## 11.3: Quantifying Uncertainty

If a system is in an indeterminate state for a given observable, it means that we can't know exactly what we're going to measure if we do in fact make a measurement of that observable. We've seen that we can calculate the average of all the measurements we might make, suitably weighted by their probabilities; that's what is called the "expectation value" in quantum mechanics. And, we have seen how we can calculate the amplitude, and from that the probability, that we'll get any given possible measurement. With the spin-1/2 system we've been talking about, there are only two possible values that we might measure for the spin along any given axis: $+\hbar/2$ and $-\hbar/2$. As such, it's convenient just to list the probability of each. If you talk about other systems where there are a lot of possible measurements (including continuous systems such as the position of a particle), it becomes impractical to list the probabilities of each state. It would be nice to have some other way of quantifying our uncertainty.