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and  $T = 1$ ). Again, the dominance argument fails as an argument for a strict preference for an unrefuted over a refuted hypothesis. But we now have an even stronger result. Since the probability function now represents the agent's own belief structure, he would be *inconsistent* in preferring, *from the point of view of truth*, the unrefuted to the refuted hypothesis.

Popper's anti-inductivism seems, then, as others have suggested, to commit him to a thoroughgoing scepticism. To my mind the foregoing is the nearest anyone has come to a formal demonstration of this. But more than a personal reputation is at stake here. For the inductivist, as Popper calls him – Carnapian, Bayesian, invoker of some principle of limited independent variety – cannot solve  $L_3$  in a positive way either, for reasons Popper, following Hume, has made very clear. What the foregoing reflections clearly demonstrate is just *how* weak must be a reformulation of  $L_1$  to admit any positive solution;  $L_3$  is, surprisingly perhaps, still far too strong.<sup>1</sup>

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<sup>1</sup> I should like to express my gratitude for invaluable criticism to staff and students at the Universities of St. Andrews, Stirling and Glasgow. I owe a particular debt to Crispin Wright and Peter Clark for their helpful comments.

## JACKSON ON PHYSICAL INFORMATION AND *QUALIA*

BY TERENCE HORGAN

In a provocative recent paper, Frank Jackson argues against Physicalism by appeal to the qualitative or phenomenal features of our mental life.<sup>1</sup> He maintains that Physicalism is refuted by the fact that no amount of physical information could ever enable us to know what it is like to undergo a pain, have an itch, taste a lemon, smell a rose, hear a loud noise, or see the sky. He concludes that *qualia* are epiphenomenal, i.e., "their presence or absence makes no difference to the physical world" (p. 133). In the present paper I shall argue that his attack on Physicalism is fallacious, being an equivocation on two different senses of the phrase 'physical information'.

### I. THE KNOWLEDGE ARGUMENT

Jackson construes Physicalism as the thesis that "all (correct) information is physical information" (p. 127). He considers it an open philosophical question how exactly to define 'physical information', but he indicates that he employs this expression broadly enough to include whatever information the physical, chemical, and biological sciences

<sup>1</sup> Frank Jackson, "Epiphenomenal Qualia," *The Philosophical Quarterly*, 32 (1982), 127–36. My subsequent page-references are to this article.

provide about the world – including what is often called the *functional role* of various physico-chemical and biological states of humans and other organisms. I myself think that Physicalism should instead be formulated as the conjunction of a general supervenience thesis and a general thesis about the physical nature of all substantial individuals,<sup>2</sup> but I shall accept Jackson's characterization for purposes of the present discussion. I also shall follow his practice of speaking of information, and of items of information, as though these are *entities* of some sort, distinct from sentences. I doubt that there are such entities, but avoiding apparent ontological commitment to them is not my present concern.

He does not say which kinds of currently popular mind-body theories count as Physicalistic in his sense – i.e., which kinds entail that all information about mentality is physical information. But I take it that he means to include type-type psychophysical identity theories, functionalist theories which embrace type-type identity claims, and functionalist theories which repudiate type-type identity claims.<sup>3</sup> It is less plausible to regard token-token identity theories as Physicalistic by themselves, however, since they tell us nothing about identity conditions for mental state-*types*, or mental properties.

He construes *qualia*, and so shall I, as properties of certain mental states: properties like the hurtfulness of pain, the itchiness of itches, and the qualitative character of one's experience when one is smelling a rose. The question, then, is whether Physicalism can accommodate these qualitative, or phenomenal, properties.

He uses the following line of reasoning, which he dubs the *knowledge argument*, in an effort to convince us that *qualia* are left out of any Physicalist story. Suppose that Fred can discriminate two groups of wavelengths in the red spectrum as consistently as we are able to sort out yellow from blue; and suppose he reports that the two kinds of red he can discriminate, which he calls red<sub>1</sub> and red<sub>2</sub>, look as different to him as yellow and blue. Then Fred can see at least one more colour than we can; we are to Fred as a totally red-green colour-blind person is to us. Jackson writes:

What kind of experience does Fred have when he sees red<sub>1</sub> and red<sub>2</sub>? What is the new colour or colours like? We would dearly like to know but do not; and it seems that no amount of physical information about Fred's brain and optical system tells us. . . . There is something about [Fred's colour experiences] we

<sup>2</sup> See Terence Horgan, "Token Physicalism, Supervenience, and the Generality of Physics," *Synthese*, 49 (1981), 395–413; and "Supervenience and Microphysics," *Pacific Philosophical Quarterly*, 63 (1982), 29–43. A number of other philosophers also have argued that physicalism should be understood in terms of supervenience. See Jaegwon Kim, "Supervenience and Nomological Incommensurables," *American Philosophical Quarterly*, 15 (1978), 149–156; John Haugeland, "Weak Supervenience," *American Philosophical Quarterly*, 19 (1982), 93–103; and David Lewis, "New York for a Theory of Universals," *Australasian Journal of Philosophy*, 61 (1983) 343–77.

<sup>3</sup> Functionalists often argue against type-type identity theory on the grounds that creatures who are radically different from humans in their physico-chemical makeup (e.g., Martians) could instantiate the same psychological state-*types* as humans. Cf. Hilary Putnam, "Psychological Predicates," in *Art, Mind, and Religion*, ed. W. H. Capitan and D. D. Merrill (Detroit, 1967). But D. M. Armstrong and David Lewis are functionalists who embrace type-type identity theory by treating mental state-*type* names as population-relative non-rigid designators; thus, under the Armstrong–Lewis view, 'pain' designates one physico-chemical state-*type* relative to humans, and a different one relative to Martians. See D. M. Armstrong, *A Materialist Theory of Mind* (London, 1968); David Lewis, "An Argument for the Identity Theory," *The Journal of Philosophy*, 63 (1966), 17–25; and especially David Lewis, "Mad Pain and Martian Pain," in *Readings in the Philosophy of Psychology*, Vol. I, ed. Ned Block (Cambridge, Mass., 1980).

Jackson, I take it, wants to count as physical not only physico-chemical state-*types* or properties, but also the more abstract kinds of state-*types* involved in Putnam's style of functionalism.

don't know. But we know, we may suppose, everything about Fred's body, his behaviour and dispositions to behaviour and about his internal physiology, and everything about his history and relation to others that can be given in physical accounts of persons. We have all the physical information. Therefore, knowing all this is *not* knowing everything about Fred. It follows that Physicalism leaves something out. (p. 129)

In short, what no amount of physical information can tell us is *what the new colour or colours are like*. Physicalism leaves out *qualia*.

This conclusion is reinforced, says Jackson, by supposing that one's own visual physiology is going to be surgically altered to match Fred's. After the operation one will know something about Fred's red<sub>1</sub> and red<sub>2</sub> experiences one did not know before, viz., what they are like. And this new information cannot be physical information, because *ex hypothesi* we had all the relevant physical information beforehand. So Physicalism must be false.

He goes on to note that Fred and the new colour(s) are inessential to the basic line of reasoning, which instead be formulated this way:

Mary is a brilliant scientist who is, for whatever reason, forced to investigate the world from a black and white room *via* a black and white television monitor. She specialises in the neuro physiology of vision and acquires, let us suppose, all the physical information there is to obtain about what goes on when we see ripe tomatoes, or the sky, and use terms like 'red', 'blue', and so on. . . .

What will happen when Mary is released from her black and white room or is given a colour television monitor? Will she *learn* anything or not? It seems just obvious that she will learn something about the world and our visual experience of it. But then it is inescapable that her previous knowledge was incomplete. But she had *all* the physical information. *Ergo* there is more to have than that, and Physicalism is false. (p. 130)

In short, what Mary learns are non-physical items of information: what it is like to see ripe tomatoes, what it is like to see the sky, and so on. She learns about *qualia*, which thus are non-physical properties.

## II. CRITIQUE OF THE KNOWLEDGE ARGUMENT

Elsewhere I myself have argued, to the contrary, that *qualia* are physical properties.<sup>4</sup> Yet I am quite prepared to concede that we do not know what Fred's red, and red<sub>2</sub> experiences are like, no matter how adequate a physical account we have of Fred's visual processes; and that Mary does not know what seeing ripe tomatoes and seeing the sky are like, prior to her first colour-experiences, despite having a fully adequate physical account of human visual processes. What I want to question is Jackson's supposition that a completely adequate physical account of a creature's visual processes gives us complete *physical information* about those processes. In one sense of 'physical information', this supposition is virtually a tautology: for, physical information is just the information that would be provided by a theoretically adequate physical account. But in

<sup>4</sup> Terence Horgan, "Functionalism, Qualia, and the Inverted Spectrum," *Philosophy and Phenomenological Research*, forthcoming. There I also contend, however, that no form of functionalism can accommodate *qualia*. I argue, contrary to most functionalists, that *qualia*-names denote specific physico-chemical properties, rather than abstract functional properties. And I argue, contrary to Armstrong and Lewis (*ibid.*), that *qualia*-names are rigid designators, rather than functionally-definable non-rigid designators.

another sense – the sense really required by the knowledge argument – the supposition is one that Physicalists can and should reject.

In order to develop this point, we need to characterize the two relevant senses of ‘physical information’. Let *S* be a sentence that expresses information about processes of a certain specific kind, such as human perceptual processes. We shall say that *S* expresses *explicitly physical information* just in case *S* belongs to, or follows from, a theoretically adequate physical account of those processes. And we shall say that *S* expresses *ontologically physical information* just in case (i) all the entities referred to or quantified over in *S* are physical entities, and (ii) all the properties and relations expressed by the predicates in *S* are physical properties and relations. Thus, explicitly physical information is expressed in overtly physicalistic language, whereas ontologically physical information can be expressed by other sorts of language – for instance, mentalistic language.

One might think that information *per se* is independent of the language in which it is expressed, and thus that any sentence which expresses ontologically physical information has the same informational content as some sentence which expresses explicitly physical information. But in fact, the notion of information which Jackson employs in his knowledge argument is heavily intensional. He clearly holds that if one lacks an item of knowledge then one lacks the corresponding item of information: witness his inference from the claim that we don’t *know* what Fred’s  $red_1$  and  $red_2$  experiences are like to the conclusion that we lack *information* about those experiences, and the parallel inference from the claim that Mary doesn’t know what colour-experiences are like to the conclusion that she lacks information about them. This close link between knowledge and information means that information inherits the intensionality of knowledge. Thus, since Lois Lane knows that Superman can fly but does not know that Clark Kent can fly, (1) and (2) must express different information even though they each attribute the same property to the same individual:

- (1) Superman can fly.
- (2) Clark Kent can fly.

So it is entirely likely that there are sentences which express ontologically physical information but not explicitly physical information.

Physicalism, construed as the doctrine that all information is physical information, is a claim about ontologically physical information. For, the Physicalist obviously does not mean to claim that the only genuine information-conveying language is the language of physical theories. Rather, he means to claim that whenever a genuine piece of information is conveyed in *any* kind of language (mentalistic language, for instance), the relevant entities, properties, and relations are all physical.

Let us now return to the knowledge argument. We shall focus on the case of Mary, but the following remarks will also apply, *mutatis mutandis*, to the case of Fred. Consider Mary at the moment when she finally has her first colour-experience – say, the experience of seeing ripe tomatoes. Jackson maintains, and I agree, that Mary obtains new knowledge at this moment, and thus new information: she finds out what it is like to see ripe tomatoes. How might she formulate this new knowledge? Not with a sentence like

- (3) Seeing ripe tomatoes is like seeing bright sunsets,

because she presumably already has the knowledge expressed by (3) by virtue of having heard the reports of many human subjects in the course of her extensive visual-perception studies. And the same holds for any other similarity judgments that are

commonly made about colour experiences. Rather, it seems she should express her new knowledge by means of an indexical term, as in (4):

(4) Seeing ripe tomatoes has *this* property,

where 'this property' is used to designate the colour-*quale* that is instantiated in her present experience.<sup>5</sup> (We shall call this property *phenomenal redness*. It should not be confused, of course, with the redness-property instantiated in the tomatoes themselves.)

Now, (4) as used by Mary certainly doesn't express explicitly physical information; for it expresses new information, and she had all the relevant explicitly physical information beforehand. (The phrase 'this property' is topic-neutral, rather than explicitly physical.) But (4) may very well express *ontologically* physical information. Phenomenal redness, the referent of 'this property', may very well be a physical property. This possibility is not ruled out by the fact that Mary learns something new from her experience.

Sentence (4) expresses new information because Mary has a new perspective on phenomenal redness: viz., the first-person ostensive perspective. Her new information is about the phenomenal colour-property *as experienced*. Thus she could not have had this information prior to undergoing the relevant sort of experience herself. But these facts are compatible with Physicalism; there is no need to suppose that when she acquires experiential awareness of phenomenal redness, she thereby comes into contact with a property distinct from those already countenanced in her prior physical account of human perception. The perspective is new, and so is the accompanying capacity to designate the relevant property indexically in a first-person ostensive manner. But the property itself need not be new.

Of course if Physicalism is correct, then a fully adequate account of human perception and cognition would have to explain the human capacity to discriminate, and then ostensively designate, those physical properties of our own neural activity which are *qualia*. But nothing in the knowledge argument provides any reason to think that such an explanation could not be given.

We may conclude, therefore, that the knowledge argument is fallacious; it rests upon a subtle equivocation between two senses of 'physical information'. Although Mary, prior to her first colour experience, does have a complete stock of *explicitly* physical information about human visual processes, it is illegitimate to infer from this that she has a complete stock of *ontologically* physical information. Physicalists can and should claim that the new information she acquires, the information she expresses by using (4), is ontologically physical information. The information is new not because the *quale* she experiences is a non-physical property, but because she is now acquainted with this property from the experiential perspective.

Perhaps it will be replied that the phrase 'this property' in (4) cannot designate a physical property, because if it did then (4) would express a piece of information which Mary had already: viz., the information that ripe-tomato perceptions possess the given physical property. But this reply ignores the all-important intensionality of the notion of information. Even though Superman is Clark Kent, nevertheless we must distinguish

<sup>5</sup> Does (4) by itself convey the information which Mary expresses by using (4)? I think not. Rather, since (4) employs an indexical term essentially, it seems that in order to obtain the information which Mary expresses by (4), a member of Mary's audience would have to experience phenomenal redness himself, and would have to know that Mary is using 'this property' to designate the same property that he experiences. Knowledge about what *qualia* are like cannot be obtained by descriptive means alone, but requires the experiencing of those qualia.

between the information that Superman can fly and the information that Clark Kent can fly. Similarly, even if phenomenal redness is a physical property, nevertheless we must distinguish between (i) the information that the given property, as physicalistically described, is possessed by ripe-tomato experiences, and (ii) the information which Mary expresses by (4).

Finally, if Physicalism is true then *qualia* presumably have all the effects which common sense attributes to them. The hurtfulness of pain is indeed partly causally responsible for the subject's seeking to avoid pain, for his saying 'It hurts', and so on; and the phenomenal redness of ripe-tomato perceptions is indeed partly causally responsible for the subject's purchasing ripe tomatoes rather than unripe ones, for his calling ripe tomatoes red, and so on. If *qualia* are physical properties, then there is no need to defy common sense by claiming, with Jackson, that they are epiphenomenal properties, causally impotent with respect to the physical world.<sup>6</sup>

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<sup>6</sup> Indeed, even if *qualia* are non-physical they may not be epiphenomenal. As long as they are supervenient upon physical properties, I think it can plausibly be argued that they inherit the causal efficacy of the properties upon which they supervene. Cf. Jaegwon Kim, "Causality, Identity, and Supervenience in the Mind-Body Problem," *Midwest Studies in Philosophy*, 4 (1979), 31-49.

## THE DISJUNCTIVE SYLLOGISM AND SUBJUNCTIVE CONDITIONALS

BY A. J. DALE

In this paper I shall discuss an argument that Anderson and Belnap present in their criticism of the extensional disjunctive syllogism and a recent response to it by Jackson and Humberstone.<sup>1</sup> Anderson and Belnap issue the following challenge:

But whether or not the reader is in sympathy with our (anti-extensional disjunctive syllogism) views, it might still be of interest to find a case (if such exists) where a person, other than a logician making jokes, *seriously* holds a proposition *A-or-B* in a sense warranting inference of *B* with the additional premise *not-A*, but is unwilling to admit *any* subjunctive conclusion from *A-or-B*. If no such examples exist, then we will feel we have made our case.<sup>2</sup>

Jackson and Humberstone agree that no such case can exist, but they argue that the lack of such examples cannot count against the validity of the extensional disjunctive syllogism. The argument which they present relies on various propositions concerning the "probabilistic soundness" of such arguments and a supporting theory of subjective probability. I shall not concern myself with the details of their argument, since I believe that what they take to have been established by it is a conclusion which follows trivially from one of its premises.

The premises of their arguments are that:

<sup>1</sup> Jackson and Humberstone, "Anderson and Belnap's Challenge", *Analysis* 42 (1982).

<sup>2</sup> Anderson and Belnap, *Entailment*, (Princeton, 1975), p. 177.