

## THE THEORY OF COMPLIMENTARITY AND MIND-BODY DUALISM : A CRITIQUE

The theory of complementarity<sup>1</sup> is an attempt to solve the perennial problem of mind-body dualism, and it has been propounded by Nicholas Bohr, a great Physicist of the 20th Century. Let me first make clear what do we mean by 'complementarity'. Complementarity means a relationship or situation, speciality in Physics, the capacity of the wave and particle theories of light together to explain all phenomena of a certain type, although each separately accounts for only some of the phenomena.<sup>2</sup> 'Complementarity' has been manifested in the *Sāṃkhya* philosophy also. For *Sāṃkhya* the application of *Puruṣa* and *Prakṛti* represents the complementarity of two universal aspects of reality, 'Essence' and 'Substance'. Bohr is convinced that it is possible to solve this perennial problem by applying his theory of complementarity. He claims that, his theory can be extended to fields other than physics.<sup>3</sup> His theory, as regard physics, is as follows.

1. Bohr introduced the principle of 'complementarity into physics'<sup>4</sup> in order to overcome certain conceptual difficulties due to the fact that the fundamental principles of macro-physics appear to be false when applied to micro-physics. In micro-physics, micro-objects or events are situated such as electrons. In macro-physics, macro-objects or events are situated such as a stone. The conceptual difficulty can be exemplified as follows. According to physical theory, the precise position and the precise

momentum of a macro-object can be determined (in the limit) simultaneously, but, according to Heisenberg's Uncertainty Principle, such a determination is not possible for a micro-object.

Another such difficulty is often referred to as 'the duality of matter and light'. According to macro-physics any micro-object that is corpuscular (C) and not wavelike (W) at the same time will always be C and not W, irrespective of the experimental arrangement by means of which it is investigated. Similarly, any macro-object that is W and not C, at the same time will always be W and not C, irrespective of the experimental arrangement by means of which it is investigated. According to macro-physics, the properties C and W are incompatible, i.e. a macro-object can have either the property C and not W or the property W and not C but not both properties.

According to Bohr's theory, the properties of C and W are not incompatible when assigned to micro-objects; rather they are non-compatible, that is, C and W can be conceived of as dispositional properties such that a micro-object can have both the property C and not W and the property W and not C. However, only one of these properties can be presented at a given time. Which of the two properties is present depends upon the kind of experimental arrangement by means of which the micro-object is investigated at that time. For example, electrons having as their manifestations a click in a Greiger counter or a track in bubble chamber are C and not W. Electrons having as their manifestations diffraction pattern when reflection from a nickel crystal, or a diffraction pattern when passing through a thin film of gold, are W and not C.

2. Each of the conceptual difficulties mentioned above represents what we call, for reason to be given presently, a paradoxical situation. But in what follows, we shall deal only with

that which involves the relation between C and W, because it is this relation which provides the basis for our discussion of complimentarity with reference to the mind-body problem.

The paradoxical situation created by the fact that the relation between C and W for macro-object is different from the relation between C and W for micro-object. That is for macro-object the relation is that of incompatibility, whereas, for micro-object it is that of non-compatibility. The situation is paradoxical, because the conceptual unity of physics seem to be violated in that the relation of C and W are different in macro-physics and micro-physics and because there exists the separate and apparently exclusive conceptions of the same micro-objects.

3. Bohr attempts to remove the paradoxical situation as follows. He notes that phenomena that are explained as assigning the property C and W to the micro-object are invariably different from phenomena explained by assigning the property W and not C to that micro-object. These phenomena are in turn obtained by the use of mutually exclusive experimental arrangements. Bohr assumes that there are two mutually exclusive classes of experimental arrangements, which may be used to investigate such micro-objects as electrons. When such a micro-object is investigated by means of members of one of these classes, the resultant phenomenon is explained by assigning the property C and not W to the micro-object. The members of the other class result in phenomena that are explained by assigning the property W and not C to the micro-object. Bohr highlights the paradoxical situation by insisting that the assignment of the properties C and not W or W and not C to a micro-object is related to the experimental arrangement used to investigate the object. Thus, for Bohr, to assign categorically to a micro-object C and not W or W and not C without relativization to an experimental arrangement is elliptical and meaningless.

According to Bohr, such an assignment is meaningful only if these properties are used to characterize not the micro-object as such but something else which includes both the micro-object and the experimental arrangement used to investigate it.

The paradox is removed because the terms C and W are no longer used to characterize the same micro-object but rather to characterize what may be conceived of as two different things, that is, a micro-object investigated by two different experimental arrangements. Thus, the relation between the terms C and W in micro-physics may be conceived of as that of incompatibility. As a result, the conceptual unity of physics is, in this respect, not violated. In addition, there are no longer two mutually exclusive conceptions of the same micro-object.

4. He now defines the complementarity in physics between C and W as follows :

C and W stand in relation of complementarity if the following conditions obtain.

- a) According to macro-physics, C and W are incompatible.
- b) According to Bohr's micro-physical theory, C and W are non-compatible.
- c) The resulting paradoxical situation is removed if a micro-object is conceived of as being either C and not W or W and not C only relative to the experimental arrangements by means of which it is investigated.

Now I would like to discuss the way in which Bohr applies complementarity theory to solve mind-body problem. His theory of complementarity as regards the mind-body problem is as follows.

Bohr states that the problem arises due to some of the conceptual difficulties about these two concepts. But these conceptual difficulties could be removed if we can understand the distinction between mental entities and physical entities clearly. This distinction can be drawn in the following way.

Firstly, 'mental entities' permit privileged access, i. e. mental entities can be experienced only by the person to whom these entities are attributed. And secondly, 'mental entities' do not have any location in any part of body, i. e. mental entities can never be experienced as having a location in some part of the body. An entity in order to be a 'mental-entity' must fulfill these two conditions.

Similarly, bodily entities also possess two different characteristics which are as follows :

Firstly, 'bodily-entities' do not permit privileged access, for 'bodily-entities' can be experienced by more than one person. And, secondly, bodily-entities do have a location in some part of the body of a person to whom these entities are attributed. These locations can be hypothetically observed or assigned to that entity. An entity becomes bodily entity if it fulfils the above two conditions.

Bohr states that, all private experiences are 'mental entities' and all 'mental entities' are synonymous with experience. He defines 'mental entities' as 'entity M' and 'M entities do not contain any reference to any statement about scientific psychology. That means, a person's having an 'M entities' can be known simply by means of the reports which he utters about his own private experience. 'M entities' are defined by Bohr as entity<sub>1</sub>.

On the other hand, 'bodily-entities' contain some reference to any statement about scientific psychology. All the members

of the bodily entities are theoretical posits or are entities inferred from observation only. Bohr calls this type of entities as entity.

It appears from the above consideration that both entities 'M' and 'B' possess totally different characteristics and hence both 'M-entities' and 'B-entities' are incompatible to each other. But a proper examination makes it clear that, though 'M-entities' and 'B-entities' are incompatible to each other, these two entities are also in the same way non-compatible to each other. Bohr proves the incompatibility and non-compatibility of these two types of entities in the following way.

I would first like to consider the conditions by which it will be possible to establish that both 'M-entities' and 'B-entities' are incompatible to each other.

Bohr states that the property-M and the property-B are incompatible when applied to entities<sub>1</sub>. That means, an entity<sub>1</sub> can have either the property-M and not B or the property-B and not M at any given time, but not both the properties. If an entity<sub>1</sub> is assigned to any one of these properties, there are circumstances that would not permit one to assign the other property to the entity<sub>1</sub>. That is, there is no current psychology or philosophical theory known to us that would contradict his belief in this incompatibility.

Two possible objections have been raised against this as noticed in the 'Identity theory' of J. J. C. Smart and H. Feigl<sup>5</sup> and in the Dulney's<sup>6</sup> 'Theory of Awareness'.

For Smart, 'M-entities' and 'B-entities' are the same; yet 'B-entities' are not entities<sub>1</sub> in any sense. Whereas 'M-entities' are entity<sub>1</sub>. Smart asserts that 'sensations are brain states'. But Smart is not correct here because one can treat brain-state

not as entity<sub>1</sub>, but as entity<sub>2</sub>. Feigl more explicitly identifies mental-entities as entity<sub>2</sub>, dealt within neurophysiology and not with any entity<sub>1</sub>. One such theory is Dulney's Theory of Awareness. Dulney gives the following illustration in order to prove the same. I would like to state the whole experiment here.

There are theories according to which a posited or inferred entity is not experienced or observed by the person making the statement about the entity, but the entity is assumed to be an experience of the person to whom the entity is attributed. In order to explain the behaviour of human subjects in experiments involving changes in verbal behaviour as a function of rewards and punishments, Dulney has developed a theory dealing with awareness, where what the subject is aware of is conceived of as a series of propositions developed by the subject in the experimental situation. Inferences are made about those propositions and numerical values are assigned to them. Theoretical rules are the basis of these inferences. The answers given by the subject to the post-experimental questionnaire are assigned in a law-like manner. Using this theory, Dulney is able to predict, with a high degree of accuracy, the responses of each of his subjects.

Two important points follow from the above consideration. First, the entities are mental, since these are assumed to be experiences and since they permit privileged access by the person to whom these are attributed. Secondly, the entities are theoretical because the entities are referred to by statements that are part of a theory belonging to scientific psychology viz. Dulney's awareness and they are not assumed to be observed or experienced by the person who makes a statement about them.

The above assertions are sufficient enough to prove that M-entities and B-entities are incompatible when applied to entities<sub>1</sub>.

Let me now consider the conditions by which it will become possible to prove that entities-M and entities-B are non-compatible when applied to entities. That means, an entity, can have both the properties M and B, but it can have either one of these properties at any given time. This assertion can be justified in the following way.

For this purpose, we can take 'hunger' as an example. The question arises : what is hunger ? Do we have any psychological theory of hunger ? Generally, it is believed that 'hunger' can be experienced as some theoretical state of an organism which is not experienced by the psychologists. 'Hunger' is in this context assumed to be created by certain accidental conditions, e.g. food deprivation, and, further, assumed to manifest its presence in the form of such 'observable behaviour' as eating behaviour. These observables are the manifestations of hunger. The question arises again, 'To which entity does hunger belong ?' It is believed that under certain conditions 'hunger' is an 'M-entity' and under other conditions 'hunger' is a B-entity. Let us see what would follow if we treat hunger as an entity. In order to bring out this point, it is worth giving the whole experiment here.

We start with the conditions in which 'hunger' is a B-entity'. Contemporary psychologists assign a decisive role to two centres in the hypothalamus (a 'satiety centre,' and a 'eating behaviour'). There is a debate among psychologists as to the mechanism that is involved. One theory dealing with this problem is the 'glucostic hypothesis',<sup>7</sup> according to which, there are glucose receptors in the centres which respond to the difference between the concentration of glucose in the peripheral arterial or capillary blood and in the peripheral veins.<sup>8</sup> When these differences in glucose concentration are large, the glucose receptors in the satiety centre cause that centre to be active. In such



a case 'hunger' is diminished. Thus, in the context of this theory, hunger can be conceived as the relation of the activity in these two centres. Changes in hunger, so conceived, will be manifested by various observed changes in eating behaviour and/or verbal reports about experience of hunger and/or diverse psychological changes, which are taken as manifestations of 'hunger' e. g. stomach contractions.

In an experiment designed to test this theory, Slunkard, Italic and Reis<sup>9</sup> injected glucogen intravenously into human subject. They found difference in the concentration of glucose, rapid decrease in the reported experience of hunger, diminution of stomach contractions etc.

In this experiment the phenomenon to be explained is the diminution of 'hunger' following the injection of glucogen. In order to explain the phenomenon, the psychologists use the 'gluocostic hypothesis' and with that the theory of hypothalamic centres. In the context of this theory, 'hunger' is essentially assigned to have a location within the body of a person and is not assigned to the property of permitting only private observation in as much as a person clearly cannot privately observe the activity at his hypothalamus. Hence, 'hunger' so conceived may be characterised as B and not as M.

We should, now, consider the conditions under which 'hunger' can be considered as an 'entity-M'. This can be explained by the use of 'cognitive dissonance theory'.

Cognitive dissonance<sup>10</sup> is a psychological state that a person tries to eliminate. It is that state which is created when an individual has two cognitive elements A and B, where A implies not B. A classical example of this would be the following.

According to some new psychological theories the characteristics of an entity, are such that they would permit us to assign the property M to them. Thus, there will be many entities, which will be M and not B under certain condition and B and not M under other conditions.

The above experiments are sufficient enough to re-establish the claim that M and B when assigned to entities, are incompatible, and when assigned to entities, are non-compatible. Bohr states that this difference in relation creates a paradoxical situation which is structurally homologous to the situation existing in psychology. He states that the paradoxical situation can be removed in a way which corresponds to the theory of complementarity which he applies in physics. His principle of complementarity in the psychological distinction between mind and body runs as follows :

M and B stand in relation of complementarity, if the following conditions obtain,

- a) When applied to entities<sub>1</sub>, M and B are incompatible.
- b) When applied to entities<sub>2</sub>, M and B are non-compatible.
- c) The resulting paradoxical situation is removed if an entity, is conceived of as being either M and 'not B' or B and not M.

Some psychologists do not accept the relation of complementarity between M and B as a correct reconstruction of trends in modern psychology. In fact, we find a great deal of controversy regarding the role of M and B entities in the psychology of science. There are four logically possible non-complementarity theories with respect to this issue. These are as follows :

- a) Neither M nor B, for example, Tolman<sup>11</sup> holds the view that explanation in psychology should never be psycho-

logical. In addition, on the basis of behaviouristic position, he refuses to refer in any sense, even a theoretical one, to the experiences of subjects.

- b) Only B, for example, Hebb<sup>12</sup> asserts that 'explanation in psychology should be psychological only.
- c) Only M, for example, Snygg and Combs<sup>13</sup> believe that all behaviour is determined by 'phenomenal field' which is in our terminology an entity, that is B.
- d) Both M and B should simultaneously be employed because such a position involves the use of the terms 'M' and 'B' in a way different from ours, since such usage would be mentally exclusive in our terminology.

In addition, there is another theory according to which the entity, the organism as a whole, is itself neither M nor B. Entities that are either M or B are two different aspects of something more fundamental – the organism as a whole.

From the above considerations it becomes clear that Bohr's theory of complimentarity has not been accepted by many psychologists. They point out that Bohr conceived complimentarity as a theoretical principle, that is, required and valid for physical knowledge only. Thus, it is entirely possible that future development in science might supersede complimentarity. Further, if we ignore complimentarity as a physical principle, and accept it as a philosophical theory, then we find that there are some major difficulties which are very prominent in this theory of complimentarity. Bohr mis-stated his theory by bringing the notion of incompatibility and non-compatibility in order to solve mind-body problem. This assertion can be justified in the following way.

Let me first consider the incompatible theory. Two things are incompatible when these two things belong to the same category. But Bohr infers incompatibility between 'mental entities' and 'physical entities' which belong to two different categories. In the opinion of Levison to bring the incompatibility between mental entities and physical entities involves *non-sequitor*. Levison is worth quoting here,

The fallacy seems to consist in inferring the incompatibility of being mental with being physical, which are first order properties of concrete phenomena, from the incompatibility of being corrigible with being incorrigible, which can only be higher order properties of statements and propositions.<sup>14</sup>

I do agree with Levison on this point. Though it is true that mental qualities and physical qualities are different from one other, yet without relating to physical body it is not possible for a mind to perform any kind of mental function. If the mind does not will it is not possible to do any deliberate action. So incompatibility thesis can be rejected.

Secondly, Bohr commits a mistake by bringing the notion of non-compatibility between the mental-physical distinction. He claims that the properties M and B when applied to entities, are non-compatible to each other. That means, neither the property M nor the property B shares any characteristics similar to each other. The question arises here : 'If it is the case, then how can two processes, which are totally different from each other, can act, react and interact upon each other?' There must be some link or connection between these two processes. 'What is this link or connection?' This has not been answered by Bohr. Further, to say that both mental and physical possess two different characteristics is not also acceptable. Though these

two entities possess different characteristics or these two are different in kind, yet both of these entities are dependent upon each other. In fact, there exists some kind of compatibility between these two events instead of possessing two different characteristics. So, either to take these two entities into the 'same category' or to take these into 'two totally different category' is not admissible at all.

Thirdly, Bohr contradicts himself by stating that there are entities that are mental, but mental entities do not have any location in any part of the body. We know that mental entities do not just fly in the air; they need some background where they may be contained. Can there be a grain without a life ?

Fourthly, to answer the question how should we know that there are mental events, and a person having a particular mental events ? Bohr states that there is no other way of knowing a particular mental event except the reports which he gives about a particular feeling of his own. The only criteria of knowing a person's mental events are only the 'first person contemporaneous reports' of his own mental states and processes. In my opinion, this view is not also justified for the following consideration.

i) There are mental events which are not always reports, for example, feeling of love, feeling of hatred, feeling of happiness,

ii) All mental events of my own are not always a report to me.

iii) Some mental entities are private and hence are not reports i. e. my particular feeling towards a particular person is not a report but I know that I have that feeling, say, jealousy. These considerations make it clear that there are mental events

which are reports, but there are also mental events which are not always reports, still these are mental events. Thus, it can be said that Bohr restricted the scope of his theory by maintaining that mental events can be known by person's reports only. In this connection, it can be said that Bohr tries to develop a kind of linguistic philosophy in order to uphold mind-body problem. But we know that besides a person's linguistic expression, he has some private mental events which it is not possible for an external observer to know or to know properly. This crucial problem is ignored by Bohr.

In conclusion, it can be said that though there are many philosophical difficulties inherent in this theory of complementarity, yet, it is a powerful theory which wants to get rid of certain difficulties involved in the theories of dualism. We know that either to treat both mind and body as two 'distinct concepts' totally different from and independent of each other or to treat both mind and body as 'same concept' creates problems for us, because we can neither separate them nor conjoin them. And if it is the case, then ultimately we have to accept complementarity between mind and body. Though Bohr fails to prove the same, credit must be given to Bohr for providing an alternative approach. It may be possible to remove the difficulties that are inherent in his theory. However, such an exercise is outside the scope of this paper.

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NOTES

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1. The essay typed in double space on one side of paper must be submitted in duplicate.
2. The essay must not be longer than 2500 words.
3. The essay must be accompanied by a certificate signed by the Head of the Institution/Department where the student is studying to the effect that
  - (a) the student is studying in that institution and is below the age of 25 years, and
  - (b) the essay is written by him / her.
4. The essays should reach Dr. Mangala R. Chinchore, Philosophy Department, Poona University, Ganeshkhind, Pune 411 007 not later than 31-5-1990.
5. The decision of the panel of referees shall be binding on all the competitors and that no correspondence of any kind would be entertained on that count.

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