11. Perception of only one version of reality.

In Ch. 10, we saw that the quantum mechanical versions of reality each correspond to separate, non-interacting universes. We now consider the consequences of that for perception by versions of the observer, again using the half-silvered mirror example.

Perception in the half-silvered mirror example.

We start after detection but before the observer looks, with the observer writing what she perceives. The wave function then is (skipping the coefficients)

$$\begin{array}{c} |\text{Det H,yes}\rangle|\text{Det V,no}\rangle|\text{Obs writes “I see nothing”}\rangle \\ \oplus \\ |\text{Det H,noV}|\text{Det V,yes}\rangle|\text{Obs writes “I see nothing”}\rangle \end{array} \qquad (1)$$

with the first term being the H branch and the second the V branch. Now the readings on the detectors are transmitted to the observer by photons. But as we argued in Ch. 10 and A10.1, the photons must stay within the branch where they were created. Thus the version of the observer on the H branch can perceive only what transpires on the H branch; she can never perceive any photons that originate on the V branch. The wave function after the observer looks is therefore

$$\begin{array}{c} |\text{Det H,yes}\rangle|\text{Det V,no}\rangle|\text{Obs writes “I see } \mathbf{only} \text{ yes,no”}\rangle \\ \oplus \\ |\text{Det H,noV}|\text{Det V,yes}\rangle|\text{Obs writes “I see } \mathbf{only} \text{ no,yes”}\rangle \end{array} \qquad (2)$$

No version ever writes “I see something other than a single, classically consistent version of reality.” The conclusion is

> **No version of the observer (communicably) perceives anything other than a single, classically consistent version of reality.**

Multiple observers.

If we have more than one observer, there will be a version of each observer on each branch. Since all photons, sound waves, electrical signals, and so on are confined within branches (no information can be transmitted from one branch to another), the versions of the observers within each branch must agree. **Multiple observers never disagree on their perceptions**.

Comments:

> **(1).** The goal of the argument is to show that the mathematics of quantum mechanics *does not disagree* with our everyday perceptions of the physical world. And we have shown that; “I see something other than a single-version ‘classical’ reality” is never written. Also multiple observers never disagree. So there is no situation which leads to perceptions in conflict with our perceptions.

(2). The state of Eq. (2) was forced by the interactions (and the results of Ch. 10). No preferred basis was used. The preferred basis problem is pursued in A11.1.

(3). A potential criticism is the use of what the versions write. We side-step this by stating the conclusion as: **Classical perceptual results follow from quantum mechanics for all communicable perceptions.** Non-communicable perceptions, which are not relevant to this argument, are not covered in this approach.

(4). In a way, this result is very satisfying. If quantum mechanics does so well at predicting *numbers*, why shouldn't we expect it to completely agree with our everyday *perceptions*? One just has to dig a little deeper to see that the *existence* of more than one version of reality in the wave function does not lead to the *perception* of more than one version of reality.

(5). Finally, part of the motivation for many interpretations is the belief that perception of only one version of reality is *not* explained by the mathematics of quantum mechanics. But since it is indeed explained, that nullifies much of the motivation for those interpretations.

Evaluation.

The perception of a single version is perhaps the most controversial aspect of Part II and in fact there are experts in the field who would initially disagree with deriving 'classical' perception from quantum mechanics by essentially using only linearity. But if we examine each part of the argument, we see there are no weak links. One might object to using what the versions write but it is surely permissible to consider only communicable perceptions.

What we are doing in Part II is determining what the mathematics of quantum mechanics can explain. Here, we have shown it can explain why we never communicably perceive more than one version of reality when many versions exist in the wave function. And we have shown that it can explain why observers agree on which version is perceived. But it cannot explain how the choice of which version we perceive is made.