



---

## UNDERSTANDING THE WORLD: THE “MIXED QUESTION” TEST

**Mortimer Adler**

Part 1 of 3

**W**E HAVE CONSIDERED how philosophy should be compared with science in three respects—progress, agreement, and usefulness. A fourth respect remains: understanding. For our understanding of the world, should we go to science or to philosophy? Which renders the world more intelligible? Which penetrates more deeply into the nature of things?

These questions plainly presuppose some conflict, or at least competition, between the pictures that science and philosophy give us or between the stories that they tell; for if their views of the world concur, or if philosophy simply endorses the scientific account of things, there would be no reason to ask which gives us the better grasp of the world in which we live, and no sense in the generally prevalent opinion that philosophy has never given and can never

give us an understanding of the world as penetrating as that which we obtain from science.

To examine the comparative merits of science and philosophy in this respect, I shall concentrate upon a single classic example of an apparent conflict between philosophy and science. I say “apparent” at this point only in order not to beg the question in advance, for if there were no appearance of conflict, we should have no problem. The crux of the problem lies in understanding why there appears to be a conflict. Once that is understood, I think the problem can be solved; and since, as I shall try to show, both the understanding of the problem and the solution of it are not scientific, but philosophical, achievements, I think it is arguable that philosophy is superior, not inferior, to science in rendering the world intelligible.

(I)

The example which serves our purpose can be stated as follows. It involves three points.

(1) A philosophy that is based on common experience would defend the common-sense opinion that the individual material objects of our experience really exist as they are experienced. Each has a *unity* of being, a *continuing identity* of being, and a *distinctness* of being; for example, this man and that man, this cat and that cat, this rose and that rose, or this chair and that chair. In addition, each is an individual sensible substance, having certain attributes and qualities. Among these attributes are its identity over a span of time and its material continuity or solidity.

This man, this cat, or this chair is not like a collection of marbles, so far as our common experience goes. We can divide the collection of marbles into two collections, or three, or four, simply by separating the discrete marbles into distinct piles; but we cannot divide this man or this cat into two or more men, or two or more cats; and though we may be able to take a chair apart and refashion its materials into two chairs, we have to destroy the original chair in order to do so. That process is ostensibly quite different from dividing a collection of marbles, precisely because the chair has material continuity, lacked by the collection of discrete marbles.

(2) Physical science, based on the very special data of experimental investigation, includes an elaborate and subtle theory of matter which involves certain so-called theoretical entities—not only discrete atoms of matter, but also the more minute particles which constitute atoms. Both the atoms and their constituent parti-

cles are intrinsically imperceptible to our senses. As N. R. Hanson points out, they are essentially unpicturable—“unpicturable-in-principle.” But the elementary particles which constitute atoms are, if this is possible to say, even more radically unpicturable than atoms.

The atom of Democritus lacked all the sensible qualities which ordinary bodies have—such as color, texture, smell—but it still had basic quantitative properties, such as weight, shape or size, position, and motion. The qualities of perceptible bodies were called “secondary qualities”; the basic physical attributes of the atom, “primary qualities” or “primary properties.” “Democritus’ atomic theory avoids investing atoms,” Hanson writes, “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. The price paid for this intellectual gain is unpicturability.”<sup>1</sup>

<sup>1</sup> *Patterns of Discovery*, Cambridge, 1958, pp. 121-122. Cf. Werner Heisenberg, *Philosophic Problems of Nuclear Physics*, New York, 1952, pp. 54-55.

Until the end of the nineteenth century, and even for the first few decades of this century, modern atomic theory retained certain of the basic features of ancient atomism. So long as the atom remained the fundamental unit of matter, it had certain attributes in common with perceptible bodies, such as weight, position, motion; in addition, it had the special atomic properties of indivisibility, impenetrability, and homogeneity. But this “Democritean-Newtonian-Daltonian atom cannot explain what has been observed in this century. Its postulated properties . . . no longer pattern and integrate our data; to account for all the facts the atom must be a complex system of more fundamental entities,” such as “electrons, protons, neutrons, positrons, mesons, anti-protons, anti-neutrons and gamma-ray photons. . . .”<sup>2</sup> Where earlier forms of atomic theory ruled out secondary qualities, the present theory of sub-atomic particles “denies its fundamental units any direct correspondence with the primary qualities, the traditional dimensions, positions, and dynamical properties. . . . The result,” Hanson concludes, “is radical unpicturability.”<sup>3</sup>

Heisenberg’s statement of the matter confirms how radical, indeed, is the unpicturability of the present conceptions. “The indivisible elementary particle of modern physics,” he writes, “possesses the quality of taking up space in no higher measure than other properties, say color and strength of material.” They “are no longer bodies in the proper sense of the word.”<sup>4</sup> They are units of matter only

in the sense in which mass and energy are interchangeable; this fundamental stuff, according to Heisenberg, “is capable of existence in different forms,” but “always appears in definite quanta.”<sup>5</sup> These discrete quanta of mass/energy cannot even be described as particles, for they are as much waves or wave packets; Eddington coined the name “wavides” for them to cover the fact that their behavior corresponds to both that of waves and that of particles.

2 Hanson, *op. cit.*, pp. 122-123.

3 *Ibid.*

4 *Op. cit.*, pp. 55-56.

(3) There would seem to be a conflict here between physical science and philosophy, if both are taken as giving us knowledge of the same real existences. It is easier to grasp this conflict in terms of the Democritean-Newtonian-Daltonian atom than in terms of the wavicle of contemporary sub-atomic physics, but *in principle* the conflict is the same. I shall state it in the easier form first.

Consider a particular real existence—a particular chair in a particular room, easily identified by all the persons in that room, who can all point to the same object, occupying the same space, and so forth. According to a philosophy based on common experience, the particular chair being pointed out is a solid material object, having certain sensible qualities and other experienceable properties. These are markedly different from the properties of a collection of marbles, no matter how the marbles are organized. According to the theory of atoms as the ultimate, indivisible units of matter, the chair is a congeries of minute and imperceptible bodies. The interaction of these bodies, with some resulting stable pattern of organization, does not abolish their discreteness or material discontinuity, made by the void or empty space which separates one from another.<sup>6</sup>

5 *Ibid.*, p. 103.

6 J. J. C. Smart, defending A. S. Eddington’s contrast between the two tables (instead of chairs)—the table of common experience and the physicist’s table—maintains that there is “a perfectly good sense in which it is true and illuminating to say that the table is *not* solid. The atoms which compose the table are like the solar system in being mostly empty space. [This was Eddington’s point.] So, though most common-sense propositions in ordinary life are true, I still wish to say that science gives us a ‘truer picture’ of the world” (*Philosophy and Scientific Realism*, New York, 1963, p. 47).

Looked at the first way, the envelope of space (that is, the place) occupied by the particular chair appears to be completely and continuously filled with matter—in other words, by *one* body. Looked at the second way, the identical region of space is conceived of as being occupied by a vast multitude of discrete or discontinuous

units of matter—by *many* bodies, in short. Can we hold these two views of one and the same place, or region of space, without a sense of conflict between them?

If we can see the apparent conflict between our commonsense view of the chair and the physicist's view of it, we should also be able to see it when we substitute the theory of sub-atomic particles or wave packets for that of atoms as the ultimate units of matter, for it is the same in principle. Let us go as far as Heisenberg would take us in the direction of divesting these quanta of matter (of mass/energy) of any of the properties assigned to sensible bodies, or even to atoms (such as position, shape, motion). The ancient contrast between atoms and the void, Heisenberg points out, can be translated into the most fundamental of all differences—that between being and non-being.<sup>7</sup> But if one recognizes that “to give an accurate description of the elementary particle—and here the emphasis is on the word ‘accurate’—the only thing which can be written down as a description is a probability function . . . then one sees that not even the quality of being (if that can be called a ‘quality’) belongs to what is described.” What, then, *is* the elementary particle or wave packet? Heisenberg's answer is that “it is a possibility for being or a tendency for being.”<sup>8</sup>

<sup>7</sup> *Physics and Philosophy*, New York, 1958, pp. 65-66.

<sup>8</sup> *Ibid.*, p. 70.

On this view, as on the view taken by old-fashioned atomism, the region of space occupied by the chair of our common experience is occupied by a vast multitude of material units. Where before that multitude consisted of units having some of the properties of bodies, including actual being or existence, now it consists of quanta of mass/energy having none of the properties of bodies, not even that of actual being. Where before the region of space occupied by the chair was not completely *filled* by atoms (since atoms, to be atoms, must be separated from one another by void), now the ultimate material units (whether in the form of particles or in the form of wave packets) are *discrete* quanta of mass or discrete quanta of energy. They may all be made of the same stuff, whatever that is, but there is a denumerable multitude of them.

We can now see why the conflict is in principle the same. It turns, not on the distinction between filled and empty space, nor even on that between being and non-being, but on the distinction between the one and the many. The chair of our common experience, the reality of which a philosophy based on common experience defends, is not only a solid body, but even more fundamentally a single being. The chair of physical theory (whether in terms of atoms

or sub-atomic particles) consists of an irreducible multiplicity of discrete units, each having some kind of being, even that minimal grade of being for which Heisenberg used the words “possibility for being or tendency for being.” Hence, whether we see the conflict in terms of one body in the region of space occupied by the chair versus many bodies (the atoms which together with the void make up the chair) or in terms of one being in that region of space versus many beings (the discrete sub-atomic units), the conflict is in principle the same, for it is a conflict between the one and the many.

If the unitary being which is the solid chair, with all its sensible qualities, is dismissed as a purely subjective fantasy on our part, then no conflict remains; for it can be said that what exists out there, where we have the illusion that there is a solid chair, is nothing but a multitude of material units, in a pattern of organization which occupies (whether or not it fills) a certain identifiable region of space. Or, if the physicist’s atoms, particles, or wave packets are merely “theoretical entities,” to which no real existence is attributed (that is, if they are *merely* mathematical forms, which have *no* physical reality), then their being posited for theoretical purposes does not challenge the view that what really exists out there is the solid chair of our experience.

*If, however, real existence of the same kind is attributed to both the theoretical entities of physics and to the solid chair of common experience, then we cannot avoid what is at least an apparent conflict between science (in this case, physics) and philosophy.<sup>9</sup>*

9 For diverse considerations of this classic example of an apparent conflict between science, on the one hand, and philosophy together with common-sense, on the other, see William James, *Principles of Psychology*, New York, 1890, Vol. II, Chapter XXI, pp. 291-293, 299-301; Arthur S. Eddington, *The Nature of the Physical World*, New York, 1928, Introduction, pp. ix—xvii; L. S. Stebbing, *Philosophy and the Physicists*, London, 1937, Part II, pp. 45-140; Gilbert Ryle, *Dilemmas*, Cambridge, 1954, pp. 75-81; Jacques Barzun, *Science: The Glorious Entertainment*, New York, 1964, p. 63; and J. J. C. Smart, *op. cit.*, pp. 47-48.

Is this apparent conflict resolvable? If so, what is the resolution? Or is it only a pseudo-problem? If so, how is the misleading appearance of conflict to be removed? All of these questions bear on the relation of science and philosophy as first-order knowledge of the world, especially when each claims to give us knowledge of one and the same region of that world.

---

---

## THE GREAT IDEAS ONLINE

is published weekly for its members by the

### CENTER FOR THE STUDY OF THE GREAT IDEAS

Founded in 1990 by Mortimer J. Adler & Max Weismann

Max Weismann, Publisher and Editor

Ken Dzigan, Senior Fellow and Archivist

A not-for-profit (501)(c)(3) educational organization.

Donations are tax deductible as the law allows.