Uncertainty Principle Fully Explained by Simple Novel Example

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Abstract

Simple thought experiment is used to explain how Uncertainty Principle arises from the conflict between the results of measurement on a real system and the restrictions of our conceptual model needed to make it conceivable to classical mind.

Suppose that an intelligent physicist who is affected by a mental disorder that diminish his perception and cognitive abilities in such a way that his idea about geometrical shapes is confined to straight line and circle, while all of his mental abilities other than this are all right. And suppose that this physicist who used to make measurements on circles knows how the area and radius of a circle are related to each other:

$$(A = \pi r^2)$$

 And besides this, he has good measuring tools that can measure areas and lengths of different shapes and can also determine the centre of any area precisely.

When this (circular-minded) physicist makes his measurement on a squire (which he regards as a circle) for the first time, he will find nothing new or problematic in the result of measurement of the area but the problem is that the value he gets for the radius is not constant but changes in worrisome manner.
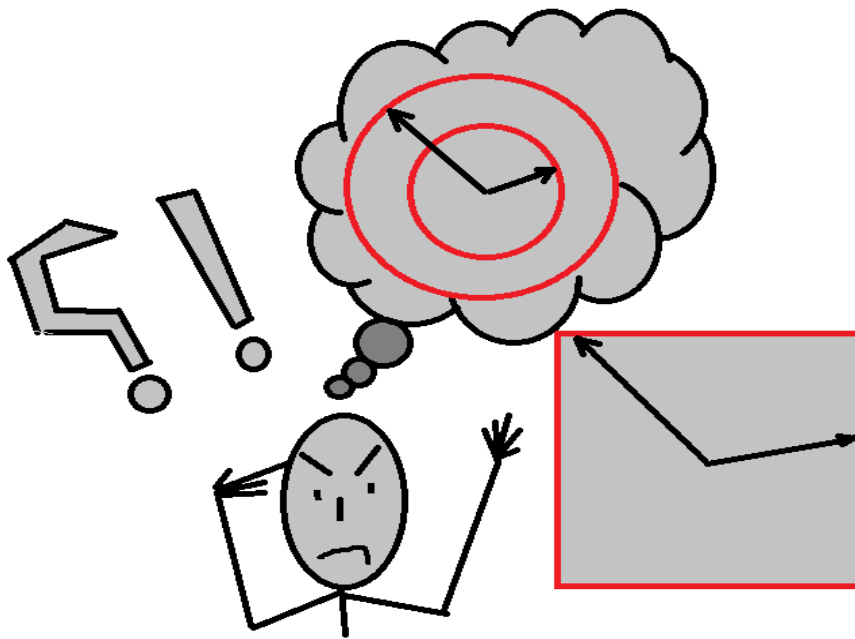
Now, to get rid of this contrast between the model in his mind and the result of measurement, this physicist must try to develop another model that agrees with measurement but still conceivable by his circular mind:

It may be that the circle has no fixed radius; it jumps every time from one value to another between two limits.
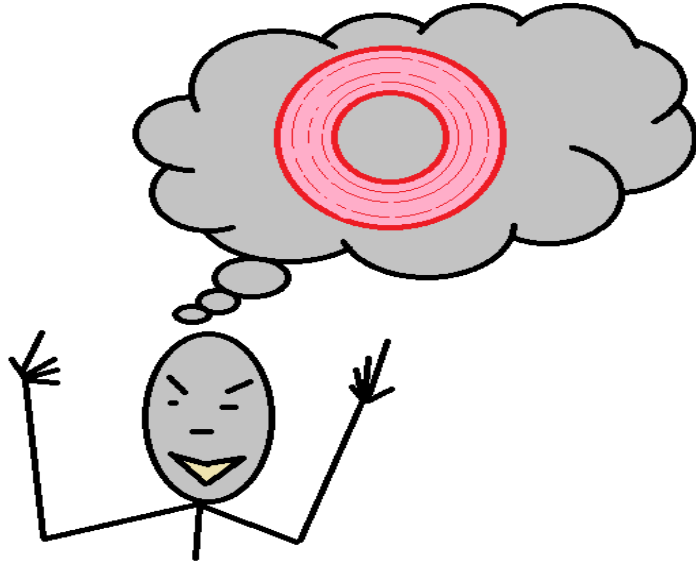
But after a while he would see that another problem arises in the results of measurement of the area because they are constant and don't jump from value to another as implied by this model.. It would look something like that a model which solves the problem of measurement of the radius generates another problem in the measurement of area and vice versa.

The general summary of this situation is that; this physicist can make a circular model that agrees with the measurement of the area but disagrees with that of the radius which is the model that regards the reality as a circle with constant radius, and he also can make a circular model that agrees with the measurement of the radius but disagrees with that of the area which is the model of a circle with a radius that jumps every time between two values.. and that he cannot build a circular model that agrees with both results of measurement except when he makes sacrifices of some of the accuracy of the measurements.