Two Slit Interference: Conclusions

Photons (or electrons …) can produce interference patterns even one at a time !

With one slit closed, the image formed is simply a single-slit pattern.
We "know" (*i.e.*, we have constrained) which way the particle went.

With both slits open, a particle interferes with itself to produce the observed two-slit interference pattern.

This amazing interference effect reflects, in a fundamental way, the indeterminacy of which slit the particle went through. We can only state the probability that a particle would have gone through a particular slit, if it had been measured.

Confused? You aren't alone! We do not know how to understand quantum behavior in terms of our everyday experience. Nevertheless - as we will see in the next lectures – we know how to use the QM equations and make definite predictions for the probability functions that agree with careful experiments!

The quantum wave, ψ, is a probability amplitude. The intensity,
$P = |\psi|^2$, tells us the probability that the object will be found at some position.