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"Science and the Physical World," W. T. Stace (1886-1967)



Biographical Sketch

Key Ideas

- I. Existence of unobservables is 'known' through causal inference. (1)

- II. All known causal laws apply only to perceivable objects.
- III. We can't make inferences about nonobservables.
- IV. Therefore, atoms don't exist, or, at any rate, we could never know if they did. ([7](#))
- V. Atomic theory is 'true' insofar as it makes accurate predictions. Some theories are 'truer' than others ([8](#), [12](#)).
- VI. It doesn't matter to science whether atoms exist; only the philosopher cares. They just help the imagination. ([9](#), [11](#), [20](#))
- VII. A force, such as gravity, isn't a thing; it's math and/or a metaphor. ([13](#))
- VIII. Science does not explain or show why. It just describes in a shorthand of laws. ([15](#), [16](#))
- IX. Nothing exists except sensations and minds. ([23](#))

Select Quotations

1. So far as I know scientists still talk about electrons, protons, neutrons, and so on. We never directly perceive these, hence if we ask how we know of their existence the only possible answer seems to be that they are an inference from what we do directly perceive. What sort of an inference? Apparently a causal inference.

2. But is it not clear that such a concept of causation, however interpreted, is invalid? The only reason we have for believing in the law of causation is that we observe certain regularities or sequences.

3. We observe that, in certain conditions, A is always followed by B. We call A the cause, B the effect. And the sequence A-B becomes a causal law. It follows that all observed causal sequences are between sensed objects in the familiar world of perception, and that all known causal objects in the familiar world of perception, and that all known causal laws apply solely to the world of sense and not to anything beyond or behind it. And this in turn means that we have not got, and never could have, one jot of evidence for believing that the law of causation can be applied outside the realm of perception, or that that realm can have any causes (such as the supposed physical objects) which are not themselves selves perceived.

4. If you admit that we never observe anything except sensed objects and their relations, regularities, and sequences, then it is obvious that we are completely

shut in by our sensations and can never get outside them.

5. No inference, therefore, can pass from what is sensible to what is not sensible.
6. The fact is that atoms are not inferences from sensations.
7. That atoms are not inferences from sensations means, of course, that from the existence of sensations we cannot validly infer the existence of atoms. And this means that we cannot have any reason at all to believe that they exist. And that is why I propose to argue that they do not exist---or at any rate that no one could know it if they did, and that we have absolutely no evidence of their existence.
8. [Like atoms, entries in a nautical almanac] are "true," inasmuch as they enable us to predict certain sensations, namely, the positions and times of certain perceived objects which we call the stars. And so the formulae of the atomic theory are true in the same sense, and perform a similar function. I suggest that they are nothing but shorthand formulae, ingeniously worked out by the human mind, to enable it to predict

its experience, i.e., to predict what sensations will be given to it.

9. It is a matter of no importance to the scientific man whether the forces exist or not. That may be said to be a purely philosophical question.
10. And I think the philosopher should pronounce them fictions. But that would not make the law useless or untrue.
11. Whether forces exist or not simply does not matter. What matters is the discovery that Newton's law does not enable us accurately to predict certain astronomical facts such as the exact position of the planet Mercury.
12. [Einstein's account of gravity] is truer than Newton's law, not because it substitutes humps and hills for forces, but solely because it is a more accurate formula of prediction.
13. Gravitation is not a "thing," but a mathematical formula, which exists only in the heads of mathematicians.

14. The planets just get "shoved about," not by forces, but by the humps and hills! But these humps and hills are pure metaphors. And anyone who takes them for "existences" gets asked awkward questions as to what "curved space" is curved "in."
15. It is not irrelevant to our topic to consider why human beings invent these metaphysical monsters of forces and bumps in space-time. The reason is that they have never emancipated themselves from the absurd idea that science "explains" things. They were not content to have laws which merely told them that the planets will, as a matter of fact, move in such and such ways. They wanted to know "why" the planets move in those ways. So Newton replied, "Forces."
16. But scientific laws, properly formulated, never "explain" anything. They simply state, in an abbreviated and generalized form, what happens. No scientist, entist, and in my opinion no philosopher, knows why anything happens, or can "explain" anything.
17. And laws of this kind obviously enable us to predict.

18. I think that atoms are in exactly the same position as forces and the humps and hills of space-time. In reality the mathematical formulae which are the scientific ways of stating the atomic theory are simply formulae for calculating what sensations will appear in given conditions.
19. The only causes of sensations are other sensations. And the relation of atoms to sensations to be felt is not the relation of cause to effect, but the relation of a mathematical formula to the facts and happenings which it enables the mathematician to calculate.
20. Their reason is not in the slightest that science has any use for the existent atom. But the imagination has. It seems somehow to explain things, to make them homely and familiar.
21. [Energy in physics is a fiction.] Either [...] energy exists or it does not exist. There is no realm of the "potential" half-way between existence and nonexistence. And the existence of energy can only consist in its being exerted. If the energy is not being exerted, then it is not energy and does not exist. Energy can no more exist without energizing than

heat can exist without being hot. The "potential" existence of the energy is, then, a fiction.

22. [T]he fiction of potential energy is introduced simply because it is convenient and makes the equations easier to work.
23. If the views which I have been expressing are followed out, they will lead to the conclusion that, strictly speaking, nothing exists except sensations (and the minds which perceive them). The rest is mental construction or fiction. But this does not mean that the conception of a star or the conception of an electron are worthless or untrue. Their truth and value consist in their capacity for helping us to **organize our experience** and **predict our sensations**.