MICRO-REDUCTION, SCIENTIFIC REALISM AND THE MIND-BODY PROBLEM*

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The following is an investigation of the tension between common sense and science, between Sellars' manifest and scientific images of the world. I will claim that physics assumes two micro-reductive principles of explanation that have had the effect of banning from physics the sensual properties that common sense things are said to essentially, objectively "have". This implies an irresolvable conflict between the images, for a realistically interpreted physics forces the relocation of occurrent, "secondary properties" to the realm of the subjective or "the mental". Indeed, I will claim that events, things, and properties termed "mental" owe their identity as mental merely to the fact that their descriptions employ predicates systematically excluded from physical-scientific descriptions by our micro-reductive assumptions. From this perspective, the mind-body problem of Hobbes seems closed to a solution consistent with the principles of materialism or scientific realism, for a realistically interpreted physics appears to be its major cause. Moreover, I will also claim that so long as our micro-reductive assumptions are constitutive of physics, there are some good reasons to deny a privileged status to descriptions under the scientific image. Indeed, there is at least one way in which such descriptions may owe an ontological debt to the manifest.

1. *Common Sense and Sentience*

If asked the question first raised by Thales, "What is the

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nature of the physical world, of what is the world composed?", most scientifically-minded men would easily agree that the universe consists of just those entities that atomic physics says there are. It would be confidently held that the basic building blocks of all matter are the micro-entities of physics which, in combination and separation, compose the objects of the everyday world. So it seems that Thales' question has been substantially answered. Modern scientific realists would thus hold an ontological commitment to micro-entities and their esoteric properties. For them, just the theoretic terms and predicates of atomic physics are taken as referring expressions.

Yet, if Thales' question has been answered, it is an answer that challenges and undermines our common sense view of the world. According to that everyday view, chairs, tables, desks and the like are paradigms of what is said to exist. Common sense objects are usually three-dimensional solids that endure through time. Among and exemplary of their characteristics is a range of occurrent, sensuous properties which they are said to "have". Thus, common sense construes colors, odors, tastes, and indeed all the "secondary qualities" as objective, more or less permanent properties of public, easily perceived objects. But now, if the scientific account of things is correct, then the world is not at all the way it appears to common sense. Not only does that account omit any reference to the sensuous properties common sense holds is exemplary of all things—indeed, physics can be construed as a language shorn of all predicates for such properties—but the properties that micro-entities are said to have, e.g. their quantum theoretic properties, are not sensibly predicable of common sense objects. So there is much to Sellars' contention that the Manifest Image and the Scientific Image are rivals that cannot be reconciled. Indeed, if the scientific realist has his way, we are forced to abandon our common sense conception of things for that of science.

But how would this be possible? Science must begin with the manifest. It attempts to explain why common sense objects

behave as they do and have the properties common sense takes them to have. Since manifest descriptions are the data for micro-physical explanation, it would seem that the entities of the *explanans* cannot be "more real" than the directly observed, colored, scented objects they are said to compose. Indeed, how could a coherent account of the real, an account that aims at completeness, systematically omit all reference to the color and scent of a rose or to the taste of a chocolate eclair? How can the esteemed Scientific Image leave out qualia, consciousness, indeed, sentience itself?

In 1954, Herbert Feigl put just such questions to Albert Einstein. Feigl writes:

> I asked Einstein whether in an ideally perfect (of course utopian) four-dimensional physical representation (*à la* Minkowski) of the universe the qualities of immediate experience (we called them metaphorically the "internal illumination" of the "knotty cluster of the world lines" representing living-awake brains) were not left out? He replied in his characteristic, humorous manner (I translate from the German in which he used a rather uncouth word): "Why, if it weren't for this 'internal illumination' [i.e. sentience] the world would be nothing but a pile of dirt!"[1]

Einstein's reply is quite interesting, for in its own way it reveals the source and scope of both the problem of the conflict between science and common sense and the infamous mind-body problem of Hobbes. That there is no room for sentience in the scientific picture of things is a fact of our pattern of scientific explanation. As I shall later show, that pattern is a reflection of certain metaphysical principles of explanation constitutive of physics such that physics as we

[1] "Postscript After Ten Years," *The "Mental" and the "Physical"* (Minneapolis: University of Minnesota Press, 1967), p. 139.

know it would collapse without them. They have their roots in early Greek thought, in the Democritian notion that *qualitative* changes are to be explained *quantitatively*; that the world as we know it through common sense is to be explained in terms of entities possessing merely mathematical-theoretical properties. But the paradox is that without sentience and consciousness, the world would indeed be "a pile of dirt," for it is only through consciousness and our sensible contact with nature that we are able to spin out the physicalistic conceptual scheme we call science. Science has brought us overwhelming knowledge, but realism with regard to its theories has nevertheless forced us to draw a line between physical nature and the sensuous, buzzing world of common sense from which we draw our data. In what follows I will claim that two principles of explanation assumed by physics have had the effect of banning from physics the predicates for the secondary qualities. I will cite some familiar views of Hanson and Heisenberg as my point of departure. But I shall also stake a claim which, no doubt, neither would abide: that the assumption by physics of these principles undermines the position of scientific realism.

2. *Micro-Reduction and the Relocation of the Sensual*

Max Otto recounted a remark attributed to Giordano Bruno to the effect that science, like a man's coat, if buttoned wrong, will be buttoned wrong all the way to the top. Wrong or not, the views of the Greek Atomists form the conceptual basis of atomic physics. Thales, Empedocles, and Democritus all held that the secondary qualities, colors, odors, tastes, etc., must be explained by something more fundamental. Yet, only Democritus saw that whatever explained the sensuous properties of objects could not itself have those properties, and the traditional Earth, Fire, Water, and Air do possess them! It was thus inevitable that Democritus' explanation should win out against its rivals. As the late N. R. Hanson put it:

> Democritus' atomic theory avoids investing at-

> oms with those secondary properties requiring explanation. It provides a pattern of concepts whereby the properties the atom *does* possess —position, shape, motion—can, as a matter of course, account for the other "secondary" properties of objects.[2]

to which the physicist Werner Heisenberg adds:

> It is impossible to explain . . . qualities of matter except by tracing these back to the behavior of entities which themselves no longer possess these qualities. If atoms are really to explain the origin of color and smell of visible material bodies, then they cannot possess properties like color and smell . . . Atomic theory consistently denies the atom any such perceptible properties.[3]

Thus, the view of Democritus became a guiding principle of atomic research.

It is interesting to note that both Hanson and Heisenberg seem to argue for the *logical impossibility* of particles having any of the sensual qualities. But why should this be the case? Hanson asks:

> Suppose you asked for an explanation of the properties of chlorine gas—its green colour and memorable odour. Would this satisfy you?—"The peculiar colour and odour of chlorine derive from this: the gas is composed of many tiny units, each one of which has the colour and the odour in question."[4]

The above does seem inadequate. To explain the greenness

[2] *Patterns of Discovery* (Cambridge: Cambridge University Press, 1961), pp. 121-122.

[3] "Gedanken der Naturphilosophie in der modernen Physik," *Die Antike*, XIII (1937), p. 119. Quoted by N. R. Hanson, *The Concept of the Positron* (Cambridge: Cambridge University Press, 1963), p. 50.

[4] *Patterns of Discovery, op. cit.*, p. 120.

of chlorine in terms of particles that are themselves green seems to either beg the question or delay proper explanation, for the question would still arise: "Why are the *particles* green?" What requires explanation in the *explanandum* cannot, without circularity, be itself part of the *explanans*.

To take a more modern example, we explain the color of ordinary things in terms of the atomic theory of matter. Very briefly, the color a thing has is explained by reference to the electromagnetic radiation given off by the atoms said to constitute the thing, i.e. given off by the atom's electrons as they "move" from a higher to a lower energy state, etc. It follows, then, that neither the atoms nor the electrons *can* be colored. If color is explained by reference to the atoms, electrons and the like, such entities cannot themselves possess color properties. It is as if color were "made possible" by the electrons, so that the question, "What color are electrons?" cannot sensibly arise.

The Democritian principles which are assumed by and legislate atomic physics, and to which, I submit, both Hanson and Heisenberg appeal, may be stated as follows:[5]

> *The Principle of Micro-Reduction* (PMR): The properties of *wholes*, their occurrence, that they have the properties they have, etc., are to be explained in terms of the properties of their *parts*, their occurrence, etc.
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> *The Principle of Property Reduction* (PPR): The properties of such parts must differ from the properties of the wholes they are invoked to explain, i.e. such parts *cannot have* among their properties those properties of wholes they are said to explain.[6]

[5] I owe the formulation of these principles to Gordon Brittan's illuminating article, Explanation and Reduction," *Journal of Philosophy*, LXVII, 13 (July 9, 1970).

[6] For a more complete treatment of these, see my "The Picturability of Micro-Entities," *Philosophy of Science*, 40, 2 (June, 1973).

It follows as an instance of the above that if common sense objects are construed as colored, scented, noisy wholes—indeed, our "observation language" is said to consist of such statements as "grass is green," "the table feels smooth," etc.—and if micro-particles are taken to be their constituent parts, then micro-entities *cannot* have color, odor, etc. And this, indeed, is a logical "cannot", stemming from the assumption of PPR.

However, there would be no reason to assume PPR without PMR. That is, unless we are first committed to atomistic, part-whole, micro-reductive explanation, PPR would be pointless. Yet there is nothing necessary about PMR. Physics could have developed from other principles, perhaps even from *macro*-theoretic ones. As Sellars has suggested, perhaps physical objects could have been explained as singularities arising from the interference of waves of "cosmic dimensions."[7] Indeed, nothing requires us to think of theoretic entities as being smaller than the ordinary objects of which they are alleged constituents! Macro-theories abound in physics, thermodynamics being the most obvious of these. But our deep-seated prejudice for micro-reductive theories cannot be denied. Perhaps it is not merely an historical habit, but, as Schlesinger has claimed,[8] the result of a systematic conflation of logical order with physical order. Whatever the reason, it is clear that though PMR is constitutive of our physics, there is no way to independently support it. It constitutes one of physics' "metaphysical foundations".

It should be mentioned that our assumption of PMR and PPR has not only had the force of denying to nature any of the secondary qualities, but has also led us to deny to successive sets of entities posited as ultimate or fundamental other properties of common sense things, even such "primary" qualities as extension or spatial position, which stood in need

[7] *Science, Perception and Reality* (New York: Humanities Press, 1963), pp. 119-120.

[8] *Method in the Physical Sciences* (London: Routledge and Kegan Paul, 1963), Chapter 2.

of explanation under the manifest image. Once 19th Century "ultimate" billiard ball atoms were themselves held to be composite, it is no surprise that their "parts" were said to have increasingly esoteric properties that not only, necessarily, differed from the properties of the "wholes" they constitute, but also seemed quite alien to common sense expectations. Indeed, each deepening level of micro-reduction leaves in its wake a new set of objects held to be fundamental whose properties appear more and more abstract and mathematical. As Heisenberg has put it, contemporary physics has succeeded in micro-reducing *all* "material" properties, even "the quality of being" itself, so that what we are left with as ultimate explainers are describable only in mathematical terms as "probability distributions".[9] This, as Hanson suggests, is the price paid for the great wealth of theory our micro-reductive assumptions have afforded us, for we must deny any sense in which we may "picture" or have any palpable model for the batch of micro-particles currently held as fundamental to matter. So it is perhaps ironic that the more nature seems to become explicable under our scientific rubrics, the less we seem able to find even a philosophic understanding of its basic constituents, for they, by necessity, cannot be anything like the familiar things of common sense from which we draw the bulk of our models.

3. *The "Mental" and the "Physical"*

So far, I have claimed that physics is conditioned by the assumption of two principles of explanation which have had the effect of banning from our physical descriptions the predicates for the sensual qualities paradigmatically predicated of common sense things. I wish to dwell on this a bit further.

Suppose, for simplicity, that we consider a thing to consist of a set of properties instantiated at some spatio-temporal location. If by "thing" we mean common sense or manifest thing, then it is clear that among its properties might be, say,

[9] *Physics and Philosophy* (New York: Harper, 1962), p. 70.

that it weighs five pounds *and* that it is (occurrently) red. Indeed, it will most likely omit a sound if struck, its surface may be rough or smooth; it may possess a range of sensual qualities in addition to its "physical" ones. But now, according to the scientific image, we are forced to say that *nothing* is red or has odor, etc.; these are no longer deemed objective "physical" properties (although they are said to have objective causes). So, to the extent that we are scientific realists, that we are wedded to the view that the only existing things and properties are those to which fundamental physics is ontologically committed, we must consign the sensuous properties to some "realm" of appearance, say, as Hobbesian "epiphenomena" or some other "never-never land" of the mental. Thus, despite the supposed immediacy of the mental, the sensuous qualities emerge as ineffable, something caused in us by the machinery of the objective world, but yet not part of that world. The effect, then, of our assumption of PMR and PPR, given a realistic interpretation of physics, is the relocation of the sensuous properties from the objective world of common sense things to that of appearance or the subjective. The upshot of this, of course, is the infamous mind-body problem so clearly drawn by Hobbes. The secondary properties seem to "dangle" from our physical theories, though it seems impossible to deny them some place or other in the scheme of things, despite the efforts of our most sanguine materialists.[10]

Similar difficulties arise in connection with our concept of a person. Common sense construes persons as basic, indivisible unities, complex whole objects. This is close to the tradition of Aristotle and Spinoza in that to the extent that common sense reflects the categories of mental and physical, they appear to be sortal for kinds of properties rather than kinds of things. So, what exists for common sense are persons and their complex properties, or, speaking metalinguistically, persons are taken as logical subjects of a vast range

[10] See my "Identity, Materialism and the Problem of the Danglers," *Metaphilosophy*, 1, 4 (Oct., 1970).

of predicates. We may thus say a number of things about persons, that they weigh such-and-such, think of Vienna, have pains, headaches, feel sick, or have blue after-images. Yet, on the scientific image, there is much we *cannot* say of persons, that we must take as wholly idiomatic and unreferential. Within that image, the predicates for the so-called intentional properties introduced by verbs of propositional attitudes, e.g. ". . . believes that snow is white," ". . . remembers the Alamo," etc., as well as the predicates for introspected, sensation properties, e.g. ". . .has pain," ". . .has a blue after-image," etc., have no place whatsoever, and must be construed as mere manners of talking. But though the intentional may very well admit of such an analysis, sensation predicates stubbornly resist this kind of treatment. The fact that persons feel and sense, as it were, "from the inside," cannot be denied. This is the fact of human sentience, although we are far from a clear understanding of how that fact is to be construed. Indeed, our problems are aided and abetted by our assumption of PMR and PPR which systematically ban the predicates used in sensation descriptions from the (privileged) predicates of physics. Again, the result is the relocation of sensual, sensation properties common sense paradigmatically applies to persons, that persons are ordinarily said to "have" in introspection. To the extent that the facts of sentience cannot be denied, they too are relocated and relegated to the realm of epiphenomena or appearance. We are forced to construe them as nomological danglers,[11] ineffably dangling from the network of physical theory and explanation.

However, the point I wish to make is that it is precisely the physicalist story and our preference for realism that causes the sensual to dangle. I wish to claim that mental phenomena owe their identity as mental to the fact that they are read out of the world as physics describes it! A realis-

[11] I am using "nomological dangler" here not to denote psycho-physical laws *à la* Feigl, but in line with Smart's use to denote the properties by virtue of which the danglers are said to dangle.

tically interpreted physics appears as a sorting device, distinguishing the objective from the subjective, cordoning off and thus rendering ontologically privileged the predicates for those properties to which its basic theories are ontologically committed. What is left over is banished from the real. But to the extent we cannot deny the *redness* of a rose or the *taste* of a chocolate eclair, we may find ourselves constructing "minds" to house them, and thus are stuck with some version of the mind-body problem.

Perhaps all this is better said metalinguistically. Suppose we had a complete list of all the predicates used in the physical sciences. Such a list would not only include obviously "physical" predicates as "... has 43 electron volts," but would also include a very large number of "topic neutral" predicates like "... lasts five seconds," or "... is to the left of ...," etc. These too I will class as physical, if merely by virtue of the fact that they appear in scientific descriptions. As such, I hold that an event, entity, or property is *physical* if and only if it falls under a description using the predicates on our list.

Now, it is clear that our list excludes a great many predicates, a number of which abound in descriptions used in ordinary discourse. Directly excluded, of course, are the predicates for the secondary qualities which, by virtue of PMR and PPR, *cannot* be on our list. What I wish to suggest is that we term an event, thing, or property *mental* merely because of how it is described.[12] If a useful description contains at least one excluded predicate, then what it describes becomes classed as irreducibly mental. Indeed, some descriptions using excluded predicates may have a different "logic", i.e. they may employ intentional verbs or verbs of propositional attitudes.[13] Some may be such that their first-person

[12] I owe an intellectual debt here to Donald Davidson's illuminating article, "Mental Events," *Experience and Theory*, ed. by L. Foster and J. Swanson (Amherst: University of Massachusetts Press, 1970).

[13] Under this rubric it is possible to render materialism consistent with dualism. It may be true that every event falls under a physical description (materialism) even though some of those *same* events fall under descriptions

ascriptive use is "incorrigible", etc. But the identity of their supposed reference as *mental* stems merely from the fact that they employ predicates excluded from our list of "physicalist" predicates. So, the claim that there are mental events, things, or properties may come to no more than the claim that events, things, and properties may fall under descriptions using excluded predicates.[14] And what gets excluded follows from the assumption of PMR and PPR, which together determine which predicates are to be excluded from the theoretical descriptions of fundamental physics at the first, formative level of the micro-reductive explanation of the behavior of common sense objects.

Much of the above has been anticipated by William Kneale, who in some recent remarks chastises modern materialists for ". . . forgetting that matter has always been distinguished by exclusion," and that it is thus "clearly absurd to maintain that physical science is all inclusive."[15] Indeed, if I am right, the important lesson to be learned from all this is that the classical mind-body problem in any of its forms cannot be solved with heavy doses of scientific realism or materialism, for a realistic interpretation of physics, along with the agency of PMR and PPR, are precisely its sources and causes. The bifurcation of our conceptual scheme, welcomed by Descartes as a way of freeing science from religious dogma, is nevertheless the *result* of our Democritian assumptions at the base of physics. As the set of *physical* descriptions, there is much that physics *must* exclude. It thus seems impossible that science could solve the conceptual problems its very success both creates and presupposes.

using excluded predicates, i.e. "mental" predicates (dualism). I also claim materialism may be made consistent with, with the supposed incorrigibility of first-person psychological reports and the fact of "freedom of the will." See my "A Quick Materialism," *Southern Journal of Philosophy*, 10, 1 (Spring, 1972).

[14] Again, one may successfully deny that intentional predicates refer, but this does not seem to be the case for the (extensional) sensual.

[15] "Critical Notice: *A Materialist Theory of the Mind* by D. M. Armstrong," *Mind*, LXXVIII, 310 (April, 1969), p. 300.

4. *Conclusion: Some Problems for Scientific Realism*

What the foregoing implies is that there is something radically wrong with the picture of things offered by the scientific realist. To the degree that he holds up scientific ontology as exhausting the inventory of the real, or holds that the set of descriptions of events comprising the scientific image is ontologically privileged, he will not only find himself essentially at odds with the common sense view of the world upon which, I also claim, the scientific image depends, but he will also fail to find a satisfactory understanding of persons, for his language must omit any reference to the experiences, which he claims verifies his privileged descriptions. Scientific realists such as Sellars and Feyerabend are aware of some of these difficulties. Sellars especially acknowledges the need for a new understanding of persons, perception and human action. But the need to embark upon such a difficult enterprise is a direct *result* of one's preference for realism. It is, perhaps, a good *prima facie* for searching out an alternative view.

But moreover, given the conflict between science and common sense, between Sellars' manifest and scientific images of the world, I have already offered some reasons for siding with common sense that may undermine Sellars' challenge. I have claimed that scientific explanation must proceed from a perspective conditioned by PMR and PPR. This implies the important fact that the scientific image cannot free itself from dependency upon the manifest, for PMR demands that whatever entities physics posits as ultimate, they must be construed as "parts" of whatever common sense *happens* to take as "wholes". Secondly, according to PPR, scientific descriptions necessarily cannot have among their predicates the predicates for the secondary qualities exemplary of objects under the manifest image. So, despite the appeal of scientific realism, the hope that science will develop some synoptic vision to replace common sense, the task may be an impossible one. The ontology of a realistically interpreted physics owes a conceptual debt to the categories and onto-

logy of common sense, though common sense owes nothing to physics.

Still, the Sellarsian may claim, all of this may change. Perhaps in some Peircean "long run" a new, utopian, "unified" science might be developed on the basis of some non-Democritian principles, such that the mind-body problem(s), the problems of perception and action, etc., will be undermined and swept away by the new conceptual tide. Indeed, all our problems would be over, come the Sellarsian revolution! Yet, try envisioning physics without the atomic theory. If Quine is right about the essential conservatism of physics, PMR would seem unshakeable, in Hanson's term, a "functional *a priori*", central to our conceptual scheme. Thus, Sellars' utopian possibility may well be wishful thinking. In the least, it does not help us in our present problems. Given the way physics is presently constituted—and there are no substitutes for atomic physics even on the horizon—there do seem to be good reasons to deny that science is the conceptual measure of all things.

However, the antidote to scientific realism is not instrumentalism. Both would need to assume the possibility of comparing an account of the real with some non-conceptualized reality in order to assess its fidelity. Simply put, there is no way out of the circle formed by our concepts enabling us to say what conceptual framework tells it as it *really* is. Indeed, there is nothing sacrosanct about common sense. It too is a construal of things from a certain perspective, from a certain set of assumptions. But again, common sense is a perspective that is not beholding to any other perspective. As a framework its use does not hinge on there being some other framework on whose ontic categories it relies in some manner for *its* categories. Given the necessity of choice, therein lies the source of my preference for common sense.

Let me resuscitate a phrase made much of by Whitehead. I claim that the scientific realist commits "the Fallacy of Misplaced Concreteness," that is, he mistakenly believes that the esoteric micro-entities of physics are more real and con-

crete than the ordinary, everyday objects of common sense. For him, concreteness would be indeed misplaced, for his account of the world would not only deny a place for what, on *his* model, are called the secondary qualities, but also for the very experience which is said to justify his theories. Sensation becomes ineffable. On the other hand, what he claims most real are the imperceptible micro-entities of physics that defy picturing by our imagination, submitting only to highly abstract mathematical description as probability functions, merely the inevitable outcome of successive layers of micro-reduction according to our principles. All this points toward the need to acknowledge the fundamental concreteness of the world as it falls under the manifest image. It is here that our metaphysical chickens come home to roost.

All this, however, is consistent with our giving the Sellarsian his chance. New conceptual frameworks are always possible, as difficult as these may be to envision. But such frameworks cannot, as it were, image the world with one eye. They could not systematically deny to the real the sensuous properties drummed out of the world on our Democritian assumptions, or else we would be merely exchanging one set of mind-body problems for others. The enormity of the task is staggering, underscoring the need for alternatives to scientific realism. But whatever one's preference, we must appreciate the fact that science, any science, is man's creation and thus reflects human ends, needs, and conditions. Hence, before we construct new systems, we need to know more about our present frameworks, of the connections between contemporary physical theory and common sense from the point of view of the descriptive and ontic categories of both. We need to know more about how our practical needs and the conceptual distinctions that underlie our everyday life are reflected in our scientific-theoretical choices.

RESUMEN

En este ensayo se examinan las discrepancias conceptuales entre la imagen de la realidad proporcionada por el sentido común y la imagen extraída de la ciencia, particularmente de la física moderna. Dicho de otro modo, se analiza la tensión entre sentido común y ciencia. Y se arguye por la prioridad conceptual del primero, en contra de lo que sostienen los realistas científicos.

La física moderna asume como principios metafísicos fundamentales dos postulados reductivos: el *principio de la micro-reducción* (PMR) y el *principio de la reducción de propiedades* (PRP). (El segundo es, en cierto modo, subsidiario del primero.) PMR sostiene que las propiedades de totalidades macroscópicas deben ser explicadas en términos de las propiedades de sus partes microscópicas. PRP afirma que las propiedades de esas partes deben ser esencialmente distintas de las propiedades de las totalidades que pretenden explicar. Ambos principios reductivos arrancan del atomismo griego y constituyen la firme base de la ciencia moderna.

La consecuencia de ambos principios es que los predicados que designan las llamadas "cualidades secundarias" (colores, sonidos, perfumes, etc.) y, en especial, los que designan estados o propiedades mentales, deben ser excluidos del discurso científico. Si se adopta el realismo científico como filosofía, entonces sólo el discurso científico es válido y, por tanto, tales propiedades sensuales y mentales (que constituyen buena parte de lo asumido por el sentido común) resultan inefables. Como, por otra parte, ningún realista científico puede negar que haya, en algún sentido, colores, sonidos, estados mentales, etc., se desprende que el viejo problema de Hobbes de la relación mente-cuerpo aparece como insoluble dentro del realismo científico.

Por otro lado, está claro que, para hacer inteligibles los mismos principios PMR y PRP, es necesario asumir las categorías del sentido común que la física pretende reducir. Las propiedades que el sentido común atribuye a las cosas y a las personas a nivel macroscópico constituyen el punto de partida de las explicaciones reductivas de la ciencia moderna. La ontología de la ciencia moderna depende de la ontología del sentido común; en cambio esta última es autosuficiente. De ahí se debe concluir la prioridad del sentido común frente a la ciencia y por tanto la inadecuación del realismo científico como concepción filosófica general.

(Resumen de C. Ulises Moulines)