

Class Two - Two Truths in Contemporary Scientific Thought

Appearance and Reality - Ryan Simonelli

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1 Eddington's Two Tables

- **Some Context:** Arthur Eddington was a theoretical physicist, and popularizing of physics. This is the introduction to his 1929 book *The Nature of the Physical World*, wherein he presents contemporary physics (in particular, relativity and quantum mechanics, which were quite new at the time) to a popular audience.
- **Table One:** The familiar one that is "a commonplace object of that environment I call the world," (ix). It:
 - Is extended in space.
 - Persists through time.
 - Is colored.
 - Is "substantial." That is "It is a *thing*; not like space, which is a mere negation," (ix).
- **Table Two:** The "scientific table." It:
 - Is "mostly emptiness. Sparsely scattered in that emptiness are numerous electric charges rushing about with great speed; but their combined bulk amounts to less than a billionth of the bulk of the table itself," (x).
 - Is not substantial
 - Is (arguably) not even pervaded by substantial things.
- **An Aside on Electrons:**
 - **Purely Symbolic?** Eddington, rather confusingly, refers to electrons and the other denizens of the world of physics as "purely symbolic." The meaning of this phrase is meant to be secured by analogy:

To the child, the letter *A* would seem horribly abstract; so we give him a familiar conception along with it: "*A* was an archer who shot at a frog." This tides over his immediate difficulty; but he cannot make serious progress with word-building so long as Archers, Butchers, Captains, dance round the letters. The letters are abstract, and sooner or later he has to realize it. In physics, we have outgrown archer and apple-pie definitions of the fundamental symbols. To request an explanation of what an electron really is supposed to be, we can only answer, "It is part of the *ABCs* of physics," (xiv).
 - **The Analogy:** The analogy here, is, for instance, with Dalton's "billiard ball" model of the atom, where we conceive of an atom as having a nucleus of a few billiard balls (protons and neutrons), with electrons as other billiard balls whizzing around that nucleus.
 - * Younger physicists, Eddington recognizes, are capable of doing without such metaphors, "rising to that plane of thought."
 - * For himself, Eddington admits admits that he is "incorrigible," and, "when I think of an electron there rises to my mind a hard, red, tiny ball," (xv).

Despite how he *does* think of an electron, he says that he *ought* to "treat the physical world as purely symbolic."
- **A Slippage Two Claims:** I think Eddington slips here between two claims, the first is plausible, and the s

- * **An Epistemological Claim:** The elements in a physical theory *can only be understood in terms of* the symbolic expressions we use in our mathematical theories.
 - **This Seems Plausible:** We have a symbolic notation, in which expressions such as $\psi(x, t)$ figure. These expressions are subject to certain mathematical rules, laid down by the theory, and the only way to understand what electrons “really are” is to master that symbolic notation.
- * **A Metaphysical Claim:** The elements of the physical theory *are themselves* symbolic.
 - **This Seems Confused:** It’s simply unclear what it could be for an electron itself itself be a “symbolic entity.” Unlike the English letter “A” which symbolizes a range of vowel sounds (which are symbolized in different ways in different scripts), it’s utterly unclear what an electron itself could “symbolize.”

Interesting as these points are, for our present purposes, they can mostly be ignored (we’ll return to them in due time), since the nature of electrons themselves is not essential to the broader point concerning the radical divergence between appearance and reality when it comes to adopting the scientific worldview. As Eddington says, “conceive of [electrons] as substantially as you will, there is a vast difference between my scientific table with its substance (if any) thinly scattered in specks in a region mostly empty and the table of everyday conception which we regard as the type of solid reality,” (xi).

- **A Crucial Claim:** The scientific table is *explanatory superior* to the ordinary table:

“Reviewing their properties one by one, there seems to be nothing to choose between the two tables for ordinary purposes; but when abnormal circumstances befall, then my scientific table shows to advantage. If the house catches fire, my scientific table will dissolve quite naturally into scientific smoke, whereas my familiar table undergoes a metamorphosis of its substantial nature which I can only regard as miraculous,” (x).

Though Eddington is not particularly explicit about the argument here, it is presumably on this basis he concludes that:

[M]odern physics has by delicate test and remorseless logic assured me that my second scientific table is the only one which is really there—wherever ‘there’ may be.

- **A Stab at an Argument:** Filling in the gaps, we can perhaps reconstruct the following argument:
 1. We can only accept one of the two tables as “really there.”
 2. The scientific table is explanatorily superior to the familiar table in that, by appealing to *it’s* nature, we are able to predict and explain the events that unfold in the world under various circumstances, whereas we can do no such thing with respect to the familiar table.
 3. If we have a choice between accepting one of two objects in our ontology as real, we should opt for the one that is explanatorily superior.
 4. We should only accept the scientific table as really there.
- **Question:** Do we accept the conclusion? If not, which premise do we reject?

2 Sellars On the Relation Between the “Two Images”

- **The Manifest Image and the Scientific Image:** Sellars speaks of Eddington’s two tables as each belonging to a different “image” of the world: the *manifest image* and the *scientific image*.
- **Two Lines of Thought:** Sellars focuses on two ways of thinking about the relation between the objects of the manifest image and the objects of the scientific image:

- ▶ **A Simple Identity Theory:** “Manifest objects are identical with systems of imperceptible particles in that simple sense in which a forest is identical with a number of trees,” (26)
- ▶ **An Appearance/Reality Dualism:** “Manifest objects are ‘appearances’ to human minds of a reality which is constituted by systems of imperceptible particles,” (26)
- **How to Understand The Second Line:** Saying “Things in the world are not really colored” is not to be understood by analogy to one’s saying “The two lines are not really different lengths,” when looking at a Müller-Lyer illusion:

[P]roperly understood, the claim that physical objects do not really have perceptible qualities is not analogous to the claim that something generally believed to be true about a certain kind of thing is actually false. It is not the denial of a belief *within a framework*, but a challenge to the framework. It is the claim that although the framework of perceptible objects, the manifest framework of everyday life, is adequate for the everyday purposes of life, it is ultimately inadequate and should not be accepted as an account of what there is all things considered.

- **The Argument Against the Simple Identity Theory**

1. Manifest objects are essentially colored.
2. Systems of imperceptible particles are not colored.
3. Manifest objects cannot be identical with systems of imperceptible objects.

- ▶ **An Argument for 1:** For 1, Sellars relies on a thought that he attributes to G.E. Moore, that “it is a framework feature of chairs, tables, etc. that they have perceptible qualities,” (27).

- * If you’re talking about something that’s essentially invisible, you’re not talking about a table—at least, not a table of the sort with which we’re familiar.

- ▶ **The Homogeneity Argument Against Identity:** Sellars’s main argument for (2) is the so-called “homogeneity argument”:

“*Pink* does not seem to be made up of imperceptible qualities in the way in which being a ladder is made up of [things that aren’t ladders, i.e.] being cylindrical (the rungs), rectangular (the frame), wooden, etc. The manifest ice cube presents itself to us as something which is pink through and through, as a pink continuum, all the regions of which, however small, are pink,” (26)

- * **An Analogy:** Consider a pointillist painter who has access to a giant white canvas and only the primary colors, yellow, blue, and red. By placing dots of yellow, blue, and red in the right configurations, she makes a painting such that, if you look at it from far enough away, it will look as if you’re looking at a painting of, say, a basket of green granny-smith apples. So, it will *appear* as if the Canvas has been painted green. However, the the canvas isn’t *really* painted green. There’s no green paint at all on the Canvas, and when you walk up close enough to it, you can see this.

- The case of ordinary objects seeming colored is like this, but the systems of particles aren’t colored *differently*; rather, *they’re not colored at all*. It’s hard to see how that could make the situation any better!

Question: Do we accept the conclusion? If not, which premise do we reject?

3 Ultimate Unification?

- **Two Worlds or Two Aspects?** Eddington’s picture is one of “two worlds.” He maintains that, *ultimately*, however, it will be one of two aspects. Though that project of unification, he maintains, is outside the scope of physics:

“ ‘You speak paradoxically of two worlds. Are they not really two aspects or two interpretations of one and the same world?’

“Yes, no doubt they are ultimately to be identified after some fashion. But the process by which the external world of physics is transformed into a world of familiar world of familiar acquaintance in human consciousness is outside the scope of physics. And so the world studied according to the methods of physics remains detached from the world familiar to consciousness, until after the physicist has finished his labours upon it. Provisionally, therefore, we regard the table which is the subject of physical research as altogether separate from the familiar table, without prejudging the question of their ultimate identification. It is true that the whole scientific inquiry starts from the familiar world and in the end it must return to the familiar world; but the part of the journey over which the physicist has charge is in foreign territory,” (xii-xiii).

- **Sellars on the Aim of Philosophy:** This sort of unification between scientific image and manifest image—transforming a “two worlds” picture into a “two aspects” picture—is Sellars’s main philosophical project:

“The aim of philosophy, abstractly formulated, is to understand how things in the broadest possible sense of the term hang together in the broadest possible sense of the term,” (*PSIM*, 1).

- **A Dissenting Voice: Are there Even Two Worlds to Be Unified?** Stebbing dissents to the very idea of there being “two tables,” even provisionally, in the first place.
 - “There is, indeed, a danger in talking about *the table* at all, for the physicist is not, in fact, concerned with tables,” (54).
 - “Eddington seems unable to free himself from the conviction that the physicist is concerned with things of the same nature as things of the familiar world; hence, *tables* are to be found in both world No. 1 and world No. 2,” (58).