

Chapter 8. The Big Bang Is Going On Right Under Your Nose. Breathe With Care.

In the last chapter we mentioned the fundamental constants of physics, and decided to call them quanstants, since they function as quantum mechanical units. We mentioned that you can express relationships among the physical quanstants purely in terms of relationships of geometry. Let's take a look at a few examples and then wend our way toward a radical new theory of elementary particles.

We noted six fundamental constants: (H), (G), (e), (c), (eo), (%). The (%), which is a new one that I call White's Dimensional Shift (or D-Shift) Operator, is spatial, and comes to 3.16227766 m or the square root of 10 m^2 . The permittivity constant (eo) is a bridge between matter and geometry. The D-shift operator (%) assists dimensional shifting of physical systems.

It requires a bit of a viewpoint shift, but we can think of a universal constant as a very stable "particle". It is even more stable than any ordinary physical structures. Included among these constants are the rest mass of the proton (M_p) and the rest mass of the electron (M_e). All ordinary matter is built from these two elementary fermions in various combinations. They are basic building blocks.

No one has satisfactorily explained why the proton and electron have the masses they have. I believe that we can not consider these particles in isolation, but must put them together with the other constants of nature. What emerges then is a set of relations based on the geometry of spheres and discs.

Let's represent our constant values of geometry as follows:

- * R_u = a 1 meter "unit" radius. (I usually use 1 meter and work in the metric system.)
- * % = the D-Shift unit = 3.16227766 m. ($\% / R_u$) = 3.16227766).
- * P = pi, the relation of half a circumference to a radius.
- * O_o = A circular orbit, or circumference, with unit radius ($2 P R_u$)
- * A_o = the area of our unit radius circle. ($P R_u^2$)
- * A_s = the area of our unit sphere. ($4 P R_u^2$)
- * S_s = the volume of our unit sphere. $(4/3)(P R_u^3)$

Thus, for example,

- * $A_s / A_o = 4$, and
- * $P \%^2 / A_o = 10$.

The proton mass relates to light speed and charge as pi relates to a unit disc and a D-shift.

- * $M_p c / e = P A_o / \%$.

One side of the equation is pure physics, and the other side is pure geometry!

$$* (1.67 \times 10^{-27} \text{ kg}) (3 \times 10^8 \text{ m / s}) / 1.602 \times 10^{-19} \text{ kg / s} = 3.12734 \text{ m.}$$

$$* (9.86965)(1) / (3.16227766) = 3.121 \text{ m.}$$

This equation comes out very close considering that we rounded off slightly and matched items spread over a range of 27 orders of magnitude.

Another, even simpler, way of writing the mass of a proton is as follows:

$$* M_p c / e = P R_u.$$

It is amazing that the proton mass times the velocity of light, divided by the unit charge happens to be almost exactly pi times 1 meter. It suggests that maybe this should be the definition of a meter. ($M_p c$) is the momentum of a proton if it travels at the speed of light, and (e) is the proton's charge. ($P R_u$) looks like half a circumference or half an orbit. One thing this equation tells us is that the proton's charge is equal to the proton's momentum at light speed divided by half a circular orbit with a radius of one meter.

Imagine that we use a different set of units, and 1 meter = 3.182 feet. The left side of our equation becomes 10.26 feet. The right side of the equation when written as ($P A_o / \%$) becomes

$$* (9.86965)(10.765 \text{ feet}^2) / (10.375433 \text{ feet}) = 10.24 \text{ feet.}$$

When written as ($P R_u$), it becomes 10.3 feet.

So we see from this that ($\%$) must be treated as a universal constant of both physics and geometry based on its ratio to $R_u =$ one meter. If we change our unit for the radius, then the relative value of ($\%$) also changes. The ratio ($\% / R_u$) must always be 3.16227766, and the absolute values are also $R_u = 1$ meter and $\% = 3.16227766$ meter. Furthermore, $\%^2 = 10 \text{ m}^2$. This is a universal constant.

We can use the above relation as a definition of the proton's mass in terms of the ratio of its charge to the speed of light times the constant

$$* (P A_o / \%).$$

$$* M_p = (e / c)(P A_o / \%).$$

Or,

$$* M_p = (e / c)(P R_u).$$

There is a tiny discrepancy between these two values that needs to be handled by a decision to redefine a standard meter adjusted to these relationships in the most useful manner for balancing the values of all the constants of physics. All of the matter that we

see and play with in the world of physics is based on the proton. The proton effectively generates our very concept of spatial intervals. It is therefore appropriate to define our basic spatial interval in terms of the proton's constant relation to the speed of light and its charge and the constant geometry of a circle.

The value $(R_u) = 1$ meter is the Observer's Gauge with which to view the universe. Without this gauge and its companion $(\%)$, we can not make sense of the rest masses of particles, the quantum unit of charge, or the speed of light. Nor is it possible to create a holistic quantum theory of gravity that will unify the various forces of nature. These fundamentals are all determined by the inherent decision by the Observer to resist his creations. This resistance takes the form of a unit distance that the observer places between himself and his creation. As we shall see, this fundamental creation is defined as the ratio of the proton's ideal light-speed momentum $(M_p c)$ to a half loop of quantum electrical charge $(P e)$.

$$* \quad R_u = M_p c / P e.$$

There may be an anthropic principle at work here that reflects into biological form. The human body grows to a height of between 1 and 2 meters.

$$* \quad 2 P R_u e = 2 M_p c.$$

Protons like to be in pairs to form molecular hydrogen. The above equation expresses the ideal "light-speed momentum" of molecular hydrogen. The $(2 P R_u)$ also forms a circle with a radius of 1 meter, the normal personal space that an individual maintains around him. The range from $(\%^2) = 10 \text{ m}^2$ to $P \%^2 = 31.416 \text{ m}^2$ is an average area sufficient to provide air, heat dispersion, minimal furnishings, storage and exercise room for an individual human's quiet living space. This perhaps can provide a little insight into what I mean when I say "resistance". If someone moves into your personal body space without your express permission, most people feel a subtle sense of pressure. This allows you to get a glimpse of the transparent belief structure we have by which we resist the world around us even while depending on it for our survival.

Experiment:

* Do Exercise # 7, "The Behavior of Attention" in **ReSurfacing**. Read the sidebar comments very carefully.

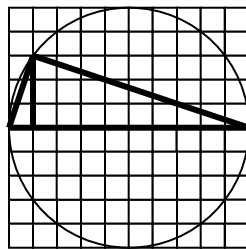
* Try moving into someone's 1 meter radius personal space with or without their permission. Do not initiate physical contact without the person's express permission!! Feel what it feels like for you when you are near a person's space, at its edge, and within their space. Also notice how the other person reacts.

* Hold a conversation with someone and notice the distance between your hearts. Try it with different people and notice what the average comes to. This average may vary a little bit from culture to culture or from one age group to another.

* Sometimes in crowded places we draw in our edges a little based on a convention that "I'll give a little if you'll give a little and we all behave ourselves, because we are all here for some common purpose." Go to an event where there is a crowd or take a ride on a crowded bus or subway. Pay attention to the distances between people and the feelings of resistance or attraction generated.

* Close friends and intimate couples are like molecules. Their energies are biased in such a way that they fit together comfortably. The resistance is turned into an attraction. Try this exercise with someone you have a strong mutual attraction to and feel what that feels like. Notice how it feels when the energy between you and a close or intimate friend gets "out of synch".

The Geometry of White's Dimensional Shift Operator and Its Relation to Physics



Much attention is given to the 1:2-rectangle that generates the $\sqrt{5}$ diagonal, pentagonal geometry, and the phi ratio. However, very little attention is given to the 1:3-rectangle, whose diagonal gives us $\sqrt{10}$. In the above diagram the perpendicular erected on the circle's diameter represents a line segment that we will label c . It cuts the diameter into two segments. The longer one we will call Vp , and the shorter one we will call Vg . If we give c the value of 1, then Vp has the value 3 and Vg has the value $1/3$. $(Vg)(Vp) = c^2$. This is the Einstein-De Broglie Velocity Relation: "The group velocity times the phase velocity equals the speed of light squared." This relation holds generally for all finite cuts of the diameter. The two triangles formed by the chords from the diameter ends connecting to the perpendicular's top are similar. We find by the Pythagorean relation that the hypotenuse of the large triangle is 3.16227766, or $\sqrt{10}$. We also find by the Pythagorean relation that the smaller hypotenuse is $\sqrt{(10/9)} = 1.054$.

If we send a light beam into open space for an interval of 1 second to represent line c , then line c becomes 3×10^8 m, Vp becomes 9×10^8 m, and Vg becomes 10^8 m. The distance (10^8 m) becomes the unit distance on our grid. Then the hypotenuse of the large triangle is 9.48683298×10^8 m, and the hypotenuse of the small triangle becomes 3.16227766×10^8 m. The ratio of 9.48683298 m. to 9 m. is 1.054. Also by the Pythagorean relation: $(3.1622776)^2 + (1.054)^2 = (10 + 1.11111) = 11.11111 = (100/9)$. The square root of this sum gives $10/3$, or 3.333, the circle's diameter.

These relationships hold at all scales. If 3 is the ratio of light speed, then 1.054 becomes the ratio of Planck's constant, 3.16227766 is the ratio of White's D-Shift Operator, and 1 is the ratio of Ru , the Radial Unit of the proton (1 meter).

- $Mp = P Ru (e/c).$

This formula gives the mass of the proton/neutron, where π is the ratio of a circle's circumference to its diameter, e is the coulomb quantum unit, and c is the speed of light. Furthermore, we have the remarkable situation that $(1.054)(3) = 3.16227766$. Thus, using h for the Planck constant, we get $(h c) = 3.16227766 \times 10^{-26} \text{ J} \cdot \text{m}$. This relation suggests a rectangle of width h and length c , and with an area of $(h c)$. Or we can think of a photon energy beam $1.054 \times 10^{-34} \text{ J}$ wide that extends for a distance of $3 \times 10^8 \text{ m}$ in a second of time when an electron emits a photon. This "energy spread" is due to the vibrating nature of photons. A single photon exchanging between two charged particles requires a certain minimum "beam width" to accommodate its vibrations. When we break the Joule unit into its components, we find that it consists of a certain mass times a velocity squared. Thus the photon behaves like a bubble, expanding as the photon energy leaves its source. Oddly the energy of the photon is determined by the density of the photon's vibrations as the photon traverses the distance between its emission and absorption points.

Having stated a formula for the mass of the proton/neutron and identified a component that I label the "Radial Unit", we must look more closely to find an interpretation for the spatial component Ru that is meaningful in physics.

"The Root Magnetic Spatial Component of a Proton"

The only way we can measure electric current is by the magnetic field it generates when its component electrons flow through a medium such as a wire. The magnetic field generates forces when it encounters a suitable medium, and we can observe the effects of these forces. So physicists set up a definition for electric current under conditions where they could measure its magnetic effect on wires. In SI units one Ampere is defined as "the current in two long parallel wires, of negligible cross section and one meter apart in vacuum, which gives rise to a magnetic force per unit length on each wire of 2×10^{-7} newtons per meter." (Definition per Folk and Radin, **Physics for Scientists and Engineers**.) The measurement here is defined in terms of meter lengths of wire. Furthermore the wires are parallel and 1 meter apart. That means the measurement of an Ampere of current involves wires that define a square meter of space and requires the observation of the effects of a current-generated magnetic force on the wires in that space.

So the only meaningful way of talking about current is in terms of observable magnetic force in a given space – the magnetic force that apparently is induced by the current.

The electric field strength \mathbf{E} is determined by the force \mathbf{F} on a stationary electric charge q that is in the field: $(\mathbf{E} = \mathbf{F} / q)$. To determine the magnetic field we have to look at how it affects a unit of electric charge – i.e. a charged particle such as an electron. We find that it varies directly as the relative velocity v of the charged particle. That means there

is no magnetic field when the charges are stationary relative to each other. The strength of the magnetic field also depends on the angle of the velocity. The force also depends on the strength of the magnetic field B , so that B acts as a constant of proportionality. The force \mathbf{F} is normal to both \mathbf{v} and \mathbf{B} , so the vector product describes it nicely: $\mathbf{F} = q \mathbf{v} \times \mathbf{B}$. Magnetic force, being normal to the motion, can do no work on the particle. So the kinetic energy of the charge stays constant.

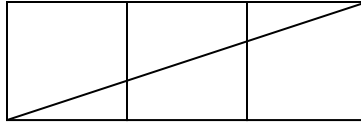
The notion of magnetic flux derives from analogy to electric flux. The electric flux for a uniform field (\mathbf{E}) is the interaction of the electric field with a surface at some angle with respect to the field (\mathbf{A}) in the relationship $\mathbf{E} \cdot \mathbf{A}$. In SI units the electric flux is expressed in terms of $\text{N} \cdot \text{m}^2 / \text{C}$. This boils down to some metric volume of electric flux per second (m^3/s).

In the SI system we measure magnetic flux in terms of webers (Wb), or tesla \cdot meters squared (or Joules per Amp). Magnetic flux for a uniform magnetic field (\mathbf{B}) interacts with a flat surface or area oriented at some angle to the field lines (\mathbf{A}) in the relationship ($\mathbf{B} \cdot \mathbf{A}$). A Joule is a Newton \cdot meter. So that means 1 weber = $1 (\text{J}/\text{A}) = 1 (\text{N} \cdot \text{m}) / (\text{N}/\text{m}) = \text{m}^2$. The tesla has no units since it is simply a constant of proportionality. It is a pure ratio between magnetic “current” and electric current (Amperes). So the weber is effectively a square meter of space influenced by so many teslas of magnetic “ratio”. As mentioned earlier a proton or neutron (they have almost the same mass) has the mass $(e/c)(P Ru)$, where e is the electrostatic coulomb constant and c is the speed of light, and Ru is a constant distance of almost exactly 1 meter. Since 1 meter is the square root of 1 meter squared, that means the Ru component of the formula is the square root of 1 weber. On the analogy of \mathbf{E} (electric field) we have a \mathbf{B} (magnetic field). Likewise we find that we have e (the Coulomb quantum unit of electric charge). So we can now set b to be the quantum unit of “magnetic charge” on analogy with e . We define $b = 1$ meter. Light is an electro-magnetic phenomenon. Maxwell discovered an amazing relation: $(eo)(mo)(c^2) = 1$ where eo is the electric permittivity of space and mo is the magnetic permeability of space. [We take eo as $8.854 \times 10^{-12} \text{ kg}/\text{m}^3$, and mo as $4 \text{ P} \times 10^{-7} \text{ N}/\text{A}^2$ (defined). The mo units can also be $(\text{m s}^2/\text{kg})$.] Combining Maxwell's relation with my proton formula we get $Mp c^3 = P e b / (eo)(mo)$. Mp is the mass of the proton (or Mn if we mean the neutron.). And $b = 1$ meter (or the square root of a weber). That formula is extremely elegant because when electric charges interact as in the case of Coulomb's Law, we multiply them and thereby get a value of e squared. So the formula states simply that the proton times the cube of light speed equals pi times the electric quantum ratio to its permittivity in space (e / eo) times the corresponding magnetic quantum ratio to its permeability in space (b / mo). It is important to note that the electric quantum e is in terms of coulombs which in turn are defined in terms of Amperes which are defined in terms of b (1 meter). So the value of b is connected to the value of e , and the whole thing intertwines. Contemplate this formula.

- $Mp c^3 = P (e / eo) (b / mo)$.

- $Mp = P (e b / c)$.

The expression (e / eo) boils down to the minimum quantum value of electric flux (volume per second). This happens to be $1.809527 \times 10^{-8} \text{ m}^3/\text{s}$. The expression (b / mo) boils down to the equivalent of a current of $7.9577539 \times 10^5 \text{ Amps}$.



Now let's get a little more adventurous and work out another example in which we can derive the D-shift at work.

The Compton Effect describes the angle and frequency shift that occurs when a photon passes near a free electron. This is found to be a universal constant relationship. We can think of a free electron as a tiny star. The passing photon is like a comet that swings by the star, shifting its angle and speed. Light has a fixed speed, so it shifts its wavelength instead. It conveys some of its energy to the electron, but, like the comet, it is so much lighter, that it shows the greater effect. The relationship looks like this:

$$* DL = 2 Lc \sin^2 (A < / 2).$$

Here DL is the wavelength shift, (A<) is the angle shift, and (Lc) is the Compton wavelength, a constant unit of quantum space.

$$* Lc = 2 P H / Me c = h / Me c = 2.425 \times 10^{-12} \text{ m}.$$

The Compton Wavelength is the more fundamental Compton Radius for electrons (Rce), or de Broglie wavelength, converted to circumference value: $(2 P Rce)$, where $Rce = h / Me c = 3.857 \times 10^{-13} \text{ m}$.

Right off the bat we see two interesting things. Any charged particle (or massive gravitational field) can have a Compton Effect, including a proton or a star. If the circumstances are right, the photon could even get trapped in an orbit around a particle that is a black hole.

So, let's substitute a proton into the relationship and look at its Compton radius (Rcp).

$$* Lcp = 2 P H / Mp c = 1.32 \times 10^{-15} \text{ m}.$$

$$* Rcp = h / Mp c = 2.108 \times 10^{-16} \text{ m}.$$

This makes sense, because the proton is more massive, so it has a tighter radius for the same photon when compared to an electron.

We'll divide this by (Mp G) and the Planck Velocity (Sp / Ps), then multiply by c³ and a geometric cluster: (Ao Ss⁴ / Oo As⁴). (G) is the gravity constant. (Sp) is defined as (Ss / Ao) = 4/3 m. (Ps) is the Planck Second, (Tp) = (hG/c⁵)^{1/2} = 1.35x10⁻⁴³ s, divided by a special ratio of 1 / .987654321.... = 1.0125....

The denominator of that ratio (.987654321...) is a D-shift number. Just as 1 / 9 = .111111..., integer multiples of .111 give .222, .333, etc. A second iteration, 1 / 81, produces .01234567..., the complementary D-shift number for base ten. That D-shift number comes from iterated powers of the decimal factor (Hdf) of (H): Hdf = (1.054....) (Hdf)² = 1.11111. (Hdf²)² = 1.234567.... The expression (Sp / Ps) is what I call the Planck Velocity. It is a D-shift velocity. It's like countdowns to blast off!

We could use (Sp / Tp), but multiplying by the D-shift number gives us a nice value of unity:

$$* (1.35 \times 10^{-43} \text{ s} / 1.0125) = 1.33333 \times 10^{-43} \text{ s} = (4/3) \times 10^{-43} \text{ s}.$$

So the (4/3) of (Sp) and the (4/3) of (Ps) cancel. The geometry of (Sp) and the relations of (Ps) are universal.

Here's our full expression with terms organized a bit.

$$* (H c^2 / G Mp^2) (Ps / Sp) (Ao Ss^4 / Oo As^4) = 3.16 \times 10^2 \text{ m}^5.$$

This happens to be (%)⁵.

$$* \% = 10^{1/2} \text{ m. (It can go in positive or negative direction.)}$$

$$* \%^2 = 10 \text{ m}^2.$$

This D-shift interval is a critical factor in operations involving Planck's constant, interactions between charge and mass (as we saw above in the first equation), and in gravitational shifts.

This next equation expresses the relations among most of the fundamental physical quantities in terms of corresponding relations between all of the basic geometric constants in our circular system. There's a corresponding equation that includes Me, the mass of the electron.

$$* (H^3 / Mp^3 G e) = (\%^9 Sp^2 Oo As^8 / P^3 Ao Ss^8).$$

This equation certainly suggests that the geometry of the universe is a gnarly multidimensional sphere. It is also remarkably simple and elegant, especially on the side of the physical quantities. We have a 3-D Planck energy related to a 3-D proton mass and interacting with gravity and coulomb force. Here is the most complete form I have found to date. It incorporates the fundamental physical quantities and all the basic constants of geometry. I consider the electron a subsystem of the proton system. (Me)

can be put in terms of (M_p), as we'll show later.

$$* \quad M_p \%^3 = (H^2 e P / G e o c)^{1/3} (Ss Ao / As Oo).$$

Or we can put physics on one side and geometry on the other:

$$* \quad M_p / (H^2 e P / G e o c)^{1/3} = (Ss Ao / As Oo \%^3)$$

One way to explore the electron is through the Rydberg constant (R_h). Niels Bohr derived the Rydberg from the other physical quantities.

$$* \quad M_e = h^3 c e o^2 R_h A_s O_o / P e^4 A_o^2.$$

The Rydberg is specifically tied to the orbital behavior of the electron and thus should tell us a lot about (M_e)s inner nature if we can just read the number properly. Rydberg noticed this value occurring in his refined version of Balmer's formula for the spectral lines of hydrogen. This value is confirmed experimentally as well as theoretically. I won't go into Rydberg's refinement of Balmer and Bohr's theoretical derivation. You can get that in physics texts. But what they don't mention is that the Rydberg has an interesting mathematical relationship to the mass of the electron.

There is a set of decimals, each of which, when added to a certain integer and then multiplied times the decimal itself, equals unity. (We keep getting back into these decimals as images of physical structures!!) The Rydberg scaled down by 8 orders of magnitude forms such a set with the integer 9. You have already seen above how 9 in our base ten system serves as a D-shift operator when it interacts with wholeness (1) at various self-iterating powers. The experimental Rydberg value is pretty close to this number.

The general formula for the decimal relationship is:

$$* \quad x^0 = x^{(mn + n^2)} = (x^{mn})(x^{nn}).$$

In this formula (x) is any number, (m) is any natural number, and (n) is the decimal that pairs with (m). The integer times the decimal plus the decimal squared also happens to equal one.

$$* \quad 1 = (9.1097722)(.1097722)$$

The experimental value: 10973731 m^{-1} , infinite mass; 10967757 m^{-1} for hydrogen.)

Other decimals in this set happen to include 1.618034, 2.41421, 3.30377, 4.236, 5.19258, 6.1622776, 7.14, 9.1231, 9.1097722, 10.099, The value ($m = 6$) is interesting here because its decimal (.1622776) happens to be the same as the decimal attached to $\% = 3.1622776 \text{ m}$. Phi is 1.618034, so this gives another link between phi and $\%$. Thus:

$$* (6.1622776)(.1622776) / Ru^2 = (6.1622776 - 3)^2 / \%^2.$$

I can derive (Me) from the other quantities about a half dozen ways getting slightly different values, which may be partly due to the limitations of my calculator, and partly due to rounding of numbers, and partly due to the possibility that these different relationships actually have different values. But the average of these various values is quite close to the experimental value. Perhaps if we identify all the ways of deriving the electron mass and average them, we will get the exact value?!

Now let's step further in for some fairly outrageous propositions. The first is that we have a wonderful working model for the Big Bang. It is right in front of our eyes in the form of the proton.

Along with this thesis comes the notion that the missing antimatter that is supposed to match to the matter may also be right under our noses, trapped inside the protons. Along the way we'll sketch out a model of the proton and the other elementaries, plus the way atoms are built, using a model that will unify gravity and electromagnetism in a very simple and elegant manner.

If we accept the notion that gravity has its opposite pole in entropy, then the major difference between the e-force and G-force is one of scale. We find that at our normal scale of observation the EM force overwhelmingly seems to dominate gravity in the way things work, -- except when you drop Aunt Betty's favorite bone china on the tile floor. On the cosmic scale of solar systems and galaxies gravity runs the show. The effect of the EM force tends to balance out between opposite charges leaving the big masses to swing around each other doing their dance of inertia vs gravity.

But what happens at the small scale? If we follow the two forces "down the tube," they reach a scale where they begin to interact as equals.

Let's explore that area. If we understand it, we may be able to harness EM forces to control gravity more efficiently than we do now. We may also be able to tap into vast sources of energy. Remember that mass is resistance. By reducing resistance we may be able to get some macroscopic quantum effects for manipulating the (e) and (G) fields. Modern physics has already discovered lots of amazing quantum effects. Maybe we can find some more or at least expand what we already know.

We'll start with the standard comparison that physics professors like to put in the textbooks to "prove" how far apart the scales of the e-force and G-force are. Having convinced you how ridiculous the whole situation is, they then dismiss the whole issue and move on to teaching the usual curriculum. This little exercise compares Coulomb's electrical law and Newton's gravitational law in terms of a single electron interacting with a single proton. What strikes everyone right off is how similar the physical laws look -- like they were struck off the same block. Then you see how far apart they are. Then you shake your head, forget about it, and move on.

You are familiar with the laws and no doubt have seen the demonstration, but I'll write the laws as they are joined together in the exercise, using my notation, and we can enjoy the pure number universal constant that emerges.

$$* \quad F_g = G M_p M_e / R^2.$$

$$* \quad F_e = e^2 / 4 \pi \epsilon_0 R^2.$$

$$* \quad E_g = F_e / F_g = e^2 / (4 \pi \epsilon_0)(G M_p M_e) = 2.3 \times 10^{39}.$$

This elegant E_g , as I call it, is a dimensionless pure number since it's the ratio of two forces, the electrostatic force, and the gravitational force. When we look at the ratio, the separation (R) cancels out. So this ratio is independent of the distance between the particles. We have e^2 on top because the charges between (M_p) and (M_e) are equal. $(4 \pi \epsilon_0)^{-1}$ is the constant for Coulomb's law, and (G) is Newton's constant. We know that the 4 comes from geometry:

$$* \quad A_s / A_o = 4.$$

We plug in here the masses of the proton and electron, and they interact gravitationally to attract. The e -force is attractive also because the charges are opposite. If they were the same, the e -force would be repulsive. So far this is the standard textbook example. The number (2.3×10^{39}) is so huge that the student says, "Oh, yes. These two forces have nothing to do with each other."

This does not seem like a very good way to indoctrinate students if you are serious about finding a theory that unifies gravity with the electromagnetic force. From the start you make it look very difficult and unlikely.

Now let's change our viewpoint and modify the exercise a little bit. We'll toss out (M_p) and (M_e), and plug in two other masses that we'll suppose are equal. We don't know what they are -- we'll call each one (M_x). The radial distance cancels out -- just like the mass cancels with falling objects -- so our equations theoretically are good for any distance between the two (M_x)s. We're going to explore what happens when we set the ratio to unity!!

$$* \quad F_e / F_g = e^2 / 4 \pi \epsilon_0 G M_x^2 = 1.$$

We solve this simple equation for (M_x).

$$* \quad M_x^2 = e^2 A_o / A_s \pi \epsilon_0 G.$$

$$* \quad M_x = 1.86 \times 10^{-9} \text{ kg}.$$

Counterintuitively, this turns out to be a relatively massive particle when compared to (M_p) and (M_e)!! Yet it is still pretty small compared to the scale we are used to. We'll call this hypothetical particle a Union ($M_x = U_n$) because it derives from a ratio of unity, and, as we'll see, it may have some properties that resemble an onion, and also because it

is an UNknown, and possibly fictitious, particle.

But, you say, this is preposterous. How could there be a fundamental particle floating around that heavy. It must be totally unstable and extinct. On the other hand, what are gravity and electricity doing unifying at a scale that is right under our noses at about the size of a very small grain of dust. Maybe this little dust mote is the door guard to a whole new world that we can imagine into existence.

$$* \quad Un^2 = e^2 A_o / A_s P e_o G,$$

$$* \quad Un^2 = (e^2 / G P e_o) (A_o / A_s) = 3.458 \times 10^{-18} \text{ kg}^2.$$

These (Un)'s could manifest anywhere from the vacuum state spontaneously, just like anything else, as virtual particles. But a (Un) particle by itself is unstable and will immediately decay back into our cooled down vacuum. Back in the prehadronic era that would not have been the case, but that's not where most of us are at the moment as observers.

Note that (Un)'s tend to come in pairs by the nature of the way we defined them. This suggests that they are bosonic, or at least pseudobosonic mesonic. If they pop when separated (and thus the distance between their singularities is not any value greater than one event horizon radius), what happens if they get close or even intersect?

Here, as you can see, we're going to make an assumption that we can treat these particles, and any other subatomic particle, as mini black holes (BHs). We know from BH research that big BHs are stable and cool, but the smaller they get, the hotter they are and the less stable. Hawking radiation increases as they get smaller, eventually causing them to explode. This does not sound promising as a way of getting stable elementary particles from BHs. But hang on.

If these two tiny hot BHs come together, they start having sex. You've seen graphics of star-and-BH binary systems where the BH sucks an arcing trail of matter from the star and gives off X-rays as the matter falls in. Here we have a similar situation, but the two are actually stuck together like a couple of copulating beetles. They are perfectly balanced, so they form a loop that feeds back and forth, violently, but silently exchanging energy. (They must be shy. We don't hear them scream. The scream goes on inside, held tight by an event horizon.)

Because they are stuck together, do their singularities become double? Yes and No. A gap forms where they overlap. It ranges from the tangent point of the two particles as one limit to the volume of (Un) as the other limit, but averages as a lenticular shape, unless it is distorted by surging forces, which it probably is.

What happens inside this lens is of particular interest. This is where the action is with (e) and (G) tidal forces from both particles interacting. The two particles may just look like a single pulsating bubble having an orgy from the outside. Inside we find that Un (A)

sucks at Un (B) and Un (B) sucks at Un (A). All this sucking goes into the lens, which is pulled both directions by equal forces. This sets up a powerful energy field inside the lenticular gap. The resultant is that it seems as if there is another particle in the gap! This is where the notion of "3 quarks for Muster Mark" comes from. (Quote from Joyce's **Finnegan's Wake**, the locus classicus of the word quark.)

The other particle could theoretically have a wide range of masses, but other factors come into play that limit the choices.

We don't see quarks wandering around free in space. They are locked together inside the proton. How and why? What if the proton (M_p) is defined by the ratio of the electric force (e) to the speed of light (c), adjusted by a constant of geometry: ($P_{Ao} / \%$)?

$$* \quad M_p = (e / c)(P_{Ao} / \%).$$

(This is just one arrangement of the equation we began our discussion with.)

Now let's propose that the "quark" that lurks in the lens has just the right mass to give us a proton.

$$* \quad M_p = 1.67 \times 10^{-27} \text{ kg} = (3.458 \times 10^{-18} \text{ kg}^2)(4.83 \times 10^{-10} \text{ kg}^{-1}).$$

We would actually experience the third quark in free space as 2.07×10^9 kg, a pretty hefty chunk of mass energy if it were expanded out as a normal particle. But it is crunched and turned inside out, so it looks about the same size and mass as a Union. You have three particles that interact forcefully and we get a resultant mass that is the same as the proton. But why on earth would we end up with a proton mass and not some other arbitrary mass?

To see this we have to go back to Hawking's BH radiation. If (T_{bh}) is the temperature of a BH on the Kelvin scale,

$$* \quad T_{bh} = (1.2 \times 10^{26} \text{ K}) 1 / (M_x / 10^{-3} \text{ kg}).$$

A BH of one solar mass (10^{30} kg) has a temperature of 10^{-7} K. It's pretty cold. But at 10^{14} kg T_{bh} is 10^9 K and we're getting photons and neutrinos radiating. When we're down to 10^{11} kg, we're getting pions and kaons and T_{bh} is around 10^{12} K. When we get down to 10^9 kg, which is the interacting black hole mass we get for the lenticular vesicle in the core of the Union ensemble, then T_{bh} goes up to around 10^{14} K. Now if you look at the Fermilab chart of the universe evolving out of the Big Bang, you'll find that you have just passed the window of the Quark-Hadron Transition. You're now in the quark soup. But at this window is just where a BH starts to spit out protons. You got it?

Bingo we have a watering hole of equilibrium!! The ensemble of Union particles is imploding and exploding at the same time and produces the effect of a movie of a proton.

Each frame shows a proton, and in between the proton disappears, and then it appears, and so on, slightly jiggling about. The Union ensemble spits out protons, and then sucks them back in again, spits them out, and sucks, spits and sucks, spits and sucks, and so on indefinitely.

If we consider a Union as a BH, what is its T_{bh} ? For a BH with a mass of around 10^{-9} kg we find a temperature at around 10^{32} K. On the Fermilab chart this is right after the Big Bang, but still in the era of super-gravity. This is not surprising since we set out to calculate in a simple way a particle that would unify the (e) force and the (G) force symmetrically. When we found our particle, it turned out to be right where modern physics puts super-gravity and super-symmetry.

If we are right, this tells us something about how symmetry broke at the end of the super-gravity era. As the energy level dropped when the system expanded, all single Unions boiled off back into the vacuum state and disappeared from the scene. From that point on, as the energy dropped, the (e) and (G) forces operated on different scales. (Why? See Chapters 13-14.) But a few Unions were caught with their pants down having sex. They still had lots of company for a while, but when the Quark-Hadron Transition window closed, all the quarks, particles with an average mass of around 10^{-28} kg, were imprisoned, trapped inside protons and neutrons, and the rest of the heavy particles decayed. In other words, the only heavier particles that survived were the Union pairs that could sustain themselves at equilibrium water holes. These mates have been at it ever since and go all the way back to the Big Bang. Now that is ultimate Tantra!!!

And it is also why I propose that the best laboratory for studying the Big Bang is right under our noses in the guise of the proton.

The next question that comes up is this. Why is it that these "quarks" don't look much like what physicists imagine quarks look like?

The fact is that nobody has ever seen a naked quark, nor will they be likely to. If you think of the quarks in a classical sense as separate particles, then you get an average mass of slightly over 5×10^{-28} kg for each one, the down quark being slightly heavier. But quarks are innately bound. And from our above analysis we now see why. They would not survive separation. They would probably immediately join with a meson and make another particle that would then decay. Or they would just exchange with a quark in another proton or other elementary particle. They can't stand being alone. A quark left alone by itself would immediately decay. Because of that, the distribution of mass among the quarks in a proton is ambiguous. It can be almost anything potentially, although some values are more probable than others, and the final result has to come out to the proton rest mass.

Why do we multiply the proton components? The proton's components are inextricably mixed into a state of mutual interaction, so we must define them using products rather than sums. Looking at them as summing their masses to form the proton mass is misleading, because that viewpoint assumes they can exist as separate particles, which, as

we have seen experimentally, is just not the case.

We also notice that the bosonic Unions would seem to have identical charges. The model equation we started with had the proton and electron interacting. However, in our calculation we pitted the electrostatic force AGAINST the gravitational force. The Union particles should each have a positive charge so that the two interacting generate a repulsive force that just balances the attractive force of gravity. That implies that the quark inside the lens must have a negative charge. The combination of two positive charges and one negative charge results in a net single positive charge. At least that is what we might surmise at a first glance. But there's more to the story.

OK. Now we have a very nonstandard model of the proton. We go a few steps further and propose that the proton is the model of the unified field. It is the laboratory of the Big Bang. It is the "glory hole" of the super-string theorists.

Right now one of the "hottest" subjects in physics is super-string theory, the idea that you can mathematically construct a standing wave that can jiggle and wiggle out all possible states of matter and energy with its various harmonics like a magical electric guitar. The problem is that there is a very large number of possible theories out there. Plus they get very complicated and impossible to follow, and there is no way to test them in the laboratory, because the energy levels seem way out of reach.

If we can't teach high school students to spell, how are we possibly going to teach them super-string theory? Advanced physics, especially field theories and super-string theories, become the arcane mysteries of a secret priesthood.

Let's take a look at standing waves (SW). What is a standing wave? It is a wave that is localized in space-time. I include time because although standing waves "stand" for a while, they all eventually dissolve and dissipate. A simple example of a SW is a guitar string. If you pluck it, it vibrates between its terminal nodes. Outside those terminals it is severely damped and disappears as a part of the recognizable SW. SWs are black hole vortices of energy trapped within boundaries. Or we can say that BHs are a type of SW if you want to say that BHs are SWs in which gravity is the dominant energy of the system. SWs also are quantum mechanical. They only count waves with whole numbers. Fractions cancel out by destructive interference. So SWs take very specific geometric shapes.

In mathematics you can have infinite waves. But from projective geometry we know that "infinite waves" terminate in a mental node called infinity at each end. Every creation, by definition, has boundaries. Thus the universe itself is a SW. Depending on the type of material and its shape, a SW will give rise to various harmonics and overtones. It is no accident that the ancients spoke of creation as being like music. Or we can say that music is a beautiful subset of the SWs of creation. Even EM waves that seem to go on forever are always terminated at each end, usually by an electron. The photon is an exchange of energy between two charged particles, so there has to be something at each end of the propagation.

Now with our model of the proton we have a laboratory for the super-string theorist to play in. He has an actual, mathematically definable and experimentally verifiable super-string to work with. This string contains in its vibration modes the entire history of the universe right from the Big Bang. The Unions ensure that. Furthermore, the components of the proton are so relatively massive that they can easily generate all the subatomic particles and all the atomic nuclei as simple vibration harmonics.

Modern chemistry stands as it is. It is OK because we can "see" what's going on. The action is out there in the electron orbits. However nuclear chemistry is a different story. We can not "see" directly into the nucleus to observe what is happening. Thus even QCD, the "science" of gluons, is highly speculative. No one has ever seen a gluon or a quark. They are completely hypothetical.

What do we know about the nucleus? We know that it grows in units of charge (Atomic Number) and roughly double units of weight (Atomic Weight), but, as you go up to heavier nuclei, the weight goes up faster than the charge. We also know that electrons in orbits around the nucleus usually balance the charges on the nuclei. That is well studied. We also know that there is a funny jump from hydrogen at AN = 1 and AW = 1 to helium at AN = 2 and AW = 4+. We explain that with the idea of neutrons and protons tending to be in pairs. But if the heavier ones get out of synch, why are the "isotopes" with AW = 2 and 3 so rare?

We suggest that all atomic nuclei above hydrogen are just fat protons. Given the internal mass dynamics of our model, proton masses are easy to make. Furthermore, the SW harmonics would tend to produce increments of proton mass as the proton's energy is boosted. Rydberg's version of Balmer's series formula gives the energy of the nth state (principle quantum number) of an electron in orbit as:

$$* \quad E_n = - h c R_h / n^2 \quad [n = 1, 2, 3, \dots] \quad (R_h \text{ is Rydberg's constant.})$$

$$* \quad E_p = h c / L \quad (\text{for photons; } (L) \text{ is wavelength, } (h) \text{ is Planck's constant, } (c) \text{ is light speed.})$$

We can imagine that the "lens" formed by the intersection of Unions is vibrating. If the Unions intersect slightly, then the lens vibrates somewhat like a drum head. If they intersect almost completely, then it looks like spherical harmonics. I'm not sure where it averages, but we can take spherical harmonics as a limiting example. Such harmonics are distinguished by counting the total number of nodal circles (n) and the number of geodesics that pass through the poles (m). You get increments that of course are always whole numbers.

Planck's constant is the basis of all BHs. This is the smallest SW configuration for energy, the ratio between energy and frequency. A feature of EM energy is that it is carried by frequency. This requires a constant factor to convert between frequency and energy. Planck named this factor "H" (usually read 'h-bar' and written as an "h" with a "bar" (-) through it. We use a capital "H" and call it "h-bar" or "h-cap".

$$* \quad E = H \omega = h f.$$

$$* \quad \omega = 2 \pi f.$$

Here (f) is frequency and (ω) is frequency in radians. If the frequency is high enough, the energy overwrites itself and forms a particle instead of a wave. A particle is a SW formed by gravity or high frequency self-containment.

$$* \quad h f = M c^2.$$

Planck found the average energy of a set of SW oscillators vibrating in various quantum states (integral multiples of $H \omega$.)

$$* \quad \langle E \rangle = H \omega / (\exp (H \omega / k T) - 1).$$

(T) is temperature, and (k) is Boltzmann's constant. The denominator in the form of an exponent gives the relation to temperature when there is a distribution of quantum states. The ratio (H / k) is about 4.8×10^{-11} to 1, so when the frequency is around the infrared range (.3-300 THz) and into the visible range, we have values near unity for the exp. As the frequency goes up higher, the value of the exp increases and this drops the average energy. Higher frequencies are only sustained at extremely high temperatures.

The distribution of intensity for the frequencies of black body radiation is governed by the SW constant (H). The quantization of energy explains why we do not have lots of X-rays coming out of hot boxes. The (exp) factor damps them out. Planck's constant is related closely to the charge constant (e), light speed (c), and the permittivity constant (ϵ_0) in the following way:

$$* \quad H = (P e / c) (P \% Ss / Ao As) (P e / \epsilon_0) (P \% Ss / Ao As).$$

$$* \quad H = (e / c) (e / \epsilon_0) (P^2 \% Ss / Ao As)^2.$$

This elegant relationship says that we have two ratios: ($P e / c$) and ($P e / \epsilon_0$) each multiplied by the same constant factor in geometry. This equation is a profound contemplation of how energy unfolds itself in space/time. You can rearrange it in various ways and study it.

The first ratio ($P e / c$) basically gives us the mass of the proton as a ratio per meter of distance!!!!

The second ratio ($P e / \epsilon_0$), when combined with the first ratio's extra distance dimension, gives us a voltage, a potential of 5.68478×10^{-8} V, for a unit of charge governed by the permittivity constant (mass moving through space).

The constant of geometry ($P \% Ss / Ao As$) gives us the dimensionless value of (10 / 9). This number is the square of the value of Planck's constant if we disregard the scale and units (which are covered by the two physical ratios.) The voltage times the proton mass gives us the units and scale to be:

$$* \quad (P e)^2 / (c e_0) = .95446 \times 10^{-34} \text{ kg m}^2 / \text{s}.$$

Amazingly this product is almost exactly a factor of 1.054 away from unity, its exact value depending on the decimal values you give for the various constants. Recall our discussion of the odd mathematics behind the Rydberg number. The factor (10/9) is two factors of 1.054 away from unity. $(1.11111...) / (1.054)(1.054) = 1$. So by multiplying our dimensionless geometric configuration times the proton mass-voltage gives us Planck's constant. This derivation of Planck's constant shows the deep connection between charge quanta (e), energy quanta ($h \nu$), and the geometry of circles and spheres, and patterns of numbers in abstract number theory. Do you also begin to see the deep importance of the (%) D-shift constant in the whole picture?

So we can build a nucleon by simply amplifying the harmonics of our proto-proton's lens by increments of resultant proton mass. We see that since this has the ratio $(P e A_0 / c \%)$, it also increments the charge (e). But if we double the charge in a proton, it simultaneously brings another electron into the picture. This second electron will be pulled into an $N = 0$ negative energy orbit (below ordinary ground state) by the combination of opposite charge and mass. Thus you get two proton masses but only one charge. There's actually a little extra energy in there accounted for by an antineutrino.

Because of the huge energy difference between the nucleus and the outside world, it's hard to break nuclei. Because of the opposite forces of the charge, it's hard to make protons stick together by banging them into each other. If they get too close, they scatter off the EM field. Because of electron spin having two quantum states, up and down, electrons like to fit in up-down pairs when they form systems. Since a proton-neutron system has one of the electrons sucked in and held down in a negative orbital canceling the second proton's charge, there's really only one electron out at play. So the nucleon doesn't feel comfortable until it has two proton-neutron pairs and hence two electrons to fill the ground state orbital. That makes helium the second stable atomic element, with two electrons, an up and a down, neatly filling in the (1s) orbital.

We know that it is possible to bombard a nucleon and split out protons or neutrons or other nucleonic "clusters", and that the heavier atomic nuclei will tend to spontaneously decay, splitting into lighter nuclei. How does this happen in our model? It's amazing and simple. The basic concept is the ground state. The single proton represents the stable ground state of matter. All other states are excited states. Protons are really, really stable. In fact, if one decayed, it would create a mini Big Bang. There's a lot of energy packed in there even though it doesn't seem so if you multiply (M_p) times c^2 . That gives us $1.5 \times 10^{-10} \text{ J}$. But the proton does not decay, because the proton watering hole is very stable. It is so stable that if a "hopped up" proton splits open, the energy that spills out, which if it is a nucleon will be some multiple of a proton mass, will just replicate itself automatically. It is a fractal object. Let's say you create an isotope by knocking a neutron out of a nucleon. The nucleon will just drop down a quantum proton (neutron) energy level, and the space right next to it will shift up from the vacuum ground state by one neutron mass, which will then not have enough charge to hold its electron in

a negative orbit, so the electron and some antineutrino energy will pop out, usually with enough kinetic energy for the electron to become a free electron.

That's about all there is to nuclear chemistry on the fission side. On the fusion side we have to boost up the energy level of the proton so that it moves up one or more harmonics. You see by now that this model does not require gluons or any strong force. We only use the EM and (G) forces at the proper scale and get the same effect. The whole issue of fusion or cold fusion will be resolved once we learn how to finesse protons to move up the scale as well as down. It takes pumping a lot of energy into a set of nucleons to get them to fuse. Usually this happens in the cores of stars. But the practical side is that fusion releases an extra bit of energy because the heavier nucleon is a bit more efficient at storing mass-energy than a lighter one due to the harmonic cooperation. That is why the AW scale creeps up faster than the AN scale does.

When a nucleon splits, it stimulates the vacuum state around it to produce another nucleon. It could be any kind of nucleon or anything at all (like a rampaging herd of elephants from Jumanji). But statistically it is simplest for it to manifest as a set of nucleons that adds up nicely to the nucleon(s) in the initial conditions when we account for neutrinos, photons, and other flotsam. We also know that we can stimulate the vacuum state directly to spit out matter-antimatter pairs. These pairs can then annihilate and return to the vacuum state. This is the same procedure done on a smaller energy scale. Our proton model has an antimatter mate made of a pair of anti-Unions with an anti-quark in its lenticular vesicle. Given a chance it could build into anti-atoms of various types, but that's hard to do in our neighborhood where antiparticles tend to meet particles and then annihilate.

Maharishi uses the principle of the bow and arrow to explain why TM is a good preparation for action. In a 2-D space a bow is an energy system. When we pull the arrow back on the bow, we create negative energy. Negative energy is usually called potential energy. A ball raised high above the ground has potential energy. Although we may measure the distance as a positive distance, it is actually a negative distance from the equilibrium orbit of the ball relative to the planet. When we let go, the arrow and the ball both convert their supply of potential energy into kinetic energy. (The neutron's 0-orbit electron is another example.) Potential and kinetic energy are thus mirrors of each other. We can say that potential energy is negative kinetic energy, or we can say that kinetic energy is negative potential energy.

You can work hard to pull the arrow back or find a way to finesse it. A crossbow might be fitted with a little crank to give you mechanical advantage for pulling the arrow back. TM is a finessing technique, much easier than pulling on a long bow. Penelope's suitors could not even string the bow of Ulysses. Physicists trying to get fusion by banging particles together are using the brute force technique, like a meditator trying to transcend by screaming his mantra as loud as he can. It can be done, and some people call this "primal scream therapy", but it exhausts you along the way.

We know that the vacuum state is stable as a ground state. We know that protons are

also stable, and so is the periodic table until you reach the unstable heavy elements. We also know that all are ultimately unstable. You can annihilate a proton with an antiproton. Actually, as a Feynman diagram shows, you don't ever really annihilate things. They just scatter and change directions in space/time. An antiproton is a proton going backwards in time. It bounces off an energy field in the vacuum state and changes directions in time. Virtual pair production and annihilation is an example of a quantum bubble at the smallest scale of creation. A decay process can be viewed the same way. Instead of viewing it as a nucleon splitting (or a heavy elementary particle decaying) we can see it as something bouncing off the vacuum state in space/time. If we map time horizontally and space vertically on a piece of paper, we draw a decay as a Y shape tilted to the right by 90 degrees ($--<$). If we flip it around by 180 degrees ($>--$), it looks like fusion. Thus fusion is just fission run backwards in time. If the laws of physics in our world are really isotropic, it should not make any difference which way we orient the Y in space/time.

Demonstration: Draw a Y on a piece of paper and place it on the table. You can turn the paper around, or you can walk around the table. It's your choice, but the bottom line is that you have shifted your viewpoint as observer when you look at the Y from a different angle. We now have a model that shows how fission works from a single proton vibrating like a super-string at various harmonics. Walk around and look at it from the fission side. Then walk around and look at it from the fusion side. Or use a mirror.

The current situation is that physicists see fission and fusion happen, but do not fully understand the mechanism. So they are banging their heads against a wall. They think they have to bang particles together to get them to stick together. This is trying to do it the hard way. In our model we see that fission takes place when a heavier nucleon is disturbed and it releases energy. Since that energy can only come in units of proton mass, it means that the nucleon splits like an ameba. Each fragment is a smaller but complete ameba. Each nucleon is just a proton at some quantum energy level of $[n(Mp)]$, not a little bundle of billiard balls. We were supposed to have left billiard ball models behind a long time ago.

Therefore, we do not have to hit the nucleons to break them, nor do we have to smash them together to get them to fuse. We understand that the energy in the proton is in a resonating harmonic state, it is a SW. We can tease it to go up or down with resonance, the same way we modulate electron orbits to get various laser effects at precise frequencies. We just need the right "mantra" and the right way to use it. For example, if we have a container with a dense hydrogen plasma, there are lots of protons zipping around incoherently. A properly applied magnetic field can get them oscillating the way photons do in a resonant cavity. We then build up a macroscopic quantum coherent wave that multiplies the protons into a large macroscopic proton. This is equivalent to enlivening the "proton" value of the vacuum state in the vicinity of where we want fusion to take place. Now we adjust it up to the frequency of the nucleon we want -- say helium. We get the container of protons all resonating in that way and bingo, they start globbing into helium nuclei. This reaction can be controlled the same way a laser can

be controlled. The photons originally are single photons. When they lase, they glom together bosonically into macroscopic photon waves. We only need 4 Mp wave packets to get helium atoms.

It may help if the shape of the container is such that it fits the shape of the harmonic wave of the proton's lens when it is in the helium state. To find this we need to calculate the shape it takes inside the Union pair's lenticular vesicle. The temperature of this nuclear reaction may be high, but nothing like the stellar core temperatures that happen in nature because we can finesse it with technology. The laser does NOT occur normally in nature. Stimulated emission is something Einstein dreamed up as a thought experiment. He examined the normal process of emission and absorption closely and came up with the idea of stimulated emission. Many years later scientists discovered how to apply this notion in practical ways and the laser was born. If there is stimulated emission, there is stimulated absorption for photons. The same is true of nucleons. The principle of deliberate stimulated emission and absorption is a general principle of physics.

The vibration of the magnetic pulses within plasma that may also be contained in a plasma bottle is what I call the "Jitterbug Tokamak". You get some good rock music going, and the dance floor is soon filled with people rocking and rolling in synchrony with the music. This is fusion by entrainment, or perhaps we should say, enchantment.

In our next chapter we will go down deeper into the subatomic world and look at the leptons and the hadrons other than the proton, and the bosons. We know now that quark theory is just a classification system for identifying particles in a zoo of resonances, and gluons are not necessary. Nevertheless, the quark classification scheme may turn out to be quite useful after all. We also need to take a look at things such as gravitons and Higgses as well as all the hypothetical super-particles called for in super-symmetry theory.