DEVELOPMENT OF THE HEISENBERG UNCERTAINTY PRINCIPLE IN THE EVANS UNIFIED FIELD THEORY

The first step towards the Heisenberg Uncertainty Principle in the standard model is to determine the conditions under which two observables may be specified simultaneously. This condition is:

$$[\hat{A}, \hat{B}] = 0 \quad -(1)$$

i.e.:

$$\hat{A}\hat{B} = \hat{B}\hat{A}. \quad -(2)$$

The examples usually given are position and momentum:

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

which means that:

$$x p_x \neq p_x x. \quad -(4)$$

In the standard model complementary observables are observables represented by non-commuting operators. It is then argued in the standard model that complementary observables are not knowable simultaneously.

This is the Heisenberg uncertainty principle (1927) of the standard model. Recently the principle has been shown to be incorrect using various types of experiment, notably:

J.R. Croca, "Towards a Nonlinear Quantum Physics"
(World Scientific, 2003)

2) This book summarizes many experiments that show the incorrectness of the uncertainty principle. It was also rejected by Einstein, Schrodinger, de Broglie, Vigier and many others. The recent Afshar experiment at Harvard also shows that the principle is incorrect, because photons and electromagnetic waves can be observed <u>simultaneously</u>. It is also well known that the Heisenberg interpretation of quantum mechanics is incompatible with Einstein's general relativity. The latter is known to be precise to $1 : 10^5$ using the latest long baseline interferometric experiments (NASA, 2002).

Recently, the Evans unified field theory has shown that the wave equations of physics can be obtained from the tetrad postulate of differential geometry. The fundamental wave function is the tetrad q^a_μ of the Palatini variation of general relativity. The fundamental structure of spacetime is determined by <u>the Evans lemma</u>:

$$\Box q^a_\mu = R q^a_\mu \quad -(5)$$

This is the lemma or subsidiary proposition that leads to <u>the Evans wave equation</u>:

$$(\Box + kT) q^a_\mu = 0 \quad -(6)$$

3)

using the contracted form of the Einstein field equation:

$$R = -kT \quad \text{— (7)}$$

Here R is scalar curvature in inverse metres squared and T is the index contracted energy-momentum density. In the limit of special relativity the correspondence principle shows that:

$$kT \rightarrow \left(\frac{mc}{\hbar}\right)^2 \quad \text{— (8)}$$

where m is the mass of a particle, c the speed of light and $\hbar$ the reduced Planck constant.

From eqn. (8) we can define the volume of a particle in the limit of special relativity:

$$\boxed{V_0 = \frac{\hbar^2 k}{mc^2}} \quad \text{— (9)}$$

It is also possible to define the momentum density:

$$\frac{p}{V} = \frac{mc}{V} \quad \text{— (10)}$$

It is seen that the concepts of volume V and momentum density p / V ~~is~~ are the result of the Evans unified field theory. The Evans Lemma shows that the fundamental structure of wave equations originates in differential geometry.

4)

These experimental and theoretical results strongly suggest that the Heisenberg uncertainty principle should be abandoned or otherwise completely re-interpreted. The Schrodinger equation on the other hand is directly obtained from the non-relativistic limit of the Evans wave equation, provided that the wave-function is recognized as the tetrad.

The basic flaw in the Heisenberg uncertainty principle is that the role of V in eqn. (9) is not recognized. In general relativity momentum is part of canonical energy-momentum density. The Evans unified field theory shows for the first time that the rest energy mc^2 of a particle must define the volume V in eqn. (9). Each elementary particle is characterised by its volume V. This fact is not recognized in the standard model and so is not recognized in the Heisenberg uncertainty principle.

For the electron:

$$m = 9.10953 \times 10^{-31} \text{ kgm}$$

and using:

$$k = 1.86595 \times 10^{-26} \text{ N s}^2 \text{ kg}^{-2}$$

$$c = 2.998 \times 10^{8} \text{ m s}^{-1}$$

$$\hbar = 1.054 \times 10^{-34} \text{ J s}$$

5) it is found that:

$$\boxed{V_0 = 2.53 \times 10^{-81} m^3} \quad -(11)$$

Therefore the volume of the electron is <u>finite</u>. It is not a point particle as in the standard model.

The standard model gives:

$$\delta x \, \delta p \geq \hbar / 2 \quad -(12)$$

from a well known statistical analysis. However, the high resolution microscope studies of Croca et al. give:

$$\delta x \, \delta p \ll \hbar / 2 \quad -(13)$$

even for moderate resolutions. For arbitrarily high resolution:

$$\delta x \, \delta p \rightarrow 0 \quad -(14)$$

in complete denial of the Heisenberg Uncertainty Principle. Also, the independent experiments of Afshar at Harvard show that the photon as particle and photon as wave can be observed simultaneously, <u>indicating eqn (14)</u>.

These results suggest ~~that~~ the

objectively correct version of eqn (12) must involve the volume V_0. This suggests that the correct form of the Heisenberg uncertainty principle is:

$$\boxed{\delta x \, \delta p \geq \frac{V_0}{V} \frac{\hbar}{2}} \quad -(15)$$

where V is the sample volume and V_0 the fundamental particle volume.

Depending on sample volume it is seen that eqn. (15) reproduces the results of the Croca experiments and the Afshar experiment. For $V = 1.0 \, m^3$ for example,:

$$\delta x \, \delta p \rightarrow 0 \quad -(16)$$

and the particle and wave can be observed simultaneously. On the other hand, if:

$$V = V_0 \quad -(17)$$

the Heisenberg uncertainty principle is regained. However, the principle is never interpreted as indeterminacy. It is interpreted to mean that the least value of angular momentum in the universe is $\hbar$.