Q is for Quantum: ERRATA, OMISSIONS AND IMPROVEMENTS

ERRATA:

Page numbers refer to the printed edition.

* page 18, paragraph 3 should read (strike through the "white or"):
It may seem that we should use exactly the same ambiguous representation for the state which emerges from a PETE box when we have dropped a black ball through it, because it also equally likely appears black or white when observed. But it must somehow be represented differently, because it must capture the fact that after a second PETE box the ball always emerges ~~white or~~ black. This means there must be some difference between a mist originating from a white ball and a mist originating from a black ball.

* on page 19 line 7, there's an extra "it"

*page 67, first paragraph should read:
The second time you flip it the coin comes up heads. Alice takes the box labelled STORAGE 2, but this time she does not hold it above the PETE box, she just pulls the lever, and a white ball drops out the bottom of the ~~PETE~~ STORAGE box. Alice says, "My second answer is white." For someone supposedly being telepathic, Alice is acting quite brusque and business-like. "Next!" she says impatiently. "There are a lot of games to play."

OMISSIONS AND IMPROVEMENTS

Based on feedback from readers of the book, here are a few points that could be improved/added/made clearer etc.

* The last paragraph of page 30 reads:

In this particular example, if we observed the two balls prior to them dropping through the PETE and NOT boxes we would find any of the possible combinations of black and white with equal likelihood. After they come out the bottom we will only ever observe the balls to have opposite colors—the configurations with BB and WW were destroyed by interference.

A better phrasing would be:

In this particular example, if we observed the two balls prior to them dropping through the PETE and NOT boxes we would find any of the possible combinations of black and white with equal likelihood. However; if we do not observe them until after they come out the bottom we will only ever observe the two balls to have opposite colors—the configurations BB and WW of the initial mist were destroyed by interference.

The point is, if you do observe the balls at the top then you destroy (collapse) the misty state. That would change the calculation of what emerges after the PETE and NOT box.

* The rules for the boxes are fixed—for example a PETE box always splits a W to a [W,B] and a B to a [W,-B]. The rules seem very arbitrary. For example, there is an asymmetry due to the fact that with a PETE box it is only the black ball which splits to inject a negative sign into the mist. Why couldn't we use something more symmetric like W splits to [-W,B] and B splits to [W,-B]? Here is the calculation using this (unfortunately incorrect) rule:

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                    Begin with a W ball.
          After the first PETE box the state is [-W,B].
              After the second PETE box the state is
                        [-[-W,B],[W,-B]]
                        which is the same as
                            [W,-B,W,-B]
  and there is no interference (cancellation) to ensure the ball
                        always emerges white.
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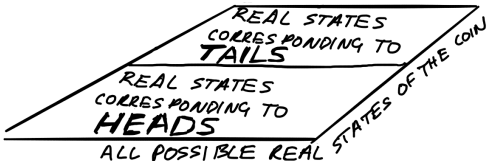
You should check it also fails to work for the case where the initial ball is black. So to fix things you would need to change some other rule somewhere, and ultimately you will get back to something equivalent to the rules I gave.

What I did not talk about in the book is that there is a lot of difficult physics that goes into working out which boxes obeying which rules are possible and which ones are impossible. For example, there is no way to construct a box that evolves W to [W,W,-B] and B to [-B,-B,W], but there does exist a box that evolves W to [W,W,-B] and B to [B,B,W].

I skipped the hard stuff and just told you to trust me about a few of the ones that can be built and what the amazing consequences of being able to build them are.

* It was pointed out to me that when this diagram is first introduced in Part III:



it looks a bit like a table or similar that the coin is being flipped onto. However; the diagram depicts something much more abstract—it depicts a "set" or "space" of points, each of which corresponds to a long list of the physical properties of a coin, what we call the "real states" of the coin.

Although I depicted it as a flat 2d rectangle, in modern physics we try to understand the "shape" of such spaces of real states (normally high-dimensional objects), under the constraint that any two points close together in the space correspond to points for which the associated lists of physical properties are also close/similar. In fact an amazing amount of information is contained in the shape of the space of real states/physical properties, and most physical theories need little more than to specify the shape of such a space. Yet when we try to understand Q-Reality—that is the types of real states which underpin the misty description of the world—we discover there is an

incredible tension between the assumption that it makes sense to talk about "real states" at all and any sort of "sensible" description of physical reality.

* I tried to give a brief high-level description of the various approaches physicists have taken to explaining the misty states and the phenomena they predict. I completely forgot to mention a class of approach that tries to be more symmetric between the future and the past, so that some of the issues of causal weirdness (discussed primarily in Part II) are circumvented by assuming the future can affect the past. Search for "retrocausality" and quantum theory.

* The figure on page 66 would be a bit clearer if the coin showed tails not heads (since then it would show a single instant of time within the story of the main text), but I couldn't draw an unambiguous looking "tails" and for pedagogical reasons wanted to describe Alice's actions given the tails outcome first.

* Page 21 and 35/36 refer to your (the reader's) mother (negative comments about the state of your room, packing lunchboxes) – using "parent" would have been more thoughtful.

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