

**SCHOOL OF PHYSICS  
AND ASTRONOMY**



**QUANTUM THEORY  
INTEGRALS. SO MANY INTEGRALS.**

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# **PART I.**

## **BACK TO BASICS — QUANTUM MECHANICS STYLE**

# TINY LITTLE THINGS SORT OF MOVING AROUND NOT ACTUALLY THAT FAST

## 1.1. DOUBLE SLIT EXPERIMENT

The double slit experiment demonstrates some of the most important points of quantum mechanics. Feynman was a particular fan of it. We make  $P_1 = |\phi_1|^2$  the probability of a particle passing through the first slit and likewise for  $P_2$ . Classically, we'd expect that

$$P_{1 \text{ or } 2} = P_1 + P_2 = |\phi_1|^2 + |\phi_2|^2,$$

which is all well and good but isn't what happens when we approach the quantum world.

We define two states,  $|i\rangle$  and  $|f\rangle$ , the initial and final states, and two intermediate states  $|1\rangle, |2\rangle \in \mathcal{H}$  for each of the slits. These are vectors in a Hilbert space, and as such are linear superposable and