June 4, 1996 LBNL-38890

Review of Chalmers' Book *

Henry P. Stapp
Theoretical Physics Group
Lawrence Berkeley National Laboratory
University of California
Berkeley, California 94720

Abstract

This is a book review for Foundations of Physics of The book by David Chalmers: "The Conscious Mind: In Search of a Fundamental Theory".

*This work was supported by the Director, Office of Energy Research, Office of High Energy and Nuclear Physics, Division of High Energy Physics of the U.S. Department of Energy under Contract DE-AC03-76SF00098.

Disclaimer

Dominant movements in philosophy during this century have endeavoured to respond to the lack of any natural place for consciousness within the basic concepts of physics by altering the philosophy rather than the physics. Thus behaviorism suggested that consciousness be stricken entirely from our scientific account of nature, and functionalism suggested identifying consciousness with certain aspects of the high-level behavior of physical systems, without challenging the basic physical premises. The latter were kept essentially as they were in the nineteenth century. According to those premises, the dynamics of the physical universe was controlled by micro-physical variables at the micro-physical level, without any reference to consciousness per se. To get consciousness into the dynamical picture the functionalist identified mental process with the functioning of high-level systems, without intimating or suggesting that anything was wrong with the underlying physics. Thus according to functionalist thinking, consciousness is something like a hurricane: it is definitely causally efficacious, and part of a high-level system of causal connections; but that level itself is generally conceived to be built ultimately out of the normal microphysical properties and facts, namely the dispositions of the particles and local fields. So the explanation of consciousness does not, in this view, involve adding to the basic physics.

Chalmers sets forth in this book [1] what I interpret to be a strong challenge to that widely held view. Chalmers is a philosopher, and his book takes into account the best contemporary philosophical thinking on this subject, building upon it in some places, and challenging it in others with reasoned arguments. In view of its serious philosophical intent, and the depth and complexity of opposing arguments, one might expect to find the book turgid and impenetrable. But Chalmers has a very lively and readable style. The book is a pleasure to read. Things are explained in ways that get quickly to the point, yet are detailed enough to be readily understandable.

For any reader interested in understanding the structure of nature from a contemporary naturalistic scientific point of view I think this book is probably a must. It addresses within a contemporary philosophical context what is surely a principal issue, namely the relationship of consciousness to the physical world as it is conceived of in physics. The message of the book, as I interpret it, and would phrase it for physicists, is that consciousness is a bona fide and basic physics problem that cannot rationally be treated by just ignoring it, or looking the other way, or by appealing to philosophical arguments that try to convert it into a nonphysics problem.

The best service I can provide the potential reader is to give an overview of the argument that Chalmers develops. Of course, the essence of the book is its detailed argumentation. So the reader must not conflate my brief overview with Chalmers' detailed work. I will try to make Chalmers thesis seem as sound and reasonable as I think it is. But the apparent a priori reasonableness of this thesis does not obviate the need for a strong defense of it against powerful contemporary voices and widespread contrary philosophical opinion.

Chalmers' thesis is expressed in the opening paragraph of chapter 3:

"Almost everything in the world can be explained in physical terms; it is natural to hope that consciousness can also be explained this way, too. In this chapter I will argue that consciousness escapes the net of reductive explanation. No explanation given wholly in physical terms can ever account for the emergence of conscious experience. This may seem to be a negative conclusion, but it leads to some strong positive conclusions that I will bring out in later chapters."

The conclusion of this argument is thus that consciousness is not like a hurricane: it is not simply a component of a high-level functional structure that can conform to high-level laws and rules, yet ultimately be reductively explained in terms of low-level physical facts, as these facts are normally conceived.

To lay a foundation for his argument Chalmers develops in detail in Chapter 2 the meaning of reductive explanation. The central concept is the notion of global logical supervenience, which he explains in considerable detail. The basic definition is this:

"The definition of global logical supervenience of B-properties on A-properties therefore comes to this: for any logically possible world W that is A-indiscernible from our world, the B-facts true of our world are true of W."

In the relevant applications the A-properties and facts are the physical properties and facts, whereas the B-properties and facts could be about weather, biology, economics, sociology, consciousness or any other natural phenomenon. Chalmers' thesis is that consciousness differs from the others. So when the others are considered the aspects related to conscious should be separated off, along with 'indexical' properties that tie the property to an 'I', or a 'my', etc..

Regarding the set of physical facts that Chalmers is referring to he says: "This enormously comprehensive set includes the facts about the distribution of every last particle and field in every last corner of space-time: from the atoms in Napoleon's hat to the electromagnetic fields in the outer ring of Saturn. Fixing this set of facts leaves very little room for anything else to vary, as we shall see."

Although Chalmers does not restrict his conception of the physical facts to the physical facts as they are conceived of in classical physics, this reference to 'particles and fields in every last corner of space-time' will seem to a physicist to be making some reference to the concepts of classical physics. Thus in order to make the meaning of 'physical facts' clear let us temporarily restricts the argument to cases in which the classical-physics conceptualization of nature is essentially adequate for the phenomona under consideration. Then the property of global logical supervenience of meteorological, biological, economic, etc. facts upon the physical facts means that any of these former facts that are true in our world will be true also in any logically possible world W that is the same as our world at the level of the microphysical facts.

The validity of this property will, I think, seem pretty obvious to a physicist: insofar as the concepts of classical mechanics give an adequate account of these phenomena, the hurricanes and reproductive activities, and bank failures in our world will be the same in any logically possible world W in which every microphysical fact is the same as in our world. This is because in the classical-mechanics conceptualization of nature these microphysical facts determine the high-level facts in question. However, consciousness is different: within the classical-mechanics conception of nature it is logically possible for all the microphysical facts to be identical in our world and world W, but for the consciousness present in our world to be absent from W. Consciousness is not globally logically supervenient on the microphysical facts.

But why is what is 'logically possible' important, anyway? One would think that what should be important in this context is what is 'physically possible' or 'naturally possible', not what is merely 'logically possible'!

The importance of 'logically possible' is this: if the B-facts globally logically supervene on the A-facts then given the A-facts of our world, the B-facts could not be other than what they are. No additional law or stipulation beyond the A-facts is needed to fix all the B-facts of our world to be exactly what they are. But if for some category B the B-facts supervene merely naturally, instead of logically, then the A-fact alone are not sufficient to fix the B-facts in our world: something else beyond the A-facts would be needed to fix these B-facts. There would have to be something 'else' in nature: something not fixed by the A-facts, which in the case at hand are the microphysical facts.

In this connection Chalmers says:

"With this in mind we can formulate precisely the the widely held doctrine of 'materialism' (or 'physicalism'), which is generally taken to hold that everything in the world is physical, or that there is nothing but the physical, or that the physical facts in a certain sense exhaust all the facts about the world. In our language, materialism is true if all the positive facts about the world are globally logically supervenient on the physical facts. This captures the intuitive notion that if materialism is true, then once God fixed the physical facts about the world, all the facts were fixed."

The conclusion that now can be drawn is this: within a context where the concepts of classical mechanics are adequate, materialism must fail. The fact that consciousness is present in our world, but is not a logically necessary consequence of the microphysical facts, means that something beyond the complete collection of all the microphysical facts is needed to fix the world to be what it turns out to be. Thus the strategy of equating consciousness to some high-level functional property does not succeed in explaining all the facts of nature in terms of the physical facts. Something beyond the complete set all the microphysical properties is needed to explain why consciousness is present at all: that fact is not entailed by the complete set of microphysical facts. Consciousness is therefore different in character from the physical facts, defined to be the set of all facts that are globally logically supervenenient upon the microphysical facts.

What this means, in brief, is that we are forced to a dualistic conception of nature: consciousness is a part of nature stands apart from the physical properties and facts!

Chalmers draws, from the outset, a sharp distinction between two aspects of mental activity. These he terms the 'phenomemal' and the 'psychological'.

The former designates the 'experiential' aspect, namely consciousness, whereas the later designates, in Chalmers' lexicon, the 'causal' aspect.

In this way of speaking, functionalism focusses on the psychological aspect of mental activity rather than the phenomenal aspect. This narrow focus is an expression of its behavioristic bias, where, however, 'behaviour' is now applied broadly on all scales. But the issue that Chalmers is addressing pertains to the experiential aspect of mental activity, not primarily to the causal aspect. The causal aspect might perhaps be explained in terms of the microphysical facts, but consciousness is not.

This alien character of consciousness is established, in the argument outlined above, only within contexts where the concepts of classical mechanics are adequate to cover the phenomena under consideration. Of course, the fact that something beyond matter is needed does not mean that the classical laws must fail: perhaps the extra something needed to fix consciousness is simply such as make conscious process "march in step" with the physical process. Thus Chalmers, recognizing this as a logical possibility, does not claim that the classical laws must be revised. Still, this sort of looseness in which one thing 'just happens to march in step' with something else is what physicists try to explain in terms of a causal structure.

So the question naturally arises as to whether a switch to quantum theory will allow for an integrated conception of nature. In the final chapter of his book Chalmers considers, as an application of his work, this possibility that quantum theory is relevant. He first gives there an excellent account of the existing situation in regard to the various proposed interpretations of quantum theory.

Once one has the quantum formalism in place one has a new basis upon which to speak of 'physical properties' and 'physical facts'. But due to the ambiguous ontological status of the wave function, and the state vector, the question of what the microphysical facts are becomes less clear than in the classical mechanics case. For example, in some interpretations the 'actual facts' only come into being at some macroscopic level, or perhaps only at the level of our conscious experience. However, if one postulates that the field-theoretic 'wave function' exists, in some a posteriori sense, over all of space-time in 'our world', then one may be in a position to extend the argument outlined above to quantum theory.

The clearest case would be a Bohm-type [2] hidden-variable theory. This theory is completely deterministic, so the idea of the microphysical facts existing over all space-time is not too problematic. The GRW theory[3] might also qualify. To the extent that the notions of microphysical and macrophysical facts can be made unambigious in these cases the argument outlined above would continue to apply: a dualistic theory would still be needed to account for the known facts of nature.

The other main interpretations are the Everett-type[4] and Wigner-type[5] interpretations. Chalmers correctly points out that there is some disagreement as to what Everett meant, but it seems clear to me that he meant is what is now often referred to as the one-world/many-minds interpretation: there is one quantum world that is represented by a state vector of the universe that evolves in accordance with the Schroedinger equation, but many internally coherent and continually branching realms of experience. Chalmers selects this one-world/many-minds Everett interpretation as the more interesting one, and suggests that his considerations involving consciousness might supply a missing piece to this interpretation.

The point is that this Everett interpretation is radically incomplete because it brings consciousness into physics in a way that is central, but that is not controlled by the laws of physics, which in this case are exhausted by the Schroedinger equation. In fact, the content of the realm of consciousness is not logically fixed even by a complete space-time description of the physical facts, represented by the state of the universe defined for all times: consciousness is not globally logically supervenient upon the physical. Hence if nature is in some sense lawful then there must be extra rules that pertain to consciousness, but that are not logically entailed either by the physical laws, or even by the complete space-time set of physical facts.

Chalmers proposes, therefore, within the Everett framework, some psychophysical laws that go beyond what can be deduced from the physical facts alone. What is important, I think, is not the specific form of his proposal, but rather his clear philosophical justification for the need to augment the physical laws with psycho-physical laws or rules that are not mere consequences of the physical laws, or even of the complete space-time set of physical facts.

Although in his consideration of the quantum option Chalmers favors the Everett interpretation, I think the more important application of his analysis will be to the other interprations, which are easier to bring into concordance with the statistical predictions of quantum theory. Once it becomes clearly appreciated that in most interpretations consciousness is not globally logically supervenient upon the physical facts, and hence demands, in order to fix its content, the existence of something beyond the physical facts, a whole new perspective will be opened on the scientific endeavour to understand the physical world and our experience of it.

It is the Wigner-type interpretation that I think is most naturally suggested by Chalmers' analysis. For in this interpretation the thing that lies beyond the physical facts, and fixes the experiential facts, can be identified as the very thing that is already required in that theory to specify the actual events of the theory. In this type of interpretation these events are both collapse events on the physical plane, and conscious events on the experiential plane. Thus the Wigner-type solution, by identifying the element needed to fix our experiences with an element aready present in the theory, is parsimomious. It also allows consciousness per se to be causally efficacious in a sense that is fundamentally different from the sense in which a classically described hurricane is causally efficacious, and this difference can have an important impact on questions such as the speed of brain processing and the effect of consciousness per se on the survival of species.[6]

REFERENCES

1. David J. Chalmers, The Conscious Mind: In Search of a Fundamental Theory. Oxford University Press, Oxford, 1996 ($29.95)

2. David Bohm and Basil Hiley, The Undivided Universe: An Ontological Interpretation of Quantum Theory. Routledge, London, 1993.

3. G.C. Girardi, A. Rimini, and T. Weber, Unified Dynamics for Microscopic and Macroscopic Systems. Physical Review D34, 470 (1986)

4. Hugh Everett III. "Relative State" Formulation of Quantum Mechanics. Reviews of Modern Physics 29, 454-62 (1957)

5. E.P. Wigner, Remarks on the Mind-Body Question. In I.J. Good, ed., The Scientist Speculates, Basic Books, New York (1961)

6. H.P. Stapp, Science of Consciousness and the Hard Problem, to appear in J. of Mind and Behavior; http://www-physics.lbl.gov/ stapp/stappfiles.html