Return to

Classical Physics

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Introduction

This book is about a return to classical physics.

Many theories in physics were developed long ago. Since then, much conflicting evidence has accumulated. This book reconciles current evidence with old, accepted theories. New theories were also developed in more recent times, and some still lack the required evidence to merit a justified acceptance.

Unfortunately, others have used the term "classical" and they disagreed in their definitions, and among various details. In my view, Newton and Maxwell defined the foundation of physics so their work can be called classical. Both are important in this book. Since their time, their works have been distorted. This book is my interpretation of the term, when removing those invalid distortions. Conclusions are accompanied by references to source materials providing the evidence to the reader.

Physics is the science of energy, forces, matter, and motion.

Each aspect (of the 4) has evolved in the wrong direction for a valid explanation for many observations, as explained here.
The lack of evidence for the progression of each aspect is a common theme.

The strict requirement for evidence is part of my expectation of classical physics.

I suspect that most agree physics must rely on evidence. This was the expectation for theories in the 1800's, the time of James Clerk Maxwell.

Some will agree that relativity, which arrived in 1905, is problematic in physics.

Its infamous black hole can be explained as impossible, in several ways, and by at least one other person (Stephen Crothers). I will present my justification for calling the black hole theory as a mistake.

Einstein's space-time is not a valid replacement of Newton's force of gravity, despite what the general public is told.
Einstein wrongly assumed two behaviors involving acceleration could be considered as equivalent. Unfortunately, free fall acceleration of a tiny mass toward a much heavier mass is not equivalent to the acceleration from the mutual force of gravity between any two masses, which decreases by inverse-square of their distance. Space-time ignores the important differences between the two contexts:

a) The rate of acceleration differs in the two contexts,

b) Gravity's effect from this observer's mass on the other mass,

c) The mutual force between charges when both the special observer and the other mass have an electric charge, affecting both masses,

d) The force from a magnetic field when the special observer has an electric charge.

These 4 crucial omissions mean space-time is invalid, both as a replacement of gravity and as an explanation for motion.

Newton defined the force of gravity, but was unable to explain its mechanism.
This omission has a simple explanation.

Newton lived before Maxwell, who explained the connection between a field from an electric charge and its force. I will describe my mechanism for the force of gravity, based on Maxwell's work, as part of an updated atomic model.

Einstein was a theoretical physicist, so others must seek evidence for his theories.

Einstein reviewed the work by Max Planck, and published a paper on the photoelectric effect, which earned the 1921 Nobel Prize in physics. The paper declared light behaved as a particle.
As a consequence, the true wave nature of light, defined by Maxwell, was incorrectly assigned a particle nature.

I will explain the mechanism of the well-known Doppler Effect, which can be explained correctly only when light is a wave, because light is a continuum of radiated energy, not a particle.

Einstein's theory of space-time was declared as confirmed by a dubious observation of a solar eclipse in Brazil, in1919. Eddington measured only a single star which was precisely at the solar limb. Other observers saw a sky having light sources being affected inconsistent with the claim by Eddington. The difficult viewing conditions and the fact the original photographic plates were lost also made the claimed confirmation inconclusive.
After the acceptance of this claimed confirmation by the community of physicists, many branches of physics were affected, including particle physics and cosmology.

The recovery needed by physics from this diversion is explained here. In subsequent years, new theories were developed but lacked suitable evidence. Conflicting evidence often did not result in a correction in the theory.

Famous physicist Richard Feynman was quoted with:" It doesn't matter how beautiful your theory is; it doesn't matter how smart you are; if it doesn't agree with experiment, it's wrong."

In this book, the word experiment is replaced with evidence.

A theory agreeing with the evidence is the goal. Those writing a theory which doesn't agree with current evidence should fix their theory. Since that correction was not done, suggestions are presented here. Several disciplines in physics are covered.

This is a brief summary of the 19 sections:

1) Introduction briefly describes this book.

2) Isaac Newton defined the foundation of physics:

   a) The independence of space and time,

   b) The relationship between force, mass, and acceleration,

   c) The force of gravity, which is the attraction between masses,

   d) Einstein defined a special moving observer and proposed their motion could be curved by changing the increments of their motion to mimic the effect of gravity,

   e) The set of 4 parameters from this observer's motion was called-space-time, because 3 were for the change in position, or in space, and the 4^{th} was for the change in time,

   f) this curved path could end at the center of a mass; this end leads to an impossible black hole, where all the mass is claimed to be compressed into its center, or a point.

3) Electromagnetism explains the work by Maxwell and others who defined the forces from an electric field and a magnetic field. Maxwell explained light as the propagation of these fields. These fields have a rate of oscillation. The oscillation is of the fields, not particles. A wave in a medium (like water) results from circular motions of the particles in the medium. There are no particles moving in circles during the oscillation of these fields. Einstein brought confusion to Maxwell's accepted explanation by proposing light is a massless particle, which has been named the photon.

4) The current atomic model, called the Standard Model, is described with its set of particles and forces.

   Its fundamental particles include quarks and others. It has 17 elementary particles and several quasi-particles. After Einstein's mistake of claiming forces have a speed limit at c, new quasi-particles are needed just to explain these instantaneous forces in this wrong context.

5) A change to the atomic mass unit is explained.

6) The atomic mass defect is explained, with its solution.

7) The updated model has only 2 fundamental particles, the electron and proton; it has a separate class of particles for those found only in particle colliders.

It has only 3 fundamental forces: electric, gravity, and magnetic.

8) The mechanism for the force of gravity is explained.

9) The respective states of matter are explained, including the important state called condensed matter, which can be liquid or solid and not gas.

10) Thermodynamics describes the different forms of energy and how its form can be changed or transferred.

11) The Doppler Effect is explained as an interaction between a moving body having kinetic energy, and energy in the form of electromagnetic radiation (light). Energy is always conserved through the moment, as required by thermodynamics.

12) Stars are celestial sources of light. All are very distant, with the notable exception of our Sun. Its new model is explained, including the layers and observed behaviors.

13) Galaxies are very distant collections of stars, with the notable exception of our Milky Way. Their possible changes in a spectrum by the Doppler Effect are explained.

14) The somewhat rare quasar is explained; its redshift mechanism is different than a galaxy. Halton Arp's mistakes with quasar redshifts are explained.

15) Cosmology covers the impact of the conclusions about galaxies and quasars on wider topics of cosmology, like dark matter, dark energy, expansion, and the big bang theory.

16) 2 Alternatives covers 2 other claims of using classical physics, by Edward Dowdye and Wal Thornhill.

17) Final Conclusion describes a conclusion based on all the preceding sections.

18) Author's Books describes my preceding 8 books; each covered particular aspects of physics; they are the background of this book having a very broad scope to cover all those topics.

19) All external references in the book have links available as directed here.

2 Newton & Einstein

This section describes the transition from:

a) Newton's defining the foundation of physics and the real force of gravity, to

b) Space-time, which is the foundation of Einstein's relativity, becoming a proclaimed replacement of the foundation set by Newton. Space-time is a newly defined context of a special, moving observer, where special, new rules can be applied, like the velocity of a mass being limited to the velocity of light. This unjustified limit is now a mistake, after protons moving at multiples of c have been measured.

Relativity enabled the definition of a black hole. A black hole was described by both Einstein and Hawking, and is claimed by many as being observed in 2019.

2.1 Introduction to Newtonian physics

By defining the initial foundation of physics, Isaac Newton defined what could be called classical physics, because the subsequent foundation could be called modern physics.

Excerpts from Wikipedia:

"According to Newton, absolute time exists independently of any perceiver and progresses at a consistent pace throughout the universe.

Absolute space, in its own nature, without regard to anything external, remains always similar and immovable. Relative space is some movable dimension or measure of the absolute spaces; which our senses determine by its position to bodies: and which is vulgarly taken for immovable space ... Absolute motion is the translation of a body from one absolute place into another: and relative motion, the translation from one relative place into another ...

— Isaac Newton

(Excerpt end)

In my words, absolute space is the background, has no features, and remains always immovable.

In my words, the universe has no defined limits and it has much stuff in this space.

After Newton, physicists understood absolute time and absolute space. They exist independently of any observer.

Most are aware of Euclidean geometry with its definitions of a plane, line, parallel, and point.
Most are also aware of the Cartesian coordinate system, where the point of origin defines the direction of increasing values in each axis (x,y,z).

In physics, a reference point in absolute space is identified for the origin of the coordinate system, so the measurements using the defined axis dimensions are relative to the reference point, not to the observer. Another observer can use the same reference point to share measurements, when using the same dimensions.

An observer is not limited to Cartesian coordinates.

The center of the Earth serves as the reference point for multiple coordinate systems. Among them is the geographic coordinate system, whose 2 angular dimensions are latitude and longitude. The Global Positioning system (GPS), using an array of satellites, adds a linear dimension for the observer's altitude.

Another is the celestial coordinate system, whose 2 angular dimensions are right ascension and declination. When using this system, the observer accounts for their position on the surface relative to the center so celestial measurements from different surface locations match.

These coordinate systems when using a common reference point enable measurements independent of the observer.

When using a common coordinate system and reference point, we can measure the location of any object or event and the time of each measurement to calculate its velocity and acceleration. Sometimes, many position measurements from different locations enable a distance calculation by parallax. This technique for a distance is used in our solar system and in our Milky Way.

2.2 Newton’s laws of motion

Excerpt from Wikipedia:

In classical mechanics, Newton's laws of motion are three laws that describe the relationship between the motion of an object and the forces acting on it. The first law states that an object either remains at rest or continues to move at a constant velocity, unless it is acted upon by an external force. The second law states that the rate of change of momentum of an object is directly proportional to the force applied, or, for an object with constant mass, that the net force on an object is equal to the mass of that object multiplied by the acceleration. The third law states that when one object exerts a force on a second object, that second object exerts a force that is equal in magnitude and opposite in direction on the first object.

(Excerpt end)

Observation:

The second law is the equation: $F = ma$
Where F is the force, m is the mass, and a is the acceleration.
One should note the equation for the force has no time variable. The force is instantaneous. A sustained force spanning a known time results in a predictable velocity.

2.3 Newton's law of universal gravitation

Excerpt from Wikipedia.

In today's language, the law states that every point mass attracts every other point mass by a force acting along the line intersecting the two points. The force is proportional to the product of the two masses, and inversely proportional to the square of the distance between them.
The equation for universal gravitation thus takes the form:

F = (m1*m2)/r2

where F is the gravitational force acting between two objects, m1 and m2 are the masses of the objects, r is the distance between the centers of their masses, and G is the gravitational constant.
The first test of Newton's theory of gravitation between masses in the laboratory was the Cavendish experiment conducted by the British scientist Henry Cavendish in 1798. It took place 111 years after the publication of Newton's Principia and approximately 71 years after his death.

Newton's law of gravitation resembles Coulomb's law of electrical forces, which is used to calculate the magnitude of the electrical force arising between two charged bodies. Both are inverse-square laws, where force is inversely proportional to the square of the distance between the bodies. Coulomb's law has the product of two charges in place of the product of the masses, and the Coulomb constant in place of the gravitational constant.

(Excerpt end)

Observation:

One should note the equation for the force has no time variable. The force is instantaneous. There are two participants, so the force is mutual and simultaneous.

2.4 Introduction to Relativity

Some advocates of relativity believe in the adage: “Spacetime tells matter how to move; matter tells spacetime how to curve.”

For someone to believe that adage, they do not understand a) coordinate systems and b) the basis of space-time, and c) physics, the science describing motion.

Space-time is just a set of 4 values from the special observer’s incremental motion. This set is used by only the tensor equations in the theory. This set is used to curve the path of the moving observer. This set has no application beyond the limited context of the special observer.
This set is not a thing which can interact with matter.

Only a force can cause motion. This is rudimentary physics.

Isaac Newton defined his laws of motion and several equations, including one for the force of gravity between 2 masses.

James Clerk Maxwell and others defined equations for electromagnetism. Maxwell is credited with bringing together several developments, including an equation for the electric force between 2 charges. Other equations are for a magnetic field, which acts on moving charges.

No matter how someone distorts a coordinate system, it is not a force and cannot affect motion.

2.5 Story of Space-time and gravity

When physicists adopted Einstein's narrowly defined behaviors of a special observer as important to the science of physics, then they broke the foundation of Newtonian physics.

Before space-time, physicists understood gravity. Newton defined it as a mutual force between 2 masses. The force required no time for its action, so it was instantaneous and simultaneous. This understanding of the force of gravity enabled the discovery of the planet Neptune in 1846, using only Newton's equations, following many measurements of planet positions over time.

Einstein derailed this understanding by developing the limited context of his special, moving observer.

Excerpt from Wikipedia, where its Minkowski Space topic explains the transition:

The views of space and time which I wish to lay before you have sprung from the soil of experimental physics, and therein lies their strength. They are radical. Henceforth space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality.

— Hermann Minkowski, 1908, 1909

Though Minkowski took an important step for physics, Albert Einstein saw its limitation:

At a time when Minkowski was giving the geometrical interpretation of special relativity by extending the Euclidean three-space to a quasi-Euclidean four-space that included time, Einstein was already aware that this is not valid, because it excludes the phenomenon of gravitation.

(Excerpt end)

Observation:

Einstein integrated gravitation into the quasi-Euclidean four-space.
Another excerpt from Wikipedia, where its topic of History of special relativity describes the transition:

Some scientists and philosophers of science were critical of Newton's definitions of absolute space and time. Ernst Mach (1883) argued that absolute time and space are essentially metaphysical concepts and thus scientifically meaningless, and suggested that only relative motion between material bodies is a useful concept in physics.

Mach argued that even effects that according to Newton depend on accelerated motion with respect to absolute space, such as rotation, could be described purely with reference to material bodies, and that the inertial effects cited by Newton in support of absolute space might instead be related purely to acceleration with respect to the fixed stars.

In 1907 Minkowski named four predecessors who contributed to the formulation of the relativity principle: Lorentz, Einstein, Poincaré and Planck. And in his famous lecture Space and Time (1908) he mentioned Voigt, Lorentz and Einstein. Minkowski himself considered Einstein's theory as a generalization of Lorentz's and credited Einstein for completely stating the relativity of time.

Einstein (1908) tried – as a preliminary in the framework of special relativity – also to include accelerated frames within the relativity principle. In the course of this attempt he recognized that for any single moment of acceleration of a body one can define an inertial reference frame in which the accelerated body is temporarily at rest. It follows that in accelerated frames defined in this way, the application of the constancy of the speed of light to define simultaneity is restricted to small localities. However, the equivalence principle that was used by Einstein in the course of that investigation, which expresses the equality of inertial and gravitational mass and the equivalence of accelerated frames and homogeneous gravitational fields, transcended the limits of special relativity and resulted in the formulation of general relativity.

Eventually, Einstein (1912) recognized the importance of Minkowski's geometric spacetime model and used it as the basis for his work on the foundations of general relativity.

Acceptance of special relativity

Planck, in 1909, compared the implications of the modern relativity principle — he particularly referred to the relativity of time – with the revolution by the Copernican system. An important factor in the adoption of special relativity by physicists was its development by Minkowski into a spacetime theory. Consequently, by about 1911, most theoretical physicists accepted special relativity.

(Excerpt end)

My observations:

First:

Physicists at the time were determined to get relative time, to replace Newton's absolute time, which cannot be affected by the observer.
The phrase "simultaneity is restricted to small localities" reveals another concern with time.

Both the electric force and the gravity force are simultaneous between the 2 participants but each force decreases by the inverse square of the distance between them. In reality, the 2 forces cannot be restricted to a "small locality."

Second:

One must note Einstein's work with the "equivalence of accelerated frames and homogeneous gravitational fields" brought with it "a new treatment of gravity, replacing the understanding of the force at that time (1912)."

This "new treatment" is simply wrong. The replacement of our "understanding of the force" was a mistake.

The unstated goal of some physicists "at that time (1912)" was replacing Newtonian physics with the possible flexibility of relative space and time.

There was no evidence space-time was better than Newton’s force. The dubious evidence was provided from Eddington, by photographs taken during a total solar eclipse in 1919.
That was sufficient for the 4-dimensions of space-time becoming a fundamental concept of physics.

The perceived "homogenous field" can arise only in the combination of a number of tiny masses near a much larger mass, like the drop of a feather and iron ball in a vacuum. This free-fall acceleration behavior was famously demonstrated on Earth and on the Moon.

Free-fall acceleration is a very limited context of gravity. The much larger mass has only the illusion of no motion. Perhaps Einstein accepted the illusion because space-time curvature cannot affect the other mass. For example, all the planets in the solar system are not in free fall acceleration in the gravitational fields of all other planets. It is a mistake basing a replacement of the real force of gravity on this context of a particular behavior.

An observer having any mass, must interact with any other mass by inverse square of distance, as explained by Newton, and as widely accepted, before space-time, like when predicting Neptune.

Space-time enables the moving observer to never affect another mass. This is simply violating Newton's force and replacing it with an incorrect interpretation.

I will take liberties here when putting relativity into simpler terms.

The special observer is moving, so in relativity their motion is described by the combination of 4 variables at each instant, in this "quasi-Euclidean four-space"

The 4 are: dx, dy, dz, dct, where "d" represents the "delta" or change in coordinate in that Euclidean dimension.

The math requires the same units among all the participants; km is the standard for a linear dimension value. Since the units for time are unlike the spatial dimensions, the time value is multiplied by the constant c, to get km as units. This product is shown as ct, and its value in the set of 4 is dct.

This observer can measure the direction to another mass to get a vector to the source of that object's gravitational field.

Relativity is background independent, so no coordinates in real, physical, or absolute space are available, for the observer or for any object they observe.

Every distance or location measurement is relative to the moving observer's current position.

Space-time is simply the mechanism for the application of the tensor equations affecting the path of the special, moving observer by using this set of changes in 4 coordinates per unit of time.

Space-time has no application other than supporting the equations of relativity.

This is the only context where this "union of the two [space and time] will preserve an independent reality."

My observation:

This phrase has an add choice of words. Newton defined absolute space and time as independent of the observer. Space-time defined the special moving observer as having no effect on any other mass or charge, during the motion. Since space-time does not identify an effect between the observer's and another's charge, space-time implicitly ignores any mutual interaction between the observer and the rest of the universe which will have mass and could have a charge.
Of course, other masses must react to the moving observer’s mass, but relativity identifies none.
An ocean tide changing with phases of the Moon is strictly a behavior from the force of gravity. That narrow behavior by a force cannot be explained by space-time which tries to mimic another narrow behavior of gravity, free-fall acceleration. A tide cannot be characterized as a free-fall acceleration.

This independent reality" is useless, beyond a game of an odd alternate reality, where literally nothing happens to whatever you pass during your motion.

This certainly a wrong form of independence for physics, where any motion is always driven by external forces. The forces from mass or charge are always mutual, though reduced by inverse-square of distance. Thus, any body in motion must affect others, though it could be too weak to measure.

Space-time is wrong; Newton's force of gravity is correct. I wrote a book titled Redefining Gravity which describes in detail why gravity must be redefined as Newton's force while removing the mistake of space-time as a replacement for gravity. Kepler’s laws of planetary were developed on the basis of Newton’s force. The orbital path of an ellipse is around a system’s center of gravity.

I must make a comment about absolute and relative time.

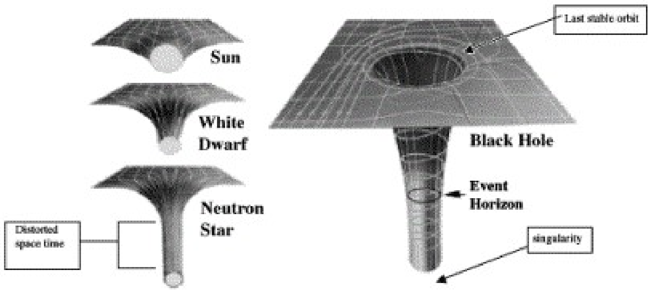
If an observer ever questions their relative time, like for possible time dilation, they can always “look out the window” to check the correct absolute time.

This “window” reference is from Einstein’s famous thought experiment on a hypothetical train, using a hypothetical light clock. I heard this phrase from someone else, long ago, but it still resonates with me. Our version of Newton’s absolute time is driven by an atomic clock and cannot be affected by anyone, certainly not by someone in a train using a light clock.
Space-time prevents “looking out the window” when restricted to a time value which can be manipulated during the special observer’s motion. Newton could not envision someone altering the normal progression of time’s increments, so it was simply called absolute time.

2.6 Space-time in Graphics

Graphical representations of space-time curvature are an intentional deception.

This unedited image from NASA will help explain this deception.



In relativity, when the observer is moving near an object with a gravitational field their current motion is obtained in 4 parameters having the observer’s change in 3-D space, and the change in time during each incremental motion. These values are manipulated to curve the path toward the source of the gravitational field.
This curvature affects only the path of the moving observer, so no one else is affected.

The left column in the image illustrates how the special observer's path in space-time could be curved when they are passing by the Sun, a white dwarf, or a neutron star.

For all other observers, the Sun, the white dwarf, or the neutron star, are observed using classical physics, such as electromagnetic radiation.

The image is deceptive because there is no distinction between the observer who is moving to or past these objects and all other observers.

One could present an edited image to represent the view for all other observers by simply removing those curved graphics which show the observer's distorted path in space-time. At the lower left is the legend "distorted space time." This explicitly notes the specific context for this image. That edited image removes the deception by showing the real universe, in which all observers can observe and measure, and which is not affected by the special observer's motion past a particular body in physical space.

The right column in the image has the most blatant deception.

The single arrow pointing to "Singularity" (at bottom right) is actually pointing to 2 entities.

1) The physical mass at that location in physical space,

The mass is not shown in this column, though each mass was shown in the left column.

The image could be edited as suggested to remove the graphs from the respective columns; then the mass should be shown here, consistent with the others, to help fix the deception for all observers other than the one moving (i.,e., non-inertial).

2) A point in the observer's reference frame or coordinate system.

The point is not in the image simply because a point has no size.

In basic terms of geometry, the center of an object, regardless of its shape, is described as a point.
In the mathematical exercise of space-time curvature for an extreme mass, the path of the observer must terminate at the center of the mass, or a point. This point in geometry is called the singularity in physics.

This singularity is called a black hole though technically it is a black point. There is no hole in anything; it is just a point in a coordinate system.

The deceptive graphic hides this mistake in physics with two simultaneous conflicting entities where one entity is a concept, just a point in a coordinate system, while the other is a physical mass.

For all other observers, the mass remains and can be observed and measured and, as a mass, it is still subject to the force of gravity from other bodies. It is a violation of physics to claim this mass simply disappears.

It is also a violation of physics to claim the mass remains intact, still generating its gravitational field, while compressed within a geometric point, or the claimed singularity.

Physicists chose to combine these two conflicting entities from geometry and physics, resulting in something physically impossible.

There should be another arrow in the image next to that of Singularity and pointing to the same point but with the legend "Impossible"

There is no such thing as a black hole. This will be explained further in its section.

Probably, if graphical representations of space-time curvature were not deceptive then impossible entities like black holes would go away.

Also, the mistaken claim of remote gravitational lensing should also go away having no justification for a remote curvature.

To present the correct consequences of a proposed black hole, the image for all observers, except for the special observer, who have no distorted space-time, the bottom right should have this note inserted using the Sun's graphic icon (instead of O):

(Begin note)

Milky Way SMBH has O x 4.1 million visible to all other observers.

(End of note)

That simple change to the figure clearly unveils the deception because there is NO real mass of that size, being observed at that location claimed for that super massive black hole.

Space-time is not an acceptable replacement for Newton’s force of gravity.

3 Eletromagnetism

Electromagnetism is the interaction between electric and magnetic fields and the forces which can result from those fields.

Excerpt from Wikipedia:

Electromagnetism is a branch of physics involving the study of the electromagnetic force, a type of physical interaction that occurs between electrically charged particles. The electromagnetic force is carried by electromagnetic fields composed of electric fields and magnetic fields, and it is responsible for electromagnetic radiation such as light. It is one of the four fundamental interactions (commonly called forces) in nature, together with the strong interaction, the weak interaction, and gravitation.
With the publication of "A Dynamical Theory of the Electromagnetic Field" in 1865, [James Clerk] Maxwell demonstrated that electric and magnetic fields travel through space as waves moving at the speed of light.

(Excerpt end)
Maxwell's equations define several properties of "free space" and those values define the rate of propagation of light through that free space.

Now, they can be considered properties of either: the vacuum of space, or the aether, which is whatever unknown "stuff" permeates the background of the universe.

The medium defines the rate of propagation of the synchronized electric and magnetic fields within light.

Most know light travels slower through glass or water than through air or space.

The diffraction index is the factor defining the change in light velocity by the medium.

Essentially, the medium has a measurable resistance to the changing of electric and magnetic fields. During the propagation of light, both fields are oscillating or in continuous change.
Light is more complicated then that simple statement because different wave lengths have different behaviors like X-rays which can be either penetrating or shielded by different media. For example, the color violet is slower than red through a glass prism.

At the foundation of Maxwell's equations are 2 constants which define how the medium affects changes in an electric field or a magnetic field:

the permittivity of free space, $\varepsilon 0$, epsilon-nought
the permeability of free space, μ, mu

These factors become Coulomb's constant.

The Electric force is described by Coulomb's law.

$F = ke * (q1 * q2) / r^2$

where ke is Coulomb's constant ($ke \approx 8.99\times10^9$ N·m^2·C^{-2}), q1 and q2 are the signed magnitudes of the charges, and the scalar r is the distance between the charges. The force of the interaction between the charges is attractive if the charges have opposite signs (i.e., F is negative) and repulsive if like-signed (i.e., F is positive).

In very simple terms, there is a mutual force between any 2 charges. This electric force is reduced by 2 factors:

1) ke from the medium,

2) r from the distance.

Observation:
The units of ke are essentially a ratio of force in an area relative to charge.

Free space defines a factor within ke resulting in a force reduction between charges.

One should note the equation for the force has no time variable. The force is instantaneous. There are two participants, so the force is mutual and simultaneous.

Excerpt of Magnetic field from Wikipedia:

A magnetic field is a vector field that describes the magnetic influence on moving electric charges, electric currents, and magnetic materials. A moving charge in a magnetic field experiences a force perpendicular to its own velocity and to the magnetic field. A permanent magnet′s magnetic field pulls on ferromagnetic materials such as iron, and attracts or repels other magnets. In addition, a magnetic field that varies with location will exert a force on a range of non-magnetic materials by affecting the motion of their outer atomic electrons.

Magnetic fields surround magnetized materials, and are created by electric currents such as those used in electromagnets, and by electric fields varying in time. Since both strength and direction of a magnetic field may vary with location, they are described as a map assigning a vector to each point of space or, more precisely—because of the way the magnetic field transforms under mirror reflection—as a field of pseudovectors.

In electromagnetics, the term "magnetic field" is used for two distinct but closely related vector fields denoted by the symbols **B** and **H**. In the International System of Units, **H**, magnetic field strength, is measured in the SI base units of ampere per meter (A/m). **B**, magnetic flux density, is measured in tesla (in SI base units: kg per second^2 per ampere), which is equivalent to newton per meter per ampere. **H** and **B** differ in how they account for magnetization. In a vacuum, the two fields are related through the vacuum permeability, μ_0 = **H**; but in a magnetized material, the terms differ by the material's magnetization at each point.
Magnetic fields are produced by moving electric charges and the intrinsic magnetic moments of elementary particles associated with a fundamental quantum property, their spin. Magnetic fields and electric fields are interrelated and are both components of the electromagnetic force, one of the four fundamental forces of nature.

(Excerpt end)

Excerpt of Lorentz Force from Wikipedia:

In physics (specifically in electromagnetism) the Lorentz force (or electromagnetic force) is the combination of electric and magnetic force on a point charge due to electromagnetic fields. A particle of charge q moving with a velocity **v** in an electric field **E** and a magnetic field **B** experiences a force of

$$\mathbf{F} = q\mathbf{E} + q\mathbf{v} \times \mathbf{B}$$

(in SI units). It says that the electromagnetic force on a charge q is a combination of a force in the direction of the electric field **E** proportional to the magnitude of the field and the quantity of charge, and a force at right angles to the magnetic field **B** and the velocity **v** of the charge, proportional to the magnitude of the field, the charge, and the velocity. Variations on this basic formula describe the magnetic force on a current-carrying wire (sometimes called Laplace force), the electromotive force in a wire loop moving through a magnetic field (an aspect of Faraday's law of induction), and the force on a moving charged particle.

Historians suggest that the law is implicit in a paper by James Clerk Maxwell, published in 1865. Hendrik Lorentz arrived at a complete derivation in 1895, identifying the contribution of the electric force a few years after Oliver Heaviside correctly identified the contribution of the magnetic force.

(Excerpt end)

Observation:

One should note the equation for the force has no time variable. The force is instantaneous.

The Standard Model has a set of 4 fundamental forces.

Excerpt from Wikipedia on electromagnetism:

The electromagnetic force is one of the four known fundamental forces. The other fundamental forces are:

- the strong nuclear force, which binds quarks to form nucleons, and binds nucleons to form nuclei.
- the weak nuclear force, which binds to all known particles in the Standard Model, and causes certain forms of radioactive decay. (In particle physics though, the electroweak interaction is the unified description of two of the four known fundamental interactions of nature: electromagnetism and the weak interaction);
- the gravitational force.

(Excerpt end)

Observation:

My updated atomic model has new definitions of the strong and weak forces.

3.1 Planck’s Equation

Lori Gardi recently concluded Planck’s equation has a mistake in its units where h x f cannot = energy.

She had other conclusions as well; some are relevant to quantum mechanics.

The YouTube video by Lori Gardi is titled:

Planck's Constant and the Nature of Light

An academic paper is also linked in the references.
They are recommended for 5 reasons:

1) The well accepted Planck's equation has a bug. She has a thorough explanation which is worthwhile to hear.

A simple revelation worth noting here is:

Planck's equation has a mistake in its units. As a result:

E = hf should be either:
a) $\Delta E = hf$
b) $E = htf$

where t is the time for the measurement.

She remarks this mistake and its fix have consequences for quantum mechanics.

2) The energy in light is in the intensity of a particular wave length, not only in the frequency, as is currently implied by the mistaken formula.

3) This video is another useful explanation of why there is no photon.

Light is a wave, not a particle. The electric and magnetic fields are oscillating with a consistent wave length during its propagation after initiation. Light never has a particle behavior. In an updated atomic model, there are no fictitious quasi-particles like a photon.

Particles require a mass to be detectable and measurable.

The conclusion that wave length intensity carries the energy is relevant to some absorption events.

4) Planck's constant defines the minimum wave length of light.

In some cases, the usage of Planck's constant must change because its units failed to address the missing time variable in Planck's equation. One usage is the uncertainty principle.

5) The uncertainty principle in quantum mechanics can have the uncertain limits defined so now they are not truly uncertain.

Copying much of her content here is not appropriate.

I have nothing to contribute to her excellent work. Excerpts can remove important context.

Observation:

From the video, this equation should be true:

$\Delta E = hc/\lambda$

Because a wave length is often used in this book, this particular formula is important. The term “quantum of energy” for one photon refers to this equation. There is no photon, but a wave length can carry energy as calculated here.

4 Standard Atomic Model

When beginning a description of the current atomic model, one must note it has an accepted, recognized, explicit problem, called the atomic mass defect.

This defect is the difference between the expected atomic mass and the measured atomic mass.

That this defect persists with no suitable explanation reveals this atomic model does not correctly describe an atom and its behaviors. This behavior is explained by my updated atomic model.

4.1 History of atomic models

Here is a brief version using an excerpt from the site AzCemistry:

The first atomic theorist was Democritus, a Greek scientist and philosopher who lived in the fifth century BC. At that time, Democritus found that if a stone was divided in half, the two halves would have essentially the same properties as the whole. And after that, he tried to cut the stone continually into smaller and smaller pieces up to some point where there would be a piece that would be so small as to be indivisible. He called these small pieces of matter "atomos", in Greek it means indivisible.

John Dalton developed the atomic theory around the 1800s. He developed the atomic theory because he disagreed with the theory of atoms that Aristotle had previously proposed. He passed through several experiments and discovered several atomic weights and created symbols for atoms and molecules.

In 1897, a scientist named J.J. Thomson did research to refine Dalton's atomic theory. Joseph John Thomson was a professor of experimental physics. He was successful for developing the atomic theory and received a Nobel Prize in physics in 1906 for his discovery of atomic theory.
At that time, Thomson experimented using a cathode ray tube or also called an electron gun. Thomson used a cathode ray tube with a magnet and find that the resulting green beam is made of negatively charged material.

In addition, he also did a lot of research and found that the mass of these particles is almost 2000 times lighter than the hydrogen atom.

From this study, Thomson suggested that Dalton's theory of atoms which said that atom could not be divided into smaller parts was wrong. After that, Thomson conducted a follow-up study and determined that the negative charge of the electron requires a positive charge that can balance both. Thus, he concludes that this negative charge is surrounded by a positively charged material.

A few years later, more precisely in 1911, Ernest Rutherford, one of Thomson's disciples, did some further research on Thomson's plum pudding model. The study was conducted by firing beam from positively charged particles called alpha particles against a very thin layer of gold foil. Since alpha particles had a lot of mass, Rutherford thought that all alpha particles would penetrate directly to the gold foil. At that time Rutherford argued that the alpha particle would penetrate the positively charged material and then would hit the screen detector on the other side.
But that hypothesis did not match with what Rutherford had predicted. Some of the alpha particles penetrated the gold layer, but some of them were deflected by the gold foil and then hit a detector at another location. Some of them even returned straight back to the path they took.
After this research, Rutherford argued that this alpha particle must hit something that was very small, dense, and positively charged so that there were some alpha particles that went straight back. From this experiment, Rutherford also concluded that atoms were composed mostly of empty spaces and the existing positive charge is not evenly distributed within the atom but squished into a tiny nucleus in the center of the atom.

Although Rutherford's theory can show that atoms have a nucleus that is positively charged and surrounded by a negative electron, this theory also has a weakness. The weakness is that Rutherford's theory cannot explain why electrons do not fall into the nucleus.

In 1913, the Danish physicist and also a student of Rutherford, Neils Bohr repaired Rutherford's atomic theory through his experiments on the spectrum of hydrogen atoms. This experiment managed to give a picture that electrons are occupying the area around atomic nucleus. Bohr's explanation of a hydrogen atom involves a combination of Rutherford's classical theory and the quantum theory of Planck, expressed by four postulates, as follows:

There is only a certain set of orbits that is allowed for one electron in a hydrogen atom. This orbit is known as a stationary motion (settling) electron and is a circular path around the nucleus. The path, which is also called the atomic shell, is a circular orbit with certain radius. Each path is marked by an integer called the principal quantum number (n), starting from 1, 2, 3, 4, 5, and so on and denoted by the symbols K, L, M, N, O, and so on. The first path with n = 1 is named shell K. The second path with n = 2 is named shell L, and so on. The larger the n value it means that is farther from the nucleus hence the greater the electron's energy orbiting the skin.
As long as the electron is in the stationary path, the energy of the electron is still remaining so there is no energy in the form of radiation that is emitted or absorbed.
Electrons can only move from one stationary path to another stationary path. In this transition, a certain amount of energy is involved, the magnitude corresponding to the Planck equation, $E2 – E1 (\Delta E) = hf$

The allowed stationary path has a magnitude with certain properties; particularly the property is called angular momentum. The magnitude of the angular momentum is a multiple of h / 2p or nh / 2p, where n is an integer and h is the Planck constant. According to the Bohr's atomic model theory, electrons surround the nucleus at certain paths called electron shells or energy levels. The lowest energy level is the deepest electron shell; the outer layer has the bigger shell number and higher energy level.

The summary of Bohr's atomic model theory is that atom consists of atomic shells as a place for electron to move. Despite this new invention, this theory also had a weakness that is this atomic theory could not able to explain the colors spectrum of atom that consisted of many electrons.

4.2 Bohr atomic model

Excerpt from Wikipedia:

In 1913, Niels Bohr identified the correspondence principle and used it to formulate a model of the hydrogen atom which explained the line spectrum. In the next few years Arnold Sommerfeld extended the quantum rule to arbitrary integrable systems making use of the principle of adiabatic invariance of the quantum numbers introduced by Lorentz and Einstein. Sommerfeld made a crucial contribution by quantizing the z-component of the angular momentum, which in the old quantum era was called space quantization (Richtungsquantelung). This allowed the orbits of the electron to be ellipses instead of circles, and introduced the concept of quantum degeneracy. The theory would have correctly explained the Zeeman effect, except for the issue of electron spin. Sommerfeld's model was much closer to the modern quantum mechanical picture than Bohr's.

(Excerpt end)

Observation:

Sommerfield "extended the quantum rule making use of quantum numbers. This allowed the orbits of the electron to be ellipses instead of circles." This used the word "allowed" but not "restricted."

4.3 Lewis Dot structure

In 1916, Gilbert Lewis proposed a dot structure to represent the number of electrons in the circular valence ring of each element.

Excerpt from Wikipedia:

Lewis structures, also known as Lewis dot formulas, Lewis dot structures, electron dot structures, or Lewis electron dot structures (LEDS), are diagrams that show the bonding between atoms of a molecule and the lone pairs of electrons that may exist in the molecule. A Lewis structure can be drawn for any covalently bonded molecule, as well as coordination compounds. The Lewis structure was named after Gilbert N. Lewis, who introduced it in his 1916 article The Atom and the Molecule. Lewis structures extend the concept of the electron dot diagram by adding lines between atoms to represent shared pairs in a chemical bond.

(Excerpt end)

Observation:

For over 100 years, chemistry has relied on the consistent behavior in an atom's electron configuration.

There is never a margin of error to accommodate the uncertainty of electrons being in their predicted rings at the moment when required.

Lewis structures are a simple representation of the valence ring, but it is so useful because the electrons are always where expected.

The supposed uncertainty with electrons which arose with quantum mechanics is only theoretical. That uncertainty does not exist in real atoms.

Simple tools like Lewis dot structures remain valid because an electron configuration is still predictable, like in 1916.

4.4 Valence bond theory

The Bohr model needed improvements, which came with valence bond theory.

Excerpt from Wikipedia:

According to this theory a covalent bond is formed between two atoms by the overlap of half filled valence atomic orbitals of each atom containing one unpaired electron. A valence bond structure is similar to a Lewis structure, but where a single Lewis structure cannot be written, several valence bond structures are used. Each of these VB structures represents a specific Lewis structure. This combination of valence bond structures is the main point of resonance theory. Valence bond theory considers that the overlapping atomic orbitals of the participating atoms form a chemical bond. Because of the overlapping, it is most probable that electrons should be in the bond region. Valence bond theory views bonds as weakly coupled orbitals (small overlap). Valence bond theory is typically easier to employ in ground state molecules. The core orbitals and electrons remain essentially unchanged during the formation of bonds.

(Excerpt end)

Observation:

The phrase “it is most probable” is apparently needed to accommodate atoms which are not in ground state,

4.5 Transition in Bohr’s model

In 1927, Erwin Schrödinger, an Austrian scientist, put forward an atomic theory called quantum mechanical model of the atom. This theory uses mathematical equations to explain the possibility of finding electrons in certain positions. The quantum mechanical model has similarities with the Niels Bohr atomic theory in terms of energy levels or atomic skins, but differs in terms of their shape or orbit.
In the atomic theory of quantum mechanical model, the position of electrons is uncertain. The thing that can be determined is about to predict the odds of the location of the electron. This model can be portrayed as a nucleus surrounded by an electron cloud. Where in the most dense clouds, there is the greatest possibility for the discovery of electrons, and vice versa, the least electrons are found in less dense cloud regions. Thus, this theory model also explains the concept of sub-energy level.
The formulation of Erwin Schrödinger was very difficult to understand by scientists at that time. Schrödinger’s theory is similar to the solar system whose orbits are erratic and the sun is at its core. For the discovery of the atomic theory of quantum mechanics, Erwin Schrödinger received physics Nobel Prize in 1933.

(Excerpt end)

Observation:

Neils Bohr developed his atomic model having circular orbits, based on his experiments with hydrogen atoms.
Schrödinger's theory arose from a misunderstanding. Orbits in the solar system are definitely not erratic. They are elliptical, as explained by Kepler's laws of planetary motion, which are based on Newton's force of gravity. Motion around a system's center of gravity is instantaneous but not symmetrical, so it is elliptical. It is certainly not erratic when these orbits are predictable.

A fixed radius orbit is symmetrical and maintains a consistent electric force defined by Coulomb's law. The great mass differential between electron and proton has no effect on this fixed radius orbit driven by the electric force.

4.6 Standard Model of particle physics

Excerpt Wikipedia:

The Standard Model of particle physics is the theory describing three of the four known fundamental forces (the electromagnetic, weak, and strong interactions, and not including gravity) in the universe, as well as classifying all known elementary particles. It was developed in stages throughout the latter half of the 20th century, through the work of many scientists around the world, with the current formulation being finalized in the mid-1970s upon experimental confirmation of the existence of quarks. Since then, confirmation of the top quark (1995), the tau neutrino (2000), and the Higgs boson (2012) have added further credence to the Standard Model.

Although the Standard Model is believed to be theoretically self-consistent and has demonstrated huge successes in providing experimental predictions, it leaves some phenomena unexplained and falls short of being a complete theory of fundamental interactions.
It does not fully explain baryon asymmetry, incorporate the full theory of gravitation as described by general relativity, or account for the accelerating expansion of the Universe as possibly described by dark energy. The model does not contain any viable dark matter particle that possesses all of the required properties deduced from observational cosmology. It also does not incorporate neutrino oscillations and their non-zero masses.

(Excerpt end)

Observation:

The entire description admits this model “does not fully explain” a list of behaviors including some in cosmology. My updated atomic model and the Cosmology section can rectify this situation in physics.

5 Atomic Mass Unit

The atomic mass unit begins the definition of the updated atomic model's foundation.

5.1 Definition of the atomic mass unit

The current atomic mass unit definition has a recommended change in this book.

This change can affect the claim of a mass defect, where the sum of the particles in an element does not add up to the element's measured atomic mass.

Some definitions from Wikipedia:

The dalton or unified atomic mass unit (symbols: Da or u) is a unit of mass widely used in physics and chemistry. It is defined as 1/12 of the mass of an unbound neutral atom of carbon-12 in its nuclear and electronic ground state and at rest. The atomic mass constant, denoted mu, is defined identically, giving $m_u = m(^{12}C)/12 = 1$ Da.

By definition, the mass of an atom of carbon-12 is 12 daltons, which corresponds with the number of nucleons that it has (6 protons and 6 neutrons). However, the mass of an atomic-scale object is affected by the binding energy of the nucleons in its atomic nuclei, as well as the mass and binding energy of its electrons.
Therefore, this equality holds only for the carbon-12 atom in the stated conditions, and will vary for other substances. For example, the mass of one unbound atom of the common hydrogen isotope (hydrogen-1, protium) is 1.007825032241 Da, the mass of one free neutron is 1.00866491595 Da, and the mass of one hydrogen-2 (deuterium) atom is 2.014101778114 Da.

In general, the difference (mass defect) is less than 0.1%; exceptions include hydrogen-1 (about 0.8%), helium-3 (0.5%), lithium (0.25%) and beryllium (0.15%).

1 u or 1 Da = $1.66053906660 \times 10^{-27}$ kg
1 1 u = 1822.888486209 m_e

1 u = 1822.888486 m_e
m_p = proton mass = 1.007276466621 u

e = electric charge = $1.602176634 \times^{-19}$ C
proton charge = +1e
m_e = mass electron = $5.48579909070 \times 10^{-4}$ u
electron charge = -1e

neutrino mass = < 2.14×10^{-37} kg, 95% confidence level, sum of 3 flavors

neutrino charge = 0e

neutrino mass = < 3.53×10^{-10} u

(Excerpt end)

Observation:

Data came from several Wikipedia topics.

The neutrino mass is my calculation using the kg to dalton conversion. It should be in the list here because it is claimed to be a known subatomic particle though poorly understood, having an uncertain mass.

Excerpt from Wikipedia:

In physics, the proton-to-electron mass ratio, μ or β, is simply the rest mass of the proton (a baryon found in atoms) divided by that of the electron (a lepton found in atoms). Because this is a ratio of like-dimensioned physical quantities, it is a dimensionless quantity, a function of the dimensionless physical constants, and has numerical value independent of the system of units, namely:
$\mu = m_p/m_e = 1836.15267343$.

(Excerpt end)

Observation:

$1/\mu = 5.4462 \times 10^{-4}$

m_e uses this value and the proton mass.

At this point, the integrity of these assigned values could be checked.

However, the definition of 1 dalton does not provide the ^{12}C mass which was used for the calculation.

The particles in the ^{12}C atom, of 6 protons, 6 electrons, and 6 neutrons, which are each a proton and electron pair, can be summed with the result of 12.0873176 u

This is from:
12 times 1.007276466621 u for 6 protons and 6 neutrons
+
12 times 5.48579909070 $\times 10^{-4}$ u for sum of 6 neutrons plus 6 pairs of a proton and orbiting electron.

Its current measured value in the Carbon isotopes topic is “exactly 12”
If the 12. value was actually used for calculating 1 Dalton then that use was a mistake.
This isotope’s mass value has the a mass defect.

The mass of protium, or ^{1}H, is provided and will be used for a better basis for calculating particle masses.

$^{1}H = 1.007825032241$

This atom is simply 2 particles:

$^{1}H = m_p + m_e$.

Using the two individual values the sum is 1.007825046530

My Excel value is slightly higher than from Wikipedia.

The current masses of an electron and proton do not add up to the mass in a protium atom.

There can be **no** other reason for this difference than the mass values, 1 or more of the 3 numbers involved, are wrong.

The protium (^{1}H) mass calculation can be from a different calculation using only one particle mass, not two:
$^{1}H = \mu\, m_e + m_e$ or $^{1}H = (\mu + 1)\, m_e$

This equation requires a high level of certainty of the precision of both the μ value and the ^{1}H value.
.
This result is 1.007825046538

This is not the measured value so either ^{1}H is wrong or m_e is wrong.

The m_e can be calculated with:

$m_e = {}^1H / (\mu +1)$

with ${}^1H$ = 1.007825032240 (Excel fails with last digit as 1

This is spec: m_e = 5.48579909070 $\times 10^{-4}$ u

The new result is m_e = 5.485799012873$\times 10^{-4}$

Calculation using 10 digits, m_e = 0.0005485799

Though the last digit is dropped for Excel, the result was slightly higher, but this is a debatable number of significant digits for a valid comparison.
This is not the current m_e so either ${}^1H$ is wrong or μ is wrong – or the current m_e is wrong. This topic proposes m_e must change.

The m_p can be calculated using m_e and the ${}^1H$ spec value:

$m_p = {}^1H - m_e$

With the calculated m_e value, m_p = 1.007276452331
Or 1.0072764523 with only 10 decimal digits

Compare with result from ${}^{12}C$: 1.007276466621

This is the result with the new m_p and m_e ${}^1H$=
1.007825032232
Compare with this spec value: ${}^1H$ = 1.007825032241

The 2 new values sum to a slightly lower ${}^1H$ by only at the limit of the software precision.

Both the old pair and the new pair add up to slightly less than the current atomic mass value, but beyond the significant digits.

My Excel 2003 handles up to 10 digits after the decimal point. The numbers add up with that precision.

I cannot define a new mass for an electron with a suitable number of significant digits, if more than 10 are required.

One could expect the community of people working with particle physics have a vested interest in agreeing on the correct values.

The atomic mass values for the elements are rarely, if ever specified with more than 10 digits after the decimal.

The updated atomic model must suit the evidence.

The current mass values are apparently wrong by a tiny amount. I expect there must be an agreement among many contributors for any change in mass of the 2 fundamental particles.

This book uses a value but if this recommendation is accepted, then a value with a defined precision, or the number of significant digits, must be agreed upon by those managing the “official” values.

This simple exercise using only ^{1}H and μ indicates physicists must confirm both values to the required precision, before assigning a mass value to the electron and proton if this alternate ^{1}H baseline is used instead of ^{12}C.

The precision of the two crucial input values affects the precision of the resulting particle mass values.

It is simply impossible for there to be “nuclear binding energy” in a nucleus consisting of only a proton.

Using the protium atom should be a better choice for defining the atomic mass unit because:

a) it consists of only the 2 fundamental particles,
b) it does not have18 particles (6 x proton, 6 x electron, 6 x neutron) like ^{12}C,
c) it has no possible binding energy,
d) it is not clear how or whether binding energy is accommodated in the current ^{12}C algorithm,
e) it makes sense to use the unbreakable electron as the benchmark for defining atomic mass,

f) it is consistent with the updated atomic model treating the electron and proton as fundamental particles,

g) the issue with this selection is it requires an accurate proton-to-electron mass ratio,

h) the precision of m_e depends on the precision of only ^1H and μ
The recommendation is a change to ^1H for calculating masses should be considered "again."
The amu has a history worth noting about its element selection, described in this story:

Atomic Mass Unit Definition (AMU)

Excerpt:

John Dalton first suggested a means of expressing relative atomic mass in 1803. He proposed the use of hydrogen-1 (protium). Wilhelm Ostwald suggested that relative atomic mass would be better if expressed in terms of 1/16th the mass of oxygen. When the existence of isotopes was discovered in 1912 and isotopic oxygen in 1929, the definition based on oxygen became confusing.
Some scientists used an AMU based on the natural abundance of oxygen, while others used an AMU based on the oxygen-16 isotope. So, in 1961 the decision was made to use carbon-12 as the basis for the unit (to avoid any confusion with an oxygen-defined unit). The new unit was given the symbol u to replace amu, plus some scientists called the new unit a Dalton. However, u and Da were not universally adopted. Many scientists kept using the amu, just recognizing it was now based on carbon rather than oxygen.
At present, values expressed in u, AMU, amu, and Da all describe the exact same measure.

(Excerpt end)

Stating just "Wilhelm Ostwald suggested" does not provide his reason for it being "better." The subsequent discovery of isotopes indicated the selection probably was not better.

After trying protium first, then oxygen, then carbon, one can conclude protium should have remained the standard. It could be awkward to change the benchmark element for a third time, by a return to the initial choice.

A hydrogen-2 (deuterium) atom can be checked with the new particle masses because ^2H mass is provided. Its nucleus is a proton and neutron.

Measured: $^2H = 2.014101778114$

$^2H = m_p + m_e + \ (m_p + m_e)$
Or it is twice ^1H
To expect: 2.0156500644

This is more than the specified mass.

When using the old calculated values:

Measured ^{2}H = 2.015650093

The differences are tiny, but notable. There is the expected, non-quantified, binding energy between the 2 nucleons.

With new particle masses, the difference is -0.000000029

Therefore, there is a known mass defect with the deuterium atom using the current particle masses. This is with either pair of values of electron and proton mass, based on either ^{1}H or ^{12}C.

This is the expected result because the measured is less than the sum, resulting in a mass deficit, which is called nuclear binding energy. The proton is binding with the neutron.
This comparison has 2 alternate explanations:
1) a neutron exhibited a loss in mass.
2) a neutron exhibited a loss in its reactivity to other masses.
This book suggests the second. No mass is becoming energy.
The difference between sets for ^{1}H ^{12}C can be compared for their summation for ^{12}C.

^{12}C is measured at 12.0

Using the respective values for m_p and m_e, the results are:

From spec values ^{12}C = 12.09390056

From ^{1}H values ^{12}C = 12.0939004

There is a very small difference in the calculated values, beyond the number of significant digits (4 after decimal point) in the ^{12}C value.

However, the values which were supposed to result in exactly 12.0096 but their sum clearly failed to do so.

Both sets exhibit a mass defect because they do not match the measured atomic mass value,
The proton and electron mass values, derived from ^{12}C failed to result in exactly 12.0096. Because that was the goal of that algorithm, the algorithm failed. It did not account for nuclear binding energy.

That observation leads to a recommendation to use protium, which is the only atom having no possible binding energy.

Conclusion of atomic mass analysis:

This exercise suggests the current proton mass value is a tiny bit high.

The value derived from protium might be closer to the “correct” value if this is the only way to calculate the mass of a proton and electron.

Instead of recommending a change, the current value for the mass of an electron can remain unchanged, for now.

The big change in particle physics is explaining the observed mass defect.

Mass defect is currently explained as an awkward mass to energy conversion possibly suggested by Einstein.
By the slight reduction in the proton mass, the mass defect in the protium atom is removed, as it should be, because the simplest nucleus has nothing to bind.

As a result, all elements will have a small reduction in their calculated mass defect.

5.2 A simpler subatomic particle model

Simpler means no quarks. This is also the basis for the new mechanism for gravity.

The 2 fundamental subatomic particles have a simple definition: mass and charge.

The current definition of atoms including the configuration of electron shells is described in the updated atomic model. The only important, but tiny, particle change in the atom is in the mass of a proton.

There are only 2 fundamental subatomic particles. Their anti-particles arise infrequently when the particle has its charge polarity flipped in a high energy event.

1) electron
mass = m_e, charge = -1e

2) proton
mass = m_p, charge = +1e

In this list, both have mass and charge. A particle must be measurable.
In a later section, the force of gravity is proposed as similar but distinct from an electric force which is driven by an electric charge.

Newton defined a simple behavior between masses, regardless of their charge.
The amount of mass in a particle determines how strongly it reacts to the presence of other masses.

Mass reactivity involves generating a field which other masses react to, just like charges react to other charges.

The strength of this effect of mass is reduced by free space, so the effect is weaker with increasing distance. In the terminology of an electric field, the density of the field lines diminishes with increasing distance from the source.

Later, the mass defect behavior appears driven by compression of nucleons.

My assumption of a proton as a fundamental particle is not affected by this observation. The compression in size of a proton is causing a reduction in its reactivity. The reactivity to other masses is a particle behavior. There is no problem here.

It is reasonable to expect the particle’s reactivity to other masses is in some way proportional to the particle’s volume.

In non-technical terms, a fundamental particle has reactivity to other masses. A fundamental particle must possess the internal energy to generate a field for other masses to interact. Similarly, the particle must possess the energy to react to the field generated by other particles. The size of the particle probably affects the strength of the variable field it can generate. The mass value is different between electron and proton. There is only value for a charge, so the particle’s size is not related to its charge value.

The amount of charge in a particle determines how strongly it reacts to the presence of other charges, or their electric field.

A charge has different behaviors than a mass.

A moving charge creates what is called a magnetic field, with its strength determined by the amount of charge moving together.

A stationary charge does not react to that magnetic field, but a moving charge is affected.

If the magnetic field is changing then it creates an electric field, so a charge will react to this change in its environment.

When a particle has the capability to react to other charges, every particle can have only one measured value of that reactivity, what is called the charge of an electron.

Having only one value of charge implies there is a single internal mechanism, among many particles, driving its reactivity to other charges. This mechanism is active at the moment of the particles creation. There are particular events when the charge polarity flips.
Conversely, there is internal mechanism, among all particles, driving its reactivity to other masses. As noted above, the size of a particle affects its mass reactivity.

There has never been a measurement of a particle having a different amount of charge than others, so the charge behavior is apparently not affected by the particle's size.

The fundamental particles are coherent, or without individual components. When the particle has this reactivity to charges, it has only one level of reactivity but 1 of 2 possible states.

This state, or polarity, either "+" or" –" , is selected at the moment of particle creation.

The presence of anti-particles suggests the polarity behavior in a particle can be flipped to the other sign, without affecting the amount of charge reactivity.
Its charge polarity is either positive or negative. When positive, it will be repelled by a net positive in its environment or attracted to a net negative in its environment. When negative, the opposite reaction occurs. This reaction is based on the polarity of the electric field in its environment.

There is no measured change of the "charge of an electron" in any particle. The mechanism is consistent, though one can wonder how thoroughly such a value can be measured in individual particles.

5.3 Comparison of forces

Atoms have charged particles.
This is a comparison of those forces.
The neutron has 2 distinct particles of opposite charge,
They are bound by both an electric force and a gravity force.

Values are from Wikipedia.

These equations are described again later.

Force of gravity equation:

$F_g = G * (m1 * m2) / r^2$

$G = 3.67430 \times 10^{-11}\ m^3 \cdot kg^{-1} \cdot s^{-2}$

e = electric charge = $1.602176634 \times 10^{-19}$ C

$m_e = 9.1 \times 10^{-31}$ kg

$m_p = 1.67262192369 \times 10^{-27}$ kg

$radius_e = 2.8179403227 \times 10^{-15}$ m

$radius_p = 0.84 \times 10^{-15}$ m

The electric force equation:

$F_e = ke * (q1 * q2) / r^2$

$ke = 8.99 * 10^9\ N \cdot m^2 \cdot C^{-2}$

For the ^1H atom:

q1 or q2 = e
m1 = m_e
m2 = m_p
^1H atom radius = Bohr radius = 5.29 x $\times 10^{-11}$ m

So for proton and electron, in ^1H atom:

The gravity force:

$F_g = 1.9795009170$ x $\times 10^{-47}$ N

The electric force:

$F_e = -8.2464899708 \times 10^{-8}$ N

F_e is negative meaning the force is attractive between opposite polarities.

When comparing F_e to F_g, the electric force is roughly
2.27×10^{39} stronger than the force of gravity.

The neutron will be mentioned later, but here is the appropriate place for this calculation and observation.

The neutron is usually in a nucleus. It disintegrates in a few minutes, when outside a nucleus.

So for proton and electron, in a neutron with $radius_p$ as their distance:

The gravity force: $F_g = 7.2468016237 \text{ x } \times 10^{-23}$ N

The electric force: $F_e = -1.8866878216 \text{ x } \times 10^{-17}$ N

Protons will be adjacent to other protons in an atom's nucleus.

Using double the proton radius as the distance between their centers, the electric force and the force of gravity can be calculated.

The gravity force:

$F_g = 1.9795009170 \text{ x } \times 10^{-47}$ N

The electric force:

$F_e = +81.7639597476$ N
F_e is positive meaning the force is repulsive between the same polarity (positive) particles.

The amount of force in F_e is substantial.

This large value should be noted, because an alpha particle ejection velocity is claimed to be near the velocity of light.

The strong force within a nucleus must overcome this repulsion among the protons in near proximity, or even adjacent.
This repulsive force must be overcome during the process of fusion, where nucleons are added to a nucleus.

The electric and gravitation forces were described above, but in an atomic nucleus, the strong force must dominate over the other forces, because most nuclei have more than one proton which repels others.

6 Atomic Mass Defect

The atomic mass defect is very important and is one of the justifications for an updated atomic model.

6.1 Mass Defect Introduction

The phenomenon called mass defect requires a new explanation in particle physics.

It is not really a defect. It is just an observation of a different mass than expected.

On the atomic scale, a difference in mass can be observed between expected and measured in an atomic nucleus. The difference could be more or less than expected. The difference is called a mass defect. When it is less then expected, it can be called a mass deficit. The measured mass value of a particular isotope is never more than expected.

In this book, data for the isotopes of the elements are from Wikipedia. Links are in References.

The nucleus consists of protons and neutrons, but each neutron is a combination of proton and electron.

The mass defect is an apparent change in the protons and neutrons in the nucleus during the process of fusion requiring compression.

After this phenomenon has an explanation, then it should not be called a defect.

There are 2 sources to compare their descriptions of the behavior.

Mass defect has this description, from Britannica:

The observed atomic mass is slightly less than the sum of the masses of the protons, neutrons, and electrons that make up the atom. The difference, called the mass defect, is accounted for during the combination of these particles by conversion into binding energy, according to an equation in which the energy (E) released equals the product of the mass (m) consumed and the square of the velocity of light in vacuum (c); thus, $E = mc^2$.

(Excerpt end)

Observation:

A difference is not always explained by this mass/energy relationship. This book offers another explanation.

Wikipedia uses another name and has no topic for Mass Defect.

In Wikipedia, the topic “mass defect” refers to an anomaly in a spiral galaxy brightness profile near its core.

Wikipedia calls the atomic mass defect behavior something else.

Excerpt from Wikipedia:

Nuclear binding energy is the minimum energy that would be required to disassemble the nucleus of an atom into its component parts. These component parts are neutrons and protons, which are collectively called nucleons. The binding energy is always a positive number, as we need to spend energy in moving these nucleons, attracted to each other by the strong nuclear force, away from each other. The mass of an atomic nucleus is less than the sum of the individual masses of the free constituent protons and neutrons, according to Einstein's equation $E=mc^2$. This 'missing mass' is known as the mass defect, and represents the energy that was released when the nucleus was formed.

Mass defect (also called "mass deficit") is the difference between the mass of an object and the sum of the masses of its constituent particles. Discovered by Albert Einstein in 1905, it can be explained using his formula $E = mc^2$, which describes the equivalence of energy and mass. The decrease in mass is equal to the energy given off in the reaction of an atom's creation divided by c^2. By this formula, adding energy also increases mass (both weight and inertia), whereas removing energy decreases mass. For example, a helium atom containing four nucleons has a mass about 0.8% less than the total mass of four hydrogen nuclei (which contain one nucleon each). The helium nucleus has four nucleons bound together, and the binding energy which holds them together is, in effect, the missing 0.8% of mass.

(Excerpt end)

The entire periodic table is reviewed in the Periodic Table section to find whether any isotopes have “extra mass.”

If this book’s conclusions are accepted, the descriptions for mass defect must be updated, including the removal of mentions of Einstein and mass/energy calculations.

6.2 Data Sets

I compiled data into several sets to support this book’s conclusions.

Any reference to PAM is to my book, Practical Atomic Model. Its data sets apply to this book about classical physics.

6.2.1 Caveat 1

There is a crucial limitation in analyzing the entire periodic table of elements.

One of the most important measurements of an atom is the radius of its outer valence ring of electrons. This ring is the primary participant in chemical bonds and its distance from the nucleus affects its electrons.

Currently, the valence radius is consistently available for only the first 86 elements, or Hydrogen through Radon. Element 87, Francium, and those heavier, do not consistently have this value. The reason must be related to these heavier elements being radioactive. The heaviest element having a stable isotope is Lead, having atomic weights of 206, 207, and 208 as stable.

There are isotopes having a measured mass for all 118 elements.

Therefore, some conclusions can be drawn for all 118, while other conclusions apply to a smaller set.

The charts present available data. Gaps result from no data.

I compiled data into several sets to support this book's conclusions.

6.2.2 Caveat 2

There is a crucial limitation in analyzing the entire periodic table of elements.

One of the most important measurements of an atom is the radius of its outer valence ring of electrons. This ring is the primary participant in chemical bonds and its distance from the nucleus affects its electrons.

Currently, the valence radius is consistently available for only the first 86 elements, or Hydrogen through Radon. Element 87, Francium, and those heavier, do not consistently have this value. The reason must be related to these heavier elements being radioactive. The heaviest element having a stable isotope is Lead, having atomic weights of 206, 207, and 208 as stable.

There are isotopes having a measured mass for all 118 elements.

Therefore, some conclusions can be drawn for all 118, while other conclusions apply to a smaller set.

The charts present available data. Gaps result from no data.

6.2.3 Isotope Data

All the long life isotopes in the periodic table are analyzed for a mass defect, or the reduction in a proton's measured mass due to its compression during fusion, and radioactive decay.

Here, a long life isotope is one which is either stable or its half-life is long enough for using its nucleus for atomic analysis. For example, isotopes having a half-life less than 1 second are usually ignored for those few unstable elements having no isotopes lasting more a few seconds.
I compiled data from all elements and their long life isotopes to compare each for their measured value against the sum of their components.
This reference file in .xls format is compressed in a .zip format for convenient distribution.

ZR-Isotopes.zip

Note: The main worksheet, using MS Excel, has over 1095 rows. Compressing that content into a smaller page is quite impractical.

Many of the 118 elements have several stable isotopes as well as multiple radioactive isotopes.

A readme text file in the zip helps explain the worksheet.

The first decay step for the radioactive decay of an isotope is noted for the author's research, as well as the daughter isotope remaining after the decay action.

The behaviors in a radioactive nucleus require a clear explanation in particle physics.

The process toward that goal begins with the analysis of this behavior among all the elements.

A stable isotope usually has consistent proton rich steps for isotopes with fewer neutrons, like beta plus or electron capture, and neutron rich decay steps for isotopes with more neutrons, like beta minus.
For example some stable isotopes are classified as "Observationally Stable" because isotopes, which I shorten to "oS"

An oS isotope is among the mix of radioactive isotopes further from the stable isotopes which can have consecutive numbers of neutrons.

A work sheet with formulae expedites this analysis. Each element has a mix of entries and calculations, such as one for the number of neutrons after entering protons and nucleons.

6.2.4 Element Data

All the elements in the periodic table are analyzed for their average pass per proton.

The respective radius values, like valence, are entered.

This reference file is Z-Elements in .xls format, for Microsoft Excel, and is compressed in a .zip format for convenient distribution.

Z-Elements-PAM.zip

Note: The main worksheet has over 118 rows, with 1 per element. Compressing that content into this text document is quite impractical.

The columns include the atomic mass details to calculate the average proton mass for each element.

When available, the atomic radius and the valence radius are entered.

When available, the element's energy values for the first ionization, second, third, to ninth ionizations are in their respective columns,

Several columns have a chart covering all the elements having that value.

The Wan der Waals radius is also entered, when available. That behavior and those values are not used here, but were entered in case a need arose.

A readme text file in the zip helps explain the worksheet.

Several atomic behaviors require a better explanation in particle physics.

The process toward that goal begins with the analysis of each behavior among all the elements. Not all behaviors are covered; this is not a chemistry text book.

A work sheet with consistent formulae enables efficiency in this analysis. These data sets are used to justify my conclusions.

6.2.5 Building a Nucleus

A worksheet was created to compile data into a convenient format.
All the valid isotopes in the periodic table are analyzed for a stable nucleus. This done for all the known proton counts in atomic nuclei, from elements 1 to 118, for nucleon counts from 1 to 295.

This reference file in .xls format is compressed in a .zip format for convenient distribution.

Z-Nucleus-Builder.zip

Note: The main worksheet, using MS Excel, has about 295 rows, covering the relevant combinations of nucleons. Compressing that content into a smaller page is quite impractical.

The stability of a nucleus depends on the physical arrangement of the protons in combination with the arrangement of the electrons whose presence results in neutrons. This behavior of building a nucleus requires a better explanation in particle physics.

The process of developing an improved explanation begins with the analysis of this behavior among all the elements.

As noted earlier, a plasma pinch provides a substantial electromagnetic force capable of compressing charged particles into a nucleus.

6.2.6 Building an Electron Configuration

Later, a change in naming electron rings is proposed.
I developed a VBA application for MS Excel to generate the electron configuration for all 118 elements. All the valid isotopes in the periodic table are analyzed for a stable nucleus for all the known proton counts in atomic nuclei, from elements 1 to 118, for nucleon counts from 1 to 295. The valence for each element is shown. This column of valences is presented in a chart.

This reference file in .xls format is compressed in a .zip format for convenient distribution.

Z-Populate-NewRings.zip

Note: The main worksheet, using MS Excel, has over 118 rows, covering all the currently known elements.

A readme text file in the zip helps explain the worksheet and operating its main macro.

The name of the file comes from its application of the new shell or ring names, replacing spdf.

6.2.7 Building a Nucleus

A worksheet was created to compile data into a convenient format.
All the valid isotopes in the periodic table are analyzed for a stable nucleus. This done for all the known proton counts in atomic nuclei, from elements 1 to 118, for nucleon counts from 1 to 295.

This reference file in .xls format is compressed in a .zip format for convenient distribution.

Z-Nucleus-Builder.zip

Note: The main worksheet, using MS Excel, has about 295 rows, covering the relevant combinations of nucleons. Compressing that content into a smaller page is quite impractical.

The stability of a nucleus depends on the physical arrangement of the protons in combination with the arrangement of the electrons whose presence results in neutrons. This behavior of building a nucleus requires a better explanation in particle physics.

The process of developing an improved explanation begins with the analysis of this behavior among all the elements.

As noted earlier, a plasma pinch provides a substantial electromagnetic force capable of compressing charged particles into a nucleus.

7 Updated Atomic Model

An update to the current atomic model fixes its known failures, like its atomic mass defect. This update also offers new explanations for several forces and observations.

7.1 Fundamental Particles

In an updated atomic model for particle physics, only a permanent particle having a measurable mass is a fundamental particle.

The Standard Model for particle physics has different criteria.

This updated model proposes the 2 fundamental subatomic particles are the proton and electron. The rare neutrino and muon are also described, but are not fundamental.

A small number of subatomic particles are observed in nature, meaning outside of particle accelerators.

These are the electron, proton, neutron, and neutrino. The muon barely qualifies because it exists in nature only as a result of atmospheric particles colliding with cosmic rays, which are the results of distant astrophysical particle accelerators. Otherwise, muons are found only in particle accelerators.

Each natural subatomic particle’s current basic description is provided. More details for each particle will follow later.

7.2 Definition of several terms in this section

Elementary or fundamental particle, from Wikipedia:

In particle physics, an elementary particle or fundamental particle is a subatomic particle with no substructure, i.e. it is not composed of other particles.

Observation:

The simple rule for an elementary particle is: it exhibits no other particles.

7.3 Electron

Excerpt from Wikipedia:

The electron is a subatomic particle, symbol
e^- or β^-, whose electric charge is negative one elementary charge. Electrons belong to the first generation of the lepton particle family, and are generally thought to be elementary particles because they have no known components or substructure.

(Excerpt end)

Observation:

The electron is elementary only because particle colliders have been unable to find a way to break one.

Perhaps someday, someone will accomplish this feat, resulting in an electron getting a new classification, depending on the fragments.

Even the use of "generally thought" confirms this rule is based on a judgment.
Particle physics needs a rule which is based on some physical evidence rather than on only the limits of accelerator technology.

7.4 Quark

From Wikipedia:

"A quark is a type of elementary particle and a fundamental constituent of matter. Quarks combine to form composite particles called hadrons, the most stable of which are protons and neutrons, the components of atomic nuclei. Due to a phenomenon known as color confinement, quarks are never found in isolation."

Observation:

Despite this description, a neutron is not stable. A neutron outside a nucleus disintegrates into its 2 parts, proton and electron, in a few minutes. When a nucleus has too many neutrons, one of them will eject its electron leaving only the proton. This is known as beta minus decay.
A quark is not consistent with the electron and proton particles because a quark is "never found in isolation."

A quark is only a fragment remaining after the destruction of a proton. Otherwise, it is "never found."

There is no justification for it to be fundamental, when it is worthless debris. Quarks contribute nothing to our understanding of an atom. Quarks have no role in any known atomic behavior.

The various fragments or debris in particle accelerators are a distraction when returning to classical physics. They are relevant to only users of the LHC or similar specialized devices.

7.5 Proton

Excerpt from Wikipedia:

A proton is a subatomic particle, symbol p or p^+, with a positive electric charge of +1e elementary charge and a mass slightly less than that of a neutron."

Although protons were originally considered fundamental or elementary particles, in the modern Standard Model of particle physics, protons are classified as hadrons, like neutrons, the other nucleon.

Protons are composite particles composed of three valence quarks: two up quarks of charge +2/3e and one down quark of charge −1/3e. The rest masses of quarks contribute only about 1% of a proton's mass. The remainder of a proton's mass is due to quantum chromodynamics binding energy, which includes the kinetic energy of the quarks and the energy of the gluon fields that bind the quarks together. Because protons are not fundamental particles, they possess a measurable size; the root mean square charge radius of a proton is about 0.84 to 0.87 fm (or 0.84×10^{-15} to 0.87×10^{-15} m).

In 2019, two different studies, using different techniques, have found the radius of the proton to be 0.833 fm, with an uncertainty of ±0.010 fm.

(Excerpt end)

Observation:

The quarks do not sum up to the mass of a proton. They have only 1%. If quarks are the claimed components of a proton then the claim immediately fails. A proton needs much more than these fragments to be capable of its observed behaviors.
This model treats a proton as a fundamental particle. A proton exhibits no substructure.

A proton can be broken into 3 fragments but they cannot be combined again to get a functional proton. Fragments from a high velocity collision are not components or substructure.

A proton exhibits mass and charge so if the set of fragments is claimed to be its components or substructure then there must be evidence these fragments either share or contribute to the known behaviors of the original particle. For a proton, there is no such evidence for the fragments being legitimate components. The 1 % is not evidence, but instead shows this is a mistake. They are no different than fine particle dust remaining after an explosion. The original object's structure is not found in the dust.

The 3 fragments have no evidence that any of them was a component of an important behavior, like mass or charge.

Because they provide nothing to improve our understanding of a proton, quarks should be ignored when explaining behaviors of atoms and its 3 components, electron, proton, and neutron.

7.6 Neutron

From Wikipedia:

"The neutron is a subatomic particle, symbol
n or n^0, which has a neutral (not positive or negative) charge and a mass slightly greater than that of a proton."

Observation:

The following statement is not in Wikipedia because it is the conclusion of my updated atomic model.

A neutron is a proton having an adjacent electron.

Therefore, a neutron is correctly not a fundamental particle, because it is a combination of 2.

7.7 Neutrino

The neutrino is not a particle in the updated atomic model because it has no mass or charge making it impossible to measure so it is impossible to verify its existence.

From Wikipedia:

A neutrino (denoted by the Greek letter ν) is a fermion (an elementary particle with spin of 1/2) that interacts only via the weak subatomic force and gravity. The neutrino is so named because it is electrically neutral and because its rest mass is so small (-ino) that it was long thought to be zero. The mass of the neutrino is much smaller than that of the other known elementary particles.

neutrinos in one of three leptonic flavors: electron neutrinos (ν_e), muon neutrinos (ν μ), or tau neutrinos (ν τ), in association with the corresponding charged lepton
Although neutrinos were long believed to be massless, it is now known that there are three discrete neutrino masses with different tiny values, but they do not correspond uniquely to the three flavors.

(Excerpt end)

Observation:

A neutrino is elementary in the Standard Model, only because it was never broken into pieces. When it has no mass, then its pieces have no mass. There is no observed decay, but is impossible to observe before a possible decay.

The mass remains “tiny” for each neutrino, to give it the illusion of being a particle.

There are 3 types or flavors of a neutrino. Each is explained in turn.

7.7.1 Electron Neutrino

Excerpt from Wikipedia:

The electron neutrino (v_e) is a subatomic lepton elementary particle which has zero net electric charge.

(Excerpt end)

Observation:

From the reference, the mass of this particle is “small but non-zero.”

It is important to get the background for a neutrino and how its ambiguous mass value arose.

That is the Cowan–Reines neutrino experiment.

Excerpt from Wikipedia:

The Cowan–Reines neutrino experiment was conducted by Washington University in St. Louis alumnus Clyde L. Cowan and Stevens Institute of Technology and New York University alumnus Frederick Reines in 1956. The experiment confirmed the existence of neutrinos. Neutrinos, subatomic particles with no electric charge and very small mass, had been conjectured to be an essential particle in beta decay processes in the 1930s. With neither mass nor charge, such particles appeared to be impossible to detect. The experiment exploited a huge flux of (hypothetical) electron antineutrinos emanating from a nearby nuclear reactor and a detector consisting of large tanks of water. Neutrino interactions with the protons of the water were observed, verifying the existence and basic properties of this particle for the first time.

Only the resulting electron was observed, so its varying energy suggested that energy may not be conserved. This quandary and other factors led Wolfgang Pauli to attempt to resolve the issue by postulating the existence of the neutrino in 1930. If the fundamental principle of energy conservation was to be preserved, beta decay had to be a three-body, rather than a two-body, decay. Therefore, in addition to an electron, Pauli suggested that another particle was emitted from the atomic nucleus in beta decay. This particle, the neutrino, had very small mass and no electric charge; it was not observed, but it carried the missing energy.

(Excerpt end)

There is no loss of mass but the electron did not have the correct kinetic energy.

The correct energy and how it is calculated are never defined. An electron ejection from the nucleus gets its acceleration from the other electrons in the nucleus, by the electric force between negative charges. This ejection occurs only when there are multiple electrons among the protons in the nucleus.

The solution was proposing a third body in the event, but it cannot have mass because none can be created, and no loss of mass is observed.

This third body eventually was named a neutrino.
This neutrino is inconsistent in particle physics because any elementary particle must have mass.

To confirm the existence of a no-mass particle it must be directly detectable, by a method having no other explanation than this neutrino.

That is why neutrino detectors were designed and built. The Sudbury Neutrino Observatory is one.

Excerpt from Wikipedia:

The Sudbury Neutrino Observatory (SNO) was a neutrino observatory located 2100 m underground in Vale's Creighton Mine in Sudbury, Ontario, Canada. The detector was designed to detect solar neutrinos through their interactions with a large tank of heavy water.
The detector was turned on in May 1999,

In the charged current interaction, a neutrino converts the neutron in a deuteron to a proton. The neutrino is absorbed in the reaction and an electron is produced. Solar neutrinos have energies smaller than the mass of muons and tau leptons, so only electron neutrinos can participate in this reaction. The emitted electron carries off most of the neutrino's energy, on the order of 5–15 MeV, and is detectable. The proton which is produced does not have enough energy to be detected easily. The electrons produced in this reaction are emitted in all directions, but there is a slight tendency for them to point back in the direction from which the neutrino came.

In the neutral current interaction, a neutrino dissociates the deuteron, breaking it into its constituent neutron and proton. The neutrino continues on with slightly less energy, and all three neutrino flavours are equally likely to participate in this interaction. Heavy water has a small cross section for neutrons, but when neutrons are captured by a deuterium nucleus, a gamma ray (photon) with roughly 6 MeV of energy is produced. The direction of the gamma ray is completely uncorrelated with the direction of the neutrino.

Some of the neutrons produced from the dissociated deuterons make their way through the acrylic vessel into the light water jacket surrounding the heavy water, and since light water has a very large cross section for neutron capture, these neutrons are captured very quickly. Gamma rays of roughly 2.2 MeV are produced in this reaction, but because the energy of the photons is less than the detector's energy threshold (meaning they do not trigger the photomultipliers), they are not directly observable. However, when the gamma ray collides with an electron via Compton scattering, the accelerated electron can be detected through Cherenkov radiation.

(Excerpt end)

Observation:

The excerpt has “when neutrons are captured by a deuterium..” but I believe that phrase is a mistake and should be “when neutrinos are captured by a deuterium...”

The gamma ray detected must have a mechanism like the alpha particle ejection, described above. The electron velocity must be similar to the alpha particle’s velocity to propagate a similar gamma ray wave length, though the experiment reports no measurement of this radiation’s spectrum.

SNO does not perform a direct detection of a neutrino. It uses an indirect method by monitoring and looking at events having no visible cause.

The technique to detect an electron neutrino involves the detection of an ejected pair of electron and neutron along with a gamma ray emission from a pool of water containing deuterium, so both ^{2}H and ^{1}H are with the single oxygen atom. The proton “does not have enough energy to be detected easily.” The more likely explanation is the proton, having lost its neutron, must remains with its orbiting electron, so the proton also must remain bound to the oxygen atom in this water molecule.

The assumption for this experiment is only the energy carried within an electron neutrino can break the bond between proton and neutron in the deuterium nucleus. There is no evidence supporting that assumption.

The excerpt continues with the results:

The first scientific results of SNO were published on 18 June 2001, and presented the first clear evidence that neutrinos oscillate (i.e. that they can transmute into one another), as they travel from the Sun. This oscillation, in turn, implies that neutrinos have non-zero masses. The total flux of all neutrino flavours measured by SNO agrees well with theoretical predictions. Further measurements carried out by SNO have since confirmed and improved the precision of the original result.

(Excerpt end)

Observation:

I disagree with these conclusions. There was nothing observed during this experiment to justify them. This is an indirect measurement by looking for results and assuming no other causes are present to explain those results.

If the neutrino is claimed to have a non-zero mass then it must be measurable.

For example, the Moon can pass between the Sun and the SNO. The Moon has a substantial non-zero mass, so the neutrino must interact with the Moon by at least changing the neutrino’s path. Therefore SNO should see detections affected by the Moon at that time. The Moon’s location is predictable.

Certainly, there is no justification of a confirmed change in flavour, unless one knows with certainty its flavour at its source. It is impossible to measure a neutrino at its point of origin.

This experiment claims to detect the results of an encounter with something having no measurable attributes, other than an uncertain amount of energy it carries. For this model, this is not sufficient to consider as evidence.

7.7.2 Tau Neutrino

Excerpt from Wikipedia:

The tau neutrino or tauon neutrino is a subatomic elementary particle which has the symbol ν τ and no net electric charge. Together with the tau (τ), it forms the third generation of leptons, hence the name tau neutrino. Its existence was immediately implied after the tau particle was detected in a series of experiments between 1974–1977 by Martin Lewis Perl with his colleagues at the SLAC–LBL group. The discovery of the tau neutrino was announced in July 2000 by the DONUT collaboration (Direct Observation of the Nu Tau).

(Excerpt end)

Observation:

The tau particle exists only in particle accelerators. This model ignores whatever fragments or claimed particles are proposed for the debris, when lacking independently verifiable evidence.

Neutrinos are claimed to have 3 flavors but none have a measured mass. A neutrino needs more experimental evidence to draw conclusions on its currently inconsistent behaviors. It is not part of an updated atomic model, which requires suitable evidence for conclusions.

7.8 Muon

From Wikipedia:

The muon from the Greek letter mu (μ) used to represent it) is an elementary particle similar to the electron, with an electric charge of −1 e and a spin of 1/2, but with a much greater mass. It is classified as a lepton. As with other leptons, the muon is not known to have any sub-structure – that is, it is not thought to be composed of any simpler particles.
The muon is an unstable subatomic particle with a mean lifetime of 2.2 μs.

Muons have a mass about 207 times that of the electron.

The dominant muon decay mode (sometimes called the Michel decay after Louis Michel) is the simplest possible: the muon decays to an electron, an electron antineutrino, and a muon neutrino.

(Excerpt end)

The muon is not consistent with other elementary particles, because it decays.

b) Because the muon decays, then those fragments should be considered as the muon's components.

c) Despite its decay, the muon remains an elementary particle in the Standard Model. It is even explicitly "similar to the electron" which never decays.

d) Its mass is 207x an electron but it decays into only 1 electron plus 1 muon neutrino plus 1 electron antineutrino.

All types of neutrinos currently have a mass of "small but non-zero."
Therefore, the decay of a muon results in the loss of mass equivalent to more than 206 electrons. This result should be a crisis for particle physics, but the discrepancy actually reveals the failure of a model based on quarks. A particle collider, including cosmic rays which can include high velocity alpha particles can create a particle having a mass less and did not than a proton and NOT result in 3 quarks. Repeatability is very important in physics and the muon is the failure of the quark explanation of a proton.

The muon is consistent with my updated atomic model. Only the charge behavior is consistent among particles; while its polarity can change. The muon description does not identify whether they have been measured at specific mass values. Given the limited data, this mechanism of mass is apparently most stable at only 2 values, m_p and m_e. This attribute remains no closer to being understood, despite the investment in the LHC. Given the muon's short life and the difficulty in creating one, the LHC is the only context available for its research. Instead, the LHC is committed to only the mistaken quark-based model.

The muon lacks a credible explanation, and has a very brief life. Its status as an elementary particle cannot be justified. Instead, it reveals the failure of particle physics.

The muon has no role in any atomic behaviors, when all are explained with the electron and proton.

Muons should be relegated to whatever category is assigned to debris from particle accelerators, which include muons and quarks.

7.9 Atomic Nuclei

This exercise describes the interaction between protons and electrons in a nucleus. The most stable counts of protons in a nucleus are described.

This is an investigation of the supposed strong force, which is claimed to hold a nucleus intact. There is no such separate force. The protons and electrons in contact are mutually attracted by the electric force.

There is no supposed weak force which is claimed to eject particles from a nucleus. When equilibrium between adjacent protons is disturbed, the electric force reverts to repulsion. The nucleus behaviors are driven by the electric force and no other.

Force is required to fuse a proton with other protons, because the electrostatic force between positive charges repels them. However, if contact is attained, the repulsive force becomes attractive, until disturbed. Combinations of electrons and protons within the nucleus enhance its stability, because the protons are also bound to the electron(s).

When an electron is attached to a proton, the combination is called a neutron because the pair of attached particles exhibits no net charge.

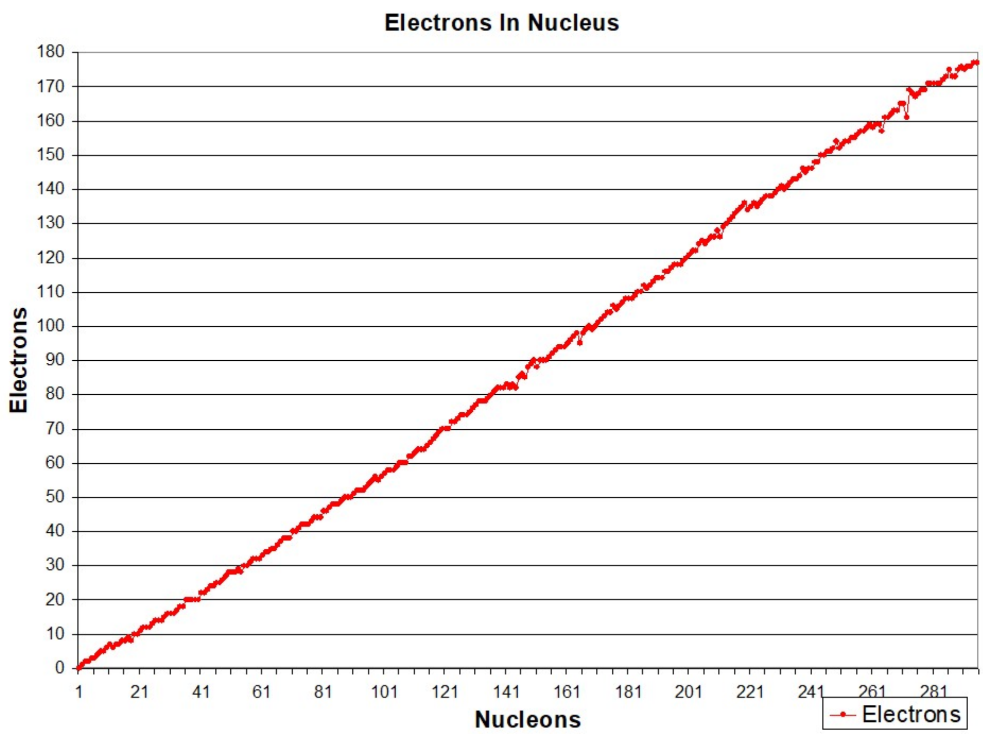
The sequence of proton and electron combinations for a stable nucleus is not linear.

Oxygen is 16 protons with 8 electrons, so its atomic number is 8 for its 16 nucleons, and is identified as ^{16}O, where the number 16 is the number of nucleons in this isotope of Oxygen. The next stable element is Fluorine having 17 nucleons and 10 electrons, so its atomic number is 9 and is ^{19}F. A nucleus with 18 nucleons with 9 electrons, or ^{18}F, is not stable.

Some of the lighter elements have the number of electrons at half the number of nucleons. That works for ^{14}N, and ^{16}O, and others, but not F, and others.

The chart contains all the stable isotopes, or each with the longest life among alternatives, for all the nucleon counts from 1, for element 1 Hydrogen, to 295 for element 118 Oganesson.

The number of electrons accompanying each number of nucleons is charted.

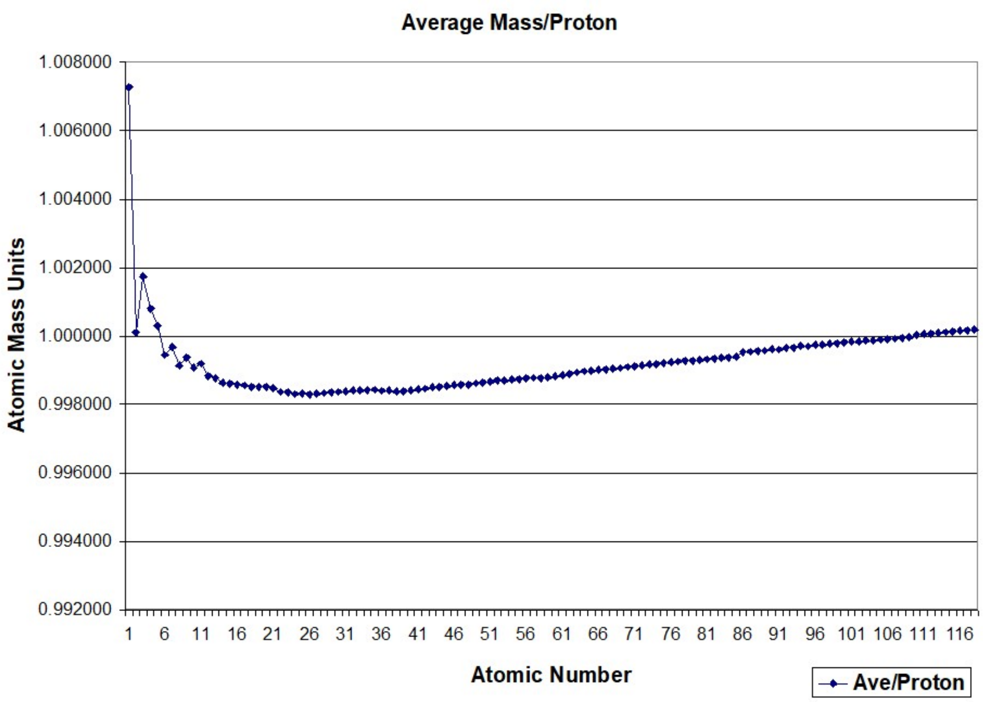


The ratio is not linear, with a few anomalies at certain nucleon counts. Those will be explained later.

7.10 Protons in a nucleus

Protons get compressed during fusion causing their mass to decrease. Here is a chart showing this decrease.

The nominal mass of an atom is the sum of its protons and neutrons. An atom's measured mass includes the electrons orbiting the nucleus. In the nucleus, a neutron is a proton with an attached electron. The average mass per proton in an atom is calculated from the atom's measured mass, subtracting the mass of all the electrons, then dividing by the number of nucleons (atomic weight). The number of nucleons is also the number of protons; some of them have attached electrons.



Hydrogen is atomic number 1. Its proton mass is Unchanged.

All the known isotopes which are not found in nature, like above 94 or Plutonium, are created by particle colliders using heavy nuclei. That mechanism probably results in inconsistent compression within the nucleus.

An atom consists of protons, neutrons, and electrons. Each neutron is the combination of a proton and electron. An atom has the same number of protons and electrons, so the non-ionized atom exhibits no net charge.

The above chart illustrates the cause of an atomic mass defect. The mass of a proton is more than 1 amu, but when measuring them compressed into a nucleus, a proton consistently measures at less than 1 amu.

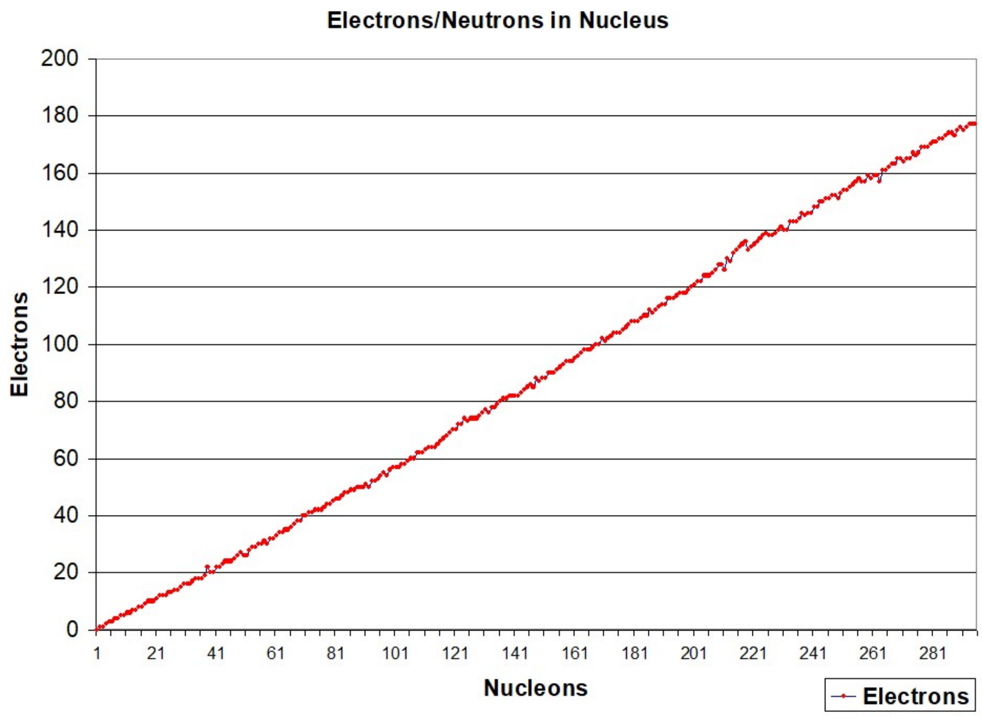
Currently it is explained as a conversion of mass to nuclear binding energy. This a wrong explanation for a mass defect.

The process of fusing protons or neutrons into a nucleus compresses the proton resulting in a reduction in its measured mass. This mass defect is not nuclear binding energy as currently claimed. The Standard Model is wrong with its description of a nucleus.

7.11 Electrons in a nucleus.

Electrons in a nucleus with the protons enhance the stability of a nucleus. If there are too few electrons or too many for the number of protons, a step of radioactive decay occurs seeking a better combination.

Here is a chart presenting the combinations having the longest lives. The number of protons in the nucleus is the X-axis with its corresponding number of electrons plotted on the Y-axis.



Heavy radioactive isotopes are at the far right.

The correct analysis of this behavior requires the nucleus topology or the packing arrangement of its nucleons. Being symmetrical or not can affect packing. Unfortunately, the topology might not be possible in most cases.

^{2}H or deuterium is stable with 2 protons and 1 electron. This is probably a triangle which is a symmetrical shape so its stability is expected.

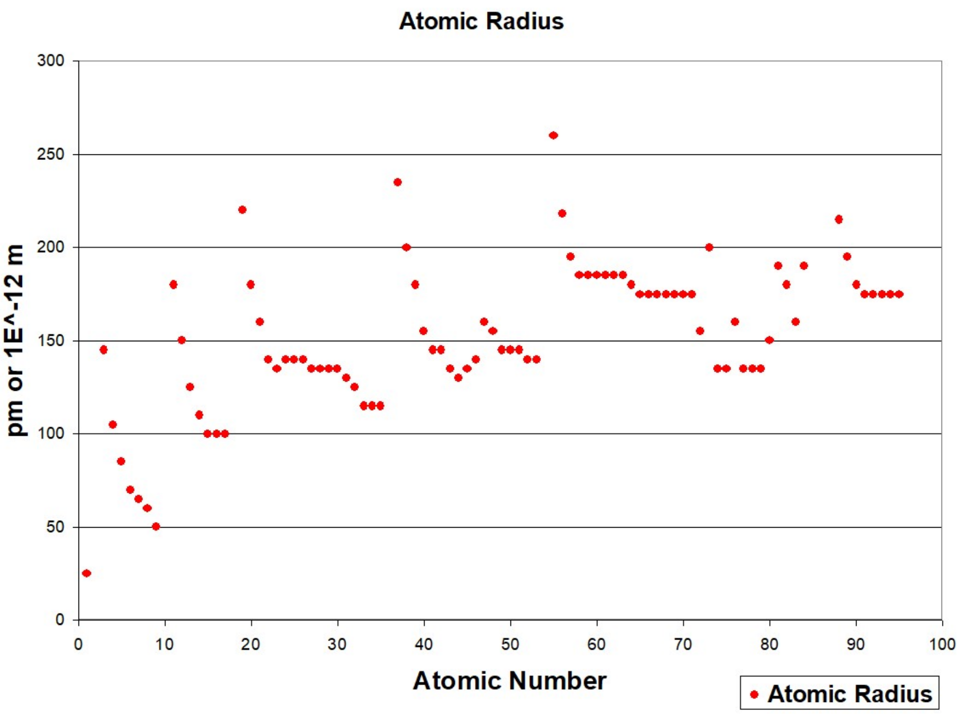
^{3}He is stable with 3 protons and 1 electron. This is probably a triangle of the protons with the electron in contact will all 3 protons. This is also a symmetrical shape so its stability is expected.

There is no stable isotope with 5 nucleons. 4 electrons in the nucleus is ^5H; 3 electrons is 5He; 2 electrons is ^5Li; 1 electron is ^5Be; none of these combinations are stable. If its shape for 5 spheres were a simple cube of 4 with the 5th in the center, then it is impossible for an electron to make contact with the proton in the center. The center proton is in a precarious equilibrium with its 4 adjacent protons while any electrons in the nucleus are attached on the outside of the 4 in the cube. Perhaps that topology is why the compact set of 5 is never stable.

The worksheet has a column indicating an odd number of protons in the nucleus. Elements having an even number of protons often have more stable isotopes than those elements having an odd number.

7.12 Size of an atom

Most, but not all, have a measured atomic radius in pm. None of the noble gas elements have a public value.

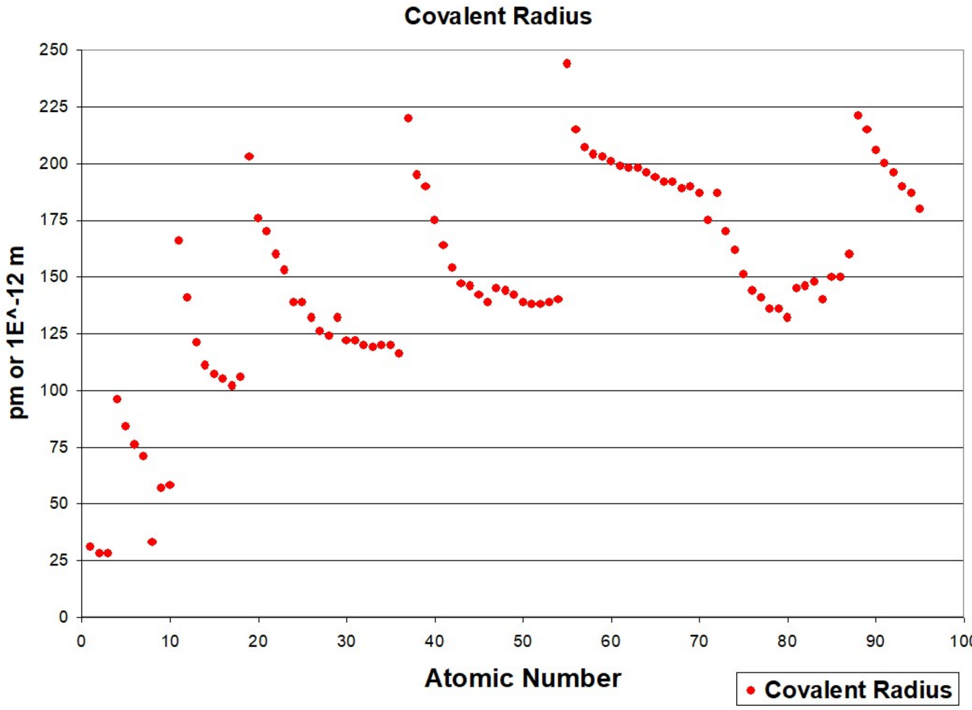


The peaks are the group 1 elements where the b ring begins each cycle. As more protons are added, while moving through the periodic table, the atomic radius decreases due to increasing protons in nucleus.

The flat sequences where consecutive elements have nearly the same radius occur when filling the d ring, to 10, or the f ring, to 14.

7.13 Covalent Radius

Most, but not all, elements have a measured atomic covalent radius in pm, which is the last shell in the sequence.



The size roughly decreases as the number of protons is increasing toward the right in a row of the periodic table.

This is the result of increasing the positive charges which increases the mutual electrostatic force, as implied by Coulomb’s law.

This book will consistently use covalent radius and not atomic radius because a covalent radius value is available for all elements.

Though these values of atomic or valence radius have only 3 significant digits, there is never a stated margin of error for any values.

If electrons were truly moving based on probabilities, then the measured values should vary based on electron actual positions at the moment. The fact that these values have no deviations confirms electrons are always in their expected positions. The supposed electron uncertainty principle does not exist; if it did, then there must be some evidence for it. There is none.

7.14 Adding to a Nucleus

There are 2 known mechanisms for adding particles to a nucleus: fusion and transmutation.

7.14.1 Fusion

Fusion is assumed to occur in the cores of stars, including our Sun. Extreme pressure and temperature are required to overcome the electrostatic force of repulsion between protons.

The section Stars has explanations and references to an alternate solar model not based on a gaseous sphere of plasma powered by fusion. This alternative is based on condensed matter, specifically liquid metallic hydrogen, which is a lattice of protons maintained by loose electrons.

7.14.2 Plasma Pinch

This mechanism is probably responsible for the creation of both spherical stars and spherical planets

Excerpt from Wikipedia:

A pinch is the compression of an electrically conducting filament by magnetic forces, or a device that does such. The conductor is usually a plasma, but could also be a solid or liquid metal. Pinches were the first type of device used for controlled nuclear fusion.

The phenomenon may also be referred to as a Bennett pinch (after Willard Harrison Bennett), electromagnetic pinch, magnetic pinch, pinch effect or plasma pinch. Pinches occur naturally in electrical discharges such as lightning bolts, the aurora, current sheets, and solar flares.

(Excerpt end)

Observation:

The excerpt notes this mechanism was used for the first attempt at controlled fusion. Duplicating the impossible conditions claimed to be in the Sun’s core is also impossible.

7.14.3 Transmutation

Nearly all elements in the periodic table are found on the Sun’s surface or in its atmosphere. They must form there because there is no other explanation for their presence. The claim they’re from ancient distant supernovae has no evidence.

Transmutation in natural, biological processes has been known for many years.

The title of the YouTube video by See the Pattern is:

Biological Transmutation of Elements

Several experiments around the world have found elements which were not present at the start. These have been called cold fusion.

The title of the YouTube video by See the Pattern is:

Experimental Transmutation of Elements

Link to the video is in References.

LENR or Low Energy Nuclear Reactions is a topic for current research by others, but is not covered here.

7.15 Even and odd Nucleon Counts

A nucleon is usually a proton or neutron. Because a neutron is just a proton having an attached electron, in this section, the term nucleons refers to the atomic weight or the number of protons and neutrons counted in the nucleus. There is a distinction between electrons orbiting the nucleus and those attached to protons in the nucleus.

An earlier section described electrons attached to protons in the nucleus. This number matches the number of neutrons.

However, the behavior is easier to describe as attached electrons rather than the number of neutrons.

The current, typical description of a nucleus is a number of protons and neutrons.

The new description of a nucleus is the number of protons and the number of attached electrons.

The number of electrons required for a stable nucleus varies on whether the number of nucleons is odd or even.
The first 5 counts of nucleons are simple. The number of electrons is half the number of nucleons with the result rounded down.

The resulting series:
1 gets none; 2 or 3 get 1 attached electron.
1 proton in a nucleus needs no electrons because ^{1}H or hydrogen is stable. 2 protons in the nucleus need 1 electron and is ^{2}H or deuterium which is stable.
3 protons in the nucleus need 1 attached electron and results in ^{3}He which is stable.

All of the nucleon counts from 6 to 17 also follow a simple rule:

a) If the count is even, then the number of attached electrons is half the number of nucleons rounded down.

b) If the count is odd, then the number of attached electrons is half the number of nucleons rounded down and adding 1.

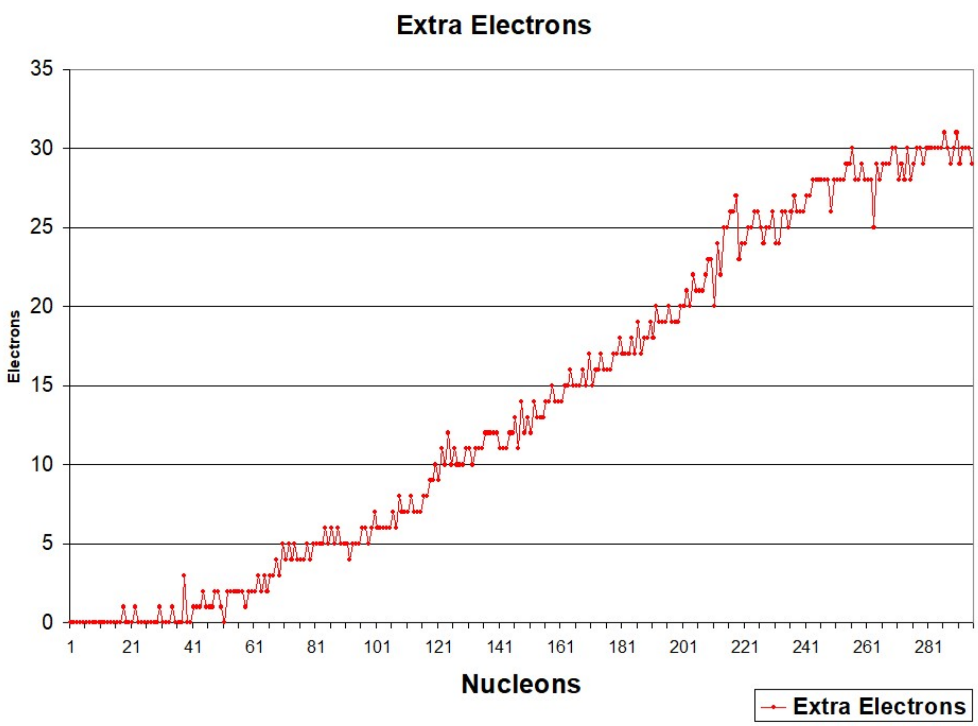
An example of an even count is 4. Halving 4 and rounding down results in 2 electrons, which is ^{4}He.

An example of an odd count is 7. Halving 7, rounding down, and adding 1, results in 4 electrons, which is ^{7}Li.

This rule does not apply to 5 nucleons. There is no stable isotope having 5 nucleons. This is probably because of the topology of 5 packed spheres. It is impossible for an electron to attach to the internal proton surrounded by 4 protons. That is the most likely densest packing of 5.

This rule was applied to predict the number of electrons for all the nucleon counts from 1 to 252 and compare that number against that of the isotope being stable, or having the longest half-life.

Here is a chart of these extra electrons beyond the simple even and odd rule, in relation to the number of nucleons.



The lower left shows those nucleon counts less than 18 follow the simple even (half) and odd (half + 1). Frequently, consecutive even and odd counts of nucleons are different elements, where the extra electrons accompanied a change in the number of protons after subtracting the number of neutrons.

The first extra electron is at 18 nucleons. The rule for even nucleons is half for 9 electrons and results in a nucleus of 9p + 9n but ^{18}F is unstable. One extra electron results in ^{18}O with 8p +10n and is stable.

The second extra electron is at 22 nucleons. The rule for even is half (for 11 electrons which results in a nucleus of 11p + 11n but ^{22}Na is unstable. One extra electron is ^{22}Ne with 10p +12n and is stable.

The third extra electron is at 30 nucleons. The rule for even is half, for 15 electrons which results in a nucleus of 15p + 15n but ^{30}P is unstable. One extra electron is ^{30}Si with 14p +16n and is stable.

The fourth extra electron is at 34 nucleons. The rule for even is half for 17 electrons which results in a nucleus of 17p + 15n but ^{34}Cl is unstable. One extra electron is ^{34}S with 16p +18n and is stable.

36 Nucleons follows the rule because ^{36}S with 18p + 18n is stable.
The next count needing extra electrons is at 38 nucleons. The rule for even is half for 19 electrons which results in a nucleus of 19p + 19n but ^{38}K is unstable. 3 extra electrons results in ^{348}Ar with 16p +18n and is stable.

40 Nucleons follows the rule because ^{40}Ca with 20p + 20n is stable.

The first extra electron with an odd number of nucleons is at 41 nucleons. The rule for odd is half+1 which is 21 electrons and results in a nucleus of 20p + 21n but ^{41}Ca is unstable. One extra electron is ^{41}K with 19p +22n and is stable.

The second extra electron with an odd number of nucleons is at 43 nucleons. The rule for odd is half+1 which is 22 electrons and results in a nucleus of 21p + 22n but ^{43}Sc is unstable. One extra electron is ^{43}Ca with 20p +23n and is stable.

These combinations are presented in the above chart. Rather than describing all 252 nucleon combinations in this book, which could require nearly 252 pages, the author recommends to those having access to spreadsheet software open the spreadsheet file identified in the earlier Data Sets.

7.16 Gather Electrons

The orbitals described in the Standard Model do not aid in understanding an atom.

7.17 Current Naming of orbitals.

An excerpt from earlier:

“ This gives the following order for filling the orbitals:

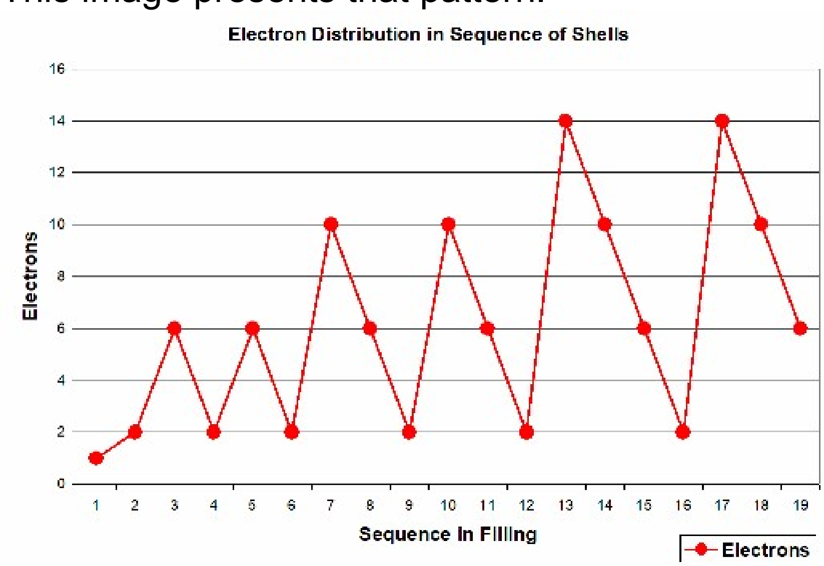
1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s, 4f, 5d, 6p, 7s, 5f, 6d, 7p, (8s, 5g, 6f, 7d, 8p, and 9s). “

Element 118 has 19 steps through 7p. There are no known elements beyond 118 and beyond 7p in that specified shell sequence.

Element 1 or Hydrogen has a single step.

By putting Hydrogen at the first step in this pattern has a first step of 1.
This sequence is: 1,2,6,2,6,2,10,6,2,10,6,2,14,10,6,2,14,10,6.

This image presents that pattern.



There is clearly a pattern.

An orbital having 2 electrons is at the beginning of each cycle.

The current orbital naming convention is not helpful. The shell 4f is after 5p and 6s. A number is often expected to indicate a state having consecutive values. The naming of the f shells fails that expectation.

The number preceding “s” could be called a cycle number.
Over the course of the periodic table, the maximum number of electrons per shell progresses from 2, to 6, to 8, to 10, to 14, with the maximum repeating in consecutive cycles or sometimes increasing in alternating cycles.

7.18 Replacing the word Orbital

The word orbital might be not quite right for an atom. The electrons move in fixed radius orbits.
The word shell has been used because of its spherical connotation. Orbits in our solar system are actually ellipses, not circles, because the motion is around the system’s center of gravity. Electrons do not move like planets around the Sun by the force of gravity. Electrons move around the nucleus by the electric force between charges, so the orbit has a constant radius. Increasing the mass in a nucleus by adding neutrons does not change the electron configuration, so gravity is not involved within the atom and its orbiting electrons. Electrons are found in concentric, fixed radius spheres or rings.

Henceforth, the word ring will be used replacing the confusing words orbital or shell. Those words encompassed the multiple lobed orbitals which had no explanation for that path having an inconsistent radius

It is the author’s opinion the word ring is better for an atom. The word shell implies a hard structure. The word sphere suggests a surface. A number of objects arranged as a circle around a center is called a ring, not a shell.

A positively charged nucleus attracts a collection of electrons in fixed radius orbits around it. These rings hold more electrons as the positive charge in the nucleus increases.

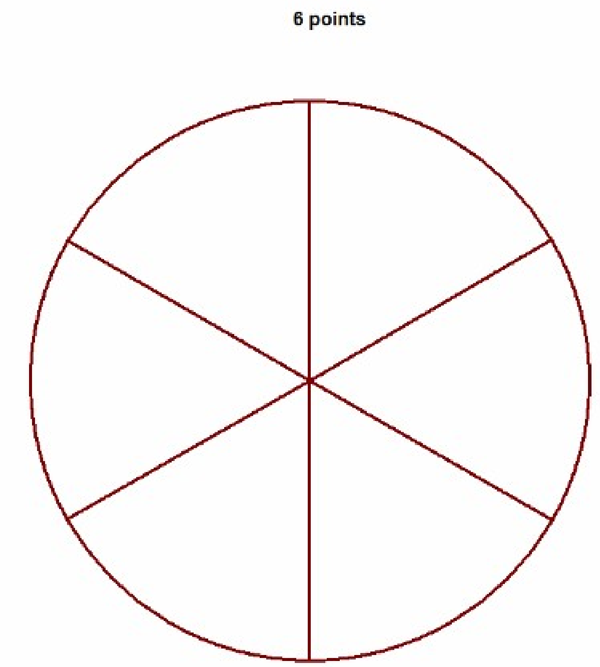
There are several distances where equilibrium of electrostatic forces is achieved. These electrons are not moving in strange orbits driven by probabilities, while in equilibrium with the nucleus and other electrons.

7.19 Shapes of Rings

As noted earlier, atomic rings have 2, 6, 10, or 14 electrons.

The following represent those symmetrical patterns, where an electron is at each intersection around the circumference.

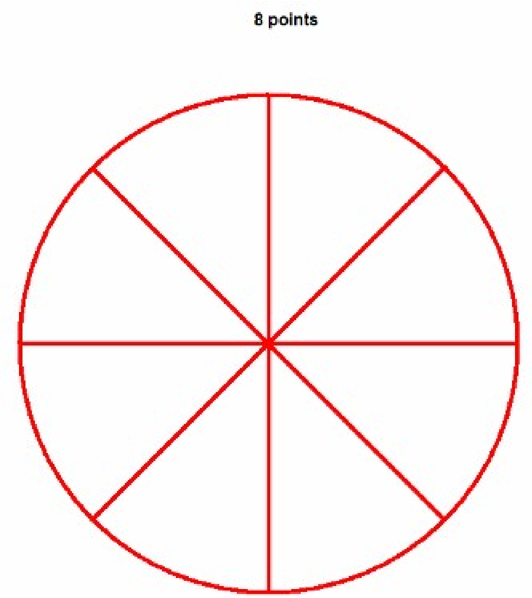
There are 3 pairs of opposing electrons.



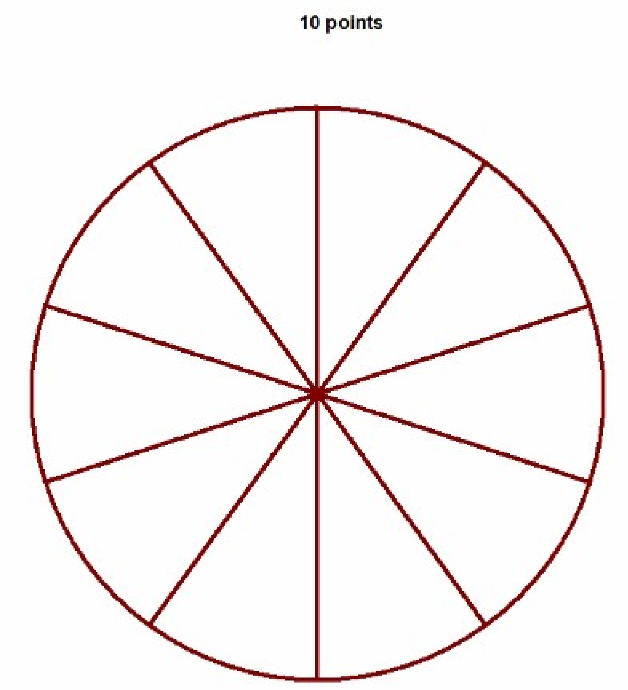
This symmetry enables equilibrium.

When filling a ring of 6, usually, the 2 electrons from the existing outer b ring are merged with the x ring, resulting in the x ring having a capacity of 8 electrons.

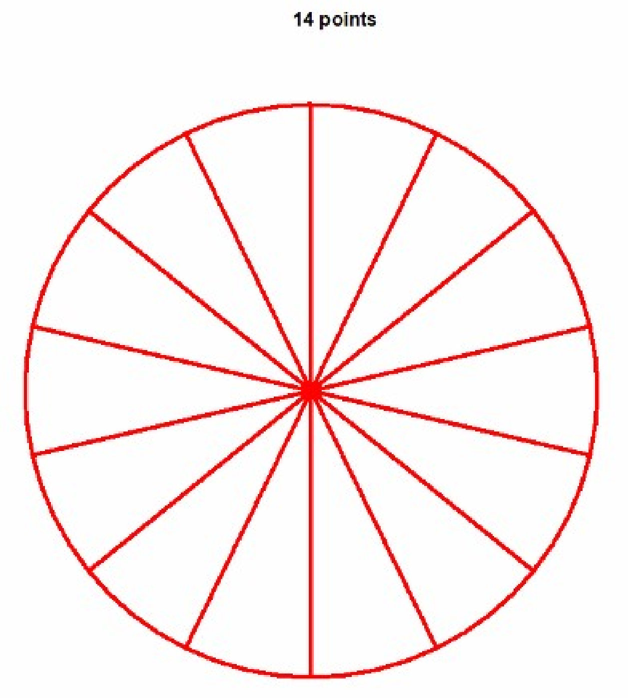
As a reminder, the ring has this symmetry.



There are 4 pairs of opposing electrons.



There are 5 pairs of opposing electrons.
This symmetry enables equilibrium.



There are 7 pairs of opposing electrons.
This symmetry enables equilibrium.

7.20 Change the naming of the rings

The naming should help describe the configuration. The current shell names are a jumble of non-consecutive numbers with 4 letters indicating nothing of the meaning of the combination.

Part of the current shell sequence has: “6s, 4f, 5d,” with 4 after 6 which is before 5. This confusing convention of names can be improved.

The I propose a new naming convention. The numbers become consecutive because the electron rings are filled in a particular pattern. The 4 recommended letters directly imply the maximum number of electrons in its ring as it fills.

.

Fortunately for a transition, the letters d and f are maintained. Several words imply the number 10 but the prefix dec- is often used, including the metric naming system. This is the basis for maintaining d for 10.

The letter f for fourteen is intuitive in English.

14 in Spanish is catorce but the letter c, being the 3^{rd} letter and implying 3, is a poor choice.

14 in French is quatorze but the letter q, from the quad- prefix and implying 4, is also a poor choice.

The letter f is maintained for 14.

The letters s and p could not be related to their number, so these become b and x, respectively. Several words suggest the number 2 but the prefix bi- is often used. This is the basis for selecting b. The letter x is found in both six and hexagon.

When an atom is filling its x ring in combination with the outer b ring, the b+x ring changes capacity from 2 or 6 to a capacity of 8 by adding the 2 electrons from the previous b ring to those in the x ring being filled.

Unfortunately, the letter x is sometimes associated with an unknown value. However In this naming, the letter x will imply 6 for the sequence where x ring has merged with the outer b ring, the letter x also means “extra” because its capacity becomes 8 or it can hold 2 extra electrons.

For clarity, the x and b rings have their distinct counts of electrons. When presenting the number of valence electrons they are summed between the two rings, but the 2 separately defined rings actually coincide in 1 ring. The number of electrons in this combined ring will begin with a range from 1 or 2, the normal range for b ring, while the x ring is empty. When the x ring begins filling, the b ring for that cycle will be filled. As a result, the range of electrons in this outer ring, which is providing the valence electrons from the combination of an x ring and b ring, will range from 1 to 8.
A ring for 6 is present in every atom having more than 4 electrons so its letter of p could warrant “principle” (one current justification for the letter p) but I recommend consistency by relating each letter to its number of electrons in the ring.

7.21 Sequence of Gathering Electrons

The sequence that the atoms collect their electrons is clear with the combination of the atomic radius and the periodic table.

The radius of each electron's configuration has been measured in pm.

Ring cycle 1

1b=fill to 2; H to He; 1:2

H covalent radius = 3; 1b1
He covalent radius = 28; 1b2

Ring cycle 2

Ring 2b begins at roughly the same radius as the completed 1b ring at the end of cycle 1. No margin of error vale is provided for these radius values measured in 10^{-12}m or pm.

2b=fill to 2; Li,Be; 3:4
2x=fill to 6; B to Ne; 5:10; 2x+2b is valence 3 to 8

The radius of each electron configuration has been measured in pm.

3 Li = 28; 2b1
4 Be = 96; 2x2
5 B = 84; 2x1+2b2
6 C = 76; 2x2+2b2
7 N = 71; 2x3+2b2
8 O = 33; 2x4+2b2
9 F = 57; 2x5+2b2
10 Ne = 58; 2x6+2b2

The first 3 elements from H to Li are compact.

The next 4 are larger.
The 8th, O, is compact
9 & 10 are at a middle size.

Filling the 2x ring somewhat pushes out the outer ring of the combined 2b+2x rings. Li and O are smaller than the others in the 2x sequence.

Perhaps by its symmetry, Oxygen with 1b2, 2b2+2x4 (a symmetrical outer ring of 6 electrons around the inner ring of 2 electrons) is more compact than the other elements in this sequence of filling the 2b+2x ring.

Ring cycle 3

Ring 3b begins at more than double the radius of the completed 2x+2b ring at the end of cycle 2. The increase is from 58 to 166.

Cycle 3 matches the sequence of cycle 2 with the insertion of an x ring inside of the outer 3b ring.

3b=fill to 2; Na; Mg; 11:12; 3b is outer ring for valence

3x=fill to 6; Al to Ar; 13:18; 3x+3b is valence 3 to 8

The radius of each electron configuration has been measured in pm.

11 Na = 166, 3b1
12 Mg = 141, 3b2

Na is 1b2, 2b2+2x2 in the inside, with 3b1 on outside.
Mg with 1b2, 2b2+2x2, with 3b2 and is slightly smaller than Na.

The radius of each electron configuration has been measured in pm.

13 Al = 121, 3x1+3b2
14 Si = 111, 3x2+3b2
15 P = 107, 3x3+3b2
16 S = 105 ,3x4+3b2
17 Cl = 102 , 3x5+3b2
18 Ar = 106, 3x6+3b2

The atoms decreased in size as both protons an electrons increased by the same increments.

The attraction from the core overcomes the repulsion between the electron rings.
The electron counts in adjacent rings do not match to develop a synchronism.

Ring Cycle 4

Ring 4b begins at nearly double the radius of the completed 3x+3b ring at the end of cycle 3. The increase is from 106 to 203.

Cycle 4 requires the insertion of a d ring inside of the outer b ring, similar to an x-before-b combination in cycle 3 but cycle 4 inserts a d ring before the subsequent x ring.

4b=fill to 2; K, Ca;19:20; 4b is outer ring for valence
4d is filled inside 4b
4d=fill to 10; Sc to Zn; 21:30; 4b is valence
4x=fill to 6; Ga to Kr;31:36; 4x+4b is valence 3 to 8

The radius of each electron configuration has been measured in pm.

19 K= 203, 4b1
20 Ca = 176, 4b2
21 Sc = 170 , 4b2
22 Ti = 160 ,4b2
23 V = 153 , 4b2
24 Cr = 139 , 4b1
25 Mn = 139 , 4b2
26 Fe = 132 ,4b2
27 Co = 126, 4b2
28 Ni = 124, 4b2
29 Cu = 132, 4b1
30 Zn = 122, 4b2
31 Ga = 122, 4x1+4b2
32 Ge = 1204x2+4b2
33 As = 1194x3+4b2
34 Se = 1204x4+4b2
35 Br = 1204x5+4b2
36 Kr = 1164x6+4b2

Ring Cycle 5

Ring 5b begins at more than nearly double the radius of the completed x+4b ring at the end of cycle 4. The increase is from116 to 220.

Cycle 5 matches the sequence of cycle 4, with the insertion of a d ring and an x ring inside of the outer b ring.
5b=fill to 2; Rb; Sr, 37, 38; 5b is outer ring for valence
5d is filled inside 5b

5d=fill to 10; Y to Cd; 39:48; 5b is valence
5x=fill to 6; In to Xe;49:54; 5x+5b is valence 3 to 8

The radius of each electron configuration has been measured in pm.
37 Rb = 220, 5b1
38 Sr = 195, 5b2
39 Y = 190, 5b2
40 Zr = 175, 5b2
41 Nb = 164, 5b2
42 Mo = 154, 5b1
43 Tc = 147, 5b2
44 Ru = 146, 5b2
45 Rh = 142, 5b1
46 Pd = 139, 5b2
47 Ag = 145, 5b1
48 Cd = 144, 5b2
49 In = 142, 5x1+5b2
50 Sn = 139, 5x2+5b2
51 Sb = 138, 5x3+5b2
52 Te = 138, 5x4+5b2
53 I = 139, 5x5+5b2
54 Xe = 140, 5x6+5b2

Ring Cycle 6

Ring 6b begins at over 70% greater the radius of the completed 5x+5b ring at the end of cycle 5. The increase is from 140 to 244.

Cycle 6 has 1 more ring than the sequence of cycle 5, with the insertion of an f ring followed by the sequence in cycle 5 of a d ring and an x ring inside of the outer b ring.

6b=fill to 2; Cs, Ba; 55:56; 6b is outer ring for valence
6f is filled inside 6b
6f=fill to 14; La to Yb; 57:70; with 6b as valence

6d is filled inside 6b
6d=fill to 10; Lu to Hg; 71:80; with 6b as valence

6x=fill to 6; Tl to Rn; 81:86; 6x+6b is valence 3 to 8

The radius of each electron configuration has been measured in pm.

55 Cs = 244, 6b1
56 Ba = 215, 6b2
57 La = 207, 6b2
58 Ce = 204, 6b2
59 Pr = 203, 6b2
60 Nd = 201, 6b2
61 Pm = 199, 6b2
62 Sm = 198, 6b2
63 Eu = 198, 6b2
64 Gd = 196, 6b2
65 Tb = 194, 6b2
66 Dy = 192, 6b2
67 Ho = 192, 6b2
68 Er = 189, 6b2
69 Tm = 190, 6b2
70 Yb = 187, 6b2
71 Lu = 175, 6b2
72 Hf = 187, 6b2
73 Ta = 170, 6b2
74 W = 162, 6b2
75 Re = 151, 6b2
76 Os = 144, 6b2
77 Ir = 141, 6b2
78 Pt = 136, 6b1
79 Au = 136, 6b1
80 Hg = 132, 6b2
81 Tl = 145, 6x1+6b2
82 Pb = 146, 6x2+6b2
83 Bi = 148, 6x3+6b2
84 Po = 140, 6x4+6b2
85 At = 150, 6x5+6b2
86 Rn = 150, 6x6+6b2

Ring Cycle 7

All the elements in cycle 7 do not have a public covalent radius value.

Ring 7b must begin with an increase in radius from the completed 6x+6b ring at the end of cycle 6. That radius was 150 pm.

7b1 is at 160, is slightly larger. 7b2 is wider at 221. As the 7f ring fills inside the 7b ring, the valence radius continues around 200. With an increasing atomic number or a higher + charge in the nucleus, the valence ring radius also decreases.

Cycle 7 repeats the ring sequence of cycle 6, with the insertion of an f ring, a d ring, and an x ring inside of the outer b ring.

7b=fill to 2; Fr, Ra; 87:88; 7b is outer ring for valence
both 7f and 7d are inside 7b
7f is filled inside 7b, inside the upcoming 7d and the subsequent 7x; x then b ends the cycle.

7f=fill to 14; Ac to No; 89:102, with 7b as valence
7d is filled outside 7f but inside 7b
7d=fill to 10; Lr to Cn; 103:112; with 7b as valence
7x=fill to 6; Nh to Og; 113:118; 7x+7b is valence 3 to 8

The valence radius of some electron configurations been measured in pm.

87 Fr = 160, 7b1
88 Ra = 221, 7b2
89 Ac = 215, 7d1+7b2
90 Th = 206, 7d2+7b2
91 Pa = 200, 7d1+7b2
92 U = 196, 7d1+7b2
93 Np = 190, 7d1+7b2
94 Pu = 187, 7b2
95 Am = 180, 7b2
96 Cm = 169, 7b2

Elements 97 through 118 have no value for valence radius.

Note:
Elements 89 through 97 have an anomaly where the electrons filling the 7f ring are actually moved to the 7d ring, which normally fills after 7f.
The 7d electrons are present in the some of the valence counts.

Element 102 has its 7f ring filled with an empty 7d ring. Element 113 begins filling its 7d ring after its 7f ring is filled.

7.22 Algorithm Demonstration

I created a spreadsheet, using Microsoft Excel 2008, to demonstrate the predictability of the electron rings for every element, from 1 to 118.

This file was mentioned in an earlier section about Data Sets.

Each ring has a column. The far right column has the valence electrons.
The order of the rings in the columns matches their increasing radius from the nucleus.
This is not an alphabetical order.

7.23 Anomalies of an electron moved between rings

Elements Vanadium, Chromium, to Manganese are atomic numbers 23 to 25.
Chromium has 1 electron in its 4s orbital but the adjacent elements have 2.

The expectation for consecutive elements is the s orbital will be consistent after it fills to 2.

Explaining these anomalies is easier with better terminology and understanding the relationship between consecutive fixed radius orbitals.

The s orbital is described as circular but p, d, f are elliptical or have lobes.

Several elements have anomalies where an electron has moved to an adjacent ring.

One example is Chromium or element 24. Its expected pattern is 4d4 + 4s2, but it has 4d5 + 4s1.

There are others between d and s.
There are several exchanges between f and d shells also.

Exchanges like this are reasonable with circular orbits, but electrons changing to different orbital paths could be awkward.

I found no list of these anomalies in the known electron configurations. If one is published, it was not found.

The 20 elements with these atomic numbers have an anomaly where their electron configuration does not match that expected:
24, 29, 41, 42, 44, 45, 46, 47, 64, 78, 79, 89, 90, 91, 92, 93, 96, 97, 103, 111.

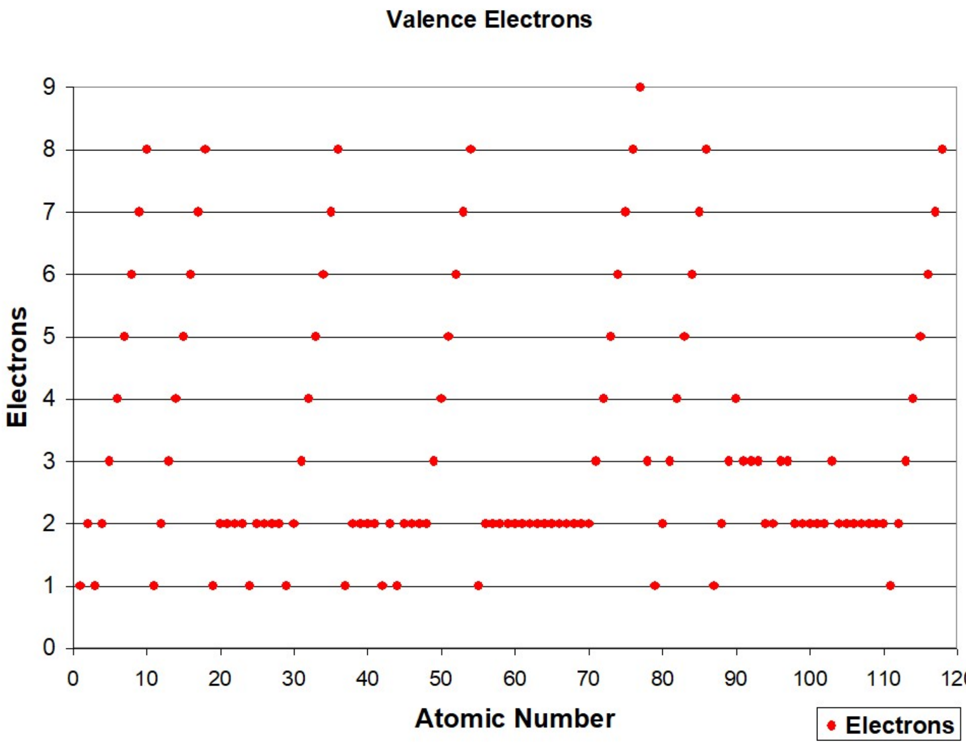
1 or 2 electrons are in an adjacent ring rather than where expected.

All of these anomalies are not critical here, but are identified in my book Practical Atomic Model.

7.24 Valence Electrons

Neither the current atomic model nor the Bohr model explains the mechanism for the valence electrons. By naming the rings by their distance from the nucleus, the outer-shell, or outer-ring, electrons are identified easily.

This chart presents that behavior for all the elements.



Iridium, or element 77, has 9 valence electrons, the highest in the chart. When the b ring begins it has 1 then 2. When the x+b ring is filling, it is incrementing from 3 to 8. While a d or f ring is filling, the b is the outer ring so the valence remains at 2 from the b ring, unless the filling ring interacts with the b ring. Sometimes, an electron will be exchanged between two rings.

7.25 New naming convention for electron rings

The following table defines a transition to the new ring names.

Old	New	type	cycle
1s	1b	binary	1st cycle
2s	2b	binary	2nd cycle
2p	2x	six	2nd cycle
3s	3b	binary	3rd cycle
3p	3x	six	3rd cycle
3d	4d	decade	4th cycle
4p	4x	six	4th cycle
4s	4b	binary	4th cycle
4d	5d	decade	5th cycle
5p	5x	six	5th cycle
5s	5b	binary	5th cycle
4f	6f	fourteen	6th cycle
5d	6d	decade	6th cycle
6p	6x	six	6th cycle
6s	6b	binary	6th cycle
5f	7f	fourteen	7th cycle
6d	7d	decade	7th cycle
7p	7x	six	7th cycle
7s	7b	binary	7th cycle

7.26 New order for the naming convention of the electron rings

This list defines the transition in both rings and order.
This is the order of rings from the nucleus.

Old	New	type	cycle
1s	1b	binary	1st cycle
2p	2x	six	2nd cycle
2s	2b	binary	2nd cycle
3p	3x	six	3rd cycle
3s	3b	binary	3rd cycle
3d	4d	decade	4th cycle
4p	4x	six	4th cycle
4s	4b	binary	4th cycle
4d	5d	decade	5th cycle
5p	5x	six	5th cycle
5s	5b	binary	5th cycle
4f	6f	fourteen	6th cycle
5d	6d	decade	6th cycle
6p	6x	six	6th cycle
6s	6b	binary	6th cycle
5f	7f	fourteen	7th cycle
6d	7d	decade	7th cycle
7p	7x	six	7th cycle
7s	7b	binary	7th cycle

The 1st cycle is only a b ring (with up to 2 electrons).

The 2nd and 3rd cycles are bx rings (with 8 electrons).

The 4th and 5th cycles are bdx rings (with 18).
The 6th cycle and beyond are bfdx rings (with 32).

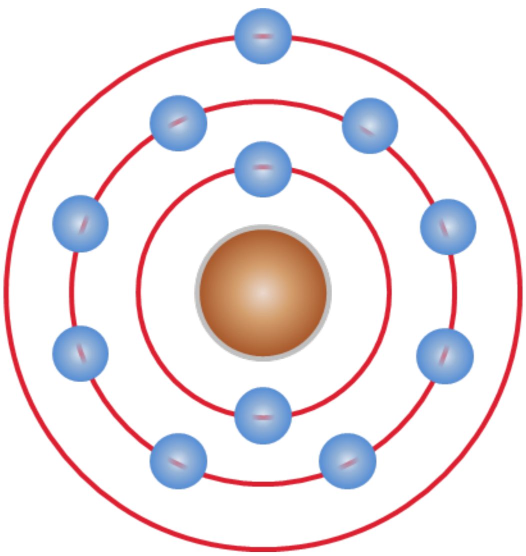
Element 118 completed the first 7 cycles or all of its rings through 7p or 7x.

I expect the bfdx sequence in a cycle, with its 32 electrons, will continue repeating through subsequent elements which are not yet found in nature. The detection of elements heavier than 118 is unlikely.

To investigate them, requires a better method using controlled fusion by extreme pressure, or using ransmutation, if that trick being used by nature is achieved in a laboratory. Creating heavy elements by high velocity collisions seems to get isotopes lacking stability. There are various combinations of protons and neutrons which are more stable than similar combinations. The mechanism being used should be closer to that found in the universe to explain the observed distribution of elements in the stars, planets, moons, and asteroids.

7.27 Simple illustration of the Practical Atomic Model

Wikipedia has an image for the electron configuration of sodium, element 11. This is from the topic Quantum Defect:



Its caption:
In an idealized Bohr model alkali atom (such as sodium, pictured here), the single outer-shell electron stays outside the ionic core and it would be expected to behave just as if in the same orbital of a hydrogen atom.

Observation:

This illustration matches the atom expected, simply because all orbitals are circular, and not having odd shapes. Either a 2-dimensional view is acceptable or a 3-dimensional view of several concentric spheres is too difficult, The caption declares an unjustified assumption. The hydrogen atom has a single electron. The sodium atom has 10 electrons orbiting around the nucleus, inside this outer-shell electron. The radius of this outer-shell orbit is the result of those intervening electrons. The expectation could be for a similar orbit but it might not be the same. By one measurement, they are not the same. The hydrogen atom's electron orbit radius, when measured as a covalent radius is 28pm, but for sodium, the outer-shell orbit radius is 166 pm.

The words "behave just as if in the same orbital" are quite ambiguous.

7.28 Atomic Bonds

There are several bonds to describe.

First, the states of matter should be explained.

Excerpt from Wikipedia:

In physics, a state of matter is one of the distinct forms in which matter can exist. Four states of matter are observable in everyday life: solid, liquid, gas, and plasma. Many intermediate states are known to exist, such as liquid crystal, and some states only exist under extreme conditions, such as Bose–Einstein condensates, neutron-degenerate matter, and quark–gluon plasma, which only occur, respectively, in situations of extreme cold, extreme density, and extremely high energy. For a complete list of all exotic states of matter, see the list of states of matter.
Historically, the distinction is made based on qualitative differences in properties. Matter in the solid state maintains a fixed volume and shape, with component particles (atoms, molecules or ions) close together and fixed into place. Matter in the liquid state maintains a fixed volume, but has a variable shape that adapts to fit its container. Its particles are still close together but move freely. Matter in the gaseous state has both variable volume and shape, adapting both to fit its container. Its particles are neither close together nor fixed in place. Matter in the plasma state has variable volume and shape, and contains neutral atoms as well as a significant number of ions and electrons, both of which can move around freely.

(Excerpt end)

Each state will be described and how it affects the atomic model. Plasma has unique behaviors and those are not relevant to this book's emphasis on the atomic model.

7.29 Gas

Excerpt from Wikipedia:

Gas is one of the four fundamental states of matter (the others being solid, liquid, and plasma). A pure gas may be made up of individual atoms (e.g. a noble gas like neon), elemental molecules made from one type of atom (e.g. oxygen), or compound molecules made from a variety of atoms (e.g. carbon dioxide). A gas mixture, such as air, contains a variety of pure gases. What distinguishes a gas from liquids and solids is the vast separation of the individual gas particles. This separation usually makes a colorless gas invisible to the human observer. The gaseous state of matter occurs between the liquid and plasma states, the latter of which provides the upper temperature boundary for gases.

(Excerpt end)

Observation:

At high temperatures, atoms and molecules can lose outer electrons, becoming positive ions. Any particle having a charge is considered plasma. Beyond Earth's ionosphere nearly everything is charged or is plasma. High energy radiation (UV and higher) will ionize exposed neutral matter.

Excerpt continued:

The only chemical elements that are stable diatomic homonuclear molecules at STP are hydrogen (H2), nitrogen (N2), oxygen (O2), and two halogens: fluorine (F2) and chlorine (Cl2). When grouped together with the monatomic noble gases – helium (He), neon (Ne), argon (Ar), krypton (Kr), xenon (Xe), and radon (Rn) – these gases are called "elemental gases".

(Excerpt end)

Observation:

STP is standard temperature and pressure. Most elements, other than the nobles, do not exist as a gas without being bound to another atom, as a molecule of 2 or more atoms.

7.30 Liquid

Excerpt from Wikipedia:

A liquid is a nearly incompressible fluid that conforms to the shape of its container but retains a (nearly) constant volume independent of pressure. As such, it is the only state with a definite volume but no fixed shape. A liquid is made up of tiny vibrating particles of matter, such as atoms, held together by intermolecular bonds. Like a gas, a liquid is able to flow and take the shape of a container. Most liquids resist compression, although others can be compressed. Unlike a gas, a liquid does not disperse to fill every space of a container, and maintains a fairly constant density. A distinctive property of the liquid state is surface tension, leading to wetting phenomena. Water is, by far, the most common liquid on Earth.
The density of a liquid is usually close to that of a solid, and much higher than in a gas. Therefore, liquid and solid are both termed condensed matter. On the other hand, as liquids and gases share the ability to flow, they are both called fluids.

(Excerpt end)

Observation:

Solid follows for comparison. They have similar molecular bonds.

7.31 Solid

Excerpt from Wikipedia:

The molecules in a solid are closely packed together and contain the least amount of kinetic energy. A solid is characterized by structural rigidity and resistance to a force applied to the surface. Unlike a liquid, a solid object does not flow to take on the shape of its container, nor does it expand to fill the entire available volume like a gas. The atoms in a solid are bound to each other, either in a regular geometric lattice (crystalline solids, which include metals and ordinary ice), or irregularly (an amorphous solid such as common window glass). Solids cannot be compressed with little pressure.

(Excerpt end)

Observation:

The difference between a liquid and solid is the strength of the interaction between molecules.

7.32 Chemical Bonds

There are several relevant bonds here.

Excerpt from Wikipedia:

A chemical bond is a lasting attraction between atoms, ions or molecules that enables the formation of chemical compounds. The bond may result from the electrostatic force of attraction between oppositely charged ions as in ionic bonds or through the sharing of electrons as in covalent bonds. The strength of chemical bonds varies considerably; there are "strong bonds" or "primary bonds" such as covalent, ionic and metallic bonds, and "weak bonds" or "secondary bonds" such as dipole–dipole interactions, the London dispersion force and hydrogen bonding.
Since opposite charges attract via a simple electromagnetic force, the negatively charged electrons that are orbiting the nucleus and the positively charged protons in the nucleus attract each other. An electron positioned between two nuclei will be attracted to both of them, and the nuclei will be attracted toward electrons in this position. This attraction constitutes the chemical bond. Due to the matter wave nature of electrons and their smaller mass, they must occupy a much larger amount of volume compared with the nuclei, and this volume occupied by the electrons keeps the atomic nuclei in a bond relatively far apart, as compared with the size of the nuclei themselves.

(Excerpt end)

Observation:

Every mention of a electron requires it to be a real particle, which it is. There is absolutely no basis for a wave or probability behavior here.

An electron must be treated as a fundamental particle, not as an uncertain wave of probability moving in odd orbitals in a cloud.

7.33 Covalent Bond

This is the most relevant bond.

Excerpt from Wikipedia:

A covalent bond is a chemical bond that involves the sharing of electron pairs between atoms. These electron pairs are known as shared pairs or bonding pairs, and the stable balance of attractive and repulsive forces between atoms, when they share electrons, is known as covalent bonding. For many molecules, the sharing of electrons allows each atom to attain the equivalent of a full outer shell, corresponding to a stable electronic configuration. In organic chemistry, covalent bonds are much more common than ionic bonds.

Covalent bonding also includes many kinds of interactions, including σ-bonding, π-bonding, metal-to-metal bonding, agostic interactions, bent bonds, three-center two-electron bonds and three-center four-electron bonds.

(Excerpt end)

7.34 Chemical Kinetics

Chemical reactions require collisions of the respective electron clouds for the atoms to share electrons.

Excerpt from Wikipedia:

Chemical kinetics, also known as reaction kinetics, is the branch of physical chemistry that is concerned with understanding the rates of chemical reactions. It is to be contrasted with thermodynamics, which deals with the direction in which a process occurs but in itself tells nothing about its rate. Chemical kinetics includes investigations of how experimental conditions influence the speed of a chemical reaction and yield information about the reaction's mechanism and transition states, as well as the construction of mathematical models that also can describe the characteristics of a chemical reaction.

The physical state (solid, liquid, or gas) of a reactant is also an important factor of the rate of change. When reactants are in the same phase, as in aqueous solution, thermal motion brings them into contact. However, when they are in separate phases, the reaction is limited to the interface between the reactants. Reaction can occur only at their area of contact; in the case of a liquid and a gas, at the surface of the liquid. Vigorous shaking and stirring may be needed to bring the reaction to completion. This means that the more finely divided a solid or liquid reactant the greater its surface area per unit volume and the more contact it with the other reactant, thus the faster the reaction. To make an analogy, for example, when one starts a fire, one uses wood chips and small branches — one does not start with large logs right away. In organic chemistry, on water reactions are the exception to the rule that homogeneous reactions take place faster than heterogeneous reactions (are those reactions in which solute and solvent not mix properly)

The reactions are due to collisions of reactant species. The frequency with which the molecules or ions collide depends upon their concentrations. The more crowded the molecules are, the more likely they are to collide and react with one another. Thus, an increase in the concentrations of the reactants will usually result in the corresponding increase in the reaction rate, while a decrease in the concentrations will usually have a reverse effect. For example, combustion will occur more rapidly in pure oxygen than in air (21% oxygen).

Temperature usually has a major effect on the rate of a chemical reaction. Molecules at a higher temperature have more thermal energy. Although collision frequency is greater at higher temperatures, this alone contributes only a very small proportion to the increase in rate of reaction. Much more important is the fact that the proportion of reactant molecules with sufficient energy to react (energy greater than activation energy: $E > Ea$) is significantly higher and is explained in detail by the Maxwell–Boltzmann distribution of molecular energies.

At a given temperature, the chemical rate of a reaction depends on the value of the A-factor, the magnitude of the activation energy, and the concentrations of the reactants. Usually, rapid reactions require relatively small activation energies.
The 'rule of thumb' that the rate of chemical reactions doubles for every 10 °C temperature rise is a common misconception. This may have been generalized from the special case of biological systems, where the α (temperature coefficient) is often between 1.5 and 2.5.

Increasing the pressure in a gaseous reaction will increase the number of collisions between reactants, increasing the rate of reaction. This is because the activity of a gas is directly proportional to the partial pressure of the gas. This is similar to the effect of increasing the concentration of a solution.

In addition to this straightforward mass-action effect, the rate coefficients themselves can change due to pressure. The rate coefficients and products of many high-temperature gas-phase reactions change if an inert gas is added to the mixture; variations on this effect are called fall-off and chemical activation. These phenomena are due to exothermic or endothermic reactions occurring faster than heat transfer, causing the reacting molecules to have non-thermal energy distributions (non-Boltzmann distribution). Increasing the pressure increases the heat transfer rate between the reacting molecules and the rest of the system, reducing this effect.

(Excerpt end)

Observation:

Perhaps, the excerpts are unnecessary. There is a rather simple conclusion:

Chemical reactions require the collisions of the respective atomic electron clouds.

Increasing the particle concentrations or increasing the velocity of the particles will increase the rate of molecular bonds. Increasing both will increase the rate further.

The respective rings of electrons in each atom must be in a compatible configuration for a bond to be achieved.

A noble gas element having a full outer ring will resist, by the electrostatic force, the intrusion of another electron cloud.

7.35 Radioactive Decay

An atom exists in a state of equilibrium.

An atom can make changes in an instant. These changes can be only in the electrons, only in the nucleus, or in both.

The equilibrium is disturbed and corrected within an instant.

Radioactive decay is one such behavior.

Among its instantaneous changes:

Alpha decay,
Beta decay,
Gamma decay,
Electron capture.

Each item will be described in turn.

Before the individual behaviors, there is another critical behavior to note. There is a particle competition within the nucleus. A context in the nucleus determines its decay selection.

Excerpt from Wikipedia:

Usually unstable nuclides are clearly either "neutron rich" or "proton rich", with the former undergoing beta decay and the latter undergoing electron capture (or more rarely, due to the higher energy requirements, positron decay). However, in a few cases of odd-proton, odd-neutron radionuclides, it may be energetically favorable for the radionuclide to decay to an even-proton, even-neutron isobar either by undergoing beta-positive or beta-negative decay.

An often-cited example is the single isotope ^{64}Cu (29 protons, 35 neutrons), which illustrates three types of beta decay in competition. Copper-64 has a half-life of about 12.7 hours. This isotope has one unpaired proton and one unpaired neutron, so either the proton or the neutron can decay.

This particular nuclide (though not all nuclides in this situation) is almost equally likely to decay through proton decay by positron emission (18%) or electron capture (43%) to ^{64}Ni, as it is through neutron decay by electron emission (39%) to ^{64}Zn.

(Excerpt end)

Observation:

Whether a nucleus is proton-rich or neutron-rich determines which beta decay occurs. Both are described below.

7.35.1 Electron capture

The electron capture step of radioactive decay involves a proton in the nucleus capturing one of the electrons in orbit at some distance.

The capture results in a) the proton changing into a neutron, b) a drop in the nucleus positive charge occurring at the same instant with c) the drop in the electron count, d) the difference between the number of electrons and protons remains the same.

The electron capture step can be important when anyone is using certain isotopes.

From Wikipedia: "The isotope technetium-97 decays only by electron capture, and could be inhibited from radioactive decay by fully ionizing it."

The electron capture event indicates there is a type of equilibrium between a nucleus and its set of electrons. There 2 sets of participants, with a number of protons matching the number of electrons, if the atom was neutral, not ionized, at the instant of the capture.

The trigger for any radioactive step is unknown, as well as the cause of an observed half-life, rather than some other duration. This ^{97}Tc nucleus can wait a long time before it pulls in an electron. ^{97}Tc has a half-life of 4.21×10^6 y.

7.35.2 Other radioactive behaviors

Several behaviors were identified above:

a) Alpha decay,
b) Beta decay,
c) Gamma decay,

7.35.3 Alpha Decay

Alpha decay requires the nucleus has the structure where an alpha particle already exists on the periphery of the nucleus. At the moment of instability, this particle of 2 protons bound to 2 neutrons is ejected by the Coulomb's force between a positive alpha particle and the rest of the nucleus which is also positive. The force for this ejection is sometimes called the weak force. Alpha decay occurs in the heaviest elements, apparently starting at Tellurium isotopes which have 59 protons. Several of its isotopes having 52 or more neutrons do alpha decay.

From the reference of radioactive elements, a general conclusion arises.

Among those lighter than Lead with alpha decay and a very long life before decay are 144Nd, 147Sm, 151Eu, 152Gd, 154Dy, 182Hf, 186Os, 190Pt.

Alpha decay more becomes frequent with heavy elements like Thorium or heavier.

7.35.4 Beta Decays

Beta decay requires the nucleus change its charge by one electron charge, by either an increase in net charge by emitting 1 e^- (beta minus) or a decrease by emitting 1 e^+ (beta plus).

Each will be explained further below. Sometimes, beta decay has a gamma ray.

7.35.5 Gamma Decay

Gamma decay is not clearly described. This step is usually associated with the element radium. It is also often associated with the alpha decay.

Excerpt from Wikipedia:

A sample of radium metal maintains itself at a higher temperature than its surroundings because of the radiation it emits – alpha particles, beta particles, and gamma rays.

More specifically, natural radium (which is mostly ^{226}Ra) emits mostly alpha particles, but other steps in its decay chain (the uranium or radium series) emit alpha or beta particles, and almost all particle emissions are accompanied by gamma rays.

In 2013, it was discovered that the nucleus of radium-224 is pear-shaped. This was the first discovery of an asymmetric nucleus.

(Excerpt end)

Observation:

The radium excerpt offers insight into radioactive decay.

First, a nucleus lacking symmetry enables a loss in stability when equilibrium between internal forces is disturbed.

Second, a spectrum is never provided for the gamma ray detection.

Synchrotron radiation when the motion of charged particles is diverted by a magnetic field. The peak frequency is determined by the velocity of the particles. This the mechanism for generating X-rays on Earth, like for medical imaging.

Alpha decay is a charged particle, having 2 protons and 2 neutrons, being ejected at high velocity, so this is charge in motion.

From Wikipedia about the alpha particle:

“Due to the mechanism of their production in standard alpha radioactive decay, alpha particles generally have a kinetic energy of about 5 MeV, and a velocity in the vicinity of 4% of the speed of light.”

If the spectrum of radiation from radium were ever measured, it will be synchrotron radiation which is a relatively flat wave length distribution with infrared at the high end and by this observation the gamma ray wavelength is present in the mix at the low end. Radium is also described to radiate heat which is expected with infrared included in the distribution.

The alpha particles apparently have the great velocity required for the energy of gamma rays to be propagated by their ejection from the nucleus.

7.35.6 Beta Plus Decay

There are 2 beta decays, beta-plus or beta-minus.

Beta plus decay is also called positron emission.

Excerpt from Wikipedia: positron emission

Positron emission or beta plus decay (β+ decay) is a subtype of radioactive decay called beta decay, in which a proton inside a radionuclide nucleus is converted into a neutron while releasing a positron and an electron neutrino (v_e). Positron emission is mediated by the weak force. The positron is a type of beta particle (β+), the other beta particle being the electron (β−) emitted from the β− decay of a nucleus.

An example of positron emission (β+ decay) is magnesium-23 decaying into sodium-23.

Because positron emission decreases proton number relative to neutron number, positron decay happens typically in large "proton-rich" radionuclides. Positron decay results in nuclear transmutation, changing an atom of one chemical element into an atom of an element with an atomic number that is less by one unit.

A positron is ejected from the parent nucleus, and the daughter (Z−1) atom must shed an orbital electron to balance charge. The overall result is that the mass of two electrons is ejected from the atom (one for the positron and one for the electron).

(Excerpt end)

Observation:

This behavior is like electron capture.
Both are protons -1 and neutrons +1

The only apparent difference is the positron emission.

This description states a neutron is created while a positron is ejected and an electron is "shed" which suggests it is missing, so the final atom is an ion.

This is the scenario with ^{23}Mg and ^{23}Na

Start:

^{23}Mg has 12p + 11n, 12 e in orbit

End:
^{23}Na has 11p + 12n, 10 e in orbit because 1 electron was "shed"
Positron was ejected also.

The instantaneous event when everything is simultaneous:
a) 1e was captured from K shell by a proton to become a neutron.
b) This instant has the12p in nucleus +1 compared to remaining 11 electrons in orbit.

c) This captured electron's polarity is flipped from normal e^- to e^+ becoming a positron.

d) Ejecting that "flipped in an instant" positron at +1 balances the charges in the atom.

e) Therefore, the positron is the captured electron but its polarity was flipped. The positron did not come from a proton as currently described.
f) Another, second electron from K shell is captured.

g) This instant has the nucleus at 11p + 12p again

The stated changes are from 12 to 10 electrons in orbit,
so one electron is captured to form a neutron, while one positron is ejected for mass balance.

At the moment an electron flips its polarity while adjacent to a proton, the two + charges repel, causing the positron ejection.

^{23}Na is known to decay with β^+ emission having a half-life of 22.422 seconds.

Positron creation is also part of Particle Pair Production, which is covered in section 10 Light.

Therefore, based on its combination of actions, beta plus decay can be called a double electron capture but the second is ejected from the nucleus as a positron.

7.35.7 Beta-minus decay

As noted above with nucleus competition description, beta minus decay occurs in a "neutron rich" nucleus. As a result, one neutron ejects its accompanying electron due to too many electrons among the neutrons. Equilibrium among these electrons in the nucleus is restored by ejecting one of the electrons.

Excerpt from Wikipedia:

> In nuclear physics, beta decay (β-decay) is a type of radioactive decay in which a beta particle (fast energetic electron or positron) is emitted from an atomic nucleus, transforming the original nuclide to an isobar. For example, beta decay of a neutron transforms it into a proton by the emission of an electron accompanied by an antineutrino.
>
> (Excerpt end)

Observation:

Beta minus decay is accompanied by an antineutrino. The neutrino was described in PPPB as a particle having a questionable existence. It has no mass to use for measurement and confirmation. The only method used for its detection is a deuterium atom (in deep pools of heavy water) losing its neutron. It is impossible to use that observation as evidence when there could be other causes for that separation, as yet unidentified.

An indirect method of detection requires absolute certainty of no other causes than the one being pursued. LIGO is the notorious example of a mistake with indirect detection. LIGO neglected the predictable, terrestrial source for a crust disturbance. That mistake resulted in never confirmed claims of a distant astrophysical source generating non-existent gravitational waves. An indirect method requires thoroughness to avoid a false conclusion.

7.36 Even and odd Nucleus

The earlier section Build Nucleus described how the even or odd count of nucleons directly affects the number of electrons required for a stable nucleus.

Radioactive decay is also driven by this even or odd simply because decay is the opposite of stability. If the electron count in the nucleus is not correct for stability then the nucleus reacts in an attempt to achieve stability. The author created a data set containing all of the stable isotopes and many of the radioactive isotopes. This file is identified in section 3 Data Sets. There are 118 elements so this data set includes over 1000 isotopes. Instead of this book detailing every radioactive isotope and the details of its action, only a few are described here. A reader wanting more is free to reference the data set having all.

In these descriptions p and e refer to protons and electrons in the nucleus. Z is commonly used for the atomic number (the number of protons with no attached electron) and N for neutrons (which is an attached pair of proton and electron). Behaviors in the nucleus are clearer when not mentioning neutrons. A neutron is not a fundamental particle like its 2 components.

The first example has an odd atomic number.

The second example has an even atomic number.

7.36.1 Example 1 Potassium

Potassium has an odd atomic number, 19.
Potassium has 8 isotopes noted in the data set. Other isotopes of potassium would have very brief half lives and are not important to the conclusion.

A first impression of the 8 notes there are only 3 isotopes which are stable or have a long half-life.

^{37}K has 37p +18e and decays by B+ (which is a capture of 2 electrons by the nucleus and the ejection of 1 positron, or a B+ particle from the nucleus) in 24s. Its remnant is ^{37}Ar which is unstable.

^{38}K has 38p +19e and decays by B+ in 8m. Its remnant is ^{38}Ar which is stable.

^{39}K has 39p+20e and is stable.

^{40}K has 40p +21e and decays by B- (which is an electron ejected from the nucleus) in $3x10^9$y. Its remnant is ^{38}Ar which is stable.

^{41}K has 41p+22e and is stable.

^{42}K has 42p +23e and decays by B- (which is an electron ejected from the nucleus) in 12h. Its remnant is ^{42}Ca which is stable.

^{43}K has 43p +24e and decays by B- (which is an electron ejected from the nucleus) in 22h. Its remnant is ^{43}Ca which is stable.

^{44}K has 44p +25e and decays by B- (which is an electron ejected from the nucleus) in 22m. Its remnant is ^{44}Ca which is stable.

Observations:

^{39}K is what the author will call the middle stable isotope.
Isotopes having a lower atomic number than this middle stable one are known as proton-rich nuclei so they react by reducing the positive charge in the nucleus. B+ decay reduces Z by 1. This results in the next lower atomic number.

Potassium is the element having an odd Z at 19. Its isotopes have different counts of neutrons for their atomic weight (Z + N). A nucleon count is the same as the atomic weight.

Odd nucleon counts of 37 to 43 have an even count of electrons resulting in an odd Z, 19 for potassium. Of the 4 odds, only ^{39}K and ^{41}K are stable; ^{37}K and ^{43}K are unstable
Even nucleon counts of 38, 40, 42 have an odd count of electrons resulting in an odd Z, 19 for potassium. All 3 evens are unstable.

7.36.2 Example 2 Calcium

Calcium has an even atomic number, 20.
Calcium has 11 isotopes noted in the data set. Other isotopes of calcium would have very brief half lives and are not important to the conclusion.

A first impression of the 11 notes there are 8 isotopes which are stable or have a long half-life. Nuclei with an even count of nucleons tend to be more stable than those with an odd count.

^{39}Ca has 39p +19e and decays by B+ in 0.86s. Its remnant is ^{39}K which is stable.

^{40}Ca has 40p+20e and is stable.

^{41}Ca has 41p+21e and decays by electron capture in 10y. Its remnant is ^{41}K which is stable

^{42}Ca has 42p+22e and is stable.

^{43}Ca has 43p+23e and is stable.

^{44}Ca has 44p+24e and is stable.

^{45}Ca has 45p+25e and decays by B- (or electron ejection) in 163d. Its remnant is ^{45}Sc which is stable.

^{46}Ca has 46p+26e and is stable.

^{47}Ca has 47p+27e and decays by B- (or electron ejection) in 4.7d. Its remnant is 47Sc which is unstable.

^{48}Ca has 48p+28e and decays by 2x B- (or 2 electrons are ejected) in 6 x10^{19}y. Its remnant is 48Sc which is unstable.

^{49}Ca has 49p+29e and decays by B- (or electron ejection) in 8.7m. Its remnant is 49Sc which is unstable.

Observations:

^{43}Ca is what I will call the middle stable isotope.

Radioactive isotopes having a lower atomic number than this middle stable one are known as proton-rich nuclei so they react by reducing the positive charge in the nucleus. B+ decay reduces Z by 1. This results in the next lower atomic number.
Radioactive isotopes having a higher atomic number than this middle stable one are known as neutron-rich nuclei so they react by decreasing the net charge in the nucleus by the B- decay which increases Z by 1. This results in the next higher atomic number. If this ejected electron is captured by the cloud then the atom's net charge is maintained; or a) the neutral atom became a positive ion; or b) the ion increased its net + charge by one.

Calcium is the element having an even Z at 20. Its isotopes have different counts of neutrons for their atomic weight (Z + N). A nucleon count is the same as the atomic weight.

Even nucleon counts of 40, 42, 44, 46, 48 have an even count of electrons resulting in an even Z, 20 for calcium. Of these 5 even isotopes, the first 4 are stable, while ^{48}Ca decays by ejecting 2 electrons after many years.

Odd nucleon counts of 39, 41, 43, 45, 47, 49 have an odd count of electrons resulting in an even Z, 20 for calcium.

Of these 6 odd isotopes, only ^{43}Ca is stable while the other 5 odd isotopes decay.

There are several radioactive isotopes among the 118 elements which exhibit this behavior: With a long half-life, the action taken is more than might be expected. Both ^{48}Ca and ^{49}Ca exhibit this behavior because they execute the expected decay twice, not once, and both have half-lives spanning many years.
For some elements taking the alpha particle ejection step, sometimes they have very long half-lives.

One might note that in Wikipedia, both ^{40}Ca and ^{46}Ca are classified as Observationally Sable. This phrase is because there is another isotope (^{41}Ca and ^{45}Ca) which decays between this particular isotope and the middle stable one.

From Wikipedia: "Isotopes that are theoretically believed to be unstable but have not been observed to decay are termed as observationally stable. "

7.37 Summary of gathering

The even or odd number of nucleons in a nucleus affects its radioactive decay behaviors just like odd or even affects its stability, as noted in an earlier section, Build Nucleus.

8 Force of Gravity

Isaac Newton defined the force of gravity but not its mechanism.

Isaac Newton was quoted as saying:

“You sometimes speak of gravity as essential and inherent to matter. Pray do not ascribe that notion to me, for the cause of gravity is what I do not pretend to know, and therefore would take more time to consider of it.”

Excerpts are from Wikipedia.

When the text might have an uncertain source, then Observation is used, but when inserted too frequently it is distracting.

Mathematical Principles of Natural Philosophy is a work in three books by Isaac Newton, in Latin, first published 1687.

Newton defined the behavior of F = ma.

A definition of mass:

Mass is both a property of a physical body and a measure of its resistance to acceleration (a change in its state of motion) when a net force is applied. An object's mass also determines the strength of its gravitational attraction to other bodies.

With the publication of "A Dynamical Theory of the Electromagnetic Field" in 1865, [James Clerk] Maxwell demonstrated that electric and magnetic fields travel through space as waves moving at the speed of light.

Observation:

Isaac Newton (178 years earlier) could not know how an electric field works so he could not propose a gravity field.

There is a YouTube video is titled:
Why is the speed of light what it is? Maxwell equations visualized

This video clearly explains Maxwell’s equations and how the velocity limit for light is explicitly defined by Maxwell. Unfortunately, it makes a drastic mistake when mentioning Einstein. Einstein and relativity were dismissed previously here as not a valid replacement of anything in physics.

Lori Gardi provided an excellent description of fields. Her videos are relevant to my proposed mechanism for gravity using a field from mass, like a field from a charge.

4.2 A New Mechanism for the Force of gravity.

This explanation begins with examining Maxwell's equations.

The video abut Maxwell's equations, noted in a previous section, offers a reader a visual presentation, which could supplement the text below, about those equations.

There is at least one alternative theory of gravity is proposing it is based on the electric force between charges in the subatomic particles in the respective masses.
Such a theory assumes there is only an electric force and gravity is just a manifestation of it, enabling a bipolar behavior.

My theory proposes gravity is a separate attractive force being somewhat dependent on the medium, just like the electric force.

Everyone knows the 2 inverse-square forces are similar in their equation format but there is a notable difference between them: gravity is much weaker.

When there are 2 similar mutual forces with similar behaviors but one is much weaker, then probably each force is uniquely affected by the medium, or open space.

Maxwell's equations define several properties of "free space" and those values define the rate of propagation of light through that free space.

Now, they can be considered properties of the medium, sometimes called the aether, which is whatever unknown "stuff" permeates the universe.

The experiments by Dayton Miller seemed to provide evidence for the invisible aether, but his conclusions were not accepted by most physicists. I remain unconvinced there must be an aether. The rate of oscillation of the propagating synchronized electric and magnetic fields in light is a measurement of these fields changing, not of particles in a medium being affected by these fields. The fields are “waving” not the medium.

The medium defines the rate of propagation of the synchronized electric and magnetic fields within light.

Most know light travels slower through glass or water than through air or space.

The diffraction index is the factor defining the change in light velocity by the medium.

Essentially, the medium has a measurable resistance to the changing of electric and magnetic fields. During the propagation of light, both fields are oscillating or in continuous change.
Light is more complicated then that simple statement, because different wave lengths have different behaviors like X-rays which can be either penetrating or shielded by different media. The color violet is slower than red through a glass prism. Also, a reddish sunset is seen through the denser lower atmosphere. Our daytime sky is blue because blue's shorter wavelength scatters more than the longer wavelengths of the other colors.

At the foundation of Maxwell's equations are 2 constants which define how the medium affects changes in an electric field or a magnetic field:

the permittivity of free space, ε0, epsilon-nought
the permeability of free space, μ, mu

These factors become Coulomb's constant.

The Electric force is described by Coulomb's law.

$F = ke * (q1 * q2) / r^2$

where ke is Coulomb's constant ($ke \approx 8.99\times10^9$ N·m^2·C^{-2}), q1 and q2 are the signed magnitudes of the charges, and the scalar r is the distance between the charges. The force of the interaction between the charges is attractive if the charges have opposite signs (i.e., F is negative) and repulsive if like-signed (i.e., F is positive).

In very simple terms, there is a force between any 2 charges. This electric force is reduced by 2 factors:

1) ke from the medium,

2) r from the distance.

Observation:
The units of ke are essentially a ratio of force in an area relative to charge.

Free space defines a factor within ke resulting in a force reduction between charges.

After noting the role of free space in electromagnetism, the force of gravity is considered next.

The force of gravity is defined by Newton's Law of Universal Gravitation.

$F = G * (m1 * m2) / r^2$

where F is the gravitational force acting between two objects, m1 and m2 are the masses of the objects, r is the distance between the centers of their masses, and G is the gravitational constant.

The measured value of the gravitational constant is approximately $6.674 \times 10^{-11} \cdot m^3 / kg \cdot s^{-2}$

One might notice the mix of units in the force equation. There are seconds in its constant's units but there is no time variable in the factor value it multiplies, which has only these units: kg^2 / m^2

The units of force are $kg \cdot m \cdot s^{-2}$

This mismatch of time in units is reminiscent of Planck's equation, noted in section 1.

Wikipedia has a topic Cavendish Experiment describing how G was initially calculated using the oscillation of a torsion bar in an experiment taking 20 minutes.

Its current accepted value is by measurement, not by a calculation using defined "free space" parameters.

I assume the units of ke are just a remnant from measurements during experiments. Dropping the s^{-2} units from the constant (again, there is no time value in the equation) leaves only:

m^3 /kg

This factor, which looks like inverse density, defines a ratio between:

a) a distance (though this m^3 in the numerator implies a distance is being treated as a volume) and

b) a participating mass, with kg in denominator.

This factor is essentially a ratio of a distance per mass.

The multiplication results in less force per kg, because the G value is much < 1

Instead of "Gravitational constant" this factor could be named "Gravitational Gradient" because the force reduces over distance, based on the medium, though the underlying parameters are not identified as Maxwell did for an electromagnetic constant.

This ratio might be considered a "free space" behavior for a gravity field.

Electric and magnetic fields required individual free space parameters. A gravity field apparently requires its own free space parameter.

8.3 Defining a New Mechanism for Force of Gravity

Newton did not propose a mechanism for mass to drive its force of gravity.

I propose the instantaneous force of gravity is the result of a mass field around every proton and electron.
Both particles already have an accepted electric field.

Both particles and atoms behave as expected for combinations of charges.

The 2 fields around both fundamental particles are different though the resulting mutual force affects both participants similarly.

The electric field is either attractive or repulsive while the gravity field is only attractive.

This simple assumption means all of Maxwell's equations for a static electric field and its mutual force also apply to this static gravity field and its mutual force.

Gravity is not electrical so permittivity for a capacitance in free space does not apply.

For gravity, open space is just a "resistance" to the force. That word is used in the definition of mass. The distributed free space resistance for this particular force explains why the force of gravity is so different between the masses of proton and electron compared to the force between their charges.

G-field is used, not M-field, to avoid confusion with a magnetic field.
Gravity field is used instead of mass field to prevent using M-field.

This new gravity field is NOT the accepted gravitational field around a sphere of uniform density causing free fall acceleration of smaller bodies near its surface.
Calling it a mass field compared to an electric field from an electric charge is appropriate when one applies Maxwell's field equations.

The following is the Wikipedia description of an electric field, but mixed with highlighted changes for an application to a gravity field.

I hope this from/to approach for changing a description from an electric field to a gravity field is clear. The exercise should reveal their similar behavior, to support this hypothesis.

1 From:

An electric field (sometimes E-field is the physical field that surrounds each electric charge and exerts force on all other charges in the field, either attracting or repelling them. Electric fields originate from electric charges, or from time-varying magnetic fields. Electric fields and magnetic fields are both manifestations of the electromagnetic force, one of the four fundamental forces (or interactions) of nature.

1 To:

A **gravity** field (sometimes **G-field** is the physical field that surrounds each **mass** and exerts force on all other **masses** in the field, attracting them. **Gravity** fields originate from **masses**. **Gravity** fields are the basis of gravity, just as a charge is the basis of an electric field driving the electric force.

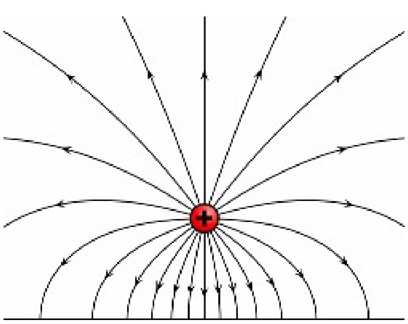
2 From:

The electric field is defined mathematically as a vector field that associates to each point in space the (electrostatic or Coulomb) force per unit of charge exerted on an infinitesimal positive test charge at rest at that point. The derived SI units for the electric field are volts per meter (V/m), exactly equivalent to newtons per coulomb (N/C).

2 To:

The **gravity** field is defined mathematically as a vector field that associates to each point in space the (force per unit of **kg** exerted on an infinitesimal positive test **mass** at rest at that point. The derived SI units for the **gravity** field are kg per meter (kg/m.

Image and caption (**3**) from Wikipedia Electric Field:



3 From:
Electric field of a positive point charge suspended over an infinite sheet of conducting material. The field is depicted by electric field lines, lines which follow the direction of the electric field in space.

3 To:

Gravity field of a point **mass** suspended over an infinite **span** of **gravity** conducting medium. The field is depicted by **gravity** field lines, lines which follow the direction of the **gravity** field in space.

4 From:

The electric field is defined at each point in space as the force (per unit charge) that would be experienced by a vanishingly small positive test charge if held at that point. As the electric field is defined in terms of force, and force is a vector (i.e. having both magnitude and direction), it follows that an electric field is a vector field. Vector fields of this form are sometimes referred to as force fields. The electric field acts between two charges similarly to the way the gravitational field acts between two masses, as they both obey an inverse-square law with distance.

4 To:

The **gravity** field is defined at each point in space as the force (per unit **mass**) that would be experienced by a vanishingly small positive test **mass** if held at that point. As the **gravity** field is defined in terms of force, and force is a vector (i.e. having both magnitude and direction), it follows that a **gravity** field is a vector field. Vector fields of this form are sometimes referred to as force fields. The **gravity** field acts between two **masses** similarly to the way the gravitational field acts between two masses, as they both obey an inverse-square law with distance. This is the basis for **Newton's** law, which states that, for stationary **masses**, the **gravity** field varies with the source **mass** and varies inversely with the square of the distance from the source. This means that if the source **mass** were doubled, the electric field would double, and if you move twice as far away from the source, the field at that point would be only one-quarter its original strength.

5 From:

This is the basis for Coulomb's law, which states that, for stationary charges, the electric field varies with the source charge and varies inversely with the square of the distance from the source. This means that if the source charge were doubled, the electric field would double, and if you move twice as far away from the source, the field at that point would be only one-quarter its original strength.

5 To:

This is the basis for **Newton's** law, which states that, for stationary **masses**, the **gravity** field varies with the source charge and varies inversely with the square of the distance from the source. This means that if the source **mass** were doubled, the **gravity** field would double, and if you move twice as far away from the source, the field at that point would be only one-quarter its original strength.

6 From:

The electric field can be visualized with a set of lines whose direction at each point is the same as the field's, a concept introduced by Michael Faraday, whose term 'lines of force' is still sometimes used. This illustration has the useful property that the field's strength is proportional to the density of the lines. The field lines are the paths that a point positive charge would follow as it is forced to move within the field, similar to trajectories that masses follow within a gravitational field.

6 To:

The **gravity** field can be visualized with a set of lines whose direction at each point is the same as the field's, a concept introduced by Michael Faraday, whose term 'lines of force' is still sometimes used. This illustration has the useful property that the field's strength is proportional to the density of the lines. The field lines are the paths that a point **mass** would follow as it is forced to move within the field, similar to trajectories that masses follow within a gravitational field. Field lines due to stationary **masses** have several important properties, including always originating from **point masses** and terminating at other **masses**, they enter all **masses** at right angles, and they never cross or close in on themselves. The field lines are a representative concept; the field actually permeates all the intervening space between the lines. More or fewer lines may be drawn depending on the precision to which it is desired to represent the field.

7 From:

Field lines due to stationary charges have several important properties, including always originating from positive charges and terminating at negative charges, they enter all good conductors at right angles, and they never cross or close in on themselves. The field lines are a representative concept; the field actually permeates all the intervening space between the lines. More or fewer lines may be drawn depending on the precision to which it is desired to represent the field.

7 To:

Field lines due to stationary **masses** have several important properties, including always originating from **masses** and they never cross or close in on themselves. The field lines are a representative concept; the field actually permeates all the intervening space between the lines. More or fewer lines may be drawn depending on the precision to which it is desired to represent the field.

8 From:

$E(x_0) = F / q_{0} .= q_{1} / (x_1 - x_0)^2$ . .

This is the electric field at point x_0 due to the point charge q_1; it is a vector-valued function equal to the Coulomb force per unit charge that a positive point charge would experience at the position x_0. Since this formula gives the electric field magnitude and direction at any point x_0 in space (except at the location of the charge itself,x_1, where it becomes infinite) it defines a vector field. From the above formula it can be seen that the electric field due to a point charge is everywhere directed away from the charge if it is positive, and toward the charge if it is negative, and its magnitude decreases with the inverse square of the distance from the charge.
The Coulomb force on a charge of magnitude q at any point in space is equal to the product of the charge and the electric field at that point

8 To:

$G(x_0) = F / m_0 = m_1 / (x_1 - x_0)^2$ . . .

This is the **gravity** field at point x_0 due to the point **mass** $\mathbf{m_1}$; it is a vector-valued function equal to the **gravity** force per unit mass that a point **mass** would experience at the position x_0. Since this formula gives the **gravity** field magnitude and direction at any point x_0 in space (except at the location of the **mass** itself,x_1, where it becomes infinite) it defines a vector field. From the above formula it can be seen that the **gravity** field due to a point **mass** is everywhere directed away from the mass, and its magnitude decreases with the inverse square of the distance from the **mass**.

The **gravity** force on a charge of magnitude q at any point in space is equal to the product of the **mass** and the electric field at that point

End of the from/to sequence of 8 steps.

Observation:

The Wikipedia descriptions of an electric field behavior frequently have a reference to a similar behavior in gravity.

In some cases, the “To” text needed no change because gravity was already there.

Excerpt from Wikipedia Electric Field:

Coulomb's law, which describes the interaction of electric charges: is similar to Newton's law of universal gravitation:

This suggests similarities between the electric field E and the gravitational field g, or their associated potentials. Mass is sometimes called "gravitational charge".
Electrostatic and gravitational forces both are central, conservative and obey an inverse-square law.

Each charge field is diminishing with distance. Their mutual interaction results in a mutual force.

(Excerpt end)

Observation:

A gravity field from a mass behaves the same with another mass like a pair of charges. The difference is an electric field has polarity and interacts with only other electric fields, or with a magnetic field.

A gravity field interacts with only other gravity fields, and is not affected by an electric or magnetic field.

The force of gravity, between gravity fields of its participants being pervasive, is instantaneous and does not propagate.

Gravity field is also simpler. Changing electric and magnetic fields create the other. A changing a mass cannot create another type of field.

The universe has pervasive charge fields and gravity fields, with "lines" to describe their relative strength.

This theoretical mechanism does not change Newton's force of gravity equation, which has been verified numerous times. It only defines its mechanism.

Relativity broke Newton's valid application of the force of gravity. Relativity must be dropped by physics because Newton’s force remains valid. Wikipedia claims relativity superseded Newton's force, which is such an incredible mistake. Even more so, when one realizes relativity applies only to a special moving observer, becoming quite irrelevant to sciences like cosmology when there is no special observer.

It seems either relativity or dark matter are always involved in every discussion of gravity. Both are invalid and must be ignored when explaining the force of gravity.

Gravity has complex behaviors like orbital resonances.

This book is seeking a mechanism based on Maxwell's explanations using fields, not redefining the math for field behaviors defined by Maxwell.

I suspect the free space parameter for gravity has a different origin. "free space" remains a mystery to physics.

I have an unrelated observation, which must be stated.

Free space parameters, like for the electric and magnetic fields, are defined by the universal medium, or what some call the aether. It is impossible to know whether these values are consistent throughout the observable universe.

9 Matter

Matter is every object we can see or measure. Each object is radiating, reflecting, or absorbing energy.

Any particle of matter holding an electrical charge is also called plasma. Plasma has unique behaviors compared to matter having no charge, because of the interaction of electric and magnetic fields. Matter consists of atoms and their molecules, as well as any subatomic particles having mass, such as electron and proton, and their anti-particles.

Excerpts from Wikipedia:

In classical physics and general chemistry, matter is any substance that has mass and takes up space by having volume. All everyday objects that can be touched are ultimately composed of atoms, which are made up of interacting subatomic particles, and in everyday as well as scientific usage, "matter" generally includes atoms and anything made up of them, and any particles (or combination of particles) that act as if they have both rest mass and volume.

In physics, a state of matter is one of the distinct forms in which matter can exist. Four states of matter are observable in everyday life: solid, liquid, gas, and plasma.

(Excerpts end)

Observation:

These states are important for thermodynamics, which describes interactions between matter and energy. The 4 states hold and move thermal energy differently. That topic is the next section.

Liquid and solid are forms of condensed matter. Both have a surface, because when condensed, or not a gas, the atoms and molecules can maintain a structure.

Excerpt from Wikipedia:

Condensed matter physics is the field of physics that deals with the macroscopic and microscopic physical properties of matter, especially the solid and liquid phases which arise from electromagnetic forces between atoms. More generally, the subject deals with "condensed" phases of matter: systems of many constituents with strong interactions between them.

(Excerpt end)

Observation:

A star is an object where condensed matter becomes important, when matter can change its phase or configuration in the star at different depths, from core, to below surface, to surface, and to above surface.

9.1 Condensed Matter as a Building Block

Condensed matter is a lattice configuration of atomic nuclei held together by loose electrons. Graphite is an example of condensed matter where the carbon nucleus is in the lattice.

This lattice of many nuclei is not a form of a molecular bond. Molecules take a shape based on the nuclei in the bond. For example water is a compound of 1 oxygen and 2 hydrogen is not symmetrical giving water characteristics from that lack of symmetry. A lattice must have symmetry.

Metallic hydrogen is another example of condensed matter but the proton is at every node in the lattice.

Metallic hydrogen has been proposed in the Sun.
This theory became public with the Dr. Pierre-Marie Robitaille paper in 2013 titled:

"Forty Lines of Evidence for Condensed Matter - The Sun on Trial: Liquid Metallic Hydrogen as a Solar Building Block"

Dr. Robitaille has a YouTube channel, Sky Scholar, with many videos about stars and this model.

This model matches the helio-seismology data and all the solar observations, like limb darkening. The gaseous sun model lacks sufficient evidence, when unable to explain all observations, including its liquid surface, different rotation rates by latitude, its hot corona, solar wind acceleration, and many more. This theory is part of the section Stars.
I am not proposing any changes to any of Dr. Robitaille’s works.

10 Thermodynamics

This topic will cover only a few details of thermodynamics, which is a sophisticated description of behaviors of matter, involving energy in different forms.

Excerpt from Wikipedia:

Thermodynamics is a branch of physics that deals with heat, work, and temperature, and their relation to energy, radiation, and physical properties of matter. The behavior of these quantities is governed by the four laws of thermodynamics which convey a quantitative description using measurable macroscopic physical quantities, but may be explained in terms of microscopic constituents by statistical mechanics. Thermodynamics applies to a wide variety of topics in science and engineering, especially physical chemistry, biochemistry, chemical engineering and mechanical engineering, but also in other complex fields such as meteorology.

(Excerpt end)

Observation:

Dr. Pierre-Marie Robitaille does such a thorough video presentation of thermodynamics; it is pointless to attempt the same here. Section References has a link to a play list of 5 videos on its laws.

These are the forms of energy relevant to this book:

a) Atomic internal energy, where energy is held in the motions of electrons in the fixed radius shells of the atom,

b) Kinetic energy, where energy is held in matter in motion,

c) Thermal energy, where energy is held in molecular vibrations,

d) Radiation energy, where energy is carried in electromagnetic radiation. This is light, here.

Here are different scenarios.

When masses having kinetic energy collide, the total must be maintained but it can change its distribution among the masses.
When a mass having kinetic energy collides with a surface of condensed matter, either the energy is maintained with a rebound, or the energy is converted to thermal energy in the condensed matter. The total must be maintained but it can change its form.

When a particle is ejected from the surface of condensed matter, during evaporation, the thermal energy is converted to kinetic energy in the particle, so it moves away and changing state to a gas.

When the surface of condensed matter absorbs light, in the instant, it must either: a) convert that energy into thermal energy in molecular vibrations, or b) re-emit the energy; this is observed as a reflection. The configuration of the condensed matter determines whether it can perform the reflection.

A glass mirror with a silver backing is a combination of light behaviors. The glass is a transparent propagation medium, so the velocity of propagation is reduced by the medium's diffraction index, as the light is absorbed and re-emitted through the condensed matter. Upon leaving the glass medium, light is instantaneously propagating at the velocity defined by the current medium. The silver lattice configuration can execute a quick absorb and re-emit for the observed reflection.

Gravitational collapse is a term used for the creation of a star, in the gaseous solar model. The force of gravity is claimed to bring all the particles together, and then the internal temperature increases to such an extreme that fusion begins. The temperature increase has no identified external energy source to explain this increase of thermal energy in the system. Therefore, this mechanism violates thermodynamics and is impossible. A valid explanation of stars is provided in that section.

11 Doppler Effect

The Doppler Effect describes the interaction between moving matter and electromagnetic radiation, or light.

Excerpt from Britannica:

Doppler effect, the apparent difference between the frequency at which sound or light waves leave a source and that at which they reach an observer, caused by relative motion of the observer and the wave source. This phenomenon is used in astronomical measurements.

(Excerpt end)

The Doppler Effect is observed by the entire spectrum of the light source being shifted in proportion to the source's velocity in that direction.
The velocity of light is set by the medium. The velocity of light cannot be affected by the light source velocity. However, the source in motion affects the distribution of the radiated energy, not its velocity.

The timing of the Doppler Effect is crucial when one observes a spectrum shift in radiation from distant objects.

The Doppler Effect occurs only at the moment of radiation emission, when the motion of the object at that instant affects the spectrum.

There are 2 sources of electromagnetic radiation affected by the Doppler Effect: stars and atoms. Each initiates the propagation of the synchronized electric and magnetic fields. This propagation is an expanding sphere from the source. This sphere of energy continues until it is absorbed by an object in its path.

Stars emit a broad spectrum of thermal radiation.

Atoms emit a characteristic wave length based on the electron configuration.

The energy being lost in the atom is transferred to the corresponding wave lengths of electromagnetic radiation. Some atoms emit more than one wave length when dropping to their ground state.

These wave lengths can be observed and measured in a spectrum, and are called emission lines.

The instant of radiation emission, the motion of the source affects the wave length distribution around that sphere. Wave lengths in the direction of the source are changed by an amount proportional to the sources velocity relative to the velocity of light. The light source is generating a continuum of energy as a sphere. Wave lengths in one side of the sphere will be reduced, or toward the blue end, in the direction of the source. Wave lengths in the other side of the sphere will be increased, or toward the red end, in the direction opposite of the source. There is perfect symmetry with the change in wave length on one side exactly matched by the change on the opposite side. The sphere is a continuum of energy, being carried in wave lengths. There is definitely no quantized behavior present.

The motion of the light source does not change the amount of energy being radiated, only its distribution around the sphere of its propagation. Energy is always conserved.

The Doppler Effect also occurs only at the moment of radiation absorption, when the motion of the object at that instant also affects the spectrum. When energy is absorbed by an object than that energy is missing from the radiation. The energy is carried in wave lengths so those wave lengths carrying the energy which was transferred to the object are missing in the spectrum. These missing wave lengths are called absorption lines.

Absorption lines arise from objects in the line of sight, between the light source which emits the intact energy or spectrum.

The absorption line behavior is affected by the velocity of the atom. A moving atom carries kinetic energy and that energy participates in the transfer of energy from the radiation to the atom. As with an emission line, the velocity of the atom relative to the velocity of light determines the energy involved in the exchange.

An atom is essentially a tiny sphere. An atom in the path of electromagnetic radiation can absorb energy from that continuum of energy. The atom’s motion relative to the radiation is important. The motion at that point in the sphere will have a proportion relative to the velocity of light and relative to the direction of the incoming light.

When the atom is moving toward the light source the kinetic energy of the atom is a participant and it reduces the energy the atom requires and absorbs from the radiation. This decrease in energy is a higher wave length.

Energy is always conserved during this exchange.

When the atom is moving away from the light source the kinetic energy of the atom is a participant and it increases the energy the atom requires and absorbs from the radiation. This increase in energy is a lower wave length.
The energy being absorbed is noted as an absorption line wave length.

11.1 Calculations

This is the simple calculation of z.

The velocity, called v here, of the source is compared to the velocity of light by dividing that value by the velocity of light, called the constant c.

The value of v has a sign. Doppler Effect is in the observer's line of sight. When the object is moving away from the observer, v is + or positive, and when moving toward the observer, v is – or negative.

The result is called z by convention.

The simple equation is z=v/c, making sure the units are the same (usually km/s).

The shift in a spectrum due to the motion of the light source is a simple equation, where EWL is the emission wavelength,

NWL is the new wavelength, so:
NWL = EWL + (EWL multiplied by z)

where the z is the factor for the change in the new wavelength from that originally emitted; z is positive for a red shift or negative for a blue shift.

There is no quantized behavior in any of the equation's factors or in the result.

11.2 Synchrotron Radiation

Excerpt from Wikipedia:

Synchrotron radiation, electromagnetic energy emitted by charged particles (e.g., electrons and ions) that are moving at speeds close to that of light when their paths are altered, as by a magnetic field. It is so called because particles moving at such speeds in a variety of particle accelerator that is known as a synchrotron produce electromagnetic radiation of this sort.

Many kinds of astronomical objects have been found to emit synchrotron radiation as well. High-energy electrons spiraling through the lines of force of the magnetic field around the planet Jupiter, for example, give off synchrotron radiation at radio wavelengths. Synchrotron radiation at such wavelengths and at those of visible and ultraviolet light is generated by electrons moving in the magnetic field associated with the supernova remnant known as the Crab Nebula. Radio emissions of the synchrotron variety also have been detected from other supernova remnants in the Milky Way Galaxy and from extragalactic objects called quasars.

(Excerpt end)

Observation:

There are many X-ray point sources in the universe including one at the core of most spiral galaxies. These sources were described in detail in the author's book Cosmology Transition.

As somewhat described in the excerpt above, all those X-ray sources have an electrical current whose path is bent by a magnetic field resulting in this broad spectrum of wave lengths spanning from X-ray to infrared.

Quasars are typically dimmed in the optical wave lengths by their surrounding clouds of gas and dust.

11.3 Thermal Radiation

Excerpt from Wikipedia:

Thermal radiation is electromagnetic radiation generated by the thermal motion of particles in matter. All matter with a temperature greater than absolute zero emits thermal radiation.

If a radiation object meets the physical characteristics of a black body in thermodynamic equilibrium, the radiation is called blackbody radiation. Planck's law describes the spectrum of blackbody radiation, which depends solely on the object's temperature. Wien's displacement law determines the most likely frequency of the emitted radiation, and the Stefan–Boltzmann law gives the radiant intensity for the wave length.

(Excerpt end)

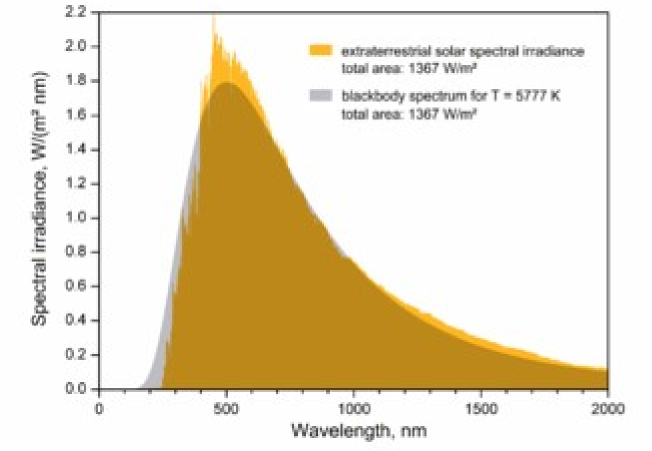
Thermal radiation is also one of the fundamental mechanisms of heat transfer. Conduction between adjacent solid objects is another.

Its spectrum is characterized by a wave length distribution, with the wave length having the highest intensity related to the object's temperature.

The wave length distribution affects whether it is visible. A cool temperature won't be. When warmer the increasing infrared intensity can be felt as heat or warmth but not seen. A rising temperature will become visible as red. When even hotter the mix of color wave lengths can result in "white hot." Our Sun is hot enough to generate the ultraviolet frequency which is not visible but can affect the eyes and skin.

Our white Sun can appear yellow when overhead due to the wave length distribution after the light passes through our atmosphere. The atmosphere can also cause a color change between sun rise and sun set, and it causes the sky to be blue.

Here is the thermal radiation spectrum from our Sun (from Wikipedia)



Important note about wave lengths: Thermal radiation typically spans a continuum of energy from ultraviolet to infrared to wave lengths covering most temperatures.

Infrared is always present with thermal radiation, but shorter wave lengths arise only with a high enough surface temperature. Our Sun's thermal radiation, seen as light, is in this wave length range of UV to infrared.

Most emission lines from atoms range from visible to ultraviolet wave lengths. As a general rule, any wave lengths measured outside of this range, like radio at the low end, and X-ray or gamma ray at the high end, were emitted by a source of synchrotron radiation.

A fictitious black hole violates this general rule because the impossible hot accretion disk is claimed to emit X-rays but that energy requires an impossible temperature.

Thermal radiation requires a surface of condensed matter.

The temperature of a gas is measured by the kinetic energy of its atoms or molecules. A gas cannot emit thermal radiation. When its atoms and molecules become ionized, then as each ion captures an electron, they emit their characteristic wave length of electromagnetic radiation. This is the non-thermal mechanism for the color of a neon light.

11.4 Red shift summary

The term "red shift" is used so loosely, most think of it as just a simple number having a consistent meaning, like a temperature.

A red shift is not that simple and anyone using the term so loosely is showing they consider it as just a simple number.

It is crucial to recognize there are 4 different red shifts. Each is a measurement of a distinct behavior.

Galaxies are totally different entities than quasars. A galaxy has billions of stars while a quasar is a quasi-stellar object having no stars.

A metallic element is one which is not hydrogen or helium.

The 4 distinct red shifts:

1) galaxy – hydrogen

2) galaxy – metal

3) quasar – hydrogen

4) quasar – metal

(1) the hydrogen absorption line is driven by hydrogen in the inter-galactic medium. This line is not from the galaxy.

(2) the calcium ion absorption line is driven by calcium ions near the galactic corona, as in the case of M31 and others. Calcium is a metal. The metallic line is not from the galaxy.

(3) The quasar high red shift comes from the hydrogen Lyman-alpha emission line.

(4) The quasar low red shift comes from the metallic ion emission lines.

(1) can never be a galaxy velocity. However, when used in conjunction with Cepheids, this value enables a distance calculation, with Cepheids providing a distance metric for the hydrogen density within the IGM in the line of sight to its galaxy.

(2) there are galaxies with either a red or blue shift of the metallic ion absorption lines. M31 has a calcium line blue shifted. This can never be a galaxy velocity, nor can it be related to a galaxy distance. Only a Cepheid provides a distance metric.

LINER galaxies, which include Seyferts, exhibit several metallic elements when taking the spectrum of only the AGN. None of these metallic lines in a LINER galaxy spectrum are related to the galaxy motion.

(3) this hydrogen emission line is found in a "typical" quasar. This can never be a quasar velocity, nor can it be related to a quasar distance.

(4) these metallic lines are found in the quasars used by Halton Arp, in his book Seeing Red. This can never be a quasar velocity, nor can it be related to a quasar distance, nor can it be related to the age of matter. These ions just slow down in apparent incremental changes in their velocity.

The z value for (3) has exceeded 7, while the z value for (4) is < 1.

It is crucial to note that none of the 4 types of a red shift is an indicator of the object's real velocity.

When one accepts that simple fact about the false velocities, then there is no "Hubble Flow." That was the term Edwin Hubble used initially for the red shift trend, but later in 1936, he noticed (1) is observed with only galaxies beyond our Local Group.

Hubble recognized the "Hubble Flow" was not consistent. Dark energy arose from the wrong assumption that the false expansion is consistent.

There is also no expansion, no dark energy, and no big bang.

11.5 Hierarchy of Reactions to light

All of an atom's reactions to light involve the nucleus and the outermost ring(s) of electrons.
An atom in the path of electromagnetic radiation must do one of the following:

1) Particle pair production,
2) Ionization,
3) Compton scattering,
4) Photoelectric effect,
5) Absorption line,
6) Reflect or absorb & re-emit it,
7) Transfer to vibration in a molecular bond,
8) Transfer to kinetic energy of the atom or molecule.

They are in the order of decreasing energy required for the operation, with the first needing the most.

Energy must be conserved in the instant of the exchange.

If (1) can be done, then the action is performed.
If not, the possible sequence of actions continues.

If (2) can be done, then the action is performed.
If not, the sequence continues.
If (3) can be done, then the action is performed.
If not, the sequence continues.
If (4) can be done, then the action is performed.
If (5) can be done, then the action is performed.
If (6) can be done, then the action is performed.
If (7) can be done, then the action is performed.
Action (7 or 8) must be done, if no other.

Energy must be transferred, as in (1,2,3.4,5,6,7), or transformed, as in (8).
Actions (1,2,5) absorb only some of the incoming energy but the total energy is conserved through the partial transfer. The laws of thermodynamics are important

Action (1) has 2 requirements.
First, the atom's outermost shell(s) must have at least 2 electrons because 2 will be ejected.

Descriptions of this action do not list the elements tested for this action.

The second requirement is the atom's state of matter.

The description of its observations mention a "cloud chamber" implying this action has been observed only with unbound atoms in a gas.

Because the descriptions of this action lack all the necessary details, it is impossible to thoroughly explain its requirements. The mechanism can be explained.

Action (2) can occur in any state. If the continuum of radiation has the energy for the outer shell to eject an electron, then in that instant, the excess energy is transferred to the ejected electron's kinetic energy. Energy is conserved

Electromagnetic radiation continues its propagation until either absorbed or transferred.

Action (3) is described separately below. This is a behavior on a surface.

Action (4) is described separately below.

Action (5) occurs in an atom or molecule in a gas.

The atom can be neutral or ionized, but must have at least one electron. An atom's Doppler Effect was explained earlier.

Actions (3,4,6,7) can occur in condensed matter, or a liquid or solid surface.

Action (8) is an instantaneous transfer of energy from the wave length to the particle's kinetic energy.

Thermal energy in a gas is held in the kinetic energy of its particles. Pressure and volume also affect the temperature of a gas.

11.6 Compton Scattering

Compton scattering is an atomic behavior involving the absorption of energy at a level between that required for particle pair production and the photoelectric effect.

Excerpt from Wikipedia:

Compton scattering, discovered by Arthur Holly Compton, is the scattering of a photon by a charged particle, usually an electron. If it results in a decrease in energy (increase in wavelength) of the photon (which may be an X-ray or gamma ray photon), it is called the Compton effect. Part of the energy of the photon is transferred to the recoiling electron. Inverse Compton scattering occurs when a charged particle transfers part of its energy to a photon.

Compton found that some X-rays experienced no wavelength shift despite being scattered through large angles; in each of these cases the photon failed to eject an electron. Thus the magnitude of the shift is related not to the Compton wavelength of the electron, but to the Compton wavelength of the entire atom, which can be upwards of 10000 times smaller. This is known as "coherent" scattering off the entire atom since the atom remains intact, gaining no internal excitation.
In Compton's original experiments the wavelength shift given above was the directly-measurable observable. In modern experiments it is conventional to measure the energies, not the wavelengths, of the scattered photons.

(Excerpt end)

Observation:

This behavior is assumed to be an interaction between a photon and an electron, and claimed to be confirmation of light as a particle, the photon, and not a wave length.

This is an outright contradiction to Compton’s conclusion the emitted wave length is determined by the “entire atom.”

There is no photon interacting with a free charged particle. An atom’s outer shell electrons are absorbing the energy required to change its energy to one which is exactly acceptable as defined by the atom and its electrons.

This behavior is the intermediate result between the other energy levels for the atom. Photoelectric effect results in an electron ejection, with the excess energy transferred to the departing electron.

The explanation for Compton scattering requires the atom absorb the necessary energy, for this action, among its electrons thereby increasing its energy level held among them. That energy must be released when the atom returns to its ground state.

Unlike the photoelectric effect having 1 action, at this higher energy level of Compton scattering, the atom performs 2 electron actions.

1) 1 electron is ejected.

2) A second electron moved to ground state resulting in the radiation for that change in its energy. This charge moved a very short distance resulting in a very short emission line.

The description states this wave length change is not quantized.

Excerpt from above:

“The wavelength shift is at least zero and at most twice the Compton wavelength of the electron.”

The Wikipedia image and description of Compton’s experiment in 1923 shows a “graphite target” suggesting a target’s surface having a lattice of carbon Carbon has 6 electrons. There is no mention of a list of the other elements having this behavior measured with consistent results.

By comparison, the higher energy particle pair production (PPairP) also affects 2 electrons in the atom.
The difference between them is PPairP ejects the second electron as a positron, while CS gets a wave length, increased than that absorbed by the atom, from the non-ejected electron.

Compton scattering (CS) is a wave length not a photon behavior.

11.7 Particle Pair Production

Excerpt from Wikipedia for particle pair production:

Pair production often refers specifically to a photon creating an electron–positron pair near a nucleus. For pair production to occur, the incoming energy of the photon must be above a threshold of at least the total rest mass energy of the two particles, and the situation must conserve both energy and momentum. However, all other conserved quantum numbers (angular momentum, electric charge, lepton number) of the produced particles must sum to zero – thus the created particles shall have opposite values of each other. For instance, if one particle has electric charge of +1 the other must have electric charge of −1, or if one particle has strangeness of +1 then another one must have strangeness of −1.

The probability of pair production in photon–matter interactions increases with photon energy and also increases approximately as the square of atomic number of the nearby atom.

(Excerpts end)

Observation:

Particle pair production probability increases with more protons, so more energy can be absorbed by the heavier nucleus.

An atom will absorb a specific wavelength when its nucleus and inner pair of electrons to a new energy state by that amount being absorbed. This is a quantized behavior of an atom, where a longer wavelength, having less energy than required, will not be absorbed by the atom.

Similarly, when an electron moves to a lower orbital, or to a lower energy state, an emission line of a particular wave length is emitted. This wave length is sometimes related to the distance between orbitals and it contains the energy being released from the electron's change in its energy.

The photoelectric effect has an extra result with the absorption line, by ejecting an electron.
When the atom absorbs enough energy for an electron to leave the atom rather than just changing orbitals, then the electron departs having the kinetic energy with the excess over the minimum required to leave.

The pair production event description is awkward in the excerpt, with "[creating a] pair near a nucleus" when describing the event is actually changing an electron pair in orbit around the nucleus. Of course, that inner orbit is "near."

Therefore, this is the proposed mechanism:

The gamma wave length energy is much greater than the ultraviolet wave length energy required for a single electron ejection.

The substantial additional energy being absorbed by the atom from the energy in one short wave length causes another particle ejection, except the second electron flips its charge's negative polarity to positive becoming a positron.

Currently, particle pair production is claimed to create matter from energy.

With this alternate mechanism, there is no matter created during the event. Instead, an electron changed to a positron. The event caused no change in mass in any particles. Also, then there is no known mechanism to convert energy into matter, where matter is usually protons and electrons, the two components of every atom.

This alternate mechanism solves the antimatter problem. Physicists cannot explain the lack of antimatter in the universe. They assume with no justification, matter and antimatter should have been created in similar quantities.

Antimatter is actually created by only by high velocity particles, from either particle accelerators like the LHC, or from cosmic rays. The one exception is the positron, or anti-electron, which can occur during an atom's radioactive decay.

The antiproton is created when a proton flips its charge polarity, just as an electron can do, as described above. Currently, an antiproton can be created only in very high energy, high velocity particle collisions. This was done in 1955 but the specific particles or nuclei being used in the collision were not identified. Sometimes the deuteron, which is proton + neutron, is mentioned for particle colliders because there are several convenient sources for hard water, but never explicitly about an antiproton. Both participants in a collision must have protons, because electrons have so little mass for this. The simple explanation is protons are just flipping their charge polarity, to become an antiproton. This is more believable than an antiproton somehow appearing.

The presence of protons when an antiproton appears is not a coincidence. That is the only mechanism for creating an antiproton.

These mechanisms for anti-particles are infrequent in the universe so, of course, the anti-particles are rare.

11.8 Photoelectric Effect

The photoelectric effect apparently resulted in the concept of a photon particle.

Excerpt from Wikipedia:

The photoelectric effect is the emission of electrons when electromagnetic radiation, such as light, hits a material. Electrons emitted in this manner are called photoelectrons.

The experimental results instead show that electrons are dislodged only when the light exceeds a certain frequency—regardless of the light's intensity or duration of exposure. Because a low-frequency beam at a high intensity could not build up the energy required to produce photoelectrons like it would have if light's energy was coming from a continuous wave, Albert Einstein proposed that a beam of light is not a wave propagating through space, but a collection of discrete wave packets, known as photons.

In 1905, Einstein proposed a theory of the photoelectric effect using a concept first put forward by Max Planck that light consists of tiny packets of energy known as photons or light quanta. Each packet carries hv energy that is proportional to the frequency v of the corresponding electromagnetic wave. The proportionality constant h has become known as the Planck constant.

The maximum kinetic energy K_{max} of the electrons that were delivered this much energy before being removed from their atomic binding is

$K_{max} = hv - W$

where W is the minimum energy required to remove an electron from the surface of the material.
Einstein's formula, however simple, explained all the phenomenology of the photoelectric effect, and had far-reaching consequences in the development of quantum mechanics.

(Excerpt end)

Observation:

Einstein described the phenomena but he did not justify a photon particle.

The energy requirement for absorption is defined by the atom. To properly test this effect, a continuum of energy must be provided The atom will absorb only the amount of energy required to complete its action, whether only enough energy to eject an electron, or accepting an excess which is passed to the electron as its kinetic energy. Energy is always conserved in the instant.

The quantized behavior is in the atom, not in the light.

This scenario is like a baby who accepts only a mouthful of milk from the bottle. The amount in a mouthful is defined by the baby, not by the milk or by the bottle.

Light is a continuous stream of energy not a collection of discrete wave packets.

Visible Light is a continuum of frequencies, essentially from violet to red. There are no discrete increments anywhere in this continuum of energy.

Our eyes see the combination of certain frequencies as white. Human eyes are not sensitive to only certain discrete packets.

There are no photons. Quantum mechanics just calls a wave length a photon. However, wave lengths have no defined increment but span a continuum of values in whatever units are used, like Angstroms. The units selected for a measurement cannot define a behavior.

11.9 Reflection

After light is emitted, it continues its propagation until absorbed.

Some surfaces, having the lattice structure of condensed matter can absorb and re-emit the incoming energy.

This action is observed with the surface of water or glass.

A mirror has the reflective surface behind the transparent glass.

The transparent glass has a diffraction index so the velocity of light’s propagation slows through the glass without being absorbed.

After passing through the glass, the propagation is affected by the current medium. When the back surface is not transparent, it must absorb or re-emit the light.

11.10 Molecular Vibration

When the energy in light is absorbed it can be transformed to thermal energy in condensed matter (liquid or solid but not gas).

Excerpt from Wikipedia:

A molecular vibration is a periodic motion of the atoms of a molecule relative to each other, such that the center of mass of the molecule remains unchanged.
The typical vibrational frequencies, range from less than 1013 Hz to approximately 1014 Hz, corresponding to wavenumbers of approximately 300 to 3000 cm^{-1}.
In general, a non-linear molecule with N atoms has 3N – 6 normal modes of vibration, but a linear molecule has 3N – 5 modes, because rotation about the molecular axis cannot be observed. A diatomic molecule has one normal mode of vibration, since it can only stretch or compress the single bond. Vibrations of polyatomic molecules are described in terms of normal modes, which are independent of each other, but each normal mode involves simultaneous vibrations of different parts of the molecule.
A molecular vibration is excited when the molecule absorbs energy, ΔE, corresponding to the vibration's frequency, v, according to the relation ΔE = hv, where h is Planck's constant. A fundamental vibration is evoked when one such quantum of energy is absorbed by the molecule in its ground state. When multiple quanta are absorbed, the first and possibly higher overtones are excited.

(Excerpt end)

Observation:

Conservation of energy is always maintained. When light encounters an atom, the energy must be absorbed, re-emitted, transferred or transformed.
Cosmological red shift has been proposed as an explanation celestial red shifts, caused by the expansion of the supposed fabric of space.. This is wrong because a spectrum change during the propagation of light violates thermodynamics. Every valid red or blue shift occurs at the moment of either emission or absorption. A spectrum change can occur at no other time.

12 Stars

There are at least 3 models of a star. Each will be described here:

1) Current model with gaseous Sun powered by fusion.
2) Metallic hydrogen, from solid in the core to liquid in convective zone and in photosphere where energy is emitted as thermal radiation. This model by Dr. Pierre-Marie Robitaiile explains all solar behaviors.
3) A model from the Thunderbolts Project proposes electric discharges in the chromosphere can explain the sunspot activity. This model of the chromosphere by Don Scott was duplicated in a lab as part of the SAFIRE project. Its sphere after the experiment indicated results from element transmutation to explain certain elements found on the solar photosphere. However, the model cannot explain the thermal radiation in the observed solar spectrum.

A star is the primary light source in the universe. Wikipedia defines a star as:

A star is an astronomical object consisting of a luminous spheroid of plasma held together by its own gravity.

Cosmology must define the mechanism for the star to radiate so much energy at a sustained rate for many years.
The current mechanism involves fusion sustained by gravitational pressure.

12.1 Introduction to Star

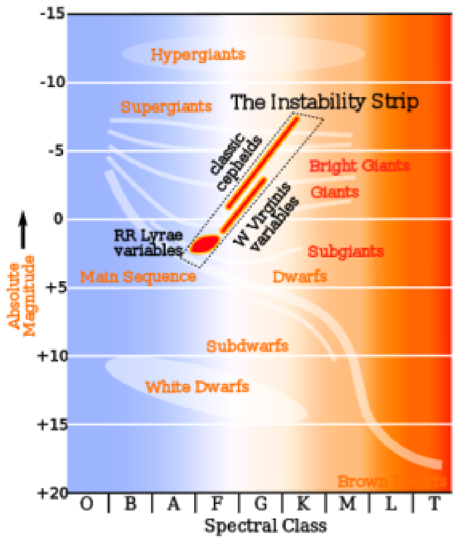
Section Gaseous Sun, describes the current model for a star.
Section LMH Sun, describes a new model for a star, based on liquid metallic hydrogen or LMH.

The section below, Electric Sun, describes a new model for a star, based on the observed electrical discharges on its surface extending into the corona.

12.2 Hertzsprung-Russell Diagram

This diagram relates brightness to temperature (from its spectrum)

This image is from Wikipedia:



Cepheid variable stars are in the instability Strip.

12.3 Star Types in Transition

First, this considers the current star types and the SAFIRE results.

Star types are interesting after SAFIRE observed element transmutation.
SAFIRE can disturb the sequence of star types when some are based on specific elements for the type. One should always recall all of the stable elements in the periodic table are observed on our Sun, which is in a type in the middle of the H-R diagram.

Excerpts are from Wikipedia:

My remarks in *italics* are inserted among the excerpts.

remark: first, the noted elements by atomic number: H-1,He-2, C-6,N-7,O-8,Ne-10,Na-11,Mg-12,Al-13,Si-14,S-16,Ar-18,Ca-20,Ti-22,V-23,Cr-24,Mn-25,Fe-26,Ni-28.

remark: second, the ambiguous words "early" vs "late" indicate confusion:

Stars are often referred to as early or late types. "Early" is a synonym for hotter, while "late" is a synonym for cooler.

Depending on the context, "early" and "late" may be absolute or relative terms. "Early" as an absolute term would therefore refer to O or B, and possibly A stars. As a relative reference it relates to stars hotter than others, such as "early K" being perhaps K0, K1, and K3.

"Late" is used in the same way, with an unqualified use of the term indicating stars with spectral types such as K and M, but it can also be used for stars that are cool relative to other stars, as in using "late G" to refer to G7, G8, and G9.

In the relative sense, "early" means a lower Arabic numeral following the class letter, and "late" means a higher number.

This obscure terminology is a hold-over from an early 20th century model of stellar evolution, which supposed that stars were powered by gravitational contraction via the Kelvin–Helmholtz mechanism, which is now known to not apply to main sequence stars. If that were true, then stars would start their lives as very hot "early-type" stars and then gradually cool down into "late-type" stars. This mechanism provided ages of the Sun that were much smaller than what is observed in the geologic record, and was rendered obsolete by the discovery that stars are powered by nuclear fusion. The terms "early" and "late" were carried over, beyond the demise of the model they were based on.

remark to above: "The terms were carried beyond the demise of their model." This is deliberate confusion for their meaning!

remark: third, here is a list of star types by temperature.
Excerpt:
The "Modern Classification System" is primarily by decreasing temperature.
type.. temp.. fraction of population
O ≥ 30,000 K. . 0.00003%
B 10,000–30,000 K . . 0.13%
A 7,500–10,000 K . . 0.6%
F 6,000–7,500 K . . 3%
G 5,200–6,000 K. . 7.6%
K 3,700–5,200 K . . 12.1%
M 2,400–3,700 K . . 76.45%

remark: fourth, here are star types and each definition. Types are in the order from O to M and beyond…

O-type stars are very hot and extremely luminous, with most of their radiated output in the ultraviolet range. These are the rarest of all main-sequence stars. Some of the most massive stars lie within this spectral class. O-type stars frequently have complicated surroundings that make measurement of their spectra difficult.

remark: 'complicated surroundings' means "cannot explain"

O-type stars have dominant lines of absorption and sometimes emission for He II lines, prominent ionized (Si IV, O III, N III, and C III) and neutral helium lines, strengthening from O5 to O9, and prominent hydrogen Balmer lines, although not as strong as in later types.

remark: “sometimes” means “inconsistent”
remark: He II emission line is probably an alpha particle capturing an electron becoming a new helium ion.

remark: here “later” must mean the intensity of lines get stronger from O5 to O9 and the quantities of elements change while the O temperature remains the same.

B-type stars are very luminous and blue. Their spectra have neutral helium lines, which are most prominent at the B2 subclass, and moderate hydrogen lines. As O- and B-type stars are so energetic, they only live for a relatively short time.

The transition from class O to class B was originally defined to be the point at which the He II λ4541 disappears. However, with modern equipment, the line is still apparent in the early B-type stars. Today, the B-class is instead defined by the intensity of the He I violet spectrum, with the maximum intensity corresponding to class B2. For supergiants, lines of silicon are used instead; the Si IV λ4089 and Si III λ4552 lines are indicative of early B. At mid B, the intensity of the latter relative to that of Si II λλ4128-30 is the defining characteristic, while for late B, it is the intensity of Mg II λ4481 relative to that of He I λ4471.

These stars tend to be found in their originating OB associations, which are associated with giant molecular clouds. The Orion OB1 association occupies a large portion of a spiral arm of the Milky Way and contains many of the brighter stars of the constellation Orion.

remark: the inconsistency of certain elements leads to 'early or 'late' types.

A-type stars are among the more common naked eye stars, and are white or bluish-white. They have strong hydrogen lines, at a maximum by A0, and also lines of ionized metals (Fe II, Mg II, Si II) at a maximum at A5. The presence of Ca II lines is notably strengthening by this point.

remark: Quantity of calcium is noted as increasing at this class A temperature which is lower temp than class B.

F-type stars have strengthening spectral lines H and K of Ca II. Neutral metals (Fe I, Cr I) beginning to gain on ionized metal lines by late F. Their spectra are characterized by the weaker hydrogen lines and ionized metals.

remark: Quantity of certain metals are increasing at this class F temperature which is lower temp than class A.

G-type stars, including the Sun, have prominent spectral lines of Ca II, which are most pronounced at G2. They have even weaker hydrogen lines than F, but along with the ionized metals, they have neutral metals. There is a prominent spike in CH molecules.

remark: Quantity of Calcium is greatest at G2 temperature. Both ionized and neutral metals appear at class G temperature. A "spike in CH molecule" quantities, but this G is cooler than F.

[K-type stars] have extremely weak hydrogen lines, if those are present at all, and mostly neutral metals (Mn I, Fe I, Si I). By late K, molecular bands of titanium oxide become present. Mainstream theories (those rooted in lower harmful radioactivity and star longevity) would thus suggest such stars have the optimal chances of heavily-evolved life developing on orbiting planets (if such life is directly analogous to earth's) due to a broad habitable zone yet much lower harmful periods of emission compared to those with the broadest such zones.

remark: "lower harmful radioactivity" probably means less ultraviolet coming from K-type being cooler than G-type.

Although most class M stars are red dwarfs, most of the largest ever supergiant stars in the Milky Way are M stars, such as VV Cephei, Antares, and Betelgeuse, which are also class M. Furthermore, the larger, hotter brown dwarfs are late class M, usually in the range of M6.5 to M9.5.

The spectrum of a class M star contains lines from oxide molecules (in the visible spectrum, especially TiO) and all neutral metals, but absorption lines of hydrogen are usually absent. TiO bands can be strong in class M stars, usually dominating their visible spectrum by about M5. Vanadium II oxide bands become present by late M.

remark: the temperature of M-type includes red dwarfs to 'the largest ever super giants' for quite the diversity. M-type is cooler than K-type and has heavier metals like titanium and vanadium.

[class W: Wolf-Rayet] were once included as type O stars; the Wolf-Rayet stars of class W or WR are notable for spectra lacking hydrogen lines. Instead their spectra are dominated by broad emission lines of highly ionized helium, nitrogen, carbon, and sometimes oxygen. They are thought to mostly be dying supergiants with their hydrogen layers blown away by stellar winds, thereby directly exposing their hot helium shells. Class W is further divided into subclasses according to the relative strength of nitrogen and carbon emission lines in their spectra (and outer layers).

remark:
remark: W-type were once included with the hottest O-type. Now there are many subclasses. I recall Robitaille describing WR stars as misunderstood by cosmologists.

remark: A number of special classes follow...
remark: Slash stars for a combination of O and WR types.

The new spectral types L, T, and Y were created to classify infrared spectra of cool stars. This includes both red dwarfs and brown dwarfs that are very faint in the visible spectrum.

Brown dwarfs, whose energy comes from gravitational attraction alone, cool as they age and so progress to later spectral types.
Remark: This creation of thermal energy is a violation of thermodynamics.

remark: there are even stars barely visible but still have a infrared spectrum.

remark: perhaps any object in the universe whose temperature is above absolute zero could reveal its temperature near the infrared but this confuses a very cold star or very cold matter. These final classes of stars do not seem to be a star.

Wikipedia definition:

A star is an astronomical object consisting of a luminous spheroid of plasma held together by its own gravity.

remark: the word 'luminous' is apparently flexible in the last star types.

Intermediate conclusion:

The star types associate surface temperature with specific elements on the surface. As the temperature decreases through the types the new elements being observed are increasing in atomic number.
There are no direct connections between just a temperature range and the elements expected.

There are also stellar associations.

Excerpt:

Young associations will contain 10–100 massive stars of spectral class O and B, and are known as OB associations. These are believed to form within the same small volume inside a giant molecular cloud. Once the surrounding dust and gas is blown away, the remaining stars become unbound and begin to drift apart. It is believed that the majority of all stars in the Milky Way were formed in OB associations.
Stellar associations will normally contain from 10 to 100 or more stars. The stars share a common origin, but have become gravitationally unbound and are still moving together through space. Associations are primarily identified by their common movement vectors and ages. Identification by chemical composition is also used to factor in association memberships.
(Excerpt end)

The Hipparcos satellite provided measurements that located a dozen OB associations within 650 parsecs of the Sun.

Observation:

These loose associations are relevant to SAFIRE. In their common local environment, the stars appear to get the same mix of metals.

An explanation is required for the formation of individual stars, so they form either a) as unique stars or b) together as a similar type and their individual evolution results in the final types.

Cosmologists probably expect (a) but SAFIRE enables (b).

The M-type has the most stars while ranging from red dwarf to red super giant; this cool type also has the heavier metals.

From Wikipedia:
The Gaia mission will create a precise three-dimensional map of astronomical objects throughout the Milky Way and map their motions, which encode the origin and subsequent evolution of the Milky Way. The spectrophotometric measurements will provide the detailed physical properties of all stars observed, characterizing their luminosity, effective temperature, gravity and elemental composition. This massive stellar census will provide the basic observational data to analyze a wide range of important questions related to the origin, structure, and evolutionary history of our galaxy.

(Excerpt end)

12.4 Conclusion to star types

The Sun is assumed to take millions of years for one orbit. If that “evolutionary history” which is possible from the Gaia mission uses dark matter then its assumptions must be questioned.

12.5 Gaseous Sun Configuration

Excerpt from Wikipedia:

Core – the innermost 20–25% of the Sun's radius, where temperature (energies) and pressure are sufficient for nuclear fusion to occur. Hydrogen fuses into helium (which cannot currently be fused at this point in the Sun's life). The fusion process releases energy, and the helium gradually accumulates to form an inner core of helium within the core itself.
Radiative zone – Convection cannot occur until much nearer the surface of the Sun. Therefore, between about 20–25% of the radius, and 70% of the radius, there is a "radiative zone" in which energy transfer occurs by means of radiation (photons) rather than by convection.
Tachocline – the boundary region between the radiative and convective zones.
Convective zone – Between about 70% of the Sun's radius and a point close to the visible surface, the Sun is cool and diffuse enough for convection to occur, and this becomes the primary means of outward heat transfer, similar to weather cells which form in the earth's atmosphere.
Photosphere – the deepest part of the Sun which we can directly observe with visible light. Because the Sun is a gaseous object, it does not have a clearly defined surface; its visible parts are usually divided into a 'photosphere' and 'atmosphere'.
Atmosphere – a gaseous 'halo' surrounding the Sun, comprising the chromosphere, solar transition region, corona and heliosphere. These can be seen when the main part of the Sun is hidden, for example, during a solar eclipse.

The core of the Sun extends from the center to about 20–25% of the solar radius. It has a density of up to 150 g/cm^3 (about 150 times the density of water) and a temperature of close to 15.7 million Kelvin (K). By contrast, the Sun's surface temperature is approximately 5800 K. Recent analysis of SOHO mission data favors a faster rotation rate in the core than in the radiative zone above. Through most of the Sun's life, energy has been produced by nuclear fusion in the core region through a series of nuclear reactions called the p–p (proton–proton) chain; this process converts hydrogen into helium. Only 0.8% of the energy generated in the Sun comes from another sequence of fusion reactions called the CNO cycle, though this proportion is expected to increase as the Sun becomes older.

The core is the only region in the Sun that produces an appreciable amount of thermal energy through fusion; 99% of the power is generated within 24% of the Sun's radius, and by 30% of the radius, fusion has stopped nearly entirely. The remainder of the Sun is heated by this energy as it is transferred outwards through many successive layers, finally to the solar photosphere where it escapes into space through radiation (photons) or advection (massive particles).
The proton–proton chain occurs around 9.2×10^{37} times each second in the core, converting about 3.7×10^{38} protons into alpha particles (helium nuclei) every second (out of a total of ~8.9×10^{56} free protons in the Sun), or about 6.2×10^{11} kg/s.

Fusing four free protons (hydrogen nuclei) into a single alpha particle (helium nucleus) releases around 0.7% of the fused mass as energy, so the Sun releases energy at the mass–energy conversion rate of 4.26 million metric tons per second (which requires 600 metric megatons of hydrogen), for 384.6 yottawatts (3.846×10^{26} W), or 9.192×10^{10} megatons of TNT per second. The large power output of the Sun is mainly due to the huge size and density of its core (compared to Earth and objects on Earth), with only a fairly small amount of power being generated per m^3. Theoretical models of the Sun's interior indicate a maximum power density, or energy production, of approximately 276.5 watts per cubic metre at the center of the core, which is about the same rate of power production as takes place in reptile metabolism or a compost pile.
The fusion rate in the core is in a self-correcting equilibrium: a slightly higher rate of fusion would cause the core to heat up more and expand slightly against the weight of the outer layers, reducing the density and hence the fusion rate and correcting the perturbation; and a slightly lower rate would cause the core to cool and shrink slightly, increasing the density and increasing the fusion rate and again reverting it to its present rate.

Radiative zone

From the core out to about 0.7 solar radii, thermal radiation is the primary means of energy transfer. The temperature drops from approximately 7 million to 2 million kelvins with increasing distance from the core. This temperature gradient is less than the value of the adiabatic lapse rate and hence cannot drive convection, which explains why the transfer of energy through this zone is by radiation instead of thermal convection. Ions of hydrogen and helium emit photons, which travel only a brief distance before being reabsorbed by other ions. The density drops a hundredfold (from 20 g/cm^3 to 0.2 g/cm^3) from 0.25 solar radii to the 0.7 radii, the top of the radiative zone.

The radiative zone and the convective zone are separated by a transition layer, the tachocline. This is a region where the sharp regime change between the uniform rotation of the radiative zone and the differential rotation of the convection zone results in a large shear between the two—a condition where successive horizontal layers slide past one another. Presently, it is hypothesized that a magnetic dynamo within this layer generates the Sun's magnetic field.

Convective zone

The Sun's convection zone extends from 0.7 solar radii (500,000 km) to near the surface. In this layer, the solar plasma is not dense enough or hot enough to transfer the heat energy of the interior outward via radiation. Instead, the density of the plasma is low enough to allow convective currents to develop and move the Sun's energy outward towards its surface. Material heated at the tachocline picks up heat and expands, thereby reducing its density and allowing it to rise. As a result, an orderly motion of the mass develops into thermal cells that carry the majority of the heat outward to the Sun's photosphere above. Once the material diffusively and radiatively cools just beneath the photospheric surface, its density increases, and it sinks to the base of the convection zone, where it again picks up heat from the top of the radiative zone and the convective cycle continues. At the photosphere, the temperature has dropped to 5,700 K and the density to only 0.2 g/m^3 (about 1/6,000 the density of air at sea level).
The thermal columns of the convection zone form an imprint on the surface of the Sun giving it a granular appearance called the solar granulation at the smallest scale and supergranulation at larger scales. Turbulent convection in this outer part of the solar interior sustains "small-scale" dynamo action over the near-surface volume of the Sun. The Sun's thermal columns are Bénard cells and take the shape of hexagonal prisms.

The effective temperature, or black body temperature, of the Sun [photosphere] (5777 K) is the temperature a black body of the same size must have to yield the same total emissive power.

The visible surface of the Sun, the photosphere, is the layer below which the Sun becomes opaque to visible light. Photons produced in this layer escape the Sun through the transparent solar atmosphere above it and become solar radiation, sunlight. The change in opacity is due to the decreasing amount of H− ions, which absorb visible light easily. Conversely, the visible light we see is produced as electrons react with hydrogen atoms to produce H− ions.

Excerpt end)

Observation: When a proton captures an electron, its Lyman-alpha wavelength is in ultraviolet, not visible.

Excerpt:

The photosphere is tens to hundreds of kilometers thick, and is slightly less opaque than air on Earth. Because the upper part of the photosphere is cooler than the lower part, an image of the Sun appears brighter in the center than on the edge or limb of the solar disk, in a phenomenon known as limb darkening.

(Excerpt end)

Observation:

Limb darkening results from the light emission from that particular lattice structure in the metallic hydrogen on the photosphere surface.

Excerpt:

The spectrum of sunlight has approximately the spectrum of a black-body radiating at 5777 K, interspersed with atomic absorption lines from the tenuous layers above the photosphere. The photosphere has a particle density of ~1023 m−3 (about 0.37% of the particle number per volume of Earth's atmosphere at sea level). The photosphere is not fully ionized—the extent of ionization is about 3%, leaving almost all of the hydrogen in atomic form.

During a total solar eclipse, the solar corona can be seen with the naked eye, during the brief period of totality.
During a total solar eclipse, when the disk of the Sun is covered by that of the Moon, parts of the Sun's surrounding atmosphere can be seen. It is composed of four distinct parts: the chromosphere, the transition region, the corona and the heliosphere.
The coolest layer of the Sun is a temperature minimum region extending to about 500 km above the photosphere, and has a temperature of about 4,100 K. This part of the Sun is cool enough to allow the existence of simple molecules such as carbon monoxide and water, which can be detected via their absorption spectra.
The chromosphere, transition region, and corona are much hotter than the surface of the Sun. The reason is not well understood, but evidence suggests that Alfvén waves may have enough energy to heat the corona.

(Excerpt end)

Observation:

The “reason is not understood” when the temperature is a blatant mistake. Ions are capturing electrons so emission lines result. These emission lines have nothing to do with a temperature.

Excerpt:
Above the temperature minimum layer is about 2,000 km thick, dominated by a spectrum of emission and absorption lines. It is called the chromosphere from the Greek root chroma, meaning color, because the chromosphere is visible as a colored flash at the beginning and end of total solar eclipses. The temperature of the chromosphere increases gradually with altitude, ranging up to around 20,000 K near the top. In the upper part of the chromosphere helium becomes partially ionized.

[An image] of the Sun [chromosphere] reveals the filamentary nature of the plasma connecting regions of different magnetic polarity.
Above the chromosphere, in a thin (about 200 km) transition region, the temperature rises rapidly from around 20000 K in the upper chromosphere to coronal temperatures closer to 1000000 K. The temperature increase is facilitated by the full ionization of helium in the transition region, which significantly reduces radiative cooling of the plasma. The transition region does not occur at a well-defined altitude.

Rather, it forms a kind of nimbus around chromospheric features such as spicules and filaments, and is in constant, chaotic motion. The transition region is not easily visible from Earth's surface, but is readily observable from space by instruments sensitive to the extreme ultraviolet portion of the spectrum.
The corona is the next layer of the Sun. The low corona, near the surface of the Sun, has a particle density around 1015 m−3 to 10^{16} m^{-3}. The average temperature of the corona and solar wind is about 1,000,000–2,000,000 K; however, in the hottest regions it is 8,000,000–20,000,000 K. Although no complete theory yet exists to account for the temperature of the corona, at least some of its heat is known to be from magnetic reconnection. The corona is the extended atmosphere of the Sun, which has a volume much larger than the volume enclosed by the Sun's photosphere. A flow of plasma outward from the Sun into interplanetary space is the solar wind.
The heliosphere, the tenuous outermost atmosphere of the Sun, is filled with the solar wind plasma. This outermost layer of the Sun is defined to begin at the distance where the flow of the solar wind becomes superalfvénic—that is, where the flow becomes faster than the speed of Alfvén waves, at approximately 20 solar radii (0.1 AU). Turbulence and dynamic forces in the heliosphere cannot affect the shape of the solar corona within, because the information can only travel at the speed of Alfvén waves. The solar wind travels outward continuously through the heliosphere, forming the solar magnetic field into a spiral shape, until it impacts the heliopause more than 50 AU from the Sun. In December 2004, the Voyager 1 probe passed through a shock front that is thought to be part of the heliopause.

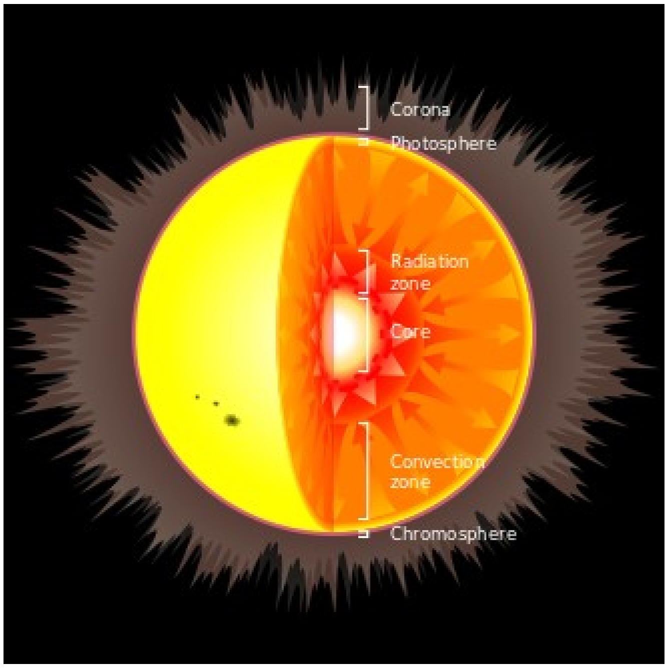
In late 2012 Voyager 1 recorded a marked increase in cosmic ray collisions and a sharp drop in lower energy particles from the solar wind, which suggested that the probe had passed through the heliopause and entered the interstellar medium.
(Excerpt end)

Observation:

The solar corona is a known mystery for the gaseous sun model.

12.6 Gaseous Sun's Layers

This image is from Wikipedia:



The structure of the Sun, from top to bottom, with brackets:

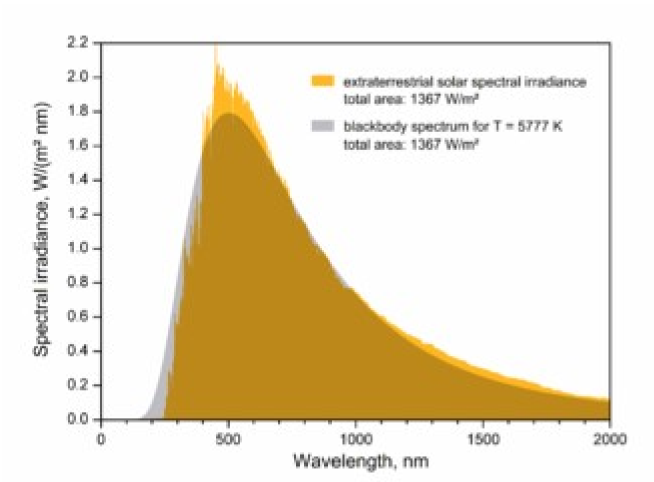
Corona
Photosphere
Radiation zone
Core
Convection zone (below radiation zone)
Chromosphere (below the photosphere)

Sun spots are shown on the photosphere, at lower left.

12.7 Solar Spectrum

A star emits energy as thermal radiation.

From Wikipedia: here is the Sun’s thermal radiation:



The caption:

The effective temperature, or black body temperature, of the Sun (5777 K) is the temperature a black body of the same size must have to yield the same total emissive power.

12.8 Pulsating Variable Star

In the Gaseous Sun, the visible photosphere is considered a layer of the atmosphere rather than a physical surface. This is because the gaseous Sun consists of only gas which can never exhibit a surface. A liquid or a solid can have a surface.

The spectrum from the photosphere was provided earlier.

12.9 Pulsating Variable Star

In the Gaseous Sun, the visible photosphere is considered a layer of the atmosphere rather than a physical surface. This is because the gaseous Sun consists of only gas which can never exhibit a surface. A liquid or a solid can have a surface.

The H-R diagram was provided earlier.

Excerpt from Wikipedia:

The kappa opacity mechanism is the driving mechanism behind the changes in luminosity of many types of pulsating variable stars. The term Eddington valve has been used for this mechanism, but this is increasingly obsolete.

Here, the Greek letter kappa (κ) is used to indicate the radiative opacity at any particular depth of the stellar atmosphere. In a normal star, an increase in compression of the atmosphere causes an increase in temperature and density; this produces a decrease in the opacity of the atmosphere, allowing heat energy to escape more rapidly. The result is an equilibrium condition where temperature and pressure are maintained in a balance. However, in cases where the opacity increases with temperature, the atmosphere becomes unstable against pulsations. If a layer of a stellar atmosphere moves inward, it becomes denser and more opaque, causing heat flow to be checked. In return, this heat increase causes a build-up of pressure that pushes the layer back out again. The result is a cyclic process as the layer repeatedly moves inward and then is forced back out again.

Stellar non-adiabatic pulsation resulting from the κ–mechanism occurs in regions where hydrogen and helium are partly ionized, or where there are negative hydrogen ions. An example of such a zone is in RR Lyrae variables where the partial second ionization of helium occurs. Hydrogen ionization is most likely the cause of pulsation activity in Mira variables, rapidly oscillating Ap stars (roAp) and ZZ Ceti variables. In Beta Cephei variables, stellar pulsations occur at a depth where the temperature reaches approximately 200,000 K and there is an abundance of iron. The increase in the opacity of iron at this depth is known as the Z bump, where Z is the astronomical symbol for elements other than hydrogen and helium.

(Excerpt end)

Observation:

This excerpt is an awkward explanation of how an observed temperature change in a physical surface could occur within a layer of the solar gaseous atmosphere.

In the LMH model, the photosphere is an actual surface which can exhibit a black-body temperature in its thermal radiation.

It is impossible for a gas to emit thermal radiation from its dispersed particles. The gas is not a “body” to do that. The temperature of a gas is determined by the kinetic energy in the amount of the gas sampled.

Whenever material is ejected from the photosphere, that material falls down by gravity and is observed to splash on a liquid surface.

The Gaseous Sun model is wrong to ignore this observed liquid surface on the photosphere.

12.10 LMH Model

There is an alternate theory for the internal structure of the Sun. It is based on a configuration of condensed matter called liquid metallic hydrogen or LMH. The protons condense into a crystal or lattice configuration with loose electrons maintaining the electromagnetic bonds.

12.11 Introduction to LMH Sun

The new theory for the internal structure of the Sun is extensively described here because the same terms are used in the section for Gaseous Sun. Section Matter provided the reference to the Dr. Robitaille theory of using metallic hydrogen as a building block for a star.

12.12 LMH configuration

This is my interpretation of the LMH model, taken from the Sky Scholar videos. This is not an excerpt, so any mistakes are mine.

A star begins with a compressed lattice of protons held together by shared electrons. This lattice of condensed matter is also called metallic hydrogen. The configuration of the protons within the lattice changes at several distinct depths in a star. The lattice holds heat in the form of vibrations in the protons. By conduction, that vibration (or heat) passes through the lattice.

The stellar core is a true solid with the tightest lattice called the body-centered cubic lattice.

Around the core, the next layer's lattice is not as compressed so it becomes a liquid and is called liquid metallic hydrogen, or LMH. Its configuration is the hexagonal lattice of type 2 liquid metallic hydrogen. This liquid allows the heat from the core to be transferred to the photosphere by convection. This region is called the convective zone.

The core has a very slow rotation. This results in a stress between a rotating solid and the liquid around it. This transition is called the tachocline.

On top of the convective zone is the photosphere where the heat can be released as thermal radiation.

The photosphere has a different lattice than the layer below.

This photosphere layer is the hexagonal lattice of type 1 liquid metallic hydrogen.

This form of condensed matter is less compressed and emits thermal radiation as light.

This is not heat transfer by conduction.

This is a transfer of thermal energy to radiated electromagnetic energy.

This energy is contained in a particular frequency distribution being radiated in this expanding sphere of energy. Thermal radiation was explained earlier.
This lattice in the photosphere explains observations like limb darkening, which the Gaseous Sun model cannot explain.

At this point:

From the core up to the photosphere all is just protons and electrons.

Above the photosphere is the chromosphere.

According to Wikipedia, the chromosphere is 2000 km deep.

Dr. Robitaille describes it as having a hexagonal lattice similar to the convective zone below it.

The chromosphere is where the results of element transmutation are observed with the presence of atoms and molecules. From section 7, the SAFIRE project observed element transmutation (or cold fusion) on their experiment's photosphere surface.

There are emission lines where atomic nuclei or ions are capturing electrons so the state change results in an emission of energy.

The photosphere, below the chromosphere, has intercalate regions which are layers of non-hydrogen atoms between the LMH lattice layers.

This observation implies heavier ions move down by the force of gravity from above where they are being formed by transmutation on the surface.

The photosphere has intercolate regions which are non-hydrogen atoms between the LMH lattices.

The chromosphere is a source of emission lines and has chemical reactions which Robitaille describes as hydrogen condensation which must be protons moving among various ions, creating temporary compounds.

The chromosphere is where atomic matter is changed, a process of building the nuclei through transmutation with protons, neutrons, electrons, and providing them with some electrons forming ions.

The solar model defined by Donald Scott proposes electric currents in loops within the convective zone affect the behaviors of sun spots which occur in the chromosphere or above the photosphere.
The layers and behaviors above the photosphere involve the corona which is composed of type 1 metallic hydrogen has several distinct layers:

K-corona emits light but has no Fraunhofer lines,

F-corona emits light but does have Fraunhofer lines,

T-corona emits thermal radiation,

E-corona has emission lines, where ions are capturing electrons.

Robitaille mentions this behavior results in a balancing of the Sun's electrical charge.

Cosmologists make a mistake with the E-corona. Rather than just electron capture, the emission lines are assumed to result from extreme temperatures, claimed to be many millions of degrees. Not only is this assumption wrong, but the cosmologists are unable to explain that claimed extreme temperature, far from the photosphere. The explanation goes further astray from valid physics with the impossible magnetic reconnection behavior. Magnetic field lines are not a thing which can hold or release energy. They are just a graphical representation of the field; they are not the field!

Field lines are claimed to break and re-connect to release this energy in the E-corona which has no source for external energy, because the energy was a mistake.

This story will continue with the creation of a star.

Dr. Robitaille describes the star requiring simple building blocks of the metallic hydrogen lattice.

Star forming regions in galaxies are called H II regions. Astronomers can identify regions of free protons (H I means a neutral hydrogen atom; H II means a proton) in both galaxies and nebulae and consider them star formation regions. The H II regions are relevant to this LMH model.

When these loose protons condense together to form the metallic hydrogen lattice, they are the star's building blocks.

A galaxy is connected to its cluster by Birkelund current pairs.

Excerpt from the Thunderbolts Project “EU Essential Guide Chapter 7”:

[Birkelund currents are] another cause of filamentation of currents in plasma. This is due to the fact that there is a force of attraction between any two parallel currents. By “parallel currents” we mean that the direction of flow or motion of like charges (say, the electrons, or the protons or ions) in one filament of matter in space is in the same or nearly the same direction in both of the two (or more, in some cases) filaments of current.

(Excerpt end)

The galaxy has an incoming supply of protons and electrons in the plasma filament connecting the galaxy to its cluster.

12.13 Corona Mass Ejection

An earlier section concluded with the Sun’s intercalate regions in the photosphere.

There are possible conclusions with those non- hydrogen elements in the layers between the liquid metallic hydrogen layers.

Metallic ions are in the intercalate regions within the photosphere and are also in the chromosphere.
The average Coronal Mass Ejection (CME) is 10^{12} kg while planet Mercury is $3x10^{23}$ kg. The CME must be ejecting mass from the intercalate region. There is no complete description of the elements detected in a CME.

Excerpt from Wikipedia:

“The red-glowing looped material [in a prominence] is plasma, a hot gas composed of electrically charged hydrogen and helium.”

(Excerpt end)

12.14 LMH Circuit

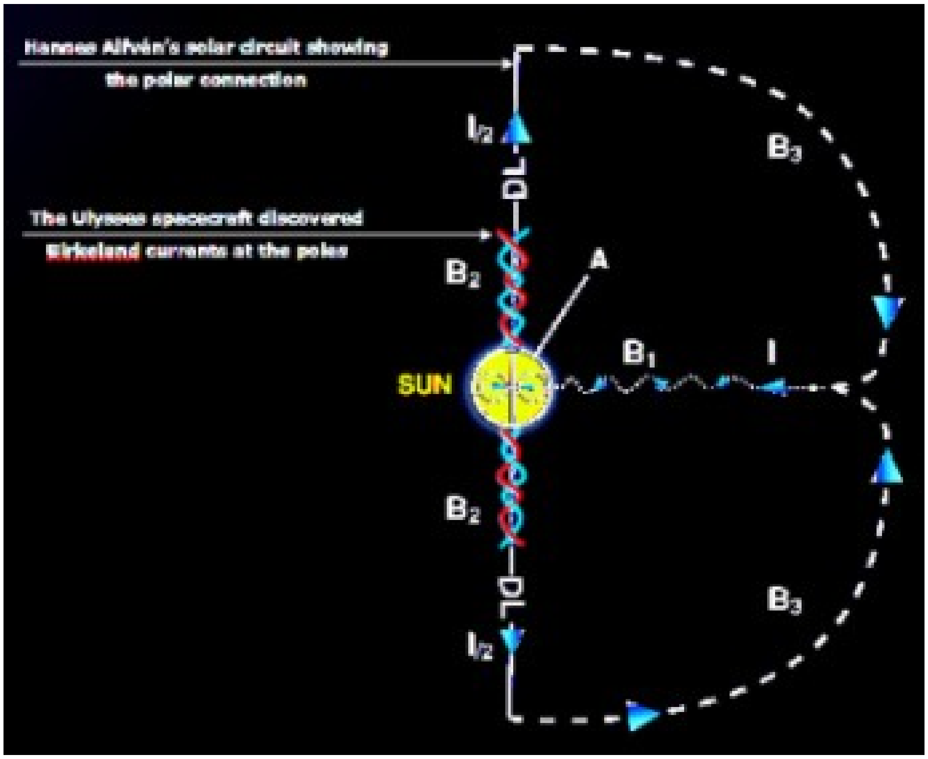
This section is the author’s interpretation. This is a useful figure and description to consider.

From Wikipedia:

Between 1994 and 1995 [Ulysses space craft] explored both the southern and northern polar regions of the Sun, respectively.

(Excerpt end)

The following figure is from the “holoscience” site and its page titled:
“Alfven Triumphs Again (&Again)”



The caption:

Alfvén’s Heliospheric Circuit. The Sun acts as a unipolar inductor (A) producing a current which goes outward along both the axes (B2) and inward in the equatorial plane along the magnetic field lines (B1).

The current must close at large distances (B3), either as a homogeneous current layer, or — more likely — as a pinched current. Analogous to the auroral circuit, there may be double layers (DLs) which should be located symmetrically on the Sun’s axes. Such double layers have not yet been discovered. Credit: Original diagram by H. Alfvén, NASA Conference Publication 2469, 1986, p. 27.

(End caption)

I believe there is nothing in the figure or its description which conflicts with the LMH model.

12.15 Conclusion to LMH

The Sky Scholar YouTube channel offers more detail than necessary here.

This presents a summary, to include this important topic for a complete picture.

12.16 Electric Sun

There is an alternate theory for the external electrical above the surface of the Sun, called the Electric Sun. Its goal is the explanation of everything on or above the surface of the Sun LMH. These observations include sun spots.

12.17 Introduction to Electric Sun

The new theory describes the electrical activity around the Sun.

The solar surface has been duplicated in a laboratory by the SAFIRE project, effectively demonstrating this model.

There are several YouTube videos describing this theory and this SAFIRE experiment, but here are two:

"Donald Scott The Electronic Sun Electric Universe 2012"

"Donald Scott: SAFIRE and the Electric Sun | Space News"

Astrophysics is beginning a transition to a different explanation for a star. This theory is suggested for consideration as part of this book's alternatives for a new cosmology.

The author found no transcripts to offer excerpts.

The theory explains sun spot cycles and other surface behaviors with electric currents below the photosphere surface so their magnetic fields affect those behaviors above the surface.

The electrical diagram for the Electric Sun is more complicated than described here; it has been shown in videos but an available image could not be found.

This theory cannot explain the thermal radiation spectrum observed with every star. It attempts to explain the sunspot activity in the chromosphere.

13 Galaxies

There are at least 2 models of a galaxy. Each will be described here.

Excerpt from Wikipedia:

Spiral galaxies are named by their spiral structures that extend from the center into the galactic disc. The spiral arms are sites of ongoing star formation and are brighter than the surrounding disc because of the young, hot OB stars that inhabit them.

Roughly two-thirds of all spirals are observed to have an additional component in the form of a bar-like structure, extending from the central bulge, at the ends of which the spiral arms begin.

(Excerpt end)

Observation:

My book Measuring Galaxies covered many galaxies (over 600) and presented spectra from several. 4 galaxies are included in this section, below, as useful examples, including both spectra and Cepheids, with a velocity and distance.

All spectrograms and screen captures are from NASA/IPAC Extragalactic Database, or NED.

13.1 Spiral Galaxy – Current model

A spiral galaxy is assumed to rotate by the force of gravity.

The stars are assumed to rotate in the disk just like the planets orbit around the Sun. This simplistic explanation resulted in the need for dark matter. The disk rotation, with its stars, gas, and dust, is not actually like the planets with their orbits around the solar system's barycenter. This wrong assumption resulted in dark matter. This was the outcome, rather than fixing the broken model.

13.2 Spiral Galaxy – 2 Relevant studies

Studies in 2010 and 2015 disprove the current model. The 2010 study implemented a fix to the model, with no publicity.

Scientists in Spain published a study in 2010, titled:
M31's Odd Rotation Curve

Previously, there was a YouTube video of that title by one of the authors. I recently checked, but I could not find it. The paper is still referenced by UniverseToday's web site.

I also found:
"Magnetic Fields and the Outer Rotation Curve of 31" in the Astrophysical Journal Letters

The conclusion was the galactic magnetic field explains the rotation curve. The paper implies they changed the model to use a specific value from M31 for their confirmation.

The galactic magnetic field would cause a relatively flat curve in the disk, as observed. M31 was expected to have its billions of stars follow orbits like our 8 planets around 1 star, our Sun. That assumption was unjustified. A complex disk having multiple spiral arms is nothing like our solar system.

A new explanation for a spiral galaxy's structure in its disk was found in 2015.

An important conclusion after a study of IC342, a large obscured, nearby spiral galaxy:

Excerpt from the study from Max-Planck Institute titled:" Twisted magnetic field in galaxy IC 342"

"Spiral arms can hardly be formed by gravitational forces alone," continues Rainer Beck. "This new IC 342 image indicates that magnetic fields also play an important role in forming spiral arms."

Cosmologists have evidence that their galaxy model is wrong for over 10 years, but there is no public recognition of the mistake.

13.3 Lyman Alpha Emitter Galaxy

Excerpt from Wikipedia:

A Lyman-alpha emitter (LAE) is a type of distant galaxy that emits Lyman-alpha radiation from neutral hydrogen.
Most known LAEs are extremely distant, and because of the finite travel time of light they provide glimpses into the history of the universe. They are thought to be the progenitors of most modern Milky Way type galaxies.

The baryonic acoustic oscillation signal should be evident in the power spectrum of Lyman-alpha emitters at high redshift. Baryonic acoustic oscillations are imprints of sound waves on scales where radiation pressure stabilized the density perturbations against gravitational collapse in the early universe. The three-dimensional distribution of the characteristically homogeneous Lyman-alpha galaxy population will allow a robust probe of cosmology. They are a good tool because the Lyman-alpha bias, the propensity for galaxies to form in the highest overdensity of the underlying dark matter distribution, can be modeled and accounted for. Lyman-alpha emitters are over dense in clusters.

(Excerpt end)

This description reveals much confusion. First, the Lyman-alpha emission line occurs when a proton captures an electron, and the electron drops to the hydrogen ground state.

References to “baryonic acoustic oscillation” are meaningless. Attempts to model “dark matter distribution” are also meaningless. There is no dark matter. That mistake is covered in section Cosmology.

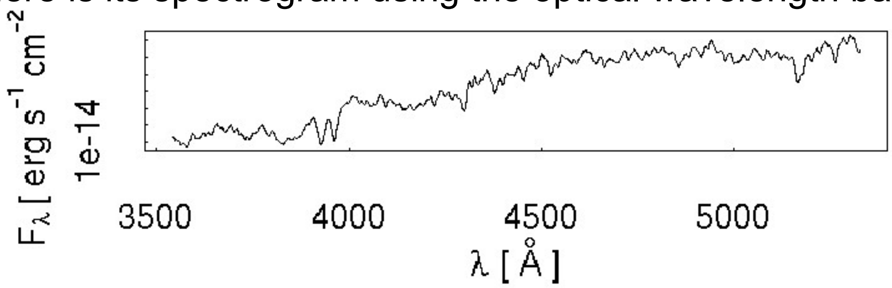
The description implies no recognition that both M31 and M33 are Lyman-alpha emitters. These 2 galaxies are very close, even within our Local Group. They directly contradict the claim the LAE type is found only at great distance.

This Lyman-alpha emission occurs from an event in the line of sight to a galaxy. That event is a proton capturing an electron. This event cannot be related to the galaxy’s velocity or age. Trying to link an electron capture by a proton to the age of the galaxy is unjustified and ridiculous.

13.4 Galaxy Example 1 – M31

M31 is a large spiral galaxy in the Local Group.

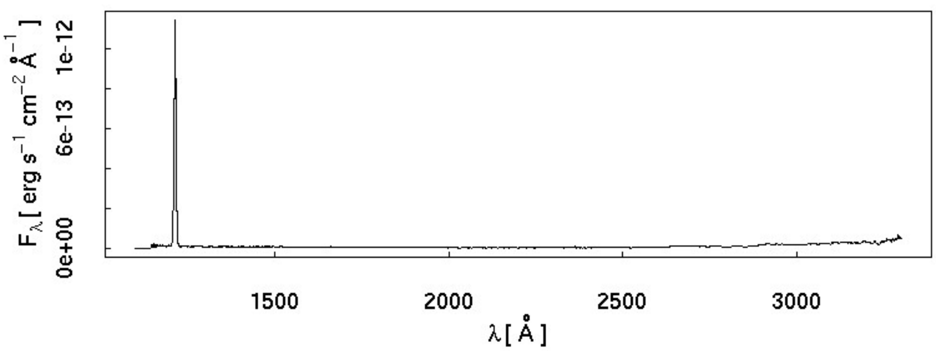
Here is its spectrogram using the optical wavelength band, from UV to infrared:



There are 2 dips below 4000 Angstroms. Those are the 2 absorption lines from calcium ions in the line of sight to M31.

The blue shift in those absorption lines is the justification of the M31 relative velocity of 401 km/s toward Earth. Atoms in the line of sight cannot be used to measure motion of a galaxy.

Here is its spectrogram in the ultraviolet wavelength band (below 4000 A):

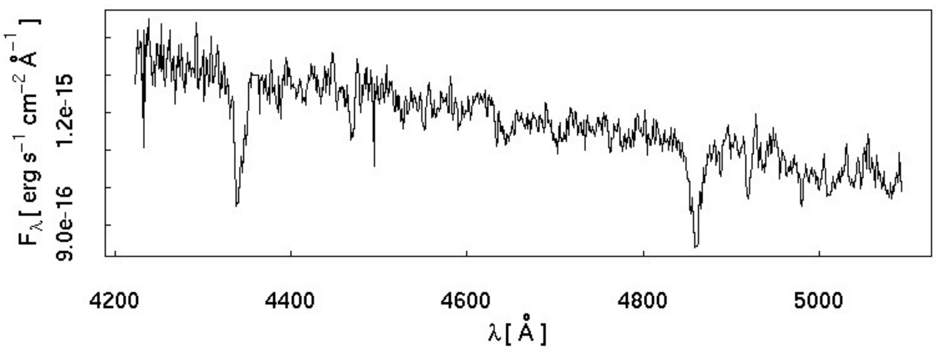


There is a strong emission line around 1216 Angstroms. That wave length was identified earlier as LAE. Therefore, M31 is of LAE type.

13.5 Galaxy Example 2 – M33

M33 is a spiral galaxy in the Local Group.

Here is its spectrogram in the optical wave length from some of UV to infrared:

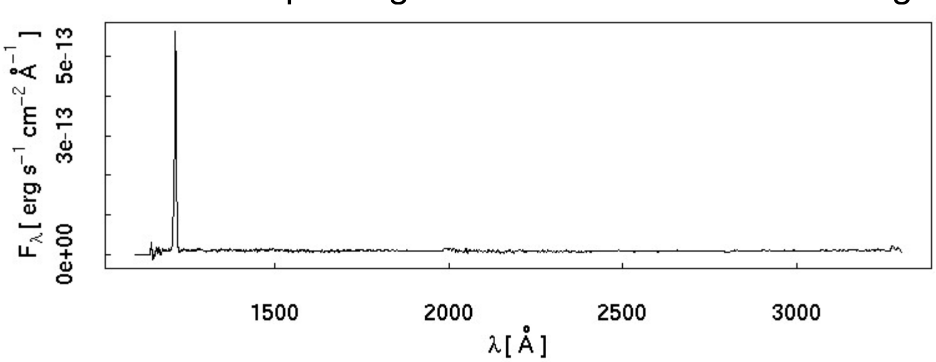


The spectrogram in NED for M33 has a slightly different span of wave lengths than for M31.

Both galaxies show the signature of synchrotron radiation with the range of wave lengths from ultraviolet to infrared having a similar intensity. Each dip is from atoms in the line of sight absorbing their characteristic wavelengths.

M33 has a number of absorption lines coming from atoms in the line of sight. They are the justification of the M33 relative velocity of 179 km/s toward Earth. Atoms in the line of sight cannot be used to measure a galaxy. The NED spectrogram for M33 does not extend below 4000 A like for M31. M33 has about the same blue shift, so the same absorption lines must have been measured by someone to calculate the stated redshift velocity. NED currently lacks the evidence for the velocity.

Here is the M33 spectrogram in the ultraviolet wavelength band:



Just like with M31, there is a strong emission line near 1216 Angstroms. M33 is also a LAE.

13.6 Galaxy Example 3 – M95

NGC 3351 is also known as M95, and is in the constellation Leo, in sky quadrant NQ2.

From NED Redshifts (35):

Preferred Redshift: Z = 0.00260, H0 = 67.8 km/sec/Mpc, Ω matter = 0.308, Ω vacuum = 0.692

V (Heliocentric) is 778 ± 4 km/s km/sec

Hubble Flow Distance and Distance Modulus (where H0 = 67.8 km/sec/Mpc ± km/sec/Mpc)

D (Local Group) 9.20 ± 0.66 Mpc

Cosmology-Corrected Quantities [H0 = 67.8 km/sec/Mpc, Ω matter = 0.308, Ω vacuum = 0.692]

[Redshift 0.003758 as corrected to the Reference Frame defined by the 3K CMB]

Observations:

1)
Calculating V from Z and c is 780 km/s
The V result difference of 2 km/s is trivial.

2)
Calculating D from NED V and H0 is 11.50442 Mpc
The D result is about 10% higher than NED

3)
From Wikipedia:
V = 778 km/s
D = 10 Mpc

Wikipedia V matches NED V
But D values differ

From NED Distances (62):

Redshift-independent Distances for MESSIER 095

View References in ADS (35) — 1 of 1 (1 - 62 of 62)

(m-M)	err(m-M)	D(Mpc)	Method	Refcode	Notes
double	double	double	char	char	char
29.77	0.08	8.99	Cepheids	1997ApJ...491...13K	46, VI
29.81	0.09	9.16	Cepheids	2002A&A...389...19P	MW HIPP
29.85	0.09	9.33	Cepheids	2001ApJ...553...47F	46, VI, KEY PROJECT
29.85	0.16	9.33	Cepheids	2002A&A...389...19P	MW P02
29.88	0.08	9.46	Cepheids	2002A&A...383..398P	110, VI
29.88	0.08	9.46	Cepheids	2002A&A...389...19P	MW GFG
29.90	0.09	9.56	Cepheids	2003A&A...411..361K	cte LMC K03
29.91	0.06	9.59	Cepheids	2001ApJ...548..564W	LMC W01
29.91	0.09	9.61	Cepheids	2003A&A...411..361K	cte U99
29.92	0.09	9.64	Cepheids	2004ApJ...608...42S	LMC VIHJK
29.93	0.09	9.67	Cepheids	2003A&A...411..361K	cte LMC STS02
29.94	0.09	9.71	Cepheids	2003A&A...411..361K	cte MW GFG98

There are 20 results for Method Cepheids (not all fit in the screen capture).

Their average = 9.9255

There are over 20 results from other distance methods (could not fit in the screen capture). This line can be found:
D=10.50 Mpc, Statistical Method; Mean of Cepheids, TRGB, and Tully Fisher

The D provided by NED is more than Wikipedia: 10.5 vs 10.0.

From NED Spectra (30):

The relevant images are provided:

Image 1, UV band, from Nucleus region.

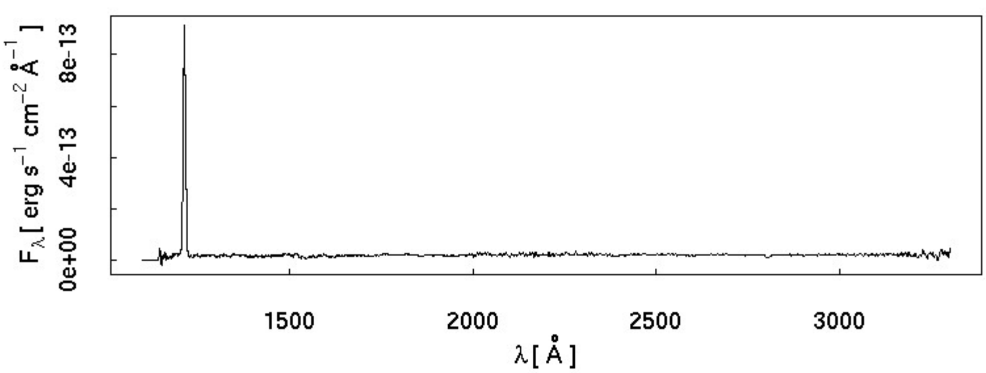


Image 2, H I, from integrated region.

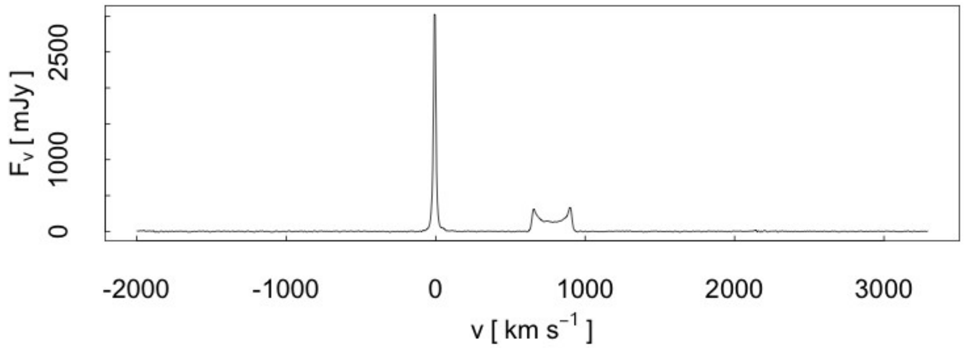


Image 3, Optical band, from Nucleus region.

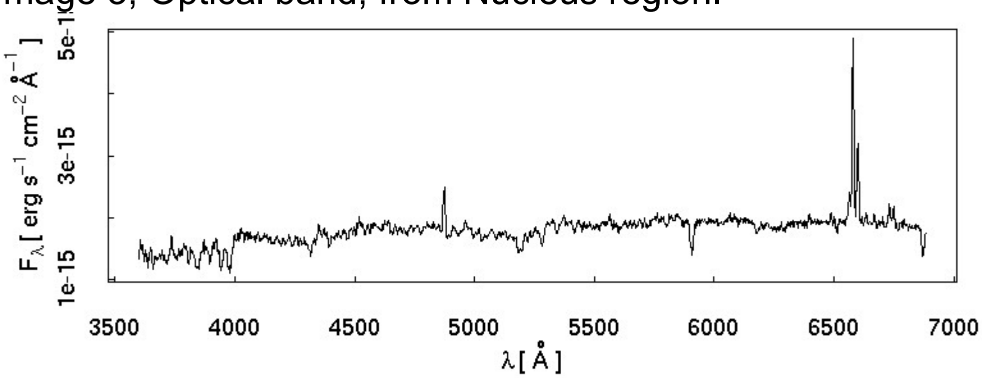
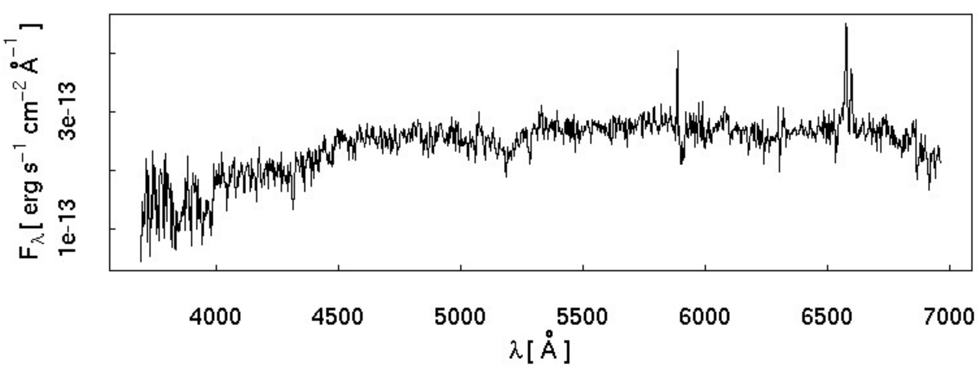


Image 4, Optical band, from Integrated-Drift Scan region.



Observations:

Image 1)

Lyman-alpha emission line was detected in UV band. It appears close to 1216 A so it was not moving fast at the moment of electron capture. This is the LAE.

This event detection in the line of sight has nothing to do with a galaxy's velocity or distance.

Image 2)

There is no spectrum provided for this plot of velocities. The only possible origin of this plot is a number of emission lines around 21 cm. There was a strong line at exactly 21 cm, so its z=0, implying 0 velocity. Each other line had its wavelength as measured compared to 21 cm. The difference was compared to 21 cm where diff / 21 cm = z. Next, each z was multiplied by c, resulting in a series of velocities with wavelength intensity as shown.

It is impossible for this set of atoms in the line of sight, having differences in their 21 cm emission line to indicate the galaxy's proper velocity. The strong non-shifted line was ignored so the weaker, shifted lines could provide a velocity, when a measurement of zero velocity could be justified for this galaxy.

The claimed velocity of 778 is apparently from the much weaker emission lines which had a shift.

None of these peaks can be the galaxy's velocity in any direction. Using them is a mistake and then using them for a proper velocity compounds the mistake.

It is impossible to measure any 3-dimensional proper velocity when using only the line of sight.

Images 3 and 4)

6563 A is the Balmer-alpha emission line, and seems to be captured by both samples. The line suggests a slow proton captured a slow electron, emitting less energy than the Lyman-alpha line, when the atom dropped to ground state, resulting in no shift of the line.

NGC 3351 has an unjustified non-zero velocity. The correct value is the statement: there has been no attempt to measure this galaxy's proper velocity.

This exercise requires measuring motion in all directions including transverse. It is a mistake of negligence when measuring only in the line of sight. The velocity measurement requires many positions recorded over a span of time. This is how we measure the motion of comets and asteroids. Galaxies are more distant and require even more time because the angular distance covered in time decreases as the distance increases, for the same velocity.

M95 or NGC 3351 should have a published statement which directly states there is a range of possible distances from its inconsistent Cepheids. The value must state the uncertainty which is demonstrated by the many different possible values coming from different attempts. A distance being derived from 20 or more values should not omit the uncertainty. Otherwise, astronomers demonstrate no effort at credibility.

M95 or NGC 3351 has a wrong velocity.

It is impossible to calculate the V/D ratio, or Hubble's constant, for this galaxy.

13.7 Galaxy Example 4 – M96

NGC 3368 is also known as M96, and is in the constellation Leo, in sky quadrant NQ2.

From NED Redshifts (28):

Preferred Redshift: Z = 0.00299, H0 = 67.8 km/sec/Mpc, Ω matter = 0.308, Ω vacuum = 0.692

V (Heliocentric) is 897 ± 4 km/s

Hubble Flow Distance and Distance Modulus (where H0 = 67.8 km/sec/Mpc ± km/sec/Mpc)

D (Local Group) = 10.98 ± 0.78 Mpc

Cosmology-Corrected Quantities [H0 = 67.8 km/sec/Mpc, Ω matter = 0.308, Ω vacuum = 0.692]

[Redshift 0.004156 as corrected to the Reference Frame defined by the 3K CMB]

Observations:

1)
Calculating V from Z and c is 897 km/s
The V result matches NED.

2)
Calculating D from NED V and H0 is 13.23009 Mpc
The D result is about 20% higher than NED

3)
From Wikipedia:
V = 897 km/s
D = 9.6 Mpc

Wikipedia V matches NED V
But D values differ

From NED Distances (71):

Redshift-independent Distances for MESSIER 096

View References in ADS (48) — 1 of 1 (1 - 71 of 71)

(m-M) double	err(m-M) double	D(Mpc) double	Method char	Refcode char	Notes char
29.94	0.13	9.72	Cepheids	2001ApJ...548..564W	LMC W01
29.96	0.10	9.80	Cepheids	2001ApJ...547L.103G	7, VI
29.97	0.06	9.86	Cepheids	2001ApJ...553...47F	9, VI, KEY PROJECT
30.05	0.06	10.20	Cepheids	2002A&A...389...19P	MW HIPP
30.08	0.17	10.40	Cepheids	2002A&A...389...19P	MW P02
30.10	0.10	10.50	Cepheids	2001ApJ...547L.103G	7, VI +Z
30.11	0.06	10.50	Cepheids	2001ApJ...553...47F	9, VI, +Z, KEY PROJECT
30.13	0.07	10.60	Cepheids	1999MNRAS.310..175T	16, VI(W)
30.14	0.10	10.70	Cepheids	1997ApJ...491...13K	7, VI
30.17	0.10	10.80	Cepheids	2002A&A...383..398P	74, VI
30.17	0.10	10.80	Cepheids	2002A&A...389...19P	MW GFG
30.20	0.10	11.00	Cepheids	1999ApJ...512...48G	7, VI

There are 21 results for Method Cepheids (not all fit in the screen capture)

Their average = 11.022857

There are more than 20 results from other distance methods than Cepheids (not all fit in the screen capture). This line can be found:
D=10.50 Mpc, Statistical Method; Mean of Cepheids, SBF, and Tully Fisher

The D provided by NED is more than Wikipedia: 10.5 vs 9.6.

The statistical method is awkward to justify when Cepheids are claimed to be a standard candle.

From NED Spectra(13):

Here are the relevant images:

Image 1, H I, from integrated region.

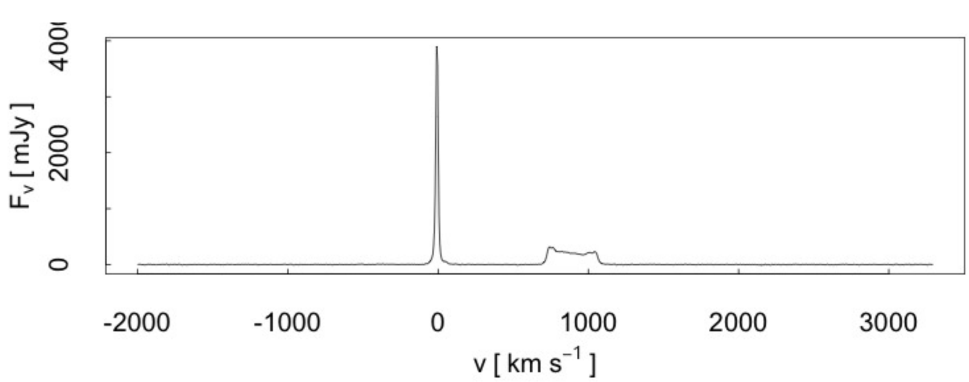


Image 2, Optical band, from Integrated-Drift Scan region.

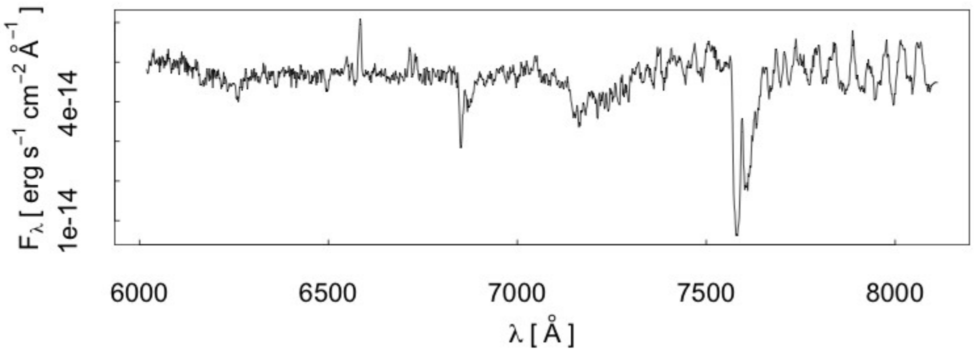


Image 3, Optical band, from Nucleus region.

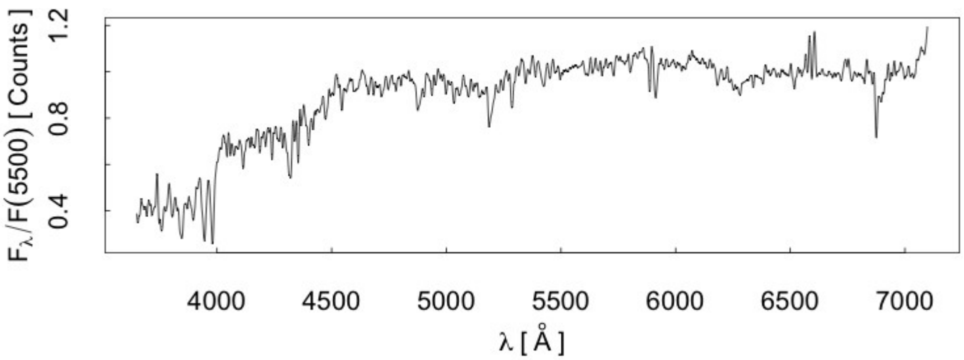
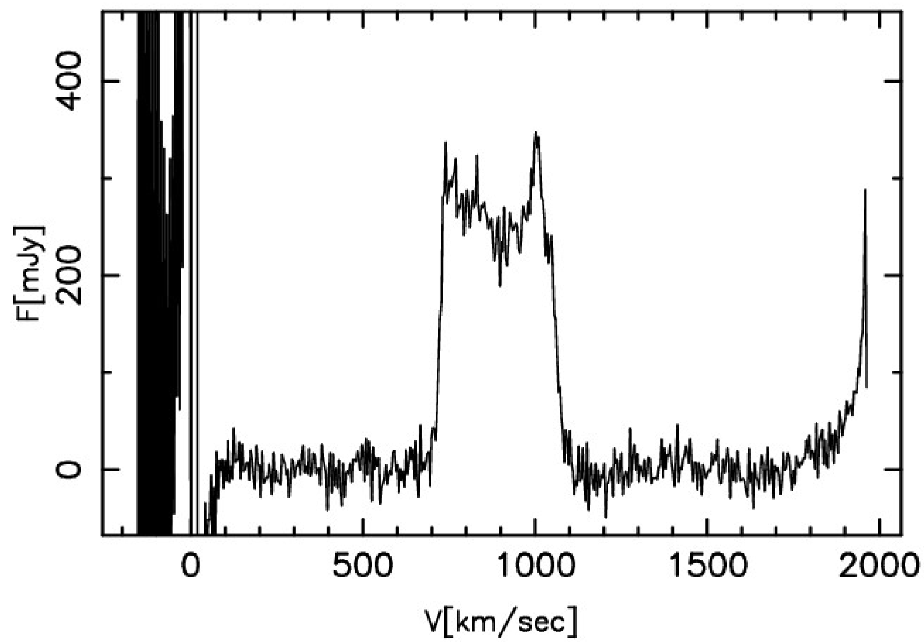


Image 4, H I, from integrated region.



There are more H I spectra than presented here.

Observations:

Image 1)

There is no spectrum provided for this plot of velocities. The only possible origin of this plot is a number of emission lines around 21 cm. Each line had its wavelength measured from 21 cm. The difference was compared to 21 cm where diff / 21 cm = z. Next, each z was multiplied by c, resulting in a series of velocity with wavelength intensity as shown.

The image is noteworthy because the strong 0 velocity means there is a strong non-shifted 21 cm line. As that must be the strongest line in the hidden spectrum, a zero velocity for this galaxy could be justified. Instead, the claimed velocity apparently was found in the weaker lines which were red shifted.

It is impossible for this set of atoms in the line of sight, having differences in their 21 cm emission line to indicate the galaxy's proper velocity.

None of these peaks can be the galaxy's velocity in any direction. Using them is a mistake and then using them for a proper velocity compounds the mistake.

It is impossible to measure any 3-dimensional proper velocity when using only the line of sight.

Images 2 and 3)

These 2 spectrograms in optical wavelengths show no consistent pattern of either absorption or emission lines, so no redshift velocity could be extracted. It would be invalid, anyway.

Image 4)

This image is bizarre compared to image 1. The strongest neutral hydrogen emission lines are showing a strong, slightly negative velocity. These were ignored to show a positive velocity instead for this galaxy.

M96 or NGC 3368 has an unjustified positive velocity. The correct value is the statement: there has been no attempt to measure this galaxy's proper velocity.

This exercise requires measuring motion in all directions including transverse. It is a mistake of negligence when measuring only in the line of sight. The proper velocity measurement of a galaxy requires many positions recorded over a span of time. This is how we measure the motion of comets and asteroids. Galaxies are more distant and require even more time because the angular distance covered in time decreases as the distance increases, for the same velocity.

M96 or NGC 3368 should have a published statement which directly states there is a range of possible distances. The value must state the uncertainty which is demonstrated by the many different possible distances coming from different attempts. A distance being derived from 21 or more values should not omit the uncertainty. Otherwise, astronomers demonstrate no effort at credibility.

M96 or NGC 3368 has a wrong velocity and an inconsistent distance.

It is impossible to calculate the V/D ratio, or Hubble's constant, for this galaxy. My book Measuring Galaxies found every galaxy gets its velocity from atoms in the line of sight. Distances when no Cepheid was present used algorithms based on luminosity and distance relationships.

14 Quasars

Quasars are misunderstood because Halton Arp, the first astronomer researching them extensively, did not understand redshifts.

14.1 Studies of quasars

A BeppoSAX study of many quasars and BL Lac objects around 2008 concluded all had a source of synchrotron radiation. That explains their spectrum spanning from X-ray to radio. The M87 plasmoid has the same distribution.

Quasars are known to be bright in X-ray but dim in optical. The clouds of gas and dust affect different wavelengths that way.

A Caltech study in 2000 had a "typical spectrum for a quasar" with z=1.34.

Its title is "Quasistellar Objects: Intervening Absorption Lines"

Quasars in the Arp collection are marked by many metallic ion emission lines.

Seyfert galaxies were the consistent parents of Arp's quasars. Seyferts are LINER galaxies. These galaxies are marked by many metallic ions around their core.

Though the respective atoms in the quasar have different masses they share the same velocity, which is a plasma behavior resulting in filaments.

As ions capture electrons from the plasmoid, they emit their characteristic emission line which is red shifted by the ion's velocity.

The electric field of the plasmoid decreases in increments so the red shift of the ion velocities drops also.
When all the ions become neutral or leave the line of sight, the quasar's red shift from the ions goes away.

The following is the most likely story of a quasar.

1) The Seyfert ejects a pair of plasmoids in opposing directions.
2) Each gets the same collection of metallic ions from the core.

This results in the same initial red shift for the pair. When the respective plasmoids follow the same electrical capacity reduction in increments, the pair follows the same red shift reduction pattern.

3) Ion captures of electrons create neutral atoms which are not pulled by the electric field pull, affecting their motion.
The cloud of ions will disperse. The red shift will dissipate to zero.

This story addresses all observations. No new theory for a quasar, of incrementally changing its mass or velocity is required.

14.2 Halton Arp's mistake with quasars

Halton Arp is noted for his Atlas of Peculiar Galaxies, first published in 1966. He is also noted for revealing galaxy and quasar redshifts are not consistent. Despite those accomplishments, he made mistakes when using these redshift values.
Halton Arp's book Seeing Red (in 1998) concentrated on quasars and their apparent quantized red shifts. One can analyze the spectra in his book Seeing Red to discover the mistakes. That analysis is done here.

The quasars mentioned in the book are low red shift quasars. Most are $z < 1$. Mistakes can arise when using a poor sample of the object being studied. One of his mistakes was a conclusion a redshift is associated with age of the light source, or the age of matter.

This "typical quasar" in the Caltech study noted above has an important difference than the NGC 4258 quasars in Figure 1-2 in Arp's book. This should be obvious in the 2 figures attached below.

Background:

Arp frequently mentions quasars and BL Lac objects.

Arp describes a BL Lac spectrum as one that washed out the hydrogen emission line which is observed with a quasa. Others concluded the BL Lac object simply has no emission lines. The distinction is important because the emission line, when present, is not directly connected to the AGN. Arp seems to treat BL Lac objects as a completely different class though they are nearly the same.

A 2002 study by BeppoSAX of both types concluded their AGN was a source of synchrotron radiation, which means, though not stated, both types are a plasmoid.
The study concluded that was the source in the AGN, not its opposite which is thermal radiation, which would come from a very hot accretion disk, which means by this study, these objects have no black hole for their AGN.

A plasmoid generates a flat spectrum so any absorption or emission lines are from atoms in the line of sight.

Excerpt from that Caltech paper:

The relatively flat quasar continuum and broad emission features are produced by the quasar itself. In some cases, gas near the quasar central engine also produces "intrinsic" absorption lines, most notably Lyalpha, and relatively high ionization metal transitions such as C IV, N V, and O VI. These intrinsic absorption lines can be broad [thousands or even tens of thousands of km/s in which case the quasar is called a broad absorption line (BAL) QSO], or narrow (tens to hundreds of km/s). However, the vast majority of absorption lines in a typical quasar spectrum are "intervening", produced by gas unrelated to the quasar that is located along the line of sight between the quasar and the Earth.

(Excerpt end)

Observation:

The Caltech quasar study does not assign the red shift velocities of lines from gas atoms to the quasar. These velocities of atoms can reach thousands of km/s.

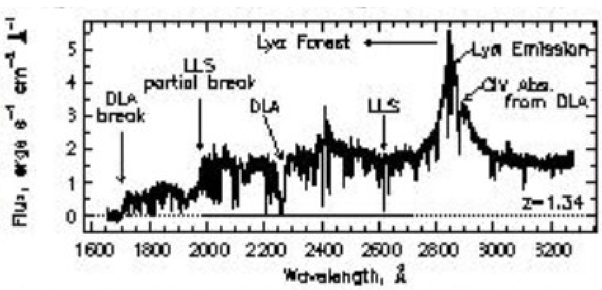


Figure 1. Typical spectrum of a quasar, showing the quasar continuum and emission lines, and the absorption lines produced by galaxies and intergalactic material that lie between the quasar and the observer. This spectrum of the z = 1.34 quasar PKS0454+039 was obtained with the Faint Object Spectrograph on the Hubble Space Telescope. The emission lines at ~ 2400 Å and ~ 2850 Å are Lyβ and Lyα. The Lyα forest, absorption produced by various intergalactic clouds, is apparent at wavelengths blueward of the Lyα emission line. The two strongest absorbers, due to galaxies, are a damped Lyα absorber at z = 0.86 and a Lyman limit system at z = 1.15. The former produces a Lyman limit break at ~ 1700 Å and the latter a partial Lyman limit break at ~ 1950 Å since the neutral Hydrogen column density is not large enough for it to absorb all ionizing photons. Many absorption lines are produced by the DLA at z = 0.86 (C IV λλ1548, for example, is redshifted onto the red wing of the quasar's Lyα emission line).

The study's Figure 1 shows a prominent Hydrogen Lyman-alpha emission line red shifted. This atom in motion is not the same as the quasar.

The speed of light is 300,000 km/s so clearly it is a drastic mistake to assign any of these measured velocities of atoms to the quasar.

The phrase "tens of thousands" could be close to the speed of light.

Figure 1 in the quasar study has $z=1.34$ as "typical" which is 402,000 km/s.

Few quasars are $z > 6$. In Arp's book, the highest red shift is $z < 3$. Many are $z < 1$.

The crucial reminder for the Doppler Effect:

The motion of the light source affects its distribution around the sphere of radiation, which is propagating in all directions. If the direction in the line of sight is toward the observer, then a blue shift is observed; if the source is in the opposite direction, then a red shift is observed.

If the source spectrum is unaffected but only absorption lines or emission lines are shifted then those shifts are from those atoms, not the source.

Here is the Seeing Red book's Figure 1-2.

Intrinsic Redshifts 11

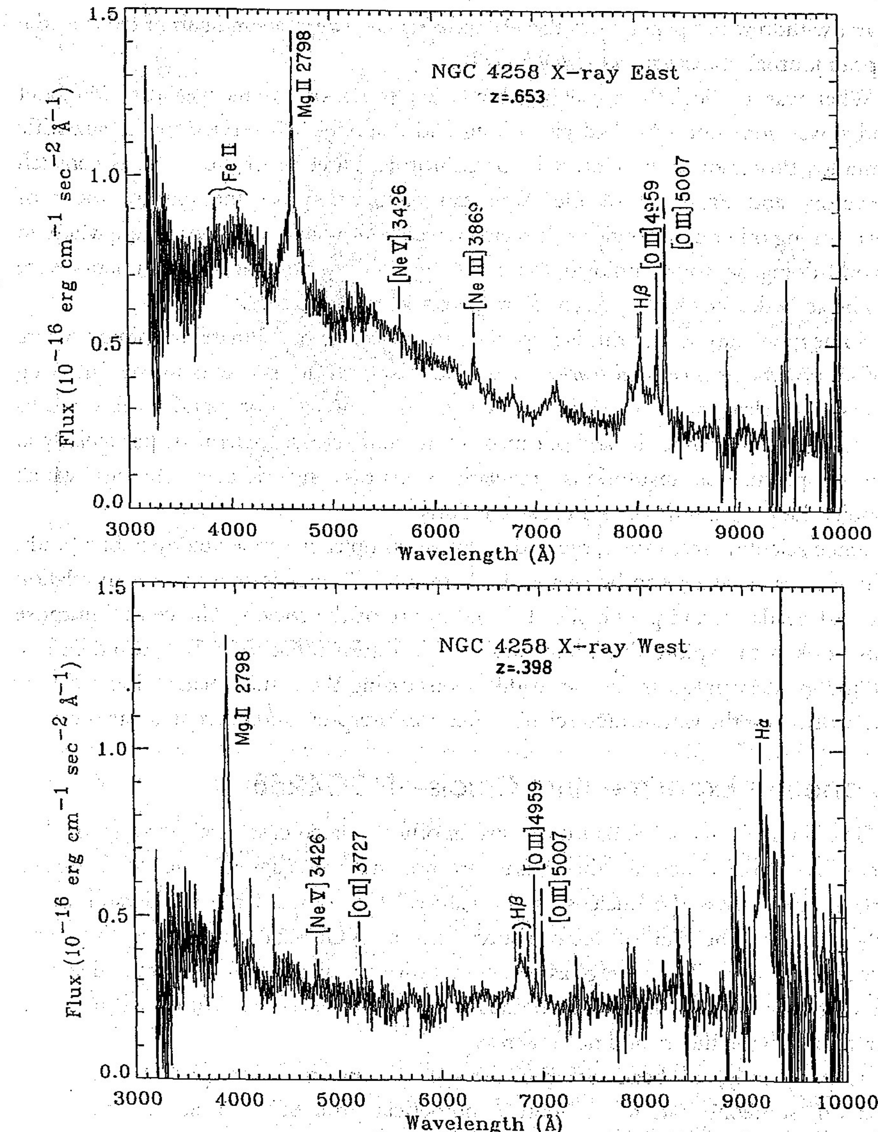


Fig. 1-2. Spectra of the two X-ray BSO's across NGC4258 with the Lick Observatory 3 meter telescope taken by Margaret Burbidge showing the similarity of the quasars.

The spectrum from NGC 4258 (or M106) is shown. This is a double lobed radio galaxy so the two spectra are for the "East" and "West" lobes which are considered by Arp to be 2 quasars..

Each spectrogram identifies specific emission lines and their emitted wavelength.

It is clear how the z value in the figure was calculated for each lobe.

From East lobe:

Mg II line emitted at 2798 Angstroms is observed at 4625 for z=0.653
Neon III line at 3869 Angstroms is at 6395 for z=0.653
H beta line at 4861 Angstroms is at 8053 for z=0.653
O III line at 5007 is at 8280 for z=0.653

From West lobe:

Mg II line at 2798 Angstroms is at 3911 for z=0.398
H beta line at 4860 Angstroms is at 6795 for z=0.398
O III line at 5007 is at 7000 for z=0.398

All these atoms appear to have the same velocity toward the plasmoid.

The above velocities are consistent until the far right:

H alpha line at 1216 Angstroms is at 9100 for z=6.5

The East lobe had no H alpha line indicated but I suspect it is that peak near the right side with no element identified.
If it is then:

H alpha line at 1216 Angstroms is at 9300 for z=6.65

Both lobes indicate a similar quasar redshift z > 6 when using the hydrogen alpha line.
The redshift is even greater when using the Lyman-alpha emission line consistent with "typical" quasars.

All these emission lines are from atoms in motion separate from the plasmoid inside the quasar.

Arp's book assumes these lobes are z= 0.653 and 0.398 which are lower than others could conclude.

A typical quasar has a prominent hydrogen emission line which is red shifted, known since 1963.

Excerpt from Britannica:

The puzzle was solved by the Dutch American astronomer Maarten Schmidt, who in 1963 recognized that the pattern of emission lines in 3C 273, the brightest known quasar, could be understood as coming from hydrogen atoms that had a redshift (i.e., had their emission lines shifted toward longer, redder wavelengths by the expansion of the universe) of 0.158. In other words, the wavelength of each line was 1.158 times longer than the wavelength measured in the laboratory, where the source is at rest with respect to the observer. At a redshift of this magnitude, 3C 273 was placed by Hubble's law at a distance of slightly more than two billion light-years. This was a large, though not unprecedented, distance (bright clusters of galaxies had been identified at similar distances), but 3C 273 is about 100 times more luminous than the brightest individual galaxies in those clusters, and nothing so bright had been seen so far away.

(Excerpt end)

Observation:

It is impossible for a quasar redshift to be related to its distance.

This description is vague because the Hydrogen atom has many lines, among the Lyman and almer series. It should identify whether the hydrogen wavelength is a) Lyman-alpha, or b) Hydrogen-alpha, which is the same as Balmer-alpha.
The description is very misleading because only one emission line is red shifted, the Hydrogen Lyman-alpha line at 1216 Angstroms. This is the important line used in a "typical" quasar by Caltech. The description implies many lines shifted the same, but that interpretation is wrong with the Lyman-alpha line. The description in Wikipedia is even further from correct.

Therefore, Arp was misdirected by using only the metallic lines in the somewhat low red shift quasars in the limited sample.

The NGC 4258 quasars have wrong red shifts because an important emission line was red shifted to the infrared, where it can be missed. If the "featured" spectra have this mistake, then the others in the sample (with no spectrograms) probably do too.

I suspect the reason why the ion emission lines show a similar velocity for each quasar is these are ionized atoms so as plasma they would be moving together. Moving plasma tends to form filaments. That behavior resulted in the name for moving charged particles.

It is impossible for the light of any object, regardless of its redshift, to reveal the age of the light source.

Halton Arp had the double misfortune of using a limited data set, and publishing his book only 2 years before others published their research of quasars.

15 Cosmology

There are several important topics in cosmology:

1) Redshifts
2) Bing Bang and dark energy
3) Dark matter
4) Hubble's constant
5) Expansion or Inflation
6) Dimensions
7) LIGO

Each is explained in turn.

15.1 Redshifts

Cosmology has several serious problems when measuring galaxies:

1) Any galaxy redshift cannot be treated as its velocity.

Each is the measurement of an atom in the line of sight.

The only way to measure a galaxy's velocity in 3-dimensions, like left/right, up/down, forward / away (or in / out).

It is a crucial mistake to assume galaxies move only in a straight line relative to Earth.

2) Hubble's Law and Constant are based on the illusion of this linear motion. In reality, the galaxies are not moving only in a line toward Earth.

Astronomers measured 3- dimensional motion in the only galaxies ever attempted, the 2 Magellanic Clouds. Both had sets of stars having transverse motion. This was in conflict with the measured redshift which could never measure motion beyond the line of sight.

All current galaxy and quasar velocities are invalid.

Only distances based on luminosity, when not using redshift, are valid. Cepheids are one example.

Therefore nearly every distance and velocity must be withdrawn, because only a few have a justifiable distance.

15.2 Big Bang and Dark Energy

When recognizing the false velocities of galaxies and quasars, everything is NOT moving away from Earth, exactly in the line of sight.

There is no need for dark energy to push non-existent motion.
There is no need for a big bang event to initiate this false motion.

15.3 Dark Matter

There are several justifications for the undefined, undetectable dark matter.

1) Scientists in Spain published a study in 2010, titled
M31's Odd Rotation Curve

Previously, there was a YouTube video of that title by one of the authors. I just checked and I could not find it, but maybe I missed it. The paper is still referenced by UniverseToday's web site.

I also found:
"Magnetic Fields and the Outer Rotation Curve of 31" in the Astrophysical Journal Letters

The conclusion was the galactic magnetic field explains the rotation curve. The paper implies they changed the model to use a specific value from M31 for their confirmation.

The galactic magnetic field would cause a relatively flat curve in the disk, as observed. M31 was expected to have its billions of stars follow orbits like our 8 planets around 1 star, our Sun. That assumption was unjustified. A complex disk having multiple spiral arms is nothing like our solar system.

2) Another alternative to dark matter was found in 2015.

An important conclusion after a study of IC342, a large obscured, nearby spiral galaxy:

Excerpt from the study from Max-Planck Institute titled:” Twisted magnetic field in galaxy IC 342"

"Spiral arms can hardly be formed by gravitational forces alone," continues Rainer Beck. "This new IC 342 image indicates that magnetic fields also play an important role in forming spiral arms."

3) Zwicky used invalid galaxy velocities. All galaxies have their velocity measured by atoms in the line of sight. That can never be the galaxy's velocity. For example, M31 has a blue shift because there are calcium ions in the line of sight and their absorption line blue shift comes from the ions, not M31, moving toward Earth. Dark energy is the excuse for wrong galactic velocities.
Dark matter is the excuse for the mistake when atoms in motion are assumed to be the galaxy's motion.

4) Filaments are sometimes explained by dark matter. This ignores an important behavior of plasma in motion, where the magnetic field being generated maintains the filament. That behavior of filaments is why plasma has its name. There is no dark matter, but there is the unobserved magnetic field, just like in M31.
Dark matter is just assumed to be the reason for any behavior driven by a missed magnetic field.

15.4 Hubble's constant

There is no relationship between redshifts from atoms in the line of sight to a distant celestial object. For several years, cosmologists confronted a crisis when this expected constant could not be found, using various methods. That failure should have forced a reconsideration of assumptions, but bad theories persisted through the lack of evidence.
15.5 Expansion or Inflation
15.6 Dimensions
A number of disciplines in physics work with a coordinate system and its dimensions for measuring positions which form the basis of theories and are needed for confirming predictions of those theories.

15.5 Expansion or Inflation

The mistake with redshifts results in more mistakes, including an impossible change in the background of space. This is inconceivable in Newton's absolute space, which is immovable and independent of all observers.

15.6 Dimensions

The universe does not have any dimensions. We can never see a dimension. Also, we can never see a coordinate system. The number of dimensions being used is ALWAYS defined by the observer, to suit whatever is being measured. Only something very close is ever measured with left/right, up/down, toward/away. The reference point for these 3 dimensions is the person looking in those directions.

Another person, standing in another place, will have different distance measurements when looking in those 3 directions.

In astronomy, right ascension and declination are always used for celestial measurements. Because the center of the Earth is the reference point for this pair of angular dimensions, all observers can share their measurements, after accounting for their offset in position from this coordinate system's reference point at the center of the Earth.

Dimensions are used only by the observer and cannot physically be part of an object or of the universe.

Our GPS coordinate system uses lines of latitude and longitude but the Earth does not have or possess these 2 dimensions. We defined them. An object can have size but it does not define its own dimensions, which can be measured in many different units. Einstein's theory of relativity defined the special moving observer's reference frame as space-time. Relativity is a background independent theory, meaning this reference frame has no defined coordinates in space (the background) outside the observer's current position.

The universe does not have space-time; only the special moving observer has (or uses) the 4-dimensions of space-time.

The black hole is a corruption between geometry and physics. When the special, moving observer of relativity moves toward a massive body, their path is curved toward the center of that body. The center of a body, no matter its shape, is described in geometry as a point. To all other observers, the mass remains at its position in space.

The black hole proposes the mass is somehow contained within this point, which is only a concept in geometry. Since a point is not a measurable entity in physics, the point must have zero size. Putting mass into a zero volume must have infinite density. Putting amass into a geometric point while maintaining its force of gravity is another violation of physics with a black hole. Claiming the entire mass simply disappears for all other observers is also impossible.

Black holes don't exist. They are needed to explain X-ray point sources. Cosmologists ignore the work of plasma physicists, like Winston Bostwick who discovered the plasmoid in the 1950's. A plasmoid can be the source of synchrotron radiation to X-ray energies.

The torus imaged at the center of the M87 galaxy was a plasmoid, not a black hole as claimed.
A black hole having an accretion disk is an impossible combination to achieve thermal radiation to the energy of X-rays. The number of dimensions being used by any observer is irrelevant to the impossible black hole.

When string theorists need many dimensions to measure expected behaviors, then the universe never has these dimensions. The universe cannot somehow take possession of someone's definition of how they wish to measure something.

The universe remains unaffected by our current coordinate system's definition which we require for our measurements.

By agreeing on a coordinate system, we can share our measurements to confirm repeatability among others. The universe and the stuff in it remain unaffected by our selections of dimensions.

There is NO correct number of dimensions. However, to share our measurements we must agree on the definition of whatever number and configuration of them are being used at the time.

15.7 LIGO

LIGO and its unjustified claims are an abomination for physics. My 8th book, LIGO Legacy, is a free PDF and covers LIGO in detail, so none of its content needs to be included here.

16 2 Alternatives

There at least 2 other theories claiming to use classical physics.

16.1 Edward Dowdye

Dowdye's Extinction Shift Principle claims the Galilean transformation applies to light emissions. That is a mistake. This transformation is about kinetic energies. He proposes the velocity of light emitted by a source is affected by the velocity of the source.

This is in direct conflict with Maxwell. The velocity of propagation is always defined by the medium at the instant. This theory violates Maxwell's explanation of light, and does not explain how the violation is reconciled by a new revision of Maxwell's work.

This theory also proposes that light in continually absorbed and re-emitted as it passes through space, perhaps by loose electrons. The assumption is one can never observe the original light emission. This re-emission could be offered as an explanation for redshifts through space. This scenario is impossible for several reasons:

1) Only condensed matter can absorb and re-emit, and space or a subatomic particle is not condensed matter,

2) A redshift of the entire spectrum is never observed with distant celestial objects. Only specific absorption or emission lines, from atoms in the line of sight, are the cause of measured redshifts. This was explained in the section Galaxies. This theory cannot explain the various observed redshifts.

When violating Maxwell's work, this theory is not an acceptable new version of classic or classical physics.

16.2 Wal Thornhill

Thornhill’s theory of electro-gravity claims the electric force between charges can also provide the illusion of gravity. This requires deformation of the spherical electron shells to obtain an apparent charge differential across the neutral atoms. A new particle is also defined, consisting of a new internal structure, within an undefined membrane. This internal pair of undefined particles moving in mutual orbits is claimed to provide the energy for the mass and charge behaviors. Just having energy does not explain how the electric force can be generated by this kinetic energy within this new particle. This new particle also cannot explain the atomic mass defect. Wal also mentions a new atomic model called the Structured Atomic Model, or SAM. I asked the group working on SAM and was told they are working on explaining the atomic mass defect. SAM also proposes electrons are squashed like a sponge between protons. This is awkward for both electron capture, and beta + and beta – decays, when the electrons must move through the nucleus. My updated atomic model puts them outside, where those decay behaviors require no motion of squashed particles within the nucleus.

Wal’s claim of classical physics is based on the reduction to only one fundamental force, that between charges, by the elimination of Newton’s gravity. The theory is a simpler attempt at classical physics but is also invalid physics, when not comprehensive by introducing undefined subatomic particles.

In my interpretation of classical physics, unnecessary items are removed. There are 2 fundamental particles, with one having much more mass than the other: proton and electron.

In my return to classical physics, there are 2 fundamental forces, with one being much stronger than the other: electric and gravity.
The combination of 2 and 2 implies a natural symmetry, like yin and yang.

Proposing only 1 fundamental force is inconsistent with nature’s simple symmetry.

Wal’s theory is not an acceptable new version of classical physics.

17 Final Conclusion

Physics derailed about the time it adopted relativity as valid.

A number of changes in physics were explained:
1) Removal of relativity and its non-existent entity called space-time,
2) Return of Newton's force of gravity (replacing space-time),
3) Particle physics and an updated atomic model,
4) Proper use of Doppler Effect.

Several changes in cosmology, considered a branch of physics, were explained. The impact of improper use of Doppler Effect was explained.

None of these exist: big bang, black hole, dark energy, dark matter, expansion or inflation of the universe, gravitational lens, gravitational wave, neutron star.

18 Author's Books

I self-published 8 books, before this one. The 8th is available only as a PDF, and not as a book having paper pages between the glossy covers.

Those previous 8 books are summarized next.

18.1 Observing Our Universe

This, OOU, is my first book. It addressed many issues in cosmology, especially the mistakes made with a spectrum analysis of distant objects, such as galaxies and quasars. There are actually 4 different red shift mechanisms. Treating them as all the same, as just a simple Doppler effect, results in many mistakes. There is no universe expansion and there was no big bang. There are two other problems when ignoring the observer's context.

The first is the special observer in relativity; no celestial objects in cosmology have such a special observer commanding their motion in their reference frame.

The second is the detection of non-existent gravitational waves. LIGO made a mistake when their detectors on Earth's surface reacted to tidal stress by the Moon or Sun, but LIGO falsely claimed a distant astrophysical source.

I gave LIGO several predictions in November, 2019, which were confirmed by LIGO detections as expected. The exercise confirmed LIGO's mistake because the earth tides by the Moon and Sun are predictable. Those terrestrial events are triggering the LIGO system. The distant sources claimed by LIGO must be impossible to predict. LIGO never detected anything being claimed or described. LIGO never provided evidence for their claims. LIGO is an abomination.

18.2 Cosmology Transition

This, CT, is my second book. It addressed many issues in cosmology, which were identified in the first book.

As part of the transition, a better scheme for archiving astronomical data is proposed.

A new solar model, proposed by Pierre-Marie Robitaille, is described.

This is a paradigm shift with stars having a hot solid core, cooling by convection out to the photosphere which cools by radiating a thermal spectrum. This model matches all solar observations, including the liquid surface of the photosphere. There is no unstable internal fusion mechanism.

The SAFIRE project duplicated the conditions of the photosphere in a controlled experiment and observed element transmutation on the globe's surface. Elements are created on the stellar surface, not in the core.
A new spiral galaxy model, proposed by Donald Scott, is also described. This model explains the disk's rotation curve by the galaxy's magnetic field, eliminating the need for the mistake of dark matter.

My new quasar model is described. Halton Arp did not understand the mechanism driving a measured red shift in quasars and galaxies though he compared their values.

I also described the basics of the entity the author calls a sphere of stars. These include a globular cluster and elliptical galaxy. Several conjectures are offered but more public data are required for better explanations of these distant objects.

One of the topics in CT is my proposed archive of astronomical data. The section Data Set in this 7th book describes my archive of data from over 600 galaxies, helping to address the deficiency in cosmology, which was noted in this earlier book.

18.3 Cosmology Connections

This, CC, is my third book. It addressed several issues in cosmology, especially when missing electrical connections among celestial bodies. There is an important distinction between thermal radiation and synchrotron radiation. That is important when the Doppler Effect is discussed.

The universe has a web of electrical currents between galaxy clusters.

Each galaxy has an electrical connection to its cluster. A spiral galaxy like our Milky Way has an axial electrical current which can split into the individual arms; our galaxy has several. This axial current creates the galactic magnetic field, which drives the disk rotation. A study by astronomers in Spain reached this conclusion in 2010 but the mistake of dark matter persists. Wherever dark matter is proposed to explain an anomaly, there is a magnetic field being ignored.

A galaxy's electrical connection affects its spectrum being measured from earth.

18.4 Redefining Gravity

This, RG, is my fourth book. It describes the author's mechanism for Newton's force of gravity, by explaining its origin and similarities to the electric force. It describes the many confirmations of the force, including Kepler's laws of planetary motion. It also explains the issues of space-time. Gravity must be redefined to be a real, fundamental force, not as curvature of the special, moving observer's reference frame.

Space-time was created to prevent an observer from exceeding the velocity of light by forcing changes on that attempt, like time dilation. Protons have been measured having a velocity at multiples of c, so the fundamental assumption of relativity is a mistake.

18.5 Practical Particle Physics

This, PPP, is my fifth book. It included an extensive research into the atomic mass defect behavior. Its conclusions included changes to the atomic model, including the proton. All of the atomic behaviors with light were described including: particle pair production, Compton scattering, photoelectric effect, and Doppler Effect. All can be explained with no photon because all are a wavelength driven behavior.

Visible Light is part of the wavelength continuum making up part of the electromagnetic radiation spectrum, which is possible from the propagation of synchronized, perpendicular electric and magnetic fields whose oscillation can be measured as either frequency or wavelength.

There is no photon, though this quasi-particle is assumed a valid particle in particle physics.

18.6 Practical Atomic Model

This, PAM, is my sixth book. It included an extensive research into the behaviors in the atomic nucleus and in the electron configurations. Electrons and protons are particles of a known mass and size. Electrons orbit around the nucleus in a defined sequence of rings, each having a known capacity and a measured radius from the nucleus. Quantum orbitals for the P, D, F electron shells are part of a theory of electrons moving subject to uncertainty and probability, or defined by a wave function. There is no evidence to justify these theoretical orbitals. There is no available force or mechanism for any path other than one having a constant radius. The evidence is for a fixed radius orbital, like the S shell.

Electrons bind to protons in the nucleus to balance its electrostatic forces. A loss of equilibrium results in an action as part of radioactive decay. The behaviors in the nucleus during these actions are described.

18.7 Measuring Galaxies

This, MG, is my 7th book. This is somewhat a sequel to the first 2 books.

At that time, the author was unaware of THE NASA / IPAC Extragalactic Database, or NED. This reference identifies how the redshift of each galaxy was measured, and how its distance was calculated.

This book is about how galaxies are measured, so NED is a crucial reference.

After finishing the sixth book, I discovered NED which has details about galaxy data not found in other sources. Every galaxy velocity is wrong; all are based on atoms in the line of sight.

18.8 LIGO Legacy

This, LL, is my 8th book. Unlike the previous 7, this one is available only free as a 77 page PDF, with no book having paper pages available for purchase.

This is somewhat a sequel to part of the first book (published in 2020) which covered LIGO detections through 2019. LIGO has continued reporting fictitious detections of non-existent gravitational waves, coming from the non-existent mergers of non-existent binaries. Some content was improved from the first book.

This book details all 97 GW detections by LIGO, from the first in 2015 through the latest, through April, 2021. The page size was increased to 8.5 x 11, from the original's format for paperback or Kindle. As a result, the page count is reduced.

19 References

The references in this book are available as clickable links from a page in the author's web site.

1. Start web browser.

2. Go to this site: www.cosmologyview.com

3. Make sure the browser is on the correct home page:

Cosmology Views

4. Scroll to near the middle.

5. Select: **Books by the author**

This page presents information for each book.

Locate the columns for this book's edition.

6. Locate: **Return To Classical Physics**

7. Below it, locate the date of this book's edition:

05/27/2021 References

8. Select: **References** after the correct date.

The selected page will list the references in the book by page number, with a link to that reference.

Each link indicates whether it is to a pdf, a YouTube video, or a URL link to a web page. The user is aware of what the browser will do with the link.