A PHOTON APPROACH TO ELECTON MASS

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Abstract: In 1981 the author discovered a frequency condition for atomic and molecular emissions. In 1983 he suggested that the mass of an atom's electron is a function of the atom's atomic number, binding energy and the temperature of its continuum. In 1985 a new model was postulated for molecular structures and an energy equation was derived for the inoization of atoms. In 1987 a universal equation for molecular structures was derived. In the present paper we return to the electron mass problem and derive certain equations based on ionization data. We also argue for a unified theory of nature based on this equation.

1. Introduction.

In the past few years there has been a lot of talk about the possibility of a grand unified theory of nature but while everyone was talking, the author continued his research on the nature of atomic and molecular particles. He now believes his universal equation for molecular structures will unify both theory and science.

In 1981 a frequency condition for atomic and molecular emissions was discovered which is given by

$$f_\infty = f_n(1 + 1/n) \qquad (1)$$

where f_∞ is the frequency of a photon released when a carrier wave jumps from a quantum state of n = ∞ to the ground state and f_n is the frequency of a photon released when a carrier wave jumps from a quantum state of n to the ground state.

Equation (1) does suggest that the mass of an electron is constant but that the mass of a carrier wave binding an electron to a nucleus is variable. However, the increase in the ionization potentials of elements with an increase in temperature of an element's continuum does suggest that the mass of an electron is variable. In this paper we will be interested in determining the mass of an electron as it is effected by changes in temperature, quantum state, velocity and kinetic energy.

In 1983 it was suggested that the mass of an electron was a function of the photon binding energy and an equation was derived for photon mass. The mass of a ground state photon is given as

$$m = m_n(1 + 1/n) \qquad (2)$$

where m is the ground state mass, m_n is the mass of a photon released when an electron jumps from a quantum state n to ground state, and n is the quantum number.

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The mass of the free photon is hidden because a free photon is in an unstressed condition. The author has also suggested that the ground state mass of each element's ground state electron was a function of the atom's atomic number and it was suggested that a photon mass was a function of temperature.

In 1985 a new model for molecular structures was postulated and an energy equation for ionization was derived. The ionization equation is given as

$$E_2Z_1^2 = E_1Z_2^2 \tag{3}$$

where E is the ionization energy of an atom's ground state electron, Z is the atomic number of an atom's nucleus and the subscripts distinguish two different atoms. In retrospect (3) does not only apply to carrier waves that bind electrons to an atom's nucleus but it also applies to carrier waves that bind molecules.

In 1987 a universal equation was derived for molecular structures which is given as

$$N = WC_p/[CZ^2(1 + 1/n)d] \tag{4}$$

where N is the number of atoms in the nucleus of a molecule, W is the atom's atomic weight, C_p is the constant pressure specific heat of the molecule's continuum, Z is the atom's atomic number, n is the quatum number of the molecule's outside carrier wave, d is the density of the molecule's continuum and C is a universal constant. Equation (4) was the final proof that the author's theory and equations were correct.

2. Theory.

All particles are bonded by photon carrier waves. Photon carrier waves are closed looped chains consisting of gravitons [Harper, 1987]. In the free state a photon carrier wave consists of two or more particles which orbit a common axis of rotation and traverse the axis of rotation at the speed of light [Currah, 1981]. Particles are bonded when one or more closed looped photon carrier waves capture two or more particles [Currah, 1985]. Electrons consist of compressed closed looped photons [Harper, 1987]. If gravity is a photon then the only difference between light, heat and gravity is the number of photon particles and the frequency of the photons [Currah, 1987]. The Harper model of the electron and the Currah model of the molecule suggest that all particles in nature and all forces in nature have the same basic structure, the structure of a photon.

The binding force of a photon is Coulombic in nature. The binding force between an atom's ground state electron and nucleus is given as

$$F = ZQ^2/(4\pi\varepsilon R^2) \tag{5}$$

where F is the binding force, Z is the atomic number of the atom's nucleus, Q is the charge of an electron, ε is the dielectric constant and R is the distance between the centers of the atom's orbiting electron and nucleus. The charge Q represents the force of tension between the gravitons and ε represents the stress on the gravitons.

The Coulomb force between the atom's electron and nucleus is balanced by centrifugal force due to the orbital motion of the electron within its orbital path about the atom's nucleus. The orbital centrifugal force is

$$F = -m_e v^2/R \tag{6}$$

where F is the orbital centrifugal force, m_e is the mass of the electron and R is the distance between the centers of the atom's electron and nucleus.

An electron's orbital potential energy is equal to its orbital kinetic energy; therefore, the orbital potential energy of an atom's ground state electron can be given as

$$E = \tfrac{1}{2}m_e v^2 \tag{7}$$

where E is an electron's ground state orbital potential energy, m_e is the electron's mass and v is the electron's orbital velocity.

Combining (6, 7) will give an expression for the orbital potential energy of an atom's ground state electron as

$$E = -FR/2 \tag{8}$$

where E is the potential energy, F is the electron's centrifugal force and R is the distance between the centers of an atom's ground state electron and nucleus.

Combining (5, 8) will give an expression for the binding force between the atom's ground state electron and nucleus as

$$F = 16\pi\varepsilon E^2/(ZQ^2) \tag{9}$$

and it will give an expression for the distance between an atom's ground state electron and nucleus as

$$R = -ZQ^3/(8\pi\varepsilon E) \tag{10}$$

where F is the binding force, R is the distance between centers, Z is the atom's atomic number, Q is the charge on the electron, ε is the dielectric constant and E is the electron's orbital potential energy.

The spring constant of the closed looped photon binding the ground state electron to the atom's nucleus is given as

$$K = \partial F/\partial R \tag{11}$$

where K is the spring constant and $\partial F/\partial R$ is the change in Coulomb force binding the atom's ground state electron to the nucleus with respect to a change in distance between the centers of the atom's ground state electron and nucleus.

Differentiation of (9) will give an expression for change in Coulombic force as

$$\partial F = 16\pi[(E\partial\varepsilon + 2E\varepsilon\partial E)Q^2 - 2E^2\varepsilon Q\partial Q]/(ZQ^4) \tag{12}$$

and differentiation of (10) will give an expression for the change in distance between the centers of the atom's ground state electron and nucleus as

$$\partial R = Z[Q^2(\varepsilon\partial E + E\partial\varepsilon) - 2E\varepsilon Q\partial Q]/(8\pi\varepsilon^2E^2) \tag{13}$$

Combining (12, 13) with (11) will give an expression for the binding photon's spring constant as

$$K = 128\pi^2\varepsilon^2\, E^2(2E^2\varepsilon Q\partial Q - Q^2E\partial\varepsilon - 2Q^2E\varepsilon\partial E)/[ZQ^4(Q^2\varepsilon\partial E + Q^2E\partial\varepsilon - 2\varepsilon Q\partial Q)] \tag{14}$$

Under steady state orbital conditions the mass and orbital velocity of an atom's ground state electron are constant; therefore, the atom's dielectric constant and the electron's charge do not change. However, the atom's ground state electron vibrates with respect to the orbital radius between the centers of the atom's ground state electron and nucleus. If we let the change in the dielectric constant, $\partial\varepsilon$, and the change in charge, ∂Q, equal zero we get an expression for the spring constant as

$$K = 256\pi^2\varepsilon^2E^3/(Z^2Q^4) \tag{15}$$

where K is the spring constant of the binding photon, ε is the dielectric constant, E is the electron orbital potential energy, Z is the atom's atomic number and Q is the charge.

The angular natural frequency of the electron is given as

$$w_e = (K/m_e)^{\frac{1}{2}} \tag{16}$$

where w_e is the angular natural frequency of an atom's ground state electron, K is the spring constant and m_e is the mass of the ground state electron.

The natural frequency of an electron within its orbital path is given as

$$f_e = w_e/(2\pi) \tag{17}$$

where f_e is the natural frequency and w_e is the angular natural frequency.

Combining (15, 16) with (17) will give an expression for the natural frequency of an atom's ground state electron as

$$f_e = [64\varepsilon^2E^3/(Z^2Q^4m\ )]^{\frac{1}{2}} \tag{18}$$

where f_e is the natural frequency, ε is the dielectric constant, E is the electron's orbital potential energy, Z is the atom's atomic number, Q is the charge and m_e is the mass of the electron.

3. Binding Energy.

The total binding energy of an orbital electron about the nucleus of an atom can be calculated from the known ionization potentials of elements. It can be seen from (4) that atoms do not exist in nature as independent particles but they are bonded together in clusters called molecules or cells. Before an electron can be ionized the molecule must be completely ionized. The total binding energy of an atom's electron at ground state is equal to the electron's ionization potential at ground state.

The total binding energy of an atom's electron above ground state is given as

$$E_t = E_n + E_g \tag{19}$$

where E_t is the electron's total binding energy, E_n is the ionization energy released when an electron jumps from a quantum state of n to ground state and E_g is the electron's ground state binding energy.

Combining (1) and De Broglie's wave frequency equation, E = hf, will give

$$E_g = E_n(1 + 1/n) \tag{20}$$

where E_g is the ground state binding energy of an atom's ground state electron, E_n is the ionization energy released when an electron jumps from a quantum state of n to ground state and n is the quantum state number.

Combining (19, 20) will give an equation for an orbital electron's total binding energy as

$$E_t = E_g(2n + 1)/(n + 1) \tag{21}$$

The ionization energy released when an electron jumps from a quantum state of n to ground state can be given as

$$E_n = E_g - E_i \tag{22}$$

where E_n is the ionization energy released, E_g is an electron's ground state binding energy and E_i is the ionization energy captured when an electron jumps from a quantum state of n to a quantum state of $n = \infty$.

Combining (20, 22) will give an expression for the quantum state number as

$$n = (E_g - E_i)/E_i \tag{23}$$

where n is an electron's quantum state number. Equation (23) is used to test ionization potentials data. The test is needed to exclude molecular ionization potentials from electron potentials.

Example 1. Determine the total binding energy of a nitrogen atom's outside electron. The ionization potentials for a nitrogen molecule are given as 14.54, 29.47, 47.17, 73.5, 97.43, 546.7 and 663 e.v. [5].

We first test the data using (23).

$$n_1 = (663 - 47.17)/47.17 = 13$$
$$n_2 = (663 - 73.5)/73.5 = 8$$

We now calculate the binding energy using (21).

$$E_{t1} = 663(2x13 + 1)/(13 + 1) = 1278.6 \text{ e.v. } (2.086745143x10^{-17} \text{ K}_g - m^2/sec^2)$$
$$E_{t2} = 663(2x8 + 1)/(8 + 1) = 1252.3 \text{ e.v. } (2.0438087999x10^{-17} \text{ K}_g - m^2/sec^2)$$
$$E_{t3} = 663(2x6 + 1)/(6 + 1) = 1231.3 \text{ e.v. } (2.009458285x10^{-17} \text{ K}_g - m^2/sec^2)$$

In view of example 1, we can see that the outside electron had jumped from a quantum state of 6 to a quantum state of 8 and 13 during the ionization of the nitrogen molecule. The ionization energy of the photons used for the ionization were in the 21 to 27 e.v. range.

4. Orbital Mass.

The orbital mass of an electron is given from Einstein's theory of relativity as

$$m = m_0/(1 - v^2/c^2)^{\frac{1}{2}} \tag{24}$$

where m is the orbital mass, m_0 is the rest mass of an electron, v is the velocity of an electron and c is the speed of light. The at-rest mass for an electron is given as $9.11x10^{-31}$ K_g, and the speed of light is $2.99793x10^8$ m/sec. Equation (24) can be used to verify the mass of an electron in orbit, if the orbital velocity is known.

The orbital mass of an electron can also be given as

$$m = m_0 + E_t/(2c^2) \tag{25}$$

where m is the orbital mass, m_0 is the at-rest mass, E_t is the orbital binding energy and c is the speed of light. We can see from (25) that the Einstein relativistic mass is equal to one half of the photon mass binding the electron.

The total kinetic energy of an orbital electron is equal to one half of the binding energy; therefore, an equation for an orbital electron's kinetic energy can be given as

$$E_t = mv^2 \tag{26}$$

where E_t is the orbital binding energy, m is the orbital mass and v is the actual combined velocity of the electron. It can be seen from (26) that the actual binding energy is balanced by relativistic mass captured by the electron.

Because an electron must travel in a helical path it rotates about its orbital path like a ball on a chain. The actual velocity of an orbital electron can be given as

$$v_1 = (v_2^2 + v_3^2)^{\frac{1}{2}} \tag{27}$$

where v_1 is the actual electron velocity, v_2 is the orbital velocity about the atom's nucleus and v_3 is the helical velocity about the orbital path.

Combining (26, 27) will give two equations for orbital velocities at two quantum states as

$$v_2 = (E_{t1}/m_1 - v_3^2)^{\frac{1}{2}} \tag{28}$$

and

$$v_5 = (E_{t2}/m_2 - v_6^2)^{\frac{1}{2}} \tag{29}$$

where v_2 and v_5 are orbital velocities, v_3 and v_6 are helical velocities and E_{t1} and E_{t2} are binding energies at two quantum states.

During a change in state, the orbital momentum of an electron does not change; therefore, a momentum balance can be given as

$$m_2v_5 = m_1v_2 \tag{30}$$

where m_1 and m_2 are the electron masses and v_2 and v_5 are the electron orbital velocities at two quantum states.

Combining (28, 29, 30) will give an equation in v_3 and v_6 as

$$m_2^2v_6^2 - m_1^2v_3^2 = m_2E_{t2} - m_1E_{t1} \tag{31}$$

The change in helical momentum of an electron can be given as

$$\Delta M = m_2v_6 - m_1v_3 \tag{32}$$

where ΔM is the change in helical momentum.

Combining (31, 32) will give equations for the helical velocities as

$$v_3 = (m_2E_{t2} - m_1E_{t1} - \Delta M^2)/(2\Delta M m_1) \tag{33}$$

and

$$v_6 = (m_2E_{t2} - m_1E_{t1} + \Delta M^2)/(2\Delta M m_2) \tag{34}$$

where v_3 and v_6 are helical velocities, m_1 and m_2 are the electron masses, ΔM is the change in helical momentum and E_{t1} and E_{t2} are the binding energies.

The significant momenums of an electron at two quantum states can be given as

$$M_1 = m_1v_2 + m_1v_3 \tag{35}$$

and

$$M_2 = m_2v_5 + m_2v_6 \tag{36}$$

where M_1 and M_2 are the significant momentums.

Multiplying (35) by v_2 and v_3 and multiplying (36) by v_5 and v_6 gives:

$$M_1v_2 = m_1v_2^2 + m_1v_2v_3 \tag{37}$$

$$M_1v_3 = m_1v_3^2 + m_1v_2v_3 \tag{38}$$

$$M_2v_5 = m_2v_5^2 + m_2v_5v_6 \tag{39}$$

$$M_2v_6 = m_2v_6^2 + m_2v_5v_6 \tag{40}$$

Combining (28, 37, 38) will give an equation for M_1, and combining (29, 39, 40) will give an equation for M_2 as

$$M_1 = (E_{t1} + 2m_1v_2v_3)/(v_2 + v_3) \tag{41}$$

and

$$M_2 = (E_{t2} + 2m_2v_5v_6)/(v_5 + v_6) \tag{42}$$

Subtracting (41) from (42) gives an equation for the change in electron momentum when an electron changes quantum states, as

$$\Delta M = [(E_{t2} + 2m_2v_5v_6)/(v_5 + v_6)] - [(E_{t1} + 2m_1v_2v_3)/(v_2 + v_3)] \tag{43}$$

Example 2. Determine the relativistic mass of a nitrogen atom's electron at quantum states 8 and 13 and verify the results with equation (22).

We first calculate the bonding energy (vide: example 1).

We next calculate the relativistic mass using (25):

$m_1 = 9.11\times10^{-31} + 2.043087999\times10^{-17}/[2(2.99793\times10^{8})^2] = 9.111137017\times10^{-31}$ Kg

$m_2 = 9.11\times10^{-31} + 2.086745143\times10^{-17}/[2(2.99793\times10^{8})^2] = 9.111160904\times10^{-31}$ Kg

We next compute the change in electron momentum with a change in quantum state and the orbital and helical velocities by trial using (41, 42, 28, 29, 41) respectively.

$v_3 = [9.111160904\times10^{-31}\times2.086745143\times10^{-17} - 9.111137017\times10^{-31}$
$\times2.043807999\times10^{-17}(6.411551254\times10^{-26})^2]/(2\times6.411551254\times10^{-26}$
$\times9.111137017\times10^{-31}) = 3313662.267$ m/sec

$v_6 = [3.912560482\times10^{-49} + (6.411551254\times10^{-26})^2]/(2\times6.411551254\times10^{-26}$
$\times9.111160904\times10^{-31}) = 338423.88$ m/sec

$v_2 = [(2.043807999\times10^{-17}/9.111137017\times10^{-31}) - (3313662.267)^2]^{\frac{1}{2}}$
$= 3384023.879$ m/sec

$v_5 = [(2.086745143\times10^{-17}/9.111160904\times10^{-31}) - (3384023.88)^2]^{\frac{1}{2}}$
$= 3384015.006$ m/sec

$\Delta M\ [2.086745143\times10^{-17} + 2\times9.111160904\times10^{-31}\times3384023.88\times3384015.006$
$/(3384023.88 + 3384015.006)]^{\frac{1}{2}} - [2.04387999\times10^{-17} + 2\times9.11113701\times10^{-31}$
$\times3313662.267\times3384023.879/(3313662.267 + 3384023.879)]^{\frac{1}{2}}$
$6.411551254\times10^{-26}$ Kg m/sec

We next calculate the actual velocity of the electron using (25):

$v_1 = [(3384023.88)^2 + (3384015.006)^2]^{\frac{1}{2}} = 4736240.622$ m/sec

$v_4 = [(3313662.27)^2 + (3384023.879)^2]^{\frac{1}{2}} = 4785726.191$ m/sec

We now verify the relativistic mass using (24):

$m_1 = 9.11\times10^{-31}/[1 - (4736240.622)^2/(2.99793\times10^{8})^2]^{\frac{1}{2}} = 9.111137088\times10^{-31}$ Kg

$m_2 = 9.11\times10^{-31}/[1 - (4785726.191)^2/(2.99793\times10^{8})^2]^{\frac{1}{2}}\ \ 9.111160978\times10^{-31}$ Kg

The computation of orbital and helical velocities by trial is done by assigning a value to ΔM; ΔM(Computed) - ΔM(Assigned) = 0.

5. Electron Orbits.

The length of an orbital electron's radius of rotation is a function of the electromagnetic forces of the binding photon. When the binding photon is in tensile condition we say the electron is negatively charged. When the binding photon is in a compressed condition we say the nucleus is positively charged. Charge is a conditional state of a photon.

The potential energy of an orbital electron about an atom's nucleus is given as

$$E = \tfrac{1}{2}KR^2 \qquad (44)$$

where E is the potential energy, K is the spring constant of the binding photon and R is the orbital radius.

Combining (44) with (15) will give an equation for orbital radii as

$$R = [Z^2Q^4/(128\pi^2\varepsilon^2E^2)]^{\frac{1}{2}} \qquad (45)$$

where R is the radius of rotation, Z is the atom's atomic number, Q is the charge, ε is the dielectric constant of free space and E is the potential energy.

The orbital energy of an electron is the energy stored in the binding photon and is equal to the orbital kinetic energy; therefore the potential energy can be given as

$$E = \tfrac{1}{2}mv^2 \tag{46}$$

where E is the orbital potential energy, m is the mass of the electron and v is the orbital velocity.

Example 3. Determine the orbital radius of a nitrogen electron at quantum state 8 and 13 (vide example 2).

We first calculate the orbital potential energy using (46).

$$E_2 = 9.111137017\text{x}10^{-31}(3384023.879)^2/2 = 5.21686286\text{x}10^{-18}\ K_g\ m^2/sec^2$$

$$E_5 = 9.111160904\text{x}10^{-31}(3384015.006)^2/2 = 5.216849175\text{x}10^{-18}\ K_g\ m^2/sec^2$$

We next calculate the orbital radii using (43).

$$R_2 = \{7^2(1.6021\text{x}10^{-19})^4(.102)^2/[128\pi^2(8.854\text{x}10^{-12})^2(5.21686286\text{x}10^{-18})^2]\}^{\frac{1}{2}}$$

$$= 1.11628132\text{x}10^{-11}\ m$$

$$R_5 = \{7^2(1.6021\text{x}10^{-19})^4(.102)^2/[128\pi^2(8.854\text{x}10^{-12})^2(5.216849175\text{x}10^{-18})^2]\}^{\frac{1}{2}}$$

$$= 1.116284249\text{x}10^{-11}\ m$$

We can see from example 3 that the orbital radius of the electron in quantum state 13 is longer than that for quantum state 8 when the potential energy is less. This is acceptable because the photon chain is longer for quantum state 13.

The orbital rotational frequency is a function of the orbital radius and the orbital velocity, and is

$$f = v/(2\pi R) \tag{47}$$

where f is the orbital rotational frequency and R is the orbital radius.

Example 4. Determine the orbital rotational frequency and the helical vibrational frequency for a nitrogen electron in quantum state 8.

We first calculate the orbital rotational frequency using (47).

$$f = 3384023.879/(2\pi 1.11628132\text{x}10^{-11}) = 4.82480642\text{x}10^{16}\ cycles/sec$$

We now calculate the helical vibrational frequency using (18).

$$f_e = \{64(8.854\text{x}10^{-12})^2(5.21686286\text{x}10^{-18})^3/[7^2(1.6021\text{x}10^{-19})^4 9.111137017\text{x}10^{-31}(.102$$

$$= 4.824806423\text{x}10^{16}\ cycles/sec$$

The helical rotational radius which is also the vibrational amplitude is given as

$$R_e = v_e/(2\pi f_e) \tag{48}$$

where R_e is the helical radius, v_e is the helical velocity and f_e is the helical rotational frequency.

Example 5. Determine the helical rotational radius of a nitrogen electron in quantum state 8 (vide examples 2 and 4).

We clculate the helical rotational radius using (48).

$$R_e = 3313662.267/(2\pi 4.824806423\text{x}10^{16}) = 1.093071272\text{x}10^{-11}\ m.$$

We can see from examples 3 and 5 that the electron rotates about its orbital path one time for each orbital rotation about its nucleus. Experiments have indicated that an electron will orbit its nucleus twice for each theoretical orbital rotation. The author suggests that the experiments indicate a helical path rather than a mystical extra rotation.

6. General Equation For Mass.

In 1983 the author suggested that the mass of an orbital electron is a function of its binding energy and its atom's atomic number and continuum temperature. If we combine (25, 21) we will obtain an expression for electron mass as

$$m = m_0 + [E_g(2n + 1)/[2c^2(n + 1)] \quad (48)$$

where m_1 is an electron's orbital mass, m_0 is an electron's rest mass, E_g is an electron's ground state binding energy, c is the speed of light and n is an electron's quantum state number.

Combining (48, 3) will give an expression for an electron's orbital mass as

$$m_1 = m_0 + E_2Z_1^2(2n_1 + 1)/[2c^2Z_2^2(n_1 + 1)] \quad (49)$$

where m_1 is an electron's orbital mass, m_0 is the rest mass, Z_1 is its atom's atomic number, n_1 is its quantum state number, c is the speed of light, E_2 is the ground state binding energy of any electron and Z_2 is the atomic number of the second electron's atom.

The binding energy of a ground state electron can be given as

$$E_2 = aT^b \quad (50)$$

where E_2 is an orbital electron's ground state binding energy, T is the temperature of the electron's atomic continuum and a and b are constants.

Combining (50, 49) will give an expression for the mass of an orbital electron as

$$m_1 = m_0 + aT_2^bZ_1^2(2n_1 + 1)/[2c^2Z_2^2(n_1 + 1)] \quad (51)$$

where m_1 is the electron's orbital mass, m_0 is the rest mass, Z_1 is its atom's atomic number, n_1 is its quantum state number, c is the speed of light T_2 is the temperature of its atom's continuum, Z_2 is the atomic number of any other atom amd a and b are constants for the binding energy of the other atom.

Expressions for the constants a and b are given as

$$b = (\ln E_2 - \ln E_1)/(\ln T_2 - \ln T_1) \quad (52)$$

and

$$a = \exp[\ln E_1 \ln T_2 - \ln E_2 \ln T_1)/(\ln T_2 - \ln T_1)] \quad (53)$$

where E_2 and E_1 are the ground state binding energies of the second atom at two temperatures.

Example 6. Determine the mass of an oxygen atom's outside electron at 30° C. The binding energy for hydrogen is given as 13.527 e.v. at 20° C, and the binding energy for hydrogen is given as 13.595 e.v. at 25° C [5, 6].

We first determine the constants a and b using (52, 53).

$$b = (\ln 13.595 - \ln 13.527)/(\ln 298.16 - \ln 293.16) = .2965038374$$

$$a = \exp[(\ln 13.527 \ln 298.16 - \ln 13.595 \ln 293.16)/(\ln 298.16 - \ln 293.16)]$$
$$= 2.510125677$$

We now calculate the mass of an oxygen atom's outside electron using the general equation for mass as

$$m_1 = 9.11 \times 10^{-31} + 2.510125677 \times 302.16^{.2965038374} 8^2 (2 \times 7 + 1) 1.6 \times 10^{-19} \times .102 / [2(2.99793 \times 10^8)^2 1^2 (7 + 1)] = 9.111487044 \times 10^{-31}$$

7. Conclusion.

If there be a 'Grand Unified Theory of Nature' then our universal equation for molecular structures and general equation for electron mass must have a place in the argument.

Our universal equation for molecular structures has unified concepts in heats of formations, internal energy, emission spectra, X-ray crystallography and laser technology.

Based on this general equation for mass, the author argues that all particles in nature consist of compressed photon loops, that photons consist of a chain of gravitons, that in the compressed condition photons have mass and in the tensile condition photons have charge. In example 2 it was seen that our equation was in 100% agreement with Einstein's theory of relativity. Our general equation is based on the idea that one half of the binding energy is converted to relativistic mass and that one half of the binding energy is converted into charge. However, mass and charge are conditional. In an unstressed condition a photon has no mass or charge.

Based on this universal equation for molecular structures it can be argued that all particles are bonded by closed looped photons and that there is a unified building code that allows the coexistence of particles.

Based on the frequency condition it can be argued that light, heat and gravity all consist of photon chains; the only difference is the number of gravitons in the chain.

It can also be argued that all other forces in nature consist of photon chains; what we observe is based on special sets of conditions for each force. Photon chains are closed looped, attached or free. Photons are compressed, stretched or unstressed.

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