de Broglie's hypothesis

The result of the experiments like blackbody radiation spectrum, Photoelectric effect among others clearly demanded a new set of principles to describe the physical systems. In his efforts along this direction, French physicist de Broglie came up with a proposal that suggested a completely new feature of matter and energy. Planck's hypothesis said that the energy of a photon of frequency ν is $E = h\nu$. But the momentum of a photon is known to be

$$p = \frac{E}{c} \tag{1}$$

which when combined gives the momentum in terms of wavelength λ of photon as

$$p = \frac{h\nu}{c} = \frac{h}{\lambda} \tag{2}$$

since $c = \nu\lambda$. Thus the momentum of radiation is determined by its wavelength.
Momentum is known to be an attribute of matter. de Broglie went ahead and proposed that the relation in eqn(2) must hold true for matter too. There must be a wave associated with every matter that has a definite momentum. The wavelength of this wave is determined again by eqn(2).
The immediate question that strikes ones mind is why we do not observe the effect of this "matter wave". Waves show the property of interference. If de Broglie's proposal holds true then one should have been able to observe the interference patterns for matter waves associated with every matter. It is very easy to experiment and check that we do not see any interference of any kind if we throw objects of mass of the order of ~ 1 gm or higher.
Interference patterns features distinct points of maxima and minima of intensity (and amplitude). The distance between consecutive maximum and minimum is of the order of the wavelength. Let us see what the wavelength of a de Broglie wave for an object of 1 gm with velocity, say, 1 m/s would be.

$$\lambda = \frac{h}{p} = \frac{6.626 \times 10^{-34}}{10^{-3}} = 6.626 \times 10^{-31} \text{ metres.} \tag{3}$$

This number is so small that no device known today can detect the interference pattern of this wave. So our observation that de Broglie waves of a mass of 1 gm does not interfere does not by itself rule out de Broglie's proposal.
On the other hand, if we find the de Broglie wavelength corresponding to an electron moving at about 10^5 m/s we find it to be

$$\lambda = \frac{h}{p} = \frac{6.626 \times 10^{-34}}{9.1 \times 10^{-31} \times 10^{7}} = 7.281 \times 10^{-9} \text{ metres.} \tag{4}$$

an eminently detectable number in many experiments. In fact, this number was put to test in an experiment done by Davisson and Germer to check for the prediction of de Broglie's proposal.