

Assignment #1: The Two-Path Experiment

Due: Lec #4

1. Read the selection from Feynman's Lectures on Physics entitled "Quantum Behavior". There are simple but deep parallels between the electron interference experiment Feynman describes and the two-path experiment discussed in class and in chapter 1 of Albert. Explain, clearly and in a page or so, what these parallels are; for the two-path experiment, refer to the depiction of it given in Handout #1. In particular, you should be able to say, clearly and precisely, what it is about Feynman's interference experiment that is analogous to the following feature of the two-path experiment: when either path is blocked, 50% of the particles that make it through the final magnet go up; but when neither path is blocked (or interfered with in any other way), all of the particles that make it through the final magnet go up.
2. Imagine someone who responds to the apparently paradoxical nature of the two-path experiment in the following way: "Look, there is just no paradox here whatsoever. The argument that there *is* assumes that we can draw inferences about what is going on when we *aren't* making an observation (i.e., when we *don't* check to see which path the particle followed) from what is going on in situations where we *are* making an observation (i.e., when we *do* check to see which path the particle followed). But no such inference is legitimate. Science concerns what we can observe. To suppose that we can ever use our observations to draw conclusions about what is going on when we 'aren't looking' is absurd. So it is not puzzling or paradoxical at all that the spin-1/2 particles behave the way they do when we don't observe which path is followed."

Critique this argument, in 2 – 3 pages. Is the author's position justified? Why or why not? In constructing this critique, organize your thoughts *carefully*. For example, one of the first things you should do is to focus on the author's second sentence, and decide whether it is true; if not, his argument obviously is less convincing. Then—with an appropriate transition—you should consider what is involved in saying that "science concerns what we can observe", and whether this claim, if true, in fact supports the crucial conclusion that "we can [never] use our observations to draw conclusions about what is going on when we aren't looking." Finally, you should consider whether this conclusion is at all plausible. Are there elements of actual scientific practice that tell against it?