Einstein and Quantum Mechanics

We discuss here a possible psychological reason for Einstein's lack of enthusiasm for Quantum Mechanics.

While Einstein is generally credited with the invention of special relativity, in fact others had preceded him in this effort. Specifically both Lorenz and Poincaré had found the equations for the Lorenz Transformation, which are the mathematical key to special relativity. Einstein's contribution, which was fundamental, was to take the existing mathematical equations and provide them with a clear and compelling physical basis. Thus the theory transitioned from a herd of mathematical modifications to existing theory into a new, unified, and aesthetically satisfying structure. Einstein saw through the equations to the physical reality lying underneath, explained it clearly, and thus gained the heights of glory. The whole journey had a great effect on Einstein's conception of what Einstein should do.

When Heisenberg, Schrödinger and others invented the new quantum theory in 1925, the situation had many similarities to that Einstein had found in 1905. Here were a set of equations that allowed one to predict physical phenomena, just as Lorenz and Poincaré's equations had. Once again, in spite of the success of the equations in predicting atomic phenomena, the meaning of the equations was shrouded in dense fog. What more natural than that Einstein should reprise his 1905 role and explain the physical mechanisms underlying the phenomena?

But the problem was, he couldn't do it. There were three possible explanations for this. First, perhaps it can't be done. Second, perhaps Einstein wasn't smart enough. Third, perhaps the meaning of the equations wasn't clear because the description of the phenomena wasn't complete. Of these, the only explanation acceptable to Einstein would be the third.

We now suspect that the true explanation is the first; the equations of quantum mechanics do not describe a set of phenomena that are explicable in terms of classical concepts in a way that would be acceptable to Einstein. The atomic world works on principles that are inexplicable from a common sense perspective and the classical world comes out of the atomic world by approximation. This certainly was not the way Einstein wanted the world to work, and he was simply unwilling to give up the idea of a causal semi-classical world. As he once remarked, if that were the case he would rather be a plumber than a physicist.

His spectacular success in 1905 supported his notion that he was right and quantum mechanics was wrong (incomplete), and that he might indeed find some sort of golden key that would correct the error. There is another quote to the effect that he spent more time thinking about quantum mechanics than he spent on any of his other projects, but the thinking produced very little, although still more than nothing; Einstein is the godfather of quantum coherence. Still, there is a hint of a warning in all this; things are as they are, not the way they should be (i.e. we want them to be).