

Hughes, April 1965

Heisenberg's analysis of spectroscopic data led him to set up matrices to represent the  
~~Heisenberg considered dyn vars as matrices~~ dyn variables in an atom

This resulted in these not satisfying comm. mult.  $ab \neq ba$

When Heisenberg first noticed this he was very disturbed by it

Physicists previously had always used com. vars. and Heisenberg thought there must be  
something wrong with his theory when it led to non-com.

But he could not escape from it. My own work.  $q$ -numbers. Fitting in with class Hamilton mechanics

The non-com turned out to be the most important feature of the new theory.

It resulted in one not being able to visualize the new theory in the way physicists would do.

One has uncertainty relations and a statistical interpretation

Shortly after Heisenberg's discovery, another form of Q.T. was put forward by Schrödinger.

Schrödinger <sup>believed</sup> thought that the energy levels of atomic systems should come out as an eigenvalue problem  
and found a neat equation for expressing his ideas, by applying de Broglie's wave

But Schrödinger also had a great worry.

Applying his eqn to the  $H$ -atom, working relativistically, he got the wrong answer

There were then two Q.T.'s to work with

Mathematicians set to work to find the connections between them. Mainly von Neumann

→ Physical Interpretation