The Physical and Philosophical Nature of the Universe

I. The Physical Nature Of Our Existence

Book 1. Fundamentals

By Harry W. Schmitz

Edited and with an Introduction by Harry A. Schmitz

Special Edition for the 2003 Annual Conference
of the Natural Philosophy Alliance

June 11, 2003

Library of Congress catalog card number: 83-70164

Printed in the United States of America

Contents

Editor's Introduction
By Harry A. Schmitz

This thin book contains enough radical science to engross legions of physicists in new investigations for decades. The concepts stagger the imagination. Their originality is astonishing. That being said, it is fitting to say a few words about the origin of these ideas, at least insofar as they came to be passed on to me.

In the 1970s, my father spent countless hours inculcating his favorite theory in my mind. Also, he wrote a treatise, modestly titled "The Physical and Philosophical Nature of the Universe," in which he summarized the main results of his lifetime of research. He passed away suddenly in November 1979, a few weeks before his fifty-sixth birthday; for his sixtieth birthday, in 1983, I printed a few copies of his treatise and distributed them to friends and family.

Twenty years have passed since then. My father estimated that he was fifty years ahead of his time. He might be about right. After all, the times have changed. There is more talk than ever before of multiverses, and dreams of a "unified field theory" or a "theory of everything" are still very much alive. The end of physics is nowhere in sight, yet it is widely acknowledged that not much more progress is possible without the introduction of radical ideas followed by a major paradigm shift.

This new edition is just on time for my father's eightieth birthday. This time, I have copyedited the text for readability. Although I have been successful on many occasions in turning obtuse writing into transparently clear prose, his style of writing does not lend itself well to revisions, and the originality of the ideas makes the task even harder. While I have striven to avoid changes to the substance and style, I would like to apologize for the shortcomings.

The original treatise was divided into two parts, covering the physical and philosophical nature of our existence. The first part contained 14 chapters plus appendices and selected investigations. Presently, I am publishing only the first seven chapters of the first part, along with an additional table of contents for the later chapters to indicate the scope of his investigations. The final unpublished chapters are natural extensions of the ideas in this book but are in a rudimentary stage of development, so I am postponing their publication.

The organization of this book is such that the derivations of important equations are presented in an abbreviated form in the main chapters, and more de-

tailed derivations are given in the appendices. Unfortunately, this organization entails some repetition and flipping back and forth between the derivation appendices and the main chapters. As the editor, I have not been able to find an alternative approach that would not substantially change the author's original presentation. I apologize for the minor inconveniences that the reader experiences with this presentation when first learning this material.

This book unequivocally presents the fundamentals of this theory. It stands by itself, introducing about a half-dozen groundbreaking equations that someday will be celebrated as among the most astounding discoveries of the twentieth century. Moreover, these equations are *not* difficult to master. Complete, simple derivations are given in the appendices. In my opinion, this book represents my father's truly creative contribution to the advancement of science.

A few words should be said about the essay titled "The Philosophical Nature of Our Existence," which will be published separately. According to my father, after he had discovered the physical theory, he searched for an appropriate philosophy to complement it. The philosophical essay obviously was written after the physical theory was discovered and developed.

The philosophical essay can be read anytime, but my father clearly intended that it be read with an understanding of the physical concepts presented in the first part. In this essay, he presents his personal views on the philosophical implications of his work. Although he was not a professional philosopher, he was a deep thinker with an excellent grasp of major philosophical trends. We are fortunate to have a personal essay from him on these issues. It is not the sort of essay that typically would be published in a scientific journal; however, it is an essential part of the original treatise and should be presented as such.

In conclusion, I would like to say that it is a privilege to be associated with what I consider to be a landmark in the advancement of Science. Those who love Science are ready for these ideas. Young and old will be eager to learn from these books. Doubtlessly, they will subject these new ideas to the most rigorous tests presently available to human kind. Ultimately, given the glorious history of Science, the readers of this book, by and by, will help to evolve a satisfactory understanding of the physical and philosophical nature of our existence, for the benefit of all human beings.

Harry A. Schmitz
Port Washington, New York
June 2003

Self Test

This self test not only serves to orient the reader to the contents of the present book but also can be used to check one's comprehension before attempting to move on to Chapters 8 through 15. Readers should become completely familiar and comfortable with the present book before turning their attention to more complex materials. I am postponing the publication of the later chapters until the answers to the questions below are broadly appreciated and understood.

Questions for Chapter 1

1. How can one overcome "psychologically conditioned impressions" and attain a worthwhile understanding of these physical concepts?
2. How is it possible to minimize the use of complex field and transformation equations?

Questions for Chapter 2

3. What conditions lead to a supernova event?
4. Can a pressure above $2P_0$ exist in a pulsar core?
5. What density corresponds to $2P_0$?
6. What is meant by the hypercritical condition of pressure energy?
7. Graph the gravitational pressure and the total energy from $r = 0$ to R_0.
8. Write the definite integral for the energy E_G needed to transport a unit volume of mass M_E through the gravitational field from $r = 0$ to $r = R_0$.
9. Explain why the gravitational energy should be approximately equal to $M_E c^2/2$.
10. The gravitational constant for the space in which a pulsar is formed can be expressed in terms of three physical properties of the pulsar. What are they?
11. Look up the indefinite integral of $\theta^2 \cos\theta$ in a table of integrals and evaluate between 0 and $\pi/2$.

Questions for Chapter 3

12. What is the number of wavelengths that can exist along the radius R_0 of a standing wave pattern in the pulsar space?

13. What is the distance that light travels in a year?

14. How many wavelengths impinge upon the surface of the pulsar in a year?

15. If the total energy of a standing wave (SW) pattern is E_T, then what fraction of energy is lost from the total energy of the pattern when a single wavelength impinges on the surface?

16. Graph the equation $exp(T/T_0) = R_0/r_0$.

Questions for Chapter 4

17. How is the total number of oscillations calculated?

18. What is the significance of the ratio of the total number of oscillations that have occurred since the supernova explosion, when it is divided by the present frequency of oscillation of the pattern?

19. What is absolute time?

20. What is relative time?

Questions for Chapter 5

21. According to this analysis, what are the two basic SW patterns that form as a result of energy focusing effects?

22. How does the energy in one wave shell compare with the energy in another?

23. How does energy focusing lead to a maximum energy state?

24. Where does the maximum energy state occur?

25. What is the "C sphere"?

26. What are the "C points" and "C ring"?

Questions for Chapter 6

27. What is the energy contained in the core of a nucleon?

28. What is the initial total energy of the pulsar core?

29. What is the ratio between the initial total energy of the pulsar core and the energy contained in the core of a nucleon of radius r_0?

30. Including all the wave shells from $r = 0$ to $r = R_0$, what is the total energy of a single standing wave pattern that has a core radius r_0?

31. What is the ratio between the initial total energy of the pulsar core and the total energy of a single SW pattern that has a core radius of r_0?

Additional Contents of the Original Treatise

I. The Physical Nature of Our Existence

Book 1. Fundamentals

Chapters 1-7 See the contents page for this book.

Book 2. Interactions

8. Field Energy Storage Analysis
   8.1 Force Equilibrium
   8.2 Motion Equilibrium
9. Gravitational Constant
10. Planck's Constant of Action
11. The Electron Charge
12. Rydberg Constant of Infinity

Book 3. Applications

13. Time Derivative Relationships
    13.1 Pulsar Invariants
    13.2 Hubble Constants
    13.3 Planetary Orbital Relationships
    13.4 Perihelion Effects
14. Cosmology
    14.1 Galaxy Formation and Evolution
    14.2 Spiral Galaxy Formation and Evolution
15. Selected Investigations
    15.1 Pulsars
    15.2 Cosmic Background Radiation

II. The Philosophical Nature of Our Existence

List of Symbols

A new physical constant, which can be called the "field energy storage constant," is mentioned in this book but not derived until the later chapters. This important constant is represented by g, the conventional symbol for the acceleration due to gravity, because its approximate value of about 980 is numerically but not dimensionally similar to the acceleration due to gravity at the Earth's surface (9.81 m/s^2 in metric units). As such, "little gee" works as a good mnemonic or memory aid for this important new constant. I believe that this constant ranks in importance besides Planck's constant and the fine structure constant. Time will be the judge with respect to the crude methods used by HWS to calculate its value. – *The Editor*

Physical Constants

$2P_0$ ... maximum pressure sustainable in the core

M_0 ... maximum density; unit volume of mass at maximum density

c ... velocity of light for universe in which core forms

M_E ... unit volume of mass in the core; $M_E = P_0/c^2$

G_0 ... gravitational constant for universe in which core forms

R_0 ... radius of core

E_0 ... total reversible energy in core

T_0 ... absolute unit of time; core radius divided by acoustic velocity

C_y ... acoustic velocity in core; distance light travels per year

g ... field energy storage constant ($\sim$ 980.665

Variables

m_n ... nucleon mass

r_0 ... radius of nucleon core

$4r_0$ ... wavelength of nucleon wave pattern

F_y ... frequency of wave pattern in cycles per year

E_T ... sum of energy in nucleon cores at time T

T_A, T ... absolute time; number of periods elapsed of duration T_0

r_t ... radius of nucleon core at time T

N_f ... total number of oscillations up to time T

τ_t ... period to travel one wavelength distance through pressure differentials

τ_0 ... period to travel wavelength distance through no pressure differentials

Δc ... increase in velocity in higher pressure region

E_N ... energy of nucleon core region

E_e ... energy of electron core region

E_G ... gravitational potential energy

P_r ... pressure at distance r from core center of nucleon or electron

Numerical Constants

A ... $16(\pi^2 - 8)/3\pi^2 \approx 1.01$

B ... $2(\pi - 2)/(\pi^2 - 8) \approx 1.22$

D ... $\pi^2/[8(\pi - 2)] \approx 1.08$

Chapter 1

Physical Concepts

A much deeper understanding of the nature and origins of our physical existence can be achieved when certain unique concepts are defined and formulated. These concepts can be used both quantitatively and qualitatively, to specify a complete model of our physical universe and to reveal the coherent unity of the knowledge that pertains to our physical existence.

Our psychologically conditioned impressions could preclude attaining a worthwhile understanding of the concepts, so any meaningful analysis requires careful attention to details. These concepts also include an absolute reference base that allows for the fullest development of our philosophical reasoning. Serious investigations into these areas could result in experiences that have major personal impacts.

Loss of objectivity in dealing with the natural laws makes continued progress impossible and simply ends in negative emotional rationalizations. It would be much more preferable to have a conflict of understanding reveal a fault in the concepts, rather than to have the conflict exist because of a misinterpretation of the full nature and scope of the concepts.

This conceptual analysis uses basic mathematical tools, including the differential and integral calculus; it follows Newton's laws; and it abides by the rules of general energy conservation. The simple geometries and imposed limitations make it possible to minimize the use of complex field and transformation equations, although the application of such mathematical methods to these physical concepts could be investigated by referring to the excellent literature available on those subjects.

An important aspect of these concepts deals with the structure of space. Fortunately, a complete mathematical model for these concepts exists within the "pulsar" core that is created by a "supernova" event; therefore, a pulsar core analogy is developed to clarify the concepts. The following analysis of a hypothetical supernova event introduces a "pulsar space" that contains an evolutionary basic frequency, standing wave, energy pattern.

Chapter 2

Pulsar Analysis

When the hydrogen nuclei of a gravitationally linked "cloud" interact, radiate away their kinetic energy of motion and chemical energy of combination, and condense into a star, then two conditions together could precipitate a supernova event.

First, the rotational moment of the cloud must be small enough that the cloud does not redistribute its mass among multiple stars and planets; secondly, the mass of the cloud must be in excess of the critical mass that would result in a massive breakdown of the nucleon wave patterns.

Contraction into a star mass continues until the gravitational forces build up pressures in excess of a critical limiting pressure, which is specified as $2P_0$. At that pressure, the nucleon waveforms break down and release energy through the highly accelerated direct fusion of nuclei. Enormous rates of energy release occur as the nuclei fuse towards the decreasing binding energy series of elements, and the star blasts away matter at the velocity of light. This explosive transformation is known as a supernova event.

As dramatic as this event may appear, the hypercritical conditions arising in the core of the supernova are even more important to this analysis.

The maximum pressure $2P_0$ and the corresponding density M_0 in the core represent the maximum pressure and density at the critical temperature that can be sustained by the nucleon wave pattern. This nucleon wave pattern is the fundamental basis of matter in the particular "astronomical" universe in which the supernova exists; consequently, this pressure ($2P_0$) and density (M_0) are the maximum values that can exist within the core of the supernova. They preclude the existence of "black holes" except as mathematical exercises carried through a region of discontinuity.

The supernova continues to explode (and matter and energy continue to be blasted into space) for as long as the total mass and the corresponding gravitational forces create pressures in excess of the critical pressure $2P_0$. Once a supercritical core radius R_0 is reached, however, certain conditions quench the explosion and define the pulsar core.

As the core shrinks in size to the radius R_0, the maximum value of gravi-

tational pressure also decreases. The gravitational pressure eventually drops to a value of approximately one-half of $2P_0$ in the center. The maximum value of the additional pressure energy also becomes equal to P_0, so that the maximum value of total pressure energy is $2P_0$. Meanwhile, as matter continues to be blown away, the pressure towards the surface decreases, resulting in a pressure gradient (i.e., a gradient of energy density, since pressure equals energy per unit volume).

Equilibrium is reached when the additional (or reversible) energy density at each point in the gradient equals the energy required to impart the escape velocity to the matter at that point. In practice, this gradient is approximated by a cosine curve distribution of pressure energy, which has a pressure P_0 at the center of the core and zero pressure at the surface.

The gravitational gradient is such that the energy required to transfer a given mass from the center of the core to the surface equals the energy that would be contained in that mass if it were travelling at the acoustic velocity, or the velocity of light. This energy is equivalent to $\frac{1}{2}M_E c^2$. (Since the potential energy of pressure times volume must equal the kinetic energy of $\frac{1}{2}M_E c^2$, the assumed cosine curve of pressure distribution is only a mathematical approximation.)

Taking into account certain correction factors (including the effects of the field energy storage constant g upon gravitational energy transfers), the following equation can be derived. (See Appendix A1.)

$$G_0 = \frac{3g}{8A}\frac{c^2}{M_E R_0^2} \tag{2.1}$$

The difference between the total pressure energy and the gravitational pressure energy now constitutes the reversible potential energy of the system. Assuming a cosine curve of distribution for this reversible potential energy of pressure, the following expression is obtained for the total reversible energy E_0. (See Appendix A2.)

$$E_0 = \frac{3AP_0R_0^3}{2} \tag{2.2}$$

This particular energy state assumes special importance, because it represents the maximum potential energy that can be reversibly contained within the gravitational field of the core. It represents the initial moment of creation of the "pulsar space," and it is also the origin of the reaction-wave energy pattern of pulsar space. At this initial moment, when the time T equals zero, the potential pressure energy E_0 begins to expand the core as it converts into the kinetic energy of motion. A true pulsar action is now initiated, and the evolution of the energy wave pattern can be analyzed.

Chapter 3

Wave Pattern Analysis

As the original, reversible, potential energy of pressure oscillates or pulsates between the potential and kinetic forms of energy (within the constraints of the gravitational field of the pulsar core), the boundary conditions at the pulsar surface (radius R_0) exert an important influence on the evolution of the wave pattern.

The surface acts as a nodal point that limits the further transmission of energy through this surface. The energy lost by this surface "ringing" of the pulsar causes a constant reduction of the wavelength of the original pressure-energy wave and gives rise to "standing waves" of increasing frequency. This wave pattern is referred to as the basic-frequency reaction wave pattern.

If the positive pressure energy of each wave "passing" through the surface is dissipated and lost, the following equation results. (See Appendix A3.)

$$e^{\frac{T}{T_0}} = \frac{E_0}{E_T} = \frac{R}{r_0} = 4F_y T_0 \tag{3.1}$$

Chapter 4

Time Standards — Absolute and Relative

The concepts of absolute and relative times should be introduced and defined at this point.

An *absolute time standard* can be established by assigning a value to the acoustic velocity, the velocity of light. A convenient time value T_0 can be defined as the core radius R_0 divided by the distance C_y that light travels in one year, i.e., $T_0 = \frac{R_0}{C_y}$. Then, this unit of time T_0 can be used to measure absolute time values.

The absolute time T_A divided by T_0 gives the number of these time cycles since the initial moment, which corresponds to $T_A = 0$. (See Appendix A4.)

$$T_A = T_0 \ln\left(\frac{R_0}{r_t}\right) \tag{4.1}$$

$$\frac{T_A}{T_0} = \ln\left(\frac{R_0}{r_t}\right) \tag{4.2}$$

A *relative time standard* can be established by assigning a value to the frequency F_y of oscillation of the basic reaction wave pattern or, equivalently, to the time interval for light to travel one wavelength $4r_0$ of the pattern.

Since the pattern frequency is constantly increasing, the relative time interval is decreasing with respect to the absolute time interval. Most conventional definitions of time assign a fixed value to a relative time interval of oscillation. Therefore, relative time standards need to be related to the absolute time standard.

To establish this relationship, let F_y equal the frequency of oscillation of the waves in the evolving energy pattern, i.e., $F_y = \frac{C_y}{4r_0}$, expressed in cycles per year. Also, let the total number of oscillations that have occurred in the basic frequency pattern be equal to N_f. The total number of oscillations N_f can be related to the frequency of oscillation by the following equation. (See Appendix A4.)

$$N_f = F_y T_0 \tag{4.3}$$

If relative time is made a constant, then the relative age of the pattern is given as follows.

$$\frac{F_y T_0}{F_y} = T_0 \tag{4.4}$$

In other words, the relative age of the pattern is equal to the absolute time required to travel the core radius R_0 at the velocity of light. This interesting fact is important for further analysis, because it establishes important time rate-of-change relationships.

When the wavelength of the basic frequency pattern becomes very small compared to the core radius R_0, then important evolutionary effects are introduced. Modified, stable, equilibrium waveforms are created.

Chapter 5

Energy Focusing Effects

The acoustic velocity differs slightly over the adiabatically varying regions of high and low pressures within the basic frequency pattern. The velocity of a superimposed waveform crossing this pattern slightly increases in the high-pressure region and slightly decreases in the low-pressure region. The following expression can be derived for the average time τ_t to travel one wavelength $4r_0$ of varying pressure. (See Appendix A5.)

$$\tau_t = \frac{4r_0}{c}\left(1 + \left(\frac{\Delta c}{c}\right)^2\right) \tag{5.1}$$

When this varying pressure is localized about a spherical point or cylindrical axis, then any crossing wave tends to curve about the sphere center or cylindrical axis. This effect tends to increase the energy differentials in the high and low pressure regions.

Eventually, two new localized basic-frequency wave patterns develop in certain volumes of the pattern, and these two, equilibrium, self-sustaining, standing reaction-wave patterns form the basic energy structures of the nucleon and the electron.

In the nucleon wave pattern, the reaction waves evolve into concentric spherical standing wave shells that are focused about a central point.

The electron wave pattern evolves into a more complex, dual waveform that includes a circulating flow of pressure-energy waves. One wave component consists of cylindrical standing-wave shells focused around a central axis. These cylindrical waves are broken into rings by a planar mode of standing waves in planes normal to the axis. The planar waves oscillate in a direction parallel to the axis throughout its continued length.

All frequencies and wavelengths are equal to the frequency and wavelength of the basic pattern, so the nucleon and electron waveforms become modifications within the basic pattern.

Stable equilibrium conditions require that the energy in each concentric spherical- or cylindrical- wave shell equals the energy in every other wave shell.

Hence, the pressures are inversely related to the volumes of the shells, although equilibrium is more complex for the electron-wave pattern because of the superimposed flow of pressure waves through the pattern.

The energy focusing effects lead to a continually increasing energy level for each wave. The increase continues until a maximum limiting energy state is reached within the central wave. The achievement of this maximum energy state marks the limiting conditions for maintaining a reversible harmonic oscillation that remains in phase with the basic pattern.

In the nucleon waveform, this limiting state occurs within the central spherical wave of radius r_0, which is equal to one-quarter of the wavelength. In the electron waveform, it occurs within a specific cylindrical volume that is located along the central axis with a radius r_0 and length $2r_0$. The pressure at the midpoint of these volumes fluctuates by plus and minus P_0.

During each oscillation and during the state of maximum kinetic energy, the limiting acoustic velocity C is attained in certain regions at a distance r_0 from the midpoints of the waveforms.

The region of the acoustic velocity C in the nucleon is referred to as the C-sphere of radius r_0. In the electron, the C-ring of radius r_0 is positioned about the electron axis in a plane normal to the axis and the two C-points are positioned on the electron axis, at a distance r_0 on either side of the plane of the C-ring. These regions assume critical importance in the analysis of the nucleon and electron.

Chapter 6

Nucleon Analysis

At the instant of maximum potential energy, a cosine distribution of pressure can be assumed to exist from $P = P_0$ at $r = 0$, to $P = 0$ at $r = r_0$. Summing up this energy gives the following equation. (See Appendix A6.)

$$E_N = \frac{3AP_0r_0^3}{2} \tag{6.1}$$

Using the relationship $P_0 = M_Ec^2$, noting that the energy E_{N_x} along any radius equals one-third of the total energy, i.e., $E_{N_x} = \frac{E_N}{3}$ and also noting that this energy is equivalent to the energy that must be displaced when the nucleon moves at the acoustic velocity, the following relationship is established between the mass of the nucleon m_n and the pulsar density M_E. (See Appendix A6.)

$$m_n = AM_Er_0^3 \tag{6.2}$$

The mass m_n is related to the cross-sectional (projected) area of the nucleon and its interactions with any pressure differentials across this area. The resulting behavior of the nucleon involves field-energy interactions and energy-transfer limitations across the C-sphere; therefore, the kinetic energy term $\frac{1}{2}m_nv^2$ is no longer linear and corrective interpretations are required in the investigation of the field energy storage of this kinetic energy. The following review of the nucleon waveform covers some important factors about the nucleon.

The energy E that is contained within the nucleon C-sphere of radius r_0 represents a limiting condition. As this energy oscillates between the maximum and minimum potential energy states, the extreme pressure states of $\pm P_0$ occur relative to the pulsar core pressure of P_0. The flow of kinetic energy is reversed through each cycle, with a maximum radial velocity of C occurring in either direction through the C-sphere.

The energies must remain in equilibrium. The energy in each spherical reaction wave equals the energy in every other wave shell, and the energy within each half-wave is also equal to that energy in every other half-wave; consequently, a reaction wave is created with the flow of kinetic energy in each half-wave equal to the flow of kinetic energy in its adjacent half-waves, but opposite in direction.

Each spherical reaction wave therefore forms a "soap bubble" -like shell about the C-sphere. The energy fluctuates between the maximum potential energy states and the maximum kinetic energy states within the thickness of this "soap-bubble" shell. The amplitudes of the pressure maximums in successively larger shells decrease as the shell volumes (of thickness $4r_0$) increase; yet, the sum of the energies in each shell remains equal to the sum of the energies in every other shell.

When the energy in each shell is summed up along any radial line (at a maximum potential energy state), a cosine curve of the energy of pressure times volume results. This cosine curve extends from the center of the nucleon to the radius R_0 of the pulsar core. It contains fixed nodal points at multiples of the radius r_0 (i.e., at r_0, $3r_0$, $5r_0$ and so on), and the pressure levels between nodes varies from P_{max} to P_{min} over each half cycle of oscillation.

The energy focusing properties of the waveform maintain the energy levels within the C-sphere at the critical level necessary for continued harmonic oscillation at the basic frequency. This condition imparts to the nucleon its physical properties of mass, inertia, gravitational interactions, and nucleon interactions. These properties are investigated after examining the special nature of the electron waveform.

Chapter 7

Electron Analysis

The equilibrium system set up by the cylindrical waveform of the electron is more complex than the one set up by the spherical waveform of the nucleon.

For the electron, the superimposed cylindrical and planar waveforms direct the wave energies radially inward, toward the axis, parallel to the planes. A critical portion of this energy passes through the electron C-ring and is redirected along the axis through the C-points on each side of the C-ring. This redirected energy flows along the axis in either direction.

Individual reaction rings are separated by the wavelength $4r_0$ in the radial direction. These rings lie in parallel planes that are normal to the axis. They are are staggered radially in adjacent planes, and the distance between adjacent planes is $2r_0$. As a result, nodal points occur every half wavelength $2r_0$ along any radial distance.

Because the energy focuses in the radial but not axial direction, the reaction wave field must initiate an additional flow of pressure differentials in toroid (i.e., donut-like) flow paths on each side of the electron C-plane, throughout the reaction wave field of the electron.

The precise location of the electron C-ring along the axis is extremely sensitive to this circulating field energy; conversely, this circulating field energy is affected by the location of the electron C-ring. Note that the C-ring may travel along the electron axis at the velocity C if the field energy is moving at this velocity.

In general, the electron is a self-sustaining, equilibrium, reaction waveform that has the energy focusing capabilities for sustaining a C-ring and C-points but is very sensitive to alterations in the energy flow throughout its field. Two electrons, for example, limit the flow of energy in the common volume between the planes of their C-rings and attempt to restore equilibrium by moving apart into the unrestricted volumes. If an electron C-ring is superimposed upon a nucleon C-sphere, then the energy storage properties of the nucleon C-sphere modifies the flow of the electron field to create a neutron.

The electron does not have the energy storage capabilities of the nucleon; but the ability of the electron to redirect the energy flow between the plane

of the C-ring and the electron axis is important in electromagnetic effects and nuclear energy exchanges. The damping effects of this energy redirection make it possible for stable nuclear, atomic and molecular structures to exist.

The energy contained within the cylindrical volume defined by the C-ring, and the C-points can be regarded as the energy E_e of the electron. (See Appendix A7.)

$$E_e = BE_n \tag{7.1}$$

The two basic wave patterns of the nucleon and the electron, as they interact within the basic frequency pattern of pulsar space, are sufficient to define all the phenomena of our material or physical existence. An analysis of the field energy storage mechanism expands on this statement.

Appendix A

Derivations

A1. Pulsar Gravitational Constant

The energy required to transport a unit volume of mass M_E through the gravitational field that exists between $r = 0$ and $r = R_0$ is

$$E_G = \int_0^{R_0} \frac{4\pi R^3}{3} \frac{G_0 M_E^2}{R^2}\, dR \tag{A.1}$$

The energy contained in this unit volume of mass M_E when travelling at the velocity c is

$$E_c = \frac{M_E c^2}{2} \tag{A.2}$$

Correction factors must be introduced to allow for the change of relationship between the force created by field energy storage effects at low velocities relative to c, and the elimination of field energy storage at the velocity c.

The forces imposed by the gravitational field at velocity c are $1/g$ times the forces present at zero velocity. The existence of a sinusoidal pressure distribution that extends from the core center to the radius R_0 gives an average pressure-density relationship of $2/\pi$ times the maximum. A complete correction factor of $\pi g/2A$ is therefore be introduced.

$$E_G = \int_0^{R_0} \frac{4\pi R^3}{3} \frac{G_0 M_E^2}{R^2}\, dR = \frac{\pi g}{2A} \frac{M_E c^2}{2} \tag{A.3}$$

$$\int_0^{R_0} \frac{4A4\pi G_0 M_E^2}{\pi g 3} R\, dR = M_E c^2 \tag{A.4}$$

$$\frac{16 A G_0 M_E}{3 g c^2} \frac{R^2}{2}\bigg|_0^{R_0} = 1 \tag{A.5}$$

$$G_0 = \frac{3gc^2}{8AM_E R_0^2} \tag{A.6}$$

A2. Pulsar Reversible Energy Summation

The reversible pressure energy in the pulsar core may be summed up by integrating the pressure times volume in spherical shells of differential thickness, extending from $r = 0$ to $r = R_0$. The pressure will be assumed to be a maximum of P_0 at $r = 0$, and to follow a cosine curve of distribution with $P = 0$ at $r = R_0$.

$$P_R = P_0 \cos\left(\frac{\pi R}{2R_0}\right) = \text{Pressure at any radius } R. \tag{A.7}$$

Let $\theta = \pi R/2R_0$; then $d\theta = \pi\, dR/2R_0$

$$E_0 = \int_0^{\frac{\pi}{2}} P_0 \cos\theta\, 4\pi \left(\frac{2R_0\theta}{\pi}\right)^2 \frac{2R_0}{\pi}\, d\theta \tag{A.8}$$

$$E_0 = \frac{32P_0R_0^3}{\pi^2}\frac{(\pi^2-8)}{4} \tag{A.9}$$

$$\text{Let } P_0 = M_E c^2, \text{ and } A = \frac{16(\pi^2-8)}{3\pi^2} \tag{A.10}$$

$$\text{Then } E_0 = \frac{3AP_0R_0^3}{2} = \frac{3AM_Ec^2R_0^3}{2} \tag{A.11}$$

$$E_0 = \frac{3m_nc^2}{2}\frac{R_0^3}{r_0^3} \tag{A.12}$$

A3. Energy Pattern Evolution

When the wavelength $4r_0$ of the evolving energy pattern becomes small relative to the pulsar core radius R_0 then an expression may be set up for the rate loss of the energy E_T that remains in the pattern.

The number of wavelengths of length $4r$ existing along the core radius R_0 is equal to $R_0/4r$. The frequency of oscillation of this wave, in cycles per year, is the velocity of light divided by the wavelength $4r$, or $C_y/4r$. If dT is made equal to an increment of time in terms of years, then the number of waves that pass through the surface in this time increment is equal to $C_y\, dT/4r$.

If we consider that the energy in each wave is equal, then the energy per wave becomes $E_T 4r/R_0$, and the energy lost through the surface becomes

$$-dE_T = E_T\,\frac{4r}{R_0}\,\frac{C_y}{4r}\,dT = E_T\frac{C_y}{R_0}\,dT \tag{A.13}$$

$$\text{Since } T_0 = \frac{R_0}{C_y} \text{ then } \frac{-dE_T}{E_T} = \frac{dT}{T_0} \tag{A.14}$$

Solving for the conditions at the absolute time $T_A = 0$, when the total energy of the pattern E_T equals E_0, gives the following result.

$$e^{-\frac{T}{T_0}} = \frac{E_T}{E_0} \tag{A.15}$$

In general we will use the following equalities:

$$\exp^{\frac{T}{T_0}} = \frac{E_0}{E_T} = \frac{R_0}{r_t} = 4F_y T_0 \tag{A.16}$$

A4. Time Scales: Absolute and Relative

The equation $e^{(\frac{T}{T_0})} = \frac{R_0}{r_t}$ creates two different time scales, which should be recognized. The time T (or T_A) in the equation will be considered an absolute time scale in that the velocity of light C may be regarded as an absolute constant when referred to the pulsar core radius R_0, which may also be considered an absolute constant.

If R_0 and C are assigned values then T_0 also becomes an absolute constant, because $T_0 = R_0/C_y$.

However, it should be recognized that our present time standard is related to an oscillation frequency that exists in nuclear patterns, and thus it is related to the basic frequency wavelength $4r_0$. The value of r_0 is inversely related to e_{T/T_0}. The basic frequency $C/4r_0$ then represents a relative time value. If a certain number of oscillations of the basic frequency pattern are assigned a specific time value, then the absolute time will vary relative to this time scale.

This relationship may be investigated by summing up the number of oscillations that the basic frequency pattern has undergone, and dividing this pattern by the number of oscillations of the basic pattern that have been assigned to a time interval of one year.

This value then becomes the relative age of the pulsar core.

$$e^{\frac{T}{T_0}} = 4F_y T_0 \quad ; \quad F_y = \frac{e^{\frac{T}{T_0}}}{4T_0} \tag{A.17}$$

$$\int_0^T F_y \, dT = N_f = \begin{array}{l}\text{The total number of oscillations} \\ \text{of the basic frequency pattern}\end{array} \tag{A.18}$$

$$\int_0^T \frac{e^{\frac{T}{T_0}}}{4T_0} \, dT \quad = \quad \left.\frac{e^{\frac{T}{T_0}}}{4}\right|_0^T \quad = \quad N_f \tag{A.19}$$

$$N_f \quad = \quad \frac{e^{\frac{T}{T_0}} - 1}{4} \quad = \quad F_y T_0 - \frac{1}{4} \tag{A.20}$$

Then the relative age of the pattern is

$$\frac{F_y T_0}{F_y} = T_0 \tag{A.21}$$

This means that the relative age of the pulsar core is equal to the absolute interval of time required to traverse the distance R_0 at the acoustic velocity C.

A5. Energy Focusing

The acoustic velocity c will vary slightly across the adiabatically varying regions of high and low pressure that are present in the basic frequency pattern. A superimposed wave form that is passing through the pattern will undergo a slight increase in velocity through a higher pressure region, and a slight decrease in velocity through a lower pressure region. This results in a slight increase in the average time required to cross these regions when compared to the time required to pass over a region that contains no pressure differentials.

$$\tau_0 \quad = \quad \frac{\lambda}{c} \quad = \quad \begin{array}{l}\text{The time needed to travel a distance } 4r_0 \\ \text{that contains no pressure differentials}\end{array} \tag{A.22}$$

$$\tau_t = \frac{1}{2}\Big(\frac{\lambda}{c+\Delta c}\Big) + \frac{1}{2}\Big(\frac{\lambda}{c-\Delta c}\Big) \tag{A.23}$$

$$\tau_t = \frac{\lambda}{c}\left(\frac{1}{1-\left(\frac{\Delta c}{c}\right)^2}\right) \tag{A.24}$$

$$\tau_t = \frac{\lambda}{c}\left(1+\left(\frac{\Delta c}{c}\right)^2\right) \tag{A.25}$$

$$\tau_t \quad = \quad \begin{array}{l}\text{The time required to travel a dis-} \\ \text{tance } 4r_o \text{ that contains varying} \\ \text{pressure differentials}\end{array} \tag{A.26}$$

A6. Nucleon Energy Summation

The energy contained within the nucleon C-sphere may be summed up at the moment of maximum potential energy, by integrating pressure times volume, in spherical shells of differential thickness, extending from $r = 0$ to $r = r_0$.

The pressure reaches a maximum value of P_0 at $r = r_0$ and decreases along a cosine curve of distribution to $P = 0$ at $r = r_0$.

$$P_r = P_0 \cos\left(\frac{\pi r}{2r_o}\right) \quad = \quad \begin{array}{l}\text{Pressure at any radius } r \\ \text{between 0 and } r_o\end{array} \tag{A.27}$$

$$E_N = \int_0^{r_0} P_0 \cos\left(\frac{\pi r}{2r_o}\right) 4\pi r^2 \, dr = \text{Total nucleon energy} \tag{A.28}$$

$$\text{Let} \quad \theta = \frac{\pi r}{2r_0} \quad ; \quad d\theta = \frac{\pi \, dr}{2r_0} \tag{A.29}$$

$$E_N = \int_0^{\frac{\pi}{2}} P_0 \cos\theta \, (4\pi) \left(\frac{4r_0^2\theta^2}{\pi^2}\right) \frac{2r_0}{\pi} \, d\theta \tag{A.30}$$

$$E_N = \left(\frac{32P_0r_0^3}{\pi^2}\right) \int_0^{\frac{\pi}{2}} P_0 \cos\theta \, d\theta \tag{A.31}$$

$$E_N = \left(\frac{3}{2}\right)\left(\frac{2}{3}\right)\frac{8(\pi^2-8)}{\pi^2} P_0 r_0^3 \tag{A.32}$$

$$\text{Let } P_0 = M_E c^2 \text{ ; and let } A = \frac{16(\pi^2-8)}{3\pi^2} \tag{A.33}$$

$$E_N = \frac{3AP_0r_0^3}{2} = \frac{3AM_Ec^2r_o^3}{2} \tag{A.34}$$

The energy along any axis is

$$E_{N_x} = \frac{E_N}{3} = \frac{m_n c^2}{2} \tag{A.35}$$

$$E_N = \frac{3}{2} m_n c^2 \tag{A.36}$$

$$\text{Then} \quad m_n = AM_E r_o^3 \tag{A.37}$$

This relates the nucleon mass m_n to the pulsar core density M_E.

A7. Electron Energy Summation

The limiting electron energy of pressure times volume is contained within a cylindrical volume, of radius r_0 and length $2r_0$, which is bounded by the C-ring and C-points.

This energy may be evaluated by integrating the pressure times area across the surface of any circular disc of radius r_0 that is centered along the electron axis, and then integrating this force times the differential thickness of the discs, extending for a distance r_0 on either side of the C ring.

The maximum pressure of P_0 exists on the electron axis at the center of the C ring and follows a cosine curve of distribution, both radially in the plane of the C ring and axially along the electron axis on both sides of the C ring.

The minimum pressure $P = 0$ exists at the radius r_0 in the C ring, and also at the distance r_0 from the C ring at the C points on the axis, as well as on the cylinder containing these points.

For any circular disc of radius r_0 along the axis, the summation of pressure times area is

$$F = \int_0^{r_0} P \cos\Big(\frac{\pi r}{2r_0}\Big) 2\pi r \, dr \tag{A.38}$$

$$\text{Let} \quad \theta = \frac{\pi r}{2r_0} \tag{A.39}$$

$$d\theta = \frac{\pi}{2r_0} \, dr \tag{A.40}$$

$$F = \frac{8Pr_0^2}{\pi} \int_0^{\frac{\pi}{2}} \theta \cos\theta \, d\theta \tag{A.41}$$

$$F = \frac{8Pr_0^2}{\pi} \big(cos\theta + \theta \sin\theta\big)\Big|_0^{\frac{\pi}{2}} \tag{A.42}$$

$$F = \frac{8Pr_0^2}{\pi} \Big(\frac{\pi}{2} - 1\Big) \tag{A.43}$$

Since $P = P_0 \cos(\pi r / 2r_0)$, the total energy is

$$E_e = \int_{-r_0}^{r_0} F \, dr = \frac{8P_0 r_0^2}{\pi} \frac{(\pi - 2)}{2} \int_{-r_0}^{r_0} \cos\Big(\frac{\pi r}{2r_0}\Big) \, dr \tag{A.44}$$

$$E_e = \frac{8P_0 r_0^2}{\pi} \frac{(\pi - 2)}{2} \Big(\frac{2r_0}{\pi}\Big) \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos\theta \, d\theta \tag{A.45}$$

$$E_e = \frac{8P_0 r_0^2}{\pi} \frac{(\pi - 2)}{2} \Big(\frac{2r_0}{\pi}\Big) \quad 2 \tag{A.46}$$

$$E_e = \frac{16(\pi - 2)}{\pi^2} P_0 r_0^3 \tag{A.47}$$

$$\text{Let} \quad B = \frac{2(\pi - 2)}{(\pi^2 - 8)} \tag{A.48}$$

$$E_e = \left[\frac{2(\pi - 2)}{(\pi^2 - 8)}\right] \frac{8(\pi^2 - 8)}{\pi^2} P_0 r_0^3 \tag{A.49}$$

According to the equation found in Appendix A6 for the energy E_N of a nucleon C sphere:

$$E_e = B E_N \tag{A.50}$$

A third constant D can defined by comparing the pressure times area value for any electron disc of radius r_0, to an average pressure P_{av} times area over the disc.

$$P_{avg}\pi r_0^2 = \frac{8P_{max}r_0^2}{\pi}\left(\frac{\pi}{2} - 1\right) \tag{A.51}$$

$$P_{max} = \frac{\pi^2}{4(\pi - 2)}P_{avg} \tag{A.52}$$

$$P_{max} = 2\left[\frac{\pi^2}{8(\pi - 2)}\right]P_{avg} = 2DP_{avg} \tag{A.53}$$

$$ABD = \left[\frac{16(\pi^2 - 8)}{3\pi^2}\right]\left[\frac{2(\pi - 2)}{(\pi^2 - 8)}\right]\left[\frac{\pi^2}{8(\pi - 2)}\right] \tag{A.54}$$

$$ABD = \frac{3}{4} \tag{A.55}$$

Note: In the energy calculations for the nucleon and the electron, the net energy content of each is considered to be the energy contained within the C volumes. This energy is equal to the energy contained in every other reaction wave, throughout the reaction wave field. The total energy, however, is not the sum of all the reaction wave energies, since each reaction wave has an equal but opposite component with the exception of the energy within the C volumes.