224(7): Simple Refutation of the Heisenberg Uncertainty Principle (UFT175)

The Heisenberg uncertainty principle can be stated as:

$$\langle [\hat{q}, \hat{p}] \rangle = i\hbar \quad -(1)$$

where $\hat{q}$ and $\hat{p}$ are generators of quantum mechanics and where $\hbar$ is the reduced planck constant:

$$\hbar = \frac{h}{2\pi} \quad -(2)$$

It was asserted erroneously by Heisenberg that eqn. (1) is a principle of indeterminacy, and that $\hat{q}$ and $\hat{p}$ may be "unknowable". These are notions Bacanian concepts rejected immediately by Einstein, de Broglie, Schroedinger and Dirac, and later by many other leading physicists.

In UFT175 the anticommutator equation was derived:

$$[\hat{x}^2, \hat{p}^2]\psi = 2i\hbar [\hat{x}, \hat{p}]\psi \quad -(3)$$

where ψ is the wavefunction, $\hat{x}$ the position operator and $\hat{p}$ the momentum operator. Eqn. (3) was evaluated by direct calculation using the

2) exact solutions of the Schrodinger equation: the harmonic oscillator, particle on a ring, spherical harmonics and wave functions of the hydrogen atom.

The following were calculated:

$[x, p_x]$, $[x, p_x^2]$, $[x^2, p_x]$, $[x^2, p_x^2]$,

$\{x, p_x\}$, $\{x, p_x^2\}$, $\{x^2, p_x\}$, $\{x^2, p_x^2\}$,

for each exact solution of the Schrodinger equation.

It was found that for the harmonic oscillator:

$$\langle [\hat{x}^2, \hat{p}_x^2] \rangle = 0 \quad \text{---(4)}$$

and also for some other exact solutions. In the Heisenberg & Copenhagen interpretation eq. (4) means that $\hat{x}$ and $\hat{p}_x$ are "knowable". However, from eq. (1), the Copenhagen interpretation asserts that $\hat{x}$ and $\hat{p}_x$ can be "absolutely unknowable", i.e. that if $\hat{p}_x$ is known completely, x is completely unknowable. However, if $\hat{x}$ is completely unknowable, it seems "completely knowable" again from eq. (4), reductio ad absurdum. The Heisenberg uncertainty principle is obviously absurd.