Quantum Mechanics and our Universe

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Introduction

100 years ago Rutherford and Niels Bohr presented their planetary atomic model where electrons circle at high orbital velocities around the atomic nucleus like planets around the Sun. At the time two kinds of velocities were known, Newton's non-relativistic velocity and Einstein's relativistic velocity. Newton's non-relativistic velocity equation worked fine for small velocities such, as rifle bullets or the outer planetary orbits; but when it was discovered that nothing could exceed the speed of light no matter how much energy was added, a new equation was needed. Einstein solved the problem in 1905 with his relativity theory.

Perhaps the most important breakthrough related to quantum mechanics at the time, was the discovery of Planck's constant *h,* by Max Planck in 1900**.** Planck found that in the atomic world energy *E* comes in frequency or cycles per second or *E/f=h*. In other words, each cycle in a frequency carries a fixed amount of energy. Then by multiplying the number of cycles per second by *h* gives the energy of a frequency or *E=hf*. This is true for electromagnetic radiation and the frequency of atomic orbits.

Bohr realized that when an electron falls in towards the atomic nucleus it will lose energy to radiation and become captured in different distinct orbits where the frequency, energy and velocity of each orbit are determined by Plank's constant *h.* Thus, the energy of atomic orbits became quantized. However, a problem became immediately clear, namely that neither Newton's nor Einstein's energy-velocity equations seemed to fit the orbital velocities. Obviously Newton's equation would not work since most orbits are too fast and can be considered relativistic. But why did Einstein's relativity equation not work? Because

Einstein's equation only works when energy is added to an electron's rest mass energy such as in a particle accelerator for example, and not when electrons have lost energy to radiation, as what happens when captured in atomic orbits.

A different energy-velocity equation for loss of energy is needed and the answer comes from Mach's Principle that involves absolute space and absolute velocities which Einstein early on wanted to incorporate in his relativity theories. However, he reluctantly changed his mind when his mathematics teacher Herman Minkowski convinced him otherwise. Minkowski introduced the pure mathematical concept of space time which eliminated absolute space and absolute velocity. This meant that the Universe had no center or center of mass to which our position in space and velocities could be referred to. That was a mistake which at long last can been rectified thanks to the rebirth of Mach's Principle which states that Inertia of mass, or energy E_0 of inertial mass must be generated by the rest of the Universe or

$$\emptyset_{univ} = \frac{G\, M_{univ}}{R_{univ}} = c^2$$

Where $\emptyset_{univ}$ is the gravitational tension of the Universe or energy per mass, E_0/m, generated by the Universe, $E_0 = m\,\emptyset_{univ} = mc^2$. R_{univ} is the absolute distance to the center of mass of the Universe and M_{univ} is the mass of the Universe within R_{univ}. *G* is the Universal gravitational constant. Since Einstein's relativistic equation, in its present form, only deals with velocities produced by an increase in energy we need to turn to Mach's principle which can handle both velocities whether generated by gain or loss of rest mass energy E_0.

1) Velocities generated by increase in rest mass energy $E_0 + \Delta E$

$$\Delta v = \sqrt{\emptyset_{univ} - \emptyset_{univ}\left[\frac{E_0}{E_0+\Delta E}\right]^2}$$ (Einstein and Mach).

2) And rest mass energy lost $E_0 - \nabla E$

$$\nabla v = \sqrt{\emptyset_{univ} - \emptyset_{univ}\left[\frac{E_0-\nabla E}{E_0}\right]^2}$$ (Mach).

That Einstein's Relativity Theory needs to be modified by Mach's Principle and split into two equations can be confirmed by Louis de Broglie's atomic theory. See also http://aflb.ensmp.fr/AFLB361/aflb361m657.pdf

Louis de Broglie's Atom

Around 1926, an important discovery was made, when the French scientist, Louis de Broglie, announced that if energy comes in frequency then energetic particles such as high speed electrons must have frequency and therefore possess associated wavelengths since velocity divided by frequency equals wavelength. Furthermore, de Broglie proposed that the circumference of an atomic orbit should equal the wavelength λ of the orbiting electron in sequences of ½λ, 1λ, 1½λ *etc*. According to de Broglie's thinking, moving particles such as electrons, must have wave lengths which he referred to as a pilot waves.

This met with ridicule at the famous Solvay congress in 1927 and since neither Newton's nor Einstein's equations worked well for de Broglie's atom, it was soon forgotten. But had de Broglie lived today he would have had the last laugh, because by applying the proper velocity equation derived from Mach's Principle his atomic theory proves to be the only right one and it provides exact mathematical solutions. Soon after de Broglie's announcement an Austrian scientist hijacked some of de Broglie's ideas, which was considered primitive, and proceeded to construct an equation based on waves only which eliminated de Broglie's orbiting electron as a particle. The equation is known as the Schrödinger equation, but can be ruled out because it is a non-relativistic equation based on Newton's mechanics and cannot offer exact solutions since atomic orbits are most definitely relativistic. Attempts were made to fudge the equation mathematically by introducing several corrections in order to match the observed orbital energies. The most noteworthy of these corrections are the Dirac-Fock correction; Self energy correction; Vacuum polarization correction; and Nuclear size correction, to mention a few. Furthermore, there is also probability mathematics associated with the Schrödinger equation and therefore, does not qualify as an exact mathematical solution, which is required in physics, and physics should be an exact science. Applying velocities derived from Mach's

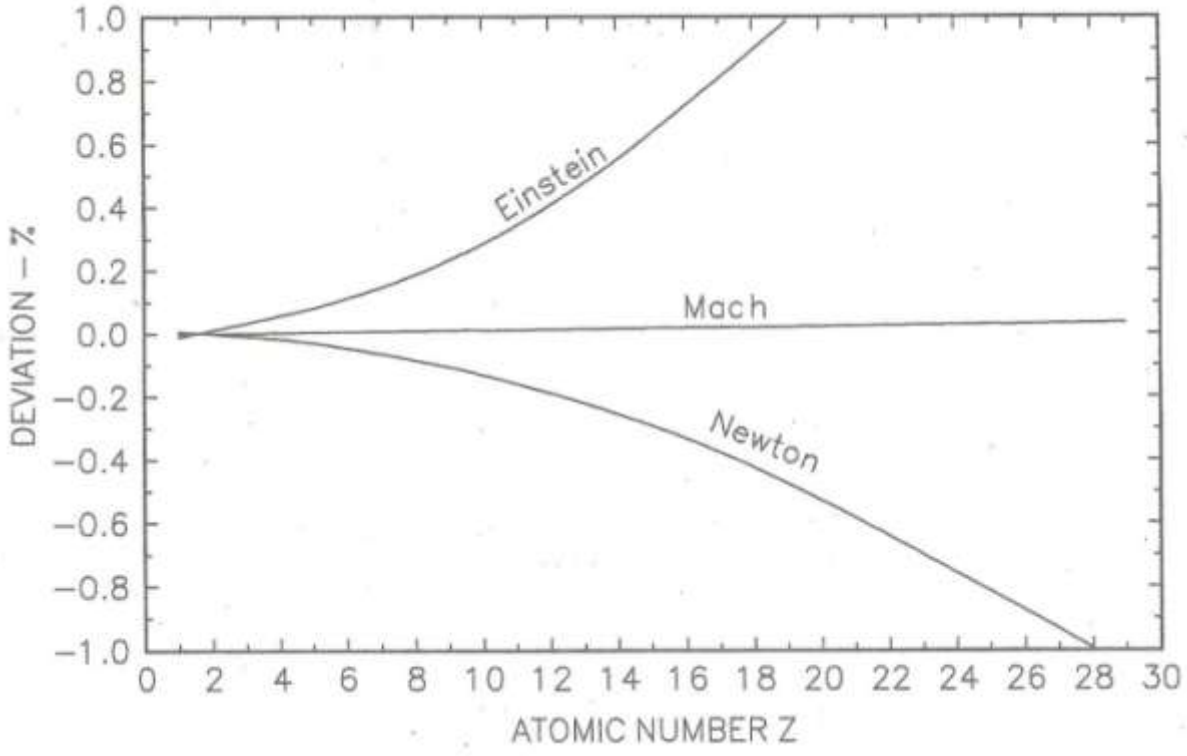
Principle to de Broglie's original atom provides exact solutions. According to Louis de Broglie's atom and wavelength equation the circumference of the innermost orbit in atoms is

$$\frac{\frac{1}{2}h\nabla v}{\nabla E} = \frac{Zq^2}{4\varepsilon_0 \nabla E} \qquad \text{(Half wavelength).}$$

Solving for ∇E by inserting ∇v from Mach's energy loss equation above

$$\nabla E_e = E_0\left[1 - \sqrt{1 - \left(\frac{Zq^2}{2\varepsilon_0 hc}\right)^2}\right] \times \frac{m_n}{m_n + m_e} \text{ (Joules),}$$

where m_e and m_n are the masses of the orbiting electron and the atomic nucleus and which reduces the energy to that of the electron only. The equation gives exact values of the orbiting electron's ground state energy for atomic numbers Z, over the entire periodic table without corrections. The diagram shows deviation in % using Einstein's, Mach's and Newton's equations compared to measured values presently available in *The Handbook of Chemistry and Physics*.



THE UNCERTAINTY PRINCIPLE

The difficulty in finding exact mathematical solutions in quantum mechanics and having to resort to statistics can mostly be blamed for by the Uncertainty Principle. The Uncertainty Principle, created by Heisenberg at the time, became a stick in the wheel for quantum mechanics since it implies that an electron, for example, cannot be pinpointed either physically or mentally. The Uncertainty Principle states that we cannot know a particle's momentum and position at the same time. In mathematical terms the Uncertainty Principle is written as

$$\Delta p\, \Delta x = \tfrac{1}{2}\, \hbar,$$

where Δp and Δx stand for changes in momentum and position respectively and $\hbar = h/2\pi$. The Uncertainty Principle together with the statistical elements of the Schrödinger's wave equation forced Bohr and his group in Copenhagen to claim that one cannot determine in finest details what happens in the quantum world and that physical processes on the quantum scale are left to chance. Einstein disagreed and said "God does not play dice" and he and some of his supporters tried hard, but in vain to disprove the Copenhagen interpretation and concluded that there must be a hidden variable in the Uncertainty Principle. Einstein's intuition proved to be right because there is, not a hidden variable, but a hidden parameter namely acceleration, since a change in momentum means a change in velocity and a change in velocity is the manifestation of acceleration.

THE COSMIC ACCELERATION

Since Δp and Δx in the Uncertainty Principle are inversely proportional and their product equals a constant (Planck's constant) we can also write $p\, x = \tfrac{1}{2}\hbar$. Choosing the maximum momentum of an electron to equal $p = m_e c$ (from Einstein's rest mass Energy $E_0 = m_e c^2$) permits us to obtain the associated displacement x as determined by $\hbar$. Since $\hbar$ is in units of angular frequency, $\omega_0 = 2\pi/s$ or one radian per second, we can write $x = a_0/\omega_0^2$ and obtain

$$\frac{m_e\, c\, a_0}{\omega_0^2} = \tfrac{1}{2}\,\hbar.$$

Solving for a_0 yields an acceleration of $7.622479 \times 10^{-12}\mathrm{m\ s^{-2}}$ which is the ever present cosmic acceleration generated by the gravitational mass and radius of the Universe or

$$\emptyset_{univ} = \frac{G\,M_{univ}}{R_{univ}} = c^2 \quad \text{and} \quad a_0 = \frac{G\,M_{univ}}{R_{univ}^2}$$

The cosmic acceleration was predicted in *Astrophysics and Space Science, Volume 74, Issue 1, pp.157-167* (1981) and later discovered from red shift measurements of streaming galaxies and more recently by supernova studies.

COSMIC GRAVITATIONAL TENSION

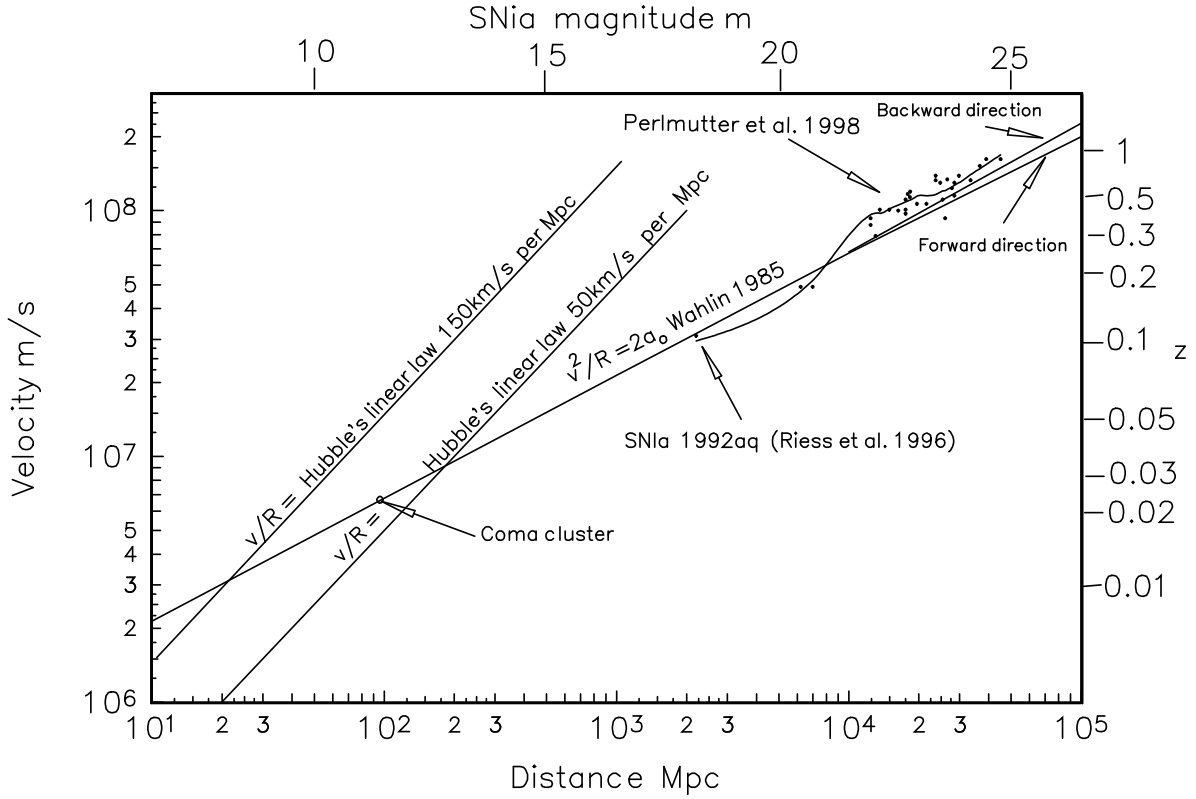
The cosmic gravitational potential or gravitational tension $\emptyset_{univ}$ above which is equal to the energy per mass (E_0/m) generated by the Universe or in other words $E_0 = m\,\emptyset_{univ}$ which is the same as Einstein's $E_0 = m\,c^2$.

I personally prefer to call $\emptyset_{univ}$ gravitational tension instead of gravitational potential since tension can be associated with vibrations and therefore act as a propagating medium (ether) for electromagnetic waves and force fields.

Knowing the cosmic acceleration a_0 one can find the distance to the center of mass of the Universe $R_{univ} = 1.17908 \times 10^{28}$ m and the total mass of the Universe within R_{univ} to equal M_{univ} =1.5948×10^{55}kg. The cosmic acceleration a_0 also accurately predicts the recession velocity v of galaxies as a function of distance *R*, from the basic equation

$$\frac{v^2}{R} = 2a_0$$

See the Hubble diagram below which was first published in 1984 (*The Collapsing Universe* ISBN 0-933407-00-9) before recent supernova measurements from the late 1990s were discovered but added here.



That the Universe is accelerating was first observed by Dressler *et al* in 1987 *Ap. J. (letters)* **343**, L37 when they found that Galaxies were streaming in one direction and accelerating with increasing velocity toward a "Great Attractor" too far to be observed. The Great Attractor is almost certainly the center of mass of the Universe. Ten years later other groups Riess *et al.* and Pearlmutter *et al* reported that the Universe is accelerating as a result of supernovae measurements, but attributed it to expansion, instead of attraction, and caused by some, up until now unexplainable dark energy.

How do we account for red shifts "z" if matter is accelerating and falling toward the center of mass of the Universe? It is in fact easier to explain than dark energy, since the galaxies that are falling ahead of our galaxy have accelerated more and are speeding away from us, while we are pulling away from galaxies that are still behind us and in an earlier state of acceleration. Because we can only observe a small fraction of our Universe it will seem that we are pulling apart, which creates the illusion of expansion.

My opinion is that we are part of an oscillating Universe in a phase of contraction and that the cosmic background radiation is a result of thermalized radiation from all stars in the Universe, Olber's light?

Several things can be learned from the above:

1) Einstein's Relativity Theory has to be modified by Mach's Principle to include absolute space and to distinguish between velocities generated by increase or by loss of rest mass energy.

2) The Uncertainty Principle is simply explained by the hidden parameter a_0, the cosmic acceleration, because It is not possible to precisely determine velocity or momentum while accelerating or to pinpoint a position.

3) Space is filled with energy in the form of gravitational tension $\emptyset_{univ}$ (c^2) because energy per unit mass is generated by the mutual gravitational mass of the whole Universe. The gravitational tension is the propagating medium for electromagnetic waves and force fields and when constant the velocity of light is constant.

4) Hubble's diagram shows that Hubble's constant is not constant but follows a quadratic function because of the cosmic acceleration a_0. Since the acceleration is so small, Hubble did not detect any deviation from linearity at the distances he measured and therefore assumed a constant expansion rate.