

7. Schrödinger's cat. Materialism.

The half-silvered mirror experiment shows that quantum mechanics implies physical existence often divides into two separate universes. There are other atomic-level systems which lead to two versions of reality and which are often used in thought or real experiments. In one, the two polarization states of light are used ([A5.3](#)). In another, the spin up and spin down states of a spin $\frac{1}{2}$ particle, say in a Stern-Gerlach experiment ([A6.1](#)) are used. But the most well-known one is Schrödinger's cat. (Note: There are also many situations where quantum mechanics leads to more than two versions of reality.)

Schrödinger's cat.

To illustrate Schrödinger's cat using a half-silvered mirror ([Ch. 6](#)), suppose we put the cat in a box that contains a bottle of cyanide. The bottle is electronically hooked to the H detector of Fig. (1) of [Ch. 6](#). If that detector says no, a signal is sent to the bottle, breaking it, and the cat dies. But if the H detector says yes, nothing happens and the cat lives. Schrödinger's illustration makes the contrast between the two versions of reality more dramatic; in one version of reality there is a live cat and in the other, simultaneously existing version, a dead cat.

In the original Schrödinger version, the two-state atomic system was not produced by light and a half-silvered mirror; instead it was produced by a radioactive nucleus. The two atomic states were the undecayed and the decayed states of the nucleus, with the decay products being detected.

Comments:

First the idea of several versions of reality is most confusing since it doesn't correspond to anything in our daily life. So how are we to understand it? What we are doing here is not attempting to understand it, but simply to *illustrate* that, in the basic linear mathematics ([Ch. 1](#), [A1.1](#)), there is often more than one version of reality. Later on ([Ch. 11](#)), we will show that the same mathematics prohibits the *perception* of more than one version of reality (even though there is more than one version in the wave function). And so the idea of multiple versions of reality (in the mathematics), startling as it seems, does not have quite the radical consequences one at first supposes.

Second, there are important details of the two-state systems that we did not include in [Ch. 6](#) (because we wanted to concentrate on the absurdity of a highly successful theory leading to multiple versions of reality).

- If the mirror is more than half-silvered, quantum mechanics implies the vertical detector, which detects the reflected beam, will record more yes's than the horizontal detector.
- Quantum mechanics implies a stronger beam of light will just produce more yes's per second.
- Quantum mechanics implies there can never be a single run of the experiment where both detectors say "yes."

Third, it is interesting that this splitting into versions of reality starts out at the microscopic level with the split in the atomic-level wave function. But then, when the

detectors are encountered and triggered, the split gets magnified up to the macroscopic, person-size level, where the differences in the states of reality are perceivable! A consequence is that in real life, says quantum mechanics, the physical universe splits into many significantly different universes each second! (But the mathematics implies we can't observe this.)

Finally, the idea that there can be more than one version of *each of us* (the versions of the observer in [Ch. 6](#), [Ch. 10](#), [Ch. 11](#)), is quite difficult to absorb. Even seasoned workers in the field will subtly assume in their reasoning that there really is one version of the observer which is somehow singled out as the "real" version.

Materialism.

Materialism is the idea that only the physical world exists, with the implied assumptions that there is only one version of that physical world and one version of each of us. Many scientists and others say that science supports this conceptual position. But the basic mathematics of quantum mechanics says there are multiple versions of reality and in particular multiple versions of each of us. So if materialists wish to justify their position by appealing to physics, they must either (1) show how materialism is modified when there are many versions of each of us and of the physical world; or (2) they must prove that there is a theory underlying quantum mechanics in which there is only one version of each of us and one version of the physical, material world. (Note: There is no evidence for either the collapse or the hidden variable interpretation, each of which has, in effect, just one version of reality.)

Evaluation.

There are statements here about the implications of the mathematics of quantum mechanics that need verifying, particularly the idea that more than one version of reality is never perceived. The supporting arguments are given in [Part II](#).

Also there will no doubt be disagreement on materialism. But to justify their position, the materialists must clearly state how they propose to phrase materialism in a theory where there are multiple versions of the observer and the material world; or they must show how to suitably modify physical law so there is just one version of each of us.