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COMMENTS

ON DR. S. WATANABE'S PAPER *

The comments that I will make will be almost entirely on the first part of Dr. Watanabe's paper, which gives some basis for the postulates that he makes. My own view on this is that the mind-body problem is an unnecessary problem. I think that it really can be avoided, and that there are some advantages in so doing.

The first postulate that was used was derived from the following difficulty: We start out with two languages, a "body language" and a "mind language". Either the mind language has some essentially new material in it that is not in the body language (or the physical language), or it does not. If it does have some new material, this contradicts one of our basic ideas of quantum mechanics – that the state-function does indeed contain all of the information. If it does not, then the physical language can express everything that the mind language can express – and perhaps even more.

Dr. Watanabe feels that the second possibility is unsatisfactory for two reasons. One is that it is operationally impossible to make the correspondence between the two languages, viz. between a specific mental state and a purported quantum mechanical state that we want to make it correspond to. The other reason is that we feel that in some sense the mental language is not a redundant one – that it does have something essential to offer; and that if the physical language is complete, this would contradict our intuitive ideas about this matter.

First of all, I'll try to show that we can make the correspondence between the physical language and the mind language without any difficulties due to quantum mechanics.

Then I will try to show that while this makes the mind language redundant in a formal sense, it still leaves the mind language as useful and as necessary to the progress of science as ever before.

* S. Watanabe, A Model of Mind-Body Relation in Terms of Modular Logic, presented at the meeting of the Boston Colloquium for the Philosophy of Science, October 26, 1961, *Synthese* **13** (1961) 261–302.

Synthese **14** (1962) 97–100;

Formally stated, the correspondence problem is as follows: Suppose we have a normal human being as a subject and he has certain mental states that he himself can identify. If we have a theory of a correspondence between mental and physical states, then this theory can be represented by a large table that lists a set of physical states of the person in the first column, and gives names of the corresponding mental states of the person in the second column. We want to find out whether this table is correct.

One thing that we might do is to first observe the physical state of this person. Having observed it we look up his physical state in the table, and we tell him what mental state it corresponds to. We then ask him: "Well, were you in that state at that time?" He will say yes or no, and this will verify or negate our theory.

It is Dr. Watanabe's contention that this in general will not be possible, because we cannot observe the physical state of a person exactly. In fact, some of the significant processes in the brain happen on the quantum level, so that a few quanta used by the observer can, in some cases, produce an unknown, though significant change in the state of the organism.

Although it is not essential to the argument I will use, I will mention as an aside, that there is some reason to believe that the "macro-operation" of the human brain may not be significantly disturbed by a few quanta of energy. This ability to operate properly in a background of disturbances (if indeed this ability exists) may be accounted for by particular kinds of error correcting circuits in the brain.

The idea that a few quanta may produce important changes in the brain, stems, perhaps, from human response to very low levels of light – on the order of a few quanta. Such sensitivities, however, occur very rarely, and only after long periods of acclimatization to darkness. The problem of making a correspondence between mental and physical states is not significantly modified if we consider a man who is temporarily cut off from external stimuli.

However, let us return to the main argument – suppose the quantum mechanical disturbances in observation *are* important. How can we go about verifying our table of correspondences? First we give the person some sort of visual input – a bright light which we focussed on his retina. Then we compute through quantum mechanics what his physical state should be (at this point, we note that this is just a *Gedankenexperiment*).

We can't tell *exactly* what state he is in: say we have them narrowed down to ten possible states, and we get a theoretical probability distribution over these states. We then go to the table and get a probability distribution for the corresponding mental states. We then give the list of possible mental states to the person who's being experimented on: we ask him which one of these he's experienced, and he tells us.

We do this experiment many times with many different kinds of inputs. Eventually we will be able – not to verify whether a particular mental state corresponds to a particular physical one – but we will be able to verify the *table as a whole*, which is quite another thing.

This corresponds, to some degree, to the fact that while we cannot tell what state a particular sodium atom is in at any particular time, we can verify various facts about sodium atoms in general to a high degree of accuracy. While we can accurately verify our general theory of the structure of the sodium atom, we cannot be certain as to how things worked out in the case of any particular atom.

In a similar way, we may not be able to verify in any particular case the direct correspondence between certain specific physical and mental states – but we *can* verify *as a single theory*, the entire table of correspondences.

The next point I will discuss is the apparent resultant redundancy of the "mind language". Suppose we do find that our physical language is adequate and that we can make this correspondence and it appears that our mind language is, at best, redundant. Due to this redundancy, shouldn't we throw out this mind language? The answer is that we can if we want to, but I don't think we will or should. This is because it is of great value to us. First of all, heuristically, it enables us to work in a very direct manner with many concepts that would not be suggested by the purely quantum mechanical picture. We are used to working with this particular language, and can make quick and easy inductions with it. It will suggest correspondences between states that we could never conceive of otherwise.

Perhaps an analogy would clarify this point. At the present time the science of chemistry as we ordinarily know it is "redundant". All of its information content can be more compactly expressed as a small set of quantum mechanical equations. All of the literature of chemistry can be viewed as a development, *ad nauseam*, of this rather simple set of equations.

We are certain, however, that classical non-quantum mechanical chemistry is extremely useful. The development of any practical results from the quantum mechanical equations is at best an arduous process, and is in most cases well beyond the power of our present-day mathematics. The language of classical chemistry is usually very convenient and compact for describing chemical reactions. Using this language it is possible to make good approximate models of chemical reactions. While these approximate models are not as accurate as the quantum mechanical ones, they are far more easily computable, and they are heuristically useful, in the sense that they are readily grasped by the mind of man. This last is of much importance. A model that a man can easily work with, will readily suggest new interesting experiments to him. A more accurate model, that is not so readily mentally manipulated, will tend to be far less suggestive to him.

Another kind of utility for the mind language is that any additional language is useful in induction. Many inductions that would be extremely unlikely using the physical language alone, become quite reasonable if we have the mind language to work with. Empirically, we find that suitably controlled inductions, using the mind language, are as reliable as any other kind of acceptable induction.

My suggestion at this point is that any additional languages for describing the world should not be accepted or rejected on the basis of their redundancy. It is far better to ask of a language: 1) Is it useful in induction? 2) Does it often suggest new experiments or observations that turn out to be interesting? 3) Does it enable us to describe phenomena easily? 4) Does it suggest simple models of the phenomena it describes?

Most scientists find it useful to use several ostensibly different languages in working with phenomena in a given field.

My conclusions are about the same as Dr. Watanabe's, but my reasons for them are somewhat different. I feel that the dualism between the mind language and the physical language is important and desirable and that both have much to contribute in the phenomena of interest. I also feel that the correspondence between mental and physical states can never be certain – but this is because of the practical limitations of finite sample size, rather than any inherent theoretical difficulty.

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