires, thoughts, and knowledge, it is reasonable to assume that it is based on innate mechanistic processes (see also Fodor, 1983). Generally, assistance may be gained from measures developed by signal detection theory to handle effects of motivation and knowledge on behavior (e.g., Macmillan & Creelman, 1990).

In many cases information of which the individual is unaware still causes a change in behavior (see Bargh, 2007; Bargh & Ferguson, 2000; Bargh & Morsella, 2008; Palmer, 1999; Roser & Gazzaniga, 2004; Winkielman & Berridge, 2004).

In many cases one plans a behavior that will satisfy one’s will/belief. In fact, many of one’s actions (e.g., reading, listening to music, watching plays and movies, travel and touring, meeting friends, and the like) are done to effect change in one’s conscious experience.

(II) Indicator by the Principle of Explanation-Matching. The principle deals with cases where behavior is divided into its components, each of which has to be assigned the appropriate (mechanistic or mentalistic) explanation. The following question then arises: what is the relation between the kind of explanation that has been matched to a whole behavior (A) and the kinds of explanation matched to its components (a_1 a_2 a_3 etc.)? To resolve this problem, the principle of explanation-matching is proposed:

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(a) Behavioral components of mentalistic behavior (behavior that is explained by a mentalistic explanation) are likely to receive both mentalistic and mechanistic explanations.

(b) Behavioral components of mechanistic behavior (behavior that is explained by a mechanistic explanation) will receive only mechanistic explanations.

Accordingly, this principle posits that the components of a mechanistic behavior cannot receive mentalistic explanations, while the components of a mentalistic behavior may receive mentalistic as well as mechanistic explanations. Hence, if mechanistic behavior A is broken down into two behavioral components a_1 and a_2 , where a mechanistic explanation is matched to a_1 and a mentalistic explanation is matched to a_2 , then either behavior A was not purely mechanistic or the match of the explanation to the behavioral component a_2 failed.

For example, since the most popular Müller-Lyer illusion is not affected by mentalistic factors such as knowledge of the structure of the illusion, it is hard to see how components of this phenomenon are likely to receive a mentalistic explanation. Furthermore, this illusion appears in fish and chicks too (see, e.g., Coren & Girus, 1978). However, if a certain plan of action is put into practice (e.g., going to the movies) a complex network of systems (mentalistic and mechanistic) is activated that enable going to the movies and all that it involves.

As another example, consider the following true Dog-Elevator episode (one of my favorite observations). My apartment is located in building A, situated on the side of a mountain. Behind and above it stands building B, in which lives the owner of the dog. At the bottom of building A there is a private parking lot, from which a curved tunnel leads to an elevator. One pair of its doors opens toward the tunnel. The elevator rises to a place between the two buildings, and its other pair of doors opens. From there one may enter building A at the top to walk down, or building B at the bottom to walk up. The dog has the habit of lying in the parking lot watching the street. One day, as I stepped out of my car, he began running ahead of me, stopping from time to time and turning his head to see if I had entered the tunnel and was walking through it. Then we both stood and waited for the elevator to come down. When the tunnel-side doors opened the dog rushed in and stood facing of the elevator's doors on the side opening toward the buildings' entrances. When these opened, he rushed out and entered building B.

How may the dog's behavior be explained? To suggest an explanation, the following two additional facts have to be considered. First, this was the only time that the dog and I went at the same time through the tunnel and stepped into the elevator. Second, although there had been no other contact between the dog and me before the present episode, the dog recognized me, and from the parking lot he would see me going into the tunnel. (He had never seen me enter the elevator.) I propose that to account for the dog's behavior and its components (running ahead of me, pausing with his head turned, waiting for the elevator, entering the elevator, facing the doors on the side of the buildings' entrances, leaving the elevator, and entering building B) one has to appeal to a purposive explanation (the dog's goal was to reach building B) which organizes the whole episode. In accordance with

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the principle of explanation-matching, the components of the dog's behavior can be accounted for partially mentalistically (e.g., waiting and checking to see if I continued walking through the tunnel) and partly mechanistically (e.g., the dog's running and retrieval of the acquired information that I use the tunnel—processes that can be accounted for cognitively–computationally). By contrast, it seems to me that it would very difficult to propose a purely mechanistic account for the dog's behavior without an appeal to his inner world (and yes, I do believe that dogs have consciousness).

The principle of explanation-matching raises the following question: how is a given behavior broken down into its components? To the best of my knowledge, the answer is not found in a simple formula for decomposition but in empirical–theoretical research (see Bechtel, 2008; Bechtel & Richardson, 1993; Carver, 2001; Rakover, 2007).

(C) Three Methodological Problems Concerning the Multi-Explanation Framework

The idea that the Multi-Explanation Framework is based on several explanation schemes (various mechanistic and various mentalistic schemes, see footnote 4) is liable to give rise to the following three problems, for which a solution is offered by the procedure of fitting the appropriate explanation scheme to behavior.

(1) *The Ad Hoc Explanation Problem.* Because the Multi-Explanation Framework contains a number of explanation models or schemes, the explanations given by this approach may well be trivial. If a certain phenomenon is not explainable by scheme (a) one may try scheme (b) and so on until a satisfactory explanation is found. The problem created by this possibility is that the theory based on this approach may be ad hoc and not be empirically refutable.

(2) *The Inconsistency Problem.* The Multi-Explanation Framework contains a number of explanation schemes, so this approach might provide an explanation for a certain phenomenon through explanation model (a), yet supply the same phenomenon a contrary explanation through explanation model (b). The theory based on this approach may thus be beset by internal contradictions.

(3) *The Incomparability Problem.* Because the Multi-Explanation Framework contains a number of explanation schemes, two specific theories that are based on this framework may not be comparable as they may employ different explanation schemes. For example, it is difficult to decide whether dissimilar predictions are generated by the different content of the theories themselves or by the different schemes they employed.

Proposal for a Solution to the Three Problems. The basic argument is that the commitment to matching an explanation to a behavioral component (i.e., to preserving the explanation-unit) solves these three problems, because for every behavioral component the researcher uses one single explanation (note that a commitment to the explanation-unit is similar to a commitment to a hypothesis; one holds it till it is disconfirmed). As a result, the researcher cannot propose

different explanations for the behavioral component, nor can she leap from explanation to explanation at will; she must use one explanation—the one determined to be most suited to handling the kind of phenomena under study. This commitment prevents the possibility of proposing ad hoc explanations. The explanation-unit is fixed in advance, similarly to the methodology applied in the natural sciences; there, for example, it is clear that the movement of bodies is treated by means of an explanation model of the kind proposed by Hempel (1965).

Matching protects the theory from the problem of inconsistency. Because for every phenomenon a matching explanation is determined in advance, no situation will arise where the researcher uses different explanations for the same behavior, hence a situation of self-contradiction will not arise.

Matching also allows empirical and theoretical comparison of different theories. This comparison may be partial or entire (when the two specific theories based on the Multi-Explanation Framework use the same explanation schemes).

Discussion

This section deals with two main issues: the methodological contribution of the present approach, and the differences between the present approach and those common in psychology.

Contribution: The major contribution of the present paper is in proposing a unique approach, Methodological Dualism, which leads to the development of the Multi-Explanation Framework. The latter helps a researcher to develop a specific psychological theory with an improved explanatory ability. The approach is not founded on the usual attempt to reduce mental states to neurophysiological states; it circumvents the ontological Mind/Body problem and the debate on dualism vs. monism, and it suggests a nontrivial integration of two kinds of explanation: mechanistic and mentalistic. The explanatory ability of a theory is enhanced by coherent use of both these kinds of explanations. The integration, which is carried out in accordance with the methodological requirements accepted in science, is based on the following four important building blocks:

- (A) Various specific purposive explanations are generated by the mentalistic scheme [Will/Belief]. Although [Will/Belief] cannot be reduced to a mechanistic explanation, it does fulfill the scientific methodological requirements for explanation.
- (B) The attainment in (a) allows the construction of a scientific framework, the Multi-Explanation Framework, which provides guidelines on how to develop a coherent specific psychological theory. A main goal of these guidelines is to produce an appropriate match between behavior and the two kinds of explanations: mechanistic and mentalistic.
- (C) The behavior/explanation match, attained in (b), establishes the coherence of a specific theory and offers solutions to certain problems that are raised by the proposed framework.
- (D) A scientific theory and a theory developed on the basis of the present framework do not differ in the method of testing. Nevertheless, the two

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theories differ methodologically in the way they provide explanations, due to very fact that the Multi-Explanation Framework is based on two irreducible kinds of explanation.

Differences: While the present approach does not attempt to solve the problem of conscious behavior, most of the approaches in psychology make an effort to confront it. Three such general approaches may be distinguished:

(1) An attempt to disregard conscious experience and develop theories that deal with behavior which meets science's criteria for observation: objectivity, public availability, and repeatability (behaviorism); (2) an attempt to conceptualize conscious experience as a theoretical term in a psychological theory (neo-behaviorism); and (3) an attempt to conceptualize conscious experience as a theoretical term that is a part of the cognitive machinery analogous to the computer (cognitive psychology).

Does conceiving consciousness as a theoretical term capture consciousness? The answer is no. Neo-behaviorism conceptualized mental terms (e.g., expectancy) as an internal chain of s_g-r_g (fractional anticipatory goal-responses), whereas cognitive psychology conceptualized them by means of analogy to a computer (see Rakover, 1990). Despite the differences between these two approaches, both attempted to grasp consciousness by employing the structure of a scientific theory borrowed from the natural sciences. Accordingly, consciousness is conceived as a theoretical term that cannot be observed directly and is defined in terms of its relations with stimuli, responses, and other theoretical terms. But this method does not capture consciousness because it is a special observational term: everyone observes directly her own consciousness, but not that of others.

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