Chapter 7. May I Have Your Attention, Please!?

In our last chapter we discovered that inertial kinetic accelerations tend to expand a system. Appearances to the contrary are due to distortions in the energy bubble caused by wave guide effects. This is true for rockets, guns, car engines, mechanical levers, and so on. And it appears to be a general principle in our universe. In thermodynamics the tendency of a system that evolves kinetically over time to expand its phase space is known as "entropy". Entropy is a measure of the number of possible configurations the microstates of a system may assume, a subject we'll discuss more in a later chapter.

The expanding tendency of kinetic systems leads us to another general principle of Observer Physics. We observe that gravity is found everywhere that a multiplicity of matter or energy manifests. Entropy also is everywhere. As the second law of thermodynamics it is considered a universal inviolable principle. It has the same universality as gravity. Like gravity it is also mono-polar. But it causes the phase space, and ordinary physical space-time occupied by a system to expand. Locally it can appear to vary its rate of change, but it is a relentless universal trend. Just like gravity, entropy can not be found in totally empty space or in a single isolated entity, or in a completely relaxed system. Both phenomena appear only in systems containing to some extent dynamic ensembles of mass-energy that are locally out of equilibrium. Thus, Observer Physics proposes that entropy and gravity are the opposite poles of a single phenomenon. Large-scale phenomena such as galaxies and solar systems are nice examples that are governed macroscopically by gravity and kinetic inertia. Smaller scale components of the universe are held together primarily by the electromagnetic bipolar force.

Because the distortions we see commonly in inertial systems are caused by wave guide effects, it seems worthwhile to look with more detail into the deeper fundamentals of how wave guides are made. You will need to have read Chapter 6 in which we introduced the concept of wave guides and the "ABC's of Awareness". We begin with our primitive observer in a field of undefined awareness -- ABC. The dynamic aspect of a wave guide is **attention,** that is awareness (**A**) undergoing change by flowing through a wave guide. The structure of the wave guide consists of boundaries **B**. The function of the wave guide is governed by **C**, the cancel operator that shifts emphasis on certain things from foreground to background. The shape of a defined boundary determines the specific distortion of awareness. Awareness is totally complaisant and conforms to any boundary, like water, air, space, or any other waveform that can conform to its container.

To explore systematically how attention works, I suggest the exercises in the little workbook **ReSurfacing** by Palmer. If you are familiar with the Transcendental Meditation (TM) technique, we can explore some aspects from that process as well, but the exploration is not as complete. We can deliberately focus and defocus attention. We also can allow our focus to adjust by default or habit. Through the experience of the TM practice people often discover that focusing of attention, contrary to popular belief, can be quite effortless.

If you do not know the TM technique, you may use **ReSurfacing** Exercise #3, "Disciplining Attention" to get a some flavor of the possible relative effortlessness of attention focus. Be sure to follow the instructions carefully. The TM process done properly will give you a much clearer demonstration. Section III of the **Avatar Materials** provides a technology to expand this principle of effortless action in any direction you please.

The Maharishi says that effortlessness in focusing attention comes from what he calls the "Natural Tendency of the Mind" (i.e., of the attention) to flow toward more and more. For most people on our planet that normally translates into a more expanded, more entropic condition of going for more money, more sex, more food, more travel, and -- hey, I like those things too! But in the TM process we are surprised to find that less and less can lead to more and more. This is the physical principle of Least Action applied to the Mental Space. Nature is fundamentally lazy and takes the path that expends the least energy when it has to move to get to a place it likes to go. Why not? Source is a nice place, full of energy, intelligence and all possibilities. Why should it be hard to get there? That would be a real teasing game. However, some people may like to play teasing games.

When we look closely at the Maharishi's principle of a Natural Tendency, it turns out to be a special case of an even more general principle:

Principle: Everything changes. C operates on B to create and de-create AB's and other states via BC's within ABC.

Corollary: The only thing that doesn't change is change itself. Whatever happens, ABC is still ABC, and its component elements naturally fluctuate between the foreground and the background.

In any case, during the TM process thoughts effortlessly (that is, with increasingly less expenditure of energy as the process proceeds) become subtler and subtler, fainter and fainter, and, at the same time, the attention becomes more and more focused. Then, suddenly, we transcend thought and end up in an unbounded gap of pure awareness, A. B backgrounds, and so boundaries drop off. C then backgrounds itself, since the backgrounding of boundaries ceases when it has no boundaries to background. A stays in the foreground. Suddenly we are completely defocused and experience pure awareness, A.

Since pure awareness is source awareness, the home of attention and the end of the mind's Natural Tendency to seek greater energy, resources, and happiness, there is no reason for attention not to stay there --, except that there are prior creations that have accreted in the body and variously in the World Space. When the attention is defocused from its preoccupations as it is during sleep, or meditation, or other distractions (either deliberate or default) that bring about relaxation and defocusing, the body of prior creations that are not fully experienced takes over and becomes a secondary source of

thought.

So we discover that thoughts (and their concomitant experiences) apparently arise from TWO different sources.

(1) Pure undefined awareness ABC can produce thoughts (beliefs) and their more expressed state as experiences through the mechanism of a will C operated **deliberately** by a Self, or

(2) Thoughts can arise **in a default manner** as reminders of "things to experience" from prior defined, but then resisted AB creations -- that is, stress patterns that are floating around un-experienced or only partially experienced in the observer's self identity. (Recall that the purpose of defining (believing) anything is to **experience** it in the manner originally intended.)

The principle that everything changes does not necessarily lead to the arising of either deliberate or secondary thoughts, just that things continue to happen. The "secondary" thoughts are other "ready-made" wave guides that volunteer to act as conduits for attention. The Natural Tendency of the Body, as the Maharishi refers to it, is to experience off and dissolve away any and all leftover "wave guides" that we carry around in our definition of self. In Cosmic Consciousness or above, such wave guides do not linger about in the observer's identity. The Self becomes flexible like water, like air, and like space. We can play with wave guides or not, but they don't stick to us, because our attention does not stick to them. It takes two to tango, as they say. You have to dance with your creations, even if you have now changed your mind about them. That is called personal responsibility.

Within a few moments practice of the TM procedure can release fixed attention on everything all at once, -- but not permanently. Regular practice of the technique, however, gradually relaxes a person so he can integrate more easily and effortlessly with his overall World Space and Mind Space. The TM technique does not address any specific issues and generally requires an extended period of practice to develop a habit of overall relaxation and integration. Palmer has developed a simple little process for releasing fixed attention on specific issues as well as general issues. Try it. (**ReSurfacing**, exercise #12.) A coach is helpful for that exercise, but is not required once you get the hang of it. The principle is general, so that once you are familiar with it, you can apply it anywhere, anytime on your own.

We know that attention involves energy, since it involves a flow of awareness. Thoughts come and go and change from moment to moment. Unless we are deeply fixated, we do not stay on the same thought all day. This dynamic flow is a sign of energy. You can do simple exercises that consistently and reliably demonstrate how this flow works and enable yourself to modify your experiences deliberately.

Exercises: For example, spend some time just putting your attention on some objects and notice what happens to your experience of those objects. (**ReSurfacing,** Exercise #3,

"Disciplining Attention".) You can use ordinary household objects such as pens, cups, chairs, etc. Or take a walk and select whatever comes up or whatever you like. Explore the details of things in your environment. Then do **ReSurfacing**, Exercise #7, "The Behavior of Attention", and notice your subjective reactions to things in your environment. Notice areas in your life where some amount of attention has been fixed for a long time. What effect does that have on your life? Do Exercise #11, "Minding the Edges" and see what effect that has on the way you perceive objects. Then find a partner and have them help you explore Exercise #12, "Releasing Fixed Attention".

The above few paragraphs and exercises give a brief introduction to mental wave guides. Now let's take another look at physical wave guides. Mental wave guides and physical wave guides are all ultimately energy structures. In the physical world we seem to observe energy manifesting as four forces: Strong, Weak, EM, and Gravity. As we continue our exploration of Observer Physics we will analyze the forces and then show how they all fit together into an integrated wholeness. To this list of "forces" we can add the mental force of Attention that is governed by the Will.

Some energy forms seem bipolar, and others seem mono-polar. If Newton is right with his laws of mechanics, there should not be any mono-polar forces. A force, by definition (and by Newton's third law), is bipolar. It is a resistance. You resist something and it responds by persisting with the same intensity as the resistance. The two forces counter-balance each other. The forces may be of the same type or of a different type. Forces are naturally complementary so as to form systems.

Experiment (The last instruction is optional and on your own responsibility): Stand next to a solid wall. Push your hand with some effort against the wall. Feel the wall push against your hand. Gently touch the wall. Feel the wall gently touch your hand. Let your hand hover just next to the wall. Observe the wall as it hovers just next to your hand. **Lastly (and very optionally)**, smash your hand against the wall as hard as you can and feel what happens. It seems to be a simple experiment. But it is quite instructive. (You don't have to do the last step. That's a joke.)

Attention is a bipolar wave guide and can guide awareness to expand or contract. Electromagnetism (EM) is also bipolar. Magnets are all bipolar. Electrically charged particles such as electrons appear to be mono-poles, but always link up with an electrical mono-pole of the opposite charge in a way we will understand better as we get into the details of what electric charge is. Physicists to date have no idea what charge is. They merely study it, describe how it behaves, and then find ways to apply it. We will propose a theory that can be tested and then accepted or rejected based on the experimental results. The weak force is biased to expansion, and the strong force is biased to contraction. We also will have to look at those two closely in Observer Physics to understand these two apparent forces. Gravity seems biased to contraction, but that may only be half the story, if as I suggested, the kinetic energy of inertial acceleration and entropy constitute gravity's expansion phase.

A galaxy or solar system is a gravity wave guide. A tokamak is an electromagnetic

wave guide. So is any chemical structure that allows for mechanical processes -- such as a tube, bucket, or lever. However, underlying such chemical-mechanical wave guides with their electromagnetic bonds is the attractive strong force that binds together the nucleus of each atom. At an even deeper level there seems to be a mysterious wave guide "force" that "holds" the stable elementary particles such as protons and electrons together as stable subatomic particles. According to Observer Physics "attractive" forces make no logical sense and are not possible in the physical world. Thus the theories of a binding strong force, gravitational attraction, and even the attractive forces of electric charge and magnetism are misunderstood and make no sense as presently taught. They require the existence of invisible and thus undetected "virtual particles" that transmit energy at a distance between particles and structures. We will not be able to unify physics until these ideas are rectified and clarified at a fundamental level. One purpose of these essays on Observer Physics is to start this process of rectifying our understanding of the natures of the various forces. Once we get clear on these matters, physics will become much simpler to understand theoretically and to apply practically in our lives.

So now let us go down to the "elementary particle" level for a bit of preliminary scouting. In spite of the numerous reputed members of the currently touted subatomic particle zoo, there are really only two types of quantum particle, fermions and bosons. We also must remember that the particles are quantized because they are special cases of wave forms. Fermions obey a mysterious law called the Pauli Exclusion Principle and do not allow more than one particle in the same energy/position state. Understanding the origin of this exclusion property is fundamental to physics. In contrast, bosons are gregarious and like to be in the same energy/position state. The boson property is the fundamental quality of existence. The fermion property is a secondary phenomenon required for physical phenomena to take on a property we might call "realism". Why fermions and bosons behave the way they do is a question not fully answered by standard theory, so we will be exploring it as we get deeper into the origin and nature of quantum particles. At the end of the essays a careful reader should not only understand the simple fundamentals of how our universe works (at least according to the Observer Physics principles I am presenting), but also be capable of generating her own stable custom universes. With a little practice and skill with the universal Avatar tools it is possible not only to play freely in a chosen universe or to shift from one universe to another. You also may design your own creation and navigation tools for play within a chosen universe.

Fermion-Boson Experiment: To get an idea of these two fundamental types of particles put some marbles, round fruits like oranges, or nuts in a bowl. Each marble will occupy a separate position in the bowl. The bowl will only hold so many items, and then it will be full. This is **fermion** behavior. Now turn on a light in a room. The whole room is filled with photonic bosons zipping about. Turn on another light, and another light in the same room. You can turn on as many lights as you like in the room. The room gets brighter, but always has more room for more light. Each light fills the room completely, but there's always room for more light. Photons like company and do not protect their individual spaces and repulse each other like marbles. This gregariousness is **boson** behavior. Physicists describe this fundamental difference with a complicated

mathematical expression. It turns out after all the arcane mathematics that only a single minus sign instead of a plus sign distinguishes the boson from the fermion. "The expected number of particles in an energy state i for Bose–Einstein [boson] statistics is

* $$n_i(\varepsilon_i) = \frac{g_i}{e^{(\varepsilon_i - \mu)/kT} - 1},$$

with $\varepsilon_i > \mu$ and where n_i is the number of particles in state i, g_i is the degeneracy of state i, ε_i is the energy of the ith state, μ is the chemical potential, k is the Boltzmann constant, and T is absolute temperature. For comparison, the average number of fermions with energy ε_i given by Fermi–Dirac [fermion] particle-energy distribution has a similar form,

* $$\bar{n}_i(\epsilon_i) = \frac{g_i}{e^{(\epsilon_i - \mu)/kT} + 1}.$$ "

(from **Wikipedia**, "Bose-Einstein statistics")

Among the seemingly endless array of fermions there are really only three stable particles: **neutrinos**, **electrons**, and **protons**. Each of these particles has an anti-twin and spin 1/2. Neutrinos can oscillate among two or three sizes, but are stable as neutrinos. All the other "elementary" particles are just souped up and unstable variations of these three. Many are just resonances of the basic fermion wave form at higher energies. This even includes the neutron, which is unstable when alone. Of course, the above statement about particles is made from the viewpoint of an observer in our expanded and diluted space/time locality, not in the super dense quark soup right after the Big Bang. But that's another discussion we will get to later on in our discourse.

The integer-spin bosons supposedly act as go-betweens, facilitating interactions between fermions. They transfer quanta of energy, and charge between "half-spin" fermions. (Quantum spin is a mysterious property of quantum particles that also needs explaining.) In the Standard Model gauge bosons show up as force transmitting particles with integer spin, such as **photons**, and **gluons**, as well as **W** and **Z** bosons. They also include the still-theoretical **Higgs boson*** and **graviton**, as well as net integer spin composite particles such as **mesons**, certain stable atomic nuclei, and some quasi-particles. (*On July 4, 2012 scientists at CERN's Large Hadron Collider announced they had detected a particle that may be the Higgs particle, but not enough is known about it to be certain of its identity yet.) Thus all bosons from a certain viewpoint seem to be transitory in nature as they pass their energy messages back and forth among the fermions. Even photons seem transitory because they are emitted and absorbed by charged fermions or by annihilating or manifesting particle pairs. Although photons can last a long time as they travel through space to exchange energy, the other gauge bosons are all extremely short-range. Mesons are transitory boson-flavored fermions, because their half-spin quark-antiquark pairs combine to form a net integer spin. The photons seem stable, but then disappear when they are absorbed. The (W) and (Z) intermediate vector bosons disappear extremely rapidly, and the theoretical gluons are effectively bound within the quark clusters, and do not venture beyond nuclear distances (held in check by mathematical notions such as Wilczek's "asymptotic freedom"). We can add that fermions act somewhat like bosons when they are in the state of Bose condensates or when certain isotopic and molecular configurations approximate boson requirements. These phenomena strongly suggest that the boson state is more fundamental than the fermion state. We will discover that there is one type of boson that is unrecognized by

the community of physicists, yet very common, and appears able to make stable particles, even though it is inherently completely unstable when in isolation at our stage of cosmological evolution.

How do you make a stable elementary particle such as a proton, electron. or neutrino in a universe that constantly changes? Off the top of the head one might guess that such stable particles might be tiny black holes. But quantum-scale black holes don't behave the same way as the large black holes physicists find lurking in the centers of galaxies. Also, black holes can be very stable, but they also keep eating anything that gets in their way, so their masses are not fixed and stable. Fermions follow the mysterious Pauli exclusion principle and seem to resist letting anything in to disturb their stable rest masses. This is opposite the character of a black hole. A fermion (such as an electron) bound in an atomic or molecular system can take on energy, but such energy is unstable, tends to slough off, and eventually returns the fermion to its ground state of energy. Black holes have a boundary region known as the event horizon that won't let anything out. That's interesting and suggests the makings of a particle boundary. Maybe stable elementary particles are "anti-black holes of matter, or anti-matter.". They won't let anything inside their event horizons just as black holes won't let anything out of their event horizons.

None of these considerations is completely true. Hawking has shown that mass-energy can tunnel out of a black hole. In fact there is a threshold of size where a small black hole will tend to evaporate and disappear spontaneously, even explosively, by Hawking radiation. The smaller the hole, the faster it evaporates. Quantum-scale black holes that tend to explode do not seem to bode well as a source of stable particles.

Robert Frost once said, "Something there is that doesn't like a wall." It turns out that, despite the efforts of the medieval castle builders, and the vast Chinese projects to build a Great Wall protecting China, walls are not very good at making for a stable situation. The Maharishi has said the same thing about immortality. If you want to get close to immortality, he suggests, create a dynamic system that governs itself automatically by an iterative self-referring feedback loop. In other words, create a lively automaton that automatically recreates itself for as long as you like.

My hypothesis about stable elementary particles is that the elementary particles such as protons and electrons have no hard walls. They are wild maelstroms of chaotic energy whirling about like vortexes in a stream. They are black holes of chaos. Because of their tiny size, they are constantly and instantly self-destructing by Hawking radiation. So how can they be stable? The possible secret is that they happen to be at resonant waterholes in vacuum state geometry, which enable them to suck energy up out of the vacuum state to rebuild themselves at the same rate at which the energy drains off from them and dissolves back into the vacuum state. They have found a stable state of dynamic equilibrium. We don't see them radiating because the exchange of energy takes place right at the boundary of an event horizon and the vacuum. The vacuum is constantly making virtual particles of all sizes, but most of the time they all decay and disappear immediately back into the vacuum. Only certain resonating states can

stabilize -- in exactly the same way that, at a grosser level, only certain electron orbits become stable and all other possible orbits instantly decay. Such a system gives rise to what we now call quantum mechanics.

The stable baryons -- the proton and the neutron -- are composite particles that exist on a scale where they interact dynamically with something called the Planck mass-energy. They loop energy in tiny vortexes at a particular "watering hole" ratio that happens to be perfectly balanced. We will find the source of this balance. I think there are several sub-cells of convection energy boiling and circulating about inside these particles like tiny weather systems, Benard cells, or spherical harmonics, and I want to work up some models and equations that will demonstrate how this works. The stable baryons are a great example of dynamic chaos theory. How else can we explain the curious rest masses (inertial resistances) that we identify for these particles such as protons that can persist indefinitely over the life of the universe and thereby allow for the construction and evolution of complex material structures and even living, self-conscious organisms?

The secret to why the "rest masses" for the fundamental particles fall where they are lies in the various constants involved in the design of the universe. The fundamental constants of physics are Planck's reduced constant ($\hbar$), light speed (c), the charge constant (e), the gravitational constant (G), plus the permittivity constant for free space (ε_o), and a constant of spatial geometry (%) which I have identified that governs looping and scaling in physical processes. Such a small set of fundamental constants sets the parameters for the space/time we live in and the possible particles that it can display in stable modes. Other universal constants can be derived from the small set of fundamental ones.

The universe can be described in terms of three properties: length (L), time (T), and mass (M). Each of these properties is measurable, but, as we mentioned when we introduced Newton's laws of mechanics, in order to make a measurement you must first establish a metric unit as a standard. Establishing units is a challenge, since the units usually end up being arbitrary. We do not know from the start what a proper standard is, so we generally have adopted something that seemed "practical" under the circumstances in which we found ourselves. Originally people used rough estimates from parts of the body, such as a palm or a foot. The problem is that circumstances change, and our perspective broadens. We also need precise standard units that are reasonably friendly to the physical scale of our bodies (for practical purposes), but also the units should be usable under any conditions anywhere in the universe.

The first problem can be resolved within a different environment or state of existence by a simple scale transformation. The second problem suggests that we need to find out whether there is a constant universal metric for the cosmos, and, if so, what is it?

As the physical sciences evolved, we have come to realize that there are certain ways in which the fundamental properties interact that form constant relationships under all conditions. It would appear that we should tune our metric system to these universal constant relationships among M, L, and T and set our units to be most friendly to those relationships. As awareness of the constants has increased, so has the trend to link the

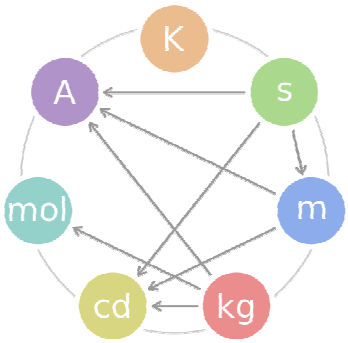
units to the universal constant relationships in the simplest way possible. Unfortunately, this process of defining and refining standard units is somewhat inhibited by the politics of getting people to agree, the difficulty of changing to a new standard once an old one is widely disseminated and deeply established in our record-keeping and engineering system, our level of awareness of the true universality of constants, our ability given certain units to measure precisely, and the instrumentation technology available to us. Despite these challenges, remarkable progress has been made.

However, the rapid growth of various disciplines has led to a disjoint in some of our systems, and we are still not absolutely certain what the best way is to establish a unit that can be used under any conditions. The meter is now pegged to the speed of electromagnetic radiation, and EM radiation is about as universal as you can get. Since 1983, it has been defined as "the length of the path traveled by light in vacuum during a time interval of 1/299,792,458 of a second." (**Wikipedia**, "Metre") This unit grew out of the measurement that light appears to travel at a constant velocity of 2.99792458×10^8 m/s under any conditions. However, we must be certain that light speed is indeed a universal constant (and note that light speed now has been standardized **to** a meter unit rather than measured **by** the meter unit. Since we have seen that it can be split into group and phase waves with different apparent speeds, we must be careful how we measure EM radiation speed and need a simple and standard test that ensures we get the right result. The scale of light speed is far out of the realm of the meter and normal human activity. I also do not understand why the standard was not simply set at $1/(3\times10^8)$ of a second. That would save punching all those 9 digits over and over in calculations. However, it is good that at least one of the three fundamental properties has now been set to what appears to be a universal constant.

Time is currently measured by the quantum oscillation of an atomic clock. "Since 1967, the second has been defined to be the duration of 9192631770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium 133 atom. In 1997, the CIPM affirmed that the preceding definition "refers to a cesium atom at rest at a temperature of 0 K." (**Wikipedia**, "Second") The problem with this standard is that under certain conditions we may not have access to cesium 133 or a simple way to measure the passage of 9192531770 oscillation periods, not to speak of getting the cesium down to 0 degrees K. I would prefer to see the second anchored to a truly universal constant.

The kilogram is now our most common standardized unit of mass. "Since 1889 the magnitude of the kilogram has been defined as the mass of an object called the *international prototype kilogram,* often referred to in the professional metrology world as the "IPK". The IPK is made of a platinum alloy known as "Pt-10Ir", which is 90% platinum and 10% iridium (by mass) and is machined into a right-circular cylinder (height = diameter) of 39.17 millimeters to minimize its surface area. The addition of 10% iridium improved upon the all-platinum Kilogram of the Archives by greatly increasing hardness while still retaining platinum's many virtues: extreme resistance to oxidation, extremely high density (almost twice as dense as lead and more than 21 times as dense as water), satisfactory electrical and thermal conductivities, and low magnetic

susceptibility." (**Wikipedia**, "Kilogram") A serious concern about the standard kilogram is mass drift. Due to various factors the mass of standard kilogram weights gradually varies over time. That is not very helpful. Also, mass as one of the fundamental properties of physical phenomena is tied to many other units, as the diagram from the "Kilogram" article (see below) shows. Mass drift of the standard kilogram results in a catastrophic cascade affecting all the other units of measure. It even ties into the Kelvin temperature in terms of the ideal gas equation, $PV = nRT$, where T is temperature in kelvin (K), because pressure (P) involves a force per area and force requires mass ($F = ma$).



"The long-term solution to this problem, however, is to liberate the SI system's dependency on the IPK by developing a practical realization of the kilogram that can be reproduced in different laboratories by following a written specification. The units of measure in such a practical realization would have their magnitudes precisely defined and expressed in terms of fundamental physical constants. While major portions of the SI system would still be based on the kilogram, the kilogram would in turn be based on invariant, universal constants of nature. Much work towards that end is ongoing, though no alternative has yet achieved the uncertainty of 20 parts per billion (~20 µg) required to improve upon the IPK. However, as of April 2007, the U.S.'s National Institute of Standards and Technology (NIST) had an implementation of the **watt balance** that was approaching this goal, with a demonstrated uncertainty of 36 µg." (**Wikipedia**, "Kilogram" article) Other competing approaches include atom counting techniques, the Avogadro project, ion accumulation, and the ampere-based force definition that defines the kilogram in terms of the ampere instead of the current definition of the ampere in terms of the kilogram. (For more on these, see the rest of the "Kilogram" article and follow developments as reported in the news and on the Internet.)

This brings us to the problem of the disunity among the units. It turns out that our modern concepts of the electric permittivity and magnetic permeability (constants that strongly suggest that the "aether" is still with us) derive from the definition of the ampere as "that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross section, and placed 1 meter apart in vacuum, would produce between these conductors a force equal to 2×10^{-7} newtons per meter of length." (The quote is from **Wikipedia**, "Vacuum Permeability".)

The decision to work from the ampere, a unit of electric current, rather than a measurement of static electrical charge derives from the problem that static charge is not

really static and tends to dissipate, except for quantum charge -- which was apparently deemed too difficult to measure as a standard (despite Millikan's experiments to measure quantum charge). It turns out that electric current is only measured indirectly by the magnetic force that it induces -- which turns out to be **ORTHOGONAL** to the direction of current flow and between two interacting parallel wires. As you can see from the above definition, this is also an idealized definition that can only be approximated. It also looks very weird from the viewpoint of Newton's laws. The vacuum magnetic permeability according to the given definition then comes to be $4\pi\times10^{-7}$ H·m^{-1}. In other words, Ampere's relation gives the magnetic force as $F/\text{m} = \mu_o I^2 / 2\pi r$, where r is the distance between the interacting wires. The force (F) is in newtons, the current (I) is in amperes, and the force per meter of distance is 2×10^{-7} N/m. Solving for the vacuum permeability according to the definition of 1 ampere gives us:

$$\mu_o = (2\pi r)\ (2\times10^{-7}\ \text{N/m}) / \text{A}^2.$$

This means that the vacuum permeability by definition of the ampere is $4\pi\times10^{-7}$ N / A^2. (For more detailed discussion of the complicated historical details, see **Wikipedia**, "Vacuum Permeability".)

The newton is a mechanical force, which is necessary to be able to measure the flow of electrical current. The unit of electrical current is the ampere. We want to look at the mechanical properties of charge, and we find that the unit of charge is defined as the coulomb (C) and is based on the ampere as an ampere-second (A·s). Ampere's force formula simply tells us that the ampere (A) is equal to the current I, but does not tell us what it is mechanically although the test for the ampere depends on its mechanical aspects. It does tell us that the magnetic permeability balances out the other units in the relationship. This brings us to Maxwell's equation as a way to determine the mechanical units of charge.

The speed of light is in meters per second. Let us assume from Coulomb's static electricity equation that the electrical permittivity (ε_o) is a measure of density and we will put it in mechanical units as a mass per volume (kg/m^3):

$$F_e = Qq\ /4\pi\varepsilon_o\ r^2.$$

Then the Qq represents two interacting charges that must be each in units of kilograms per second (kg/s). If Maxwell's equation [$1\ /(\varepsilon_o\ \mu_o) = c^2$] holds, then the mechanical units of permeability must be (ms^2/kg), because Maxwell's relationship must then give the following units: (m^3/kg) (kg/ms^2) = m^2 / s^2.

The problem here is that our scientists do not give a clear-cut mechanical unit for charge, so we must derive it from the ampere, and the ampere is only derived indirectly from a magnetic force. The magnetic force, according to Ampere's force law depends on the units of magnetic permeability. So the whole thing is circular. Miles Mathis demonstrates the nature of the problem in his article, "Electrical Charge" (pp. 29-30), where he cites as a starting point the SI units for the permeability constant ($\mu_o = 4\pi\times10^{-7}$ N/A**²**), and then, just for fun, suggests that we take the ampere (A) to be the same as the herz (Hz = s^{-1}). Then he substitutes the corresponding units for permeability (kg m) into Maxwell's

relation ($\varepsilon_o = 1/(c^2\ \mu_o)$ to derive the permittivity units (s^2/kg m^3). Next he plugs the ε_o units into Coulomb's equation ($F_e = q_1q_2 / 4\pi\ \varepsilon_o\ r^2$). In that case all the units cancel out, leaving the charge to be what he calls a "floater" -- i.e. nothing at all but some pure number ratio. That makes an ampere become a herz, and a volt then becomes a joule. The ampere force and the coulomb force then both derive from a magnetic force interacting with the speed of light rather than from some charge. The magnetic force only arises when there is motion. Then Mathis turns around and uses the cgs system to show that charge is equivalent to mass, and mass alternatively can be in terms of length and time, which of course means motion. All of this suggests that mass only appears when there is motion, and the idea of "rest mass" is a fiction. If that sounds confusing, it is, because it is also unnecessarily confusing. But wait, there's more!!

Another proposal is that electric current can be treated like what it is called -- a "current". Current implies the velocity of a volume, as for example we might measure the flow of water through a pipe with a given diameter aperture. However, from the idealized definition of an electrical current as point charges flowing along an infinitely thin wire, then we do not need to consider a volume. We only have an idealized velocity (m/s) of point charges flowing along a line.

I have prepared a chart below that shows how the mechanical interpretation of electromagnetic phenomena varies significantly depending on how we define the ampere (A) in mechanical terms. In the chart "Mech" stands for a mechanical interpretation; "a" is based on taking permittivity as density (kg/m^3), "b" is the approach suggested by Mathis in the above-mentioned article. Some physics textbooks provide a table that purports to show analogies between mechanical and electrical quantities. These analogies often rely on formulas that look similar in the "corresponding" mechanical and electrical situations, starting with the above-mentioned idea that electrical current resembles a liquid current and thus can be considered a velocity. You can see this "Mech c" analogy in Harris Benson, **University Physics**, p. 660. Richard Feynman has a similar chart in his **Lectures on Physics**, volume 1, p. 23-6.

The empty parentheses in my chart ( ) indicate that the unit becomes a dimensionless number indicating the scale of something with respect to some other dimension. For example, the coulomb in the "Mech b" system becomes dimensionless because the units cancel out when an ampere is a frequency and a coulomb is an ampere-second.

Unit	**Symbols**	**SI**	**Mech a**	**Mech b**	**Mech c**
ampere	A	A	kg/s^2	s^{-1}	m/s
coulomb	C	A·s	kg/s	( )	m
volt	V	J/C	m^2/s	kg m^2/s^2 = J	kg m/s^2 = N
herz	Hz	s^{-1}	s^{-1}	s^{-1}	s^{-1}
watt	W	J/s	kg m^2/s^3	kg m^2/s^3	kg m^2/s^3
v. permittivity	ε_o	F/m	kg/m^3	s^2/kg m^3	s^2/kg m = N^{-1}
v. permeability	μ_o	N/A^2	ms^2/kg	kg m	kg/m
ohm	Ω	V/A	m^2 s/kg	kg m^2/s	kg/s
tesla	T	N/A·m	( )	kg/s	kg/ms

weber	Wb	T·m²	m^2	kg m^2/s	kg m/s = *p*
henry	H	V·s/A	m^2 s^2/kg	kg m^2	kg
farad	F	C/V	kg/m^2	s^2/kg m^2 = J^{-1}	s^2/kg

In addition to the SI system that is based on the meter-kilogram-second (**mks**) mechanical units, there is the older centimeter-gram-second (**cgs**) system that uses electrostatic units to measure electric charge, current, and voltage. The statcoulomb (statC) unit of electric charge is defined as follows: if two stationary objects each carry a charge of 1 statC and are 1 cm apart, they will electrically repel each other with a force of 1 dyne, where 1 dyne equals 10^{-5} newtons. The cgs system has the advantage that the statC unit is closer to most real world systems than the very large coulomb (1 C = 2,997,924,580 statC, which rounds off to 3×10^9 statC -- basically a coulomb multiplied by ten times the speed of light). However, in the cgs system Coulomb's force law is simply the product of the two charges divided by the square of the distance between them. That means charge has the strange units of $M^{1/2}\ L^{3/2}\ T^{-1}$, (where M = mass, L = length, T = time) which looks pretty unreal, and suggests that components are hiding in the cgs formula $F_e = q_1q_2/r^2$. Indeed, there is the question of the permittivity constant. Furthermore, the statC has to be multiplied by 4π to serve as the coulomb of electric flux. It makes sense that a charge should be expressed in a whole unit of mass or length rather than the square root of a mass or a length until we notice that no single quantum charge exists by itself in isolation. It always has a partner with which to interact if we are to measure any charge.

The question is: which system is more in accord with reality? One of these, or something else? As I look over the chart, I am attracted to **Mech c**, the notion that an electrical current is a velocity and a voltage is a force. Also it makes some sense that a resistance (R) is a mass per second ($I = V/R$). Current is voltage divided by resistance: m/s = (kg m/s^2) (s/kg). Electric permittivity is a force that works against the transmission of electric flux and is thus somewhat like electrical resistance. Magnetic permeability is an effective mass that is dependent on the coulomb charge. It also makes some sense that mass is particularly involved with magnetism, because magnetic phenomena only appear when a charge is in motion, and mass can only be measured when something is in motion. The one apparently strange unit in this interpretation (**Mech c**) is the coulomb itself that turns out to be a meter, which is a unit of length.

In his Reciprocity System Dewey Larson takes current as velocity and charge as a spatial unit -- corresponding to 1 meter in my system, but distinguishes this electric quantity from a charge flux, which he considers to be a reciprocal velocity, that is, time (t) per space (s). Larson's system is rendered unfamiliar because he reduces mass to a relation between space and time. This has not been our habit since Newton coined the notion of mass as a fundamental property. Furthermore there is the problem of whether or not there is a distinction between static charge and current charge. There is also the question of whether or not uncharged electrons may exist. Here is what Larson says on the subject.

"The truth is that this concept of an electrostatic force (Eq) applied to the electron mass is one of the fundamental errors introduced into electrical theory by the assumption that the

electric current is a motion of electric charges. . . . Such a force would produce an accelerating rate of current flow, conflicting with the observations. In the universe of motion the moving electrons that constitute the electric current are uncharged and massless. The mass that is involved in the current flow is not a property of the electrons, which are merely rotating units of space; it is a property of the matter of the conductor. Instead of an electrostatic force, t/s^2, applied to a mass, t^3/s^3, producing an acceleration ($F/m = t/s^2 \times s^3/t^3 = s/t^2$), what actually exists is a mechanical force (voltage, t/s^2) applied to a mass per unit time, a resistance, t^2/s^3, producing a steady flow, an electric current ($V/R = t/s^2 \times s^3/t^2 = s/t$).

"Furthermore, it is observed that the conductors are electrically neutral even when a current is flowing. The explanation given for this in present-day electrical theory is that the negative* charges which are assumed to exist on the electrons are neutralized by equivalent positive* charges on the atomic nuclei. **But if the hypothetical electrostatic charges are neutralized so that no net charge exists, there is no electrostatic force to produce the movement that constitutes the current.** Thus, even on the basis of conventional physical theory, there is abundant evidence to show that the moving electrons do not carry charges. The identification of the electric current phenomena with the *mechanical* aspects of electricity that we derive from the theory of the universe of motion now provides a complete and consistent explanation of these phenomena without recourse to the hypothesis of moving charged electrons."

In Larson's discussion he clearly treats a current as a velocity, a voltage as a mechanical force (insert t^3/s^3 for the mass unit in his system), and the particle moving in the current is "merely a rotating unit of space" whose displacement in the current can be measured in meters.

For some time I have maintained that Newton's idea of mass is only to be understood as a force per acceleration ($m = F / a$). In other words, without a force applied to something such that there is an observable acceleration, there is no "rest mass". (The idea that rest mass is there when not being pushed on is an unproven assumption. Evidence against rest mass is that all objects in free fall have the same vertical acceleration in a given gravity field regardless of "mass". They only splat or scatter differently on impact.) We can see acceleration. A force is some form of resistance applied to an object that causes the object to accelerate. There can be force on an object without acceleration that causes the whole object to move through space. In that case the force produces a change in pressure, volume, shape, and/or temperature within the object -- in which case the acceleration is suppressed and spread out among the particles that make up the object, distorting its internal structure.

However, despite what Larson says, the idea that a charge is merely a displacement in space is a bit hard to envision. What if we say that the ampere's mechanical value is that of the newton ($kg\ m/s^2$)? Then the coulomb's mechanical value is that of momentum (kg m/s), and the volt becomes an electrical velocity, or flow of charge (m/s).

Permittivity becomes mass per displacement (kg/m), and permeability becomes an "antinewton" (s^2/kg m). Electrical resistance becomes a rate of "antimass" (s/kg). The tesla (m^{-1}) and the weber (m) become reciprocal magnetic displacements. The henry becomes an "antimass acceleration" (s^2/kg) or an antinewton per meter, and the farad is simply a unit of mass like the electron or proton.

Unit	**Symbols**	**SI**	**Mech d**
ampere	A	A	kgm/s^2
coulomb	C	A·s	kgm/s
volt	V	J/C	m/s
watt	W	J/s	kg m^2/s^3
v. permittivity	ε_o	F/m	kg/m
v. permeability	μ_o	N/A^2	s^2/kg m
ohm	Ω	V/A	s/kg
tesla	T	N/A·m	m^{-1}
weber	Wb	$T \cdot m^2$	m
henry	H	V·s/A	s^2/kg
farad	F	C/V	kg

From this further example of dimensional analysis of mechanical electrical units, we discover that, strange as it may seem, perhaps there is no definite anchor between electromagnetic phenomena and ordinary mechanical phenomena. We can change interpretation of the units and keep the numerical relations the same, or we can change the numerical relations along with the dimensional units as we do with cgs (centimeter-gram-second) and fps (foot-pound-second) systems. Or perhaps there is a "right" way of integrating the units.

I am drawn to **Mech a**, but I also like aspects of **Mech c** and **Mech d**, so sometimes I may put an equation in **Mech d**, for example, to see what it looks like. Theoreticians and engineers each have their favorite way of calculating that may make their particular calculations easier or more aesthetic. However, we really should explore more and then decide whether there is a best way to do the units. I personally believe that we should use the speed of light to define the second rather than the meter. I have another approach for defining the meter that I will propose further on in these discussions. In any case, the electromagnetic units should have a clear and unambiguous relation to the mechanical units, and the mechanical units, or some set of fundamental units, should all be based on universal constants. That way we become ready for the space age and can carry our science to the far reaches of the universe.

The other two components of a system of measuring and calculating physical phenomena involve giving a precise numerical quantity to the chosen units. Because of the vast range of physical phenomena, we use scientific notation that consists of a ratio (r) expressed in base ten as $1<r<10$ and then some power of ten that gives the scale of the measurement. With all the above in mind, here are the basic constants expressed in kms scientific notation according to **Mech a**.

* $\hbar$ = Planck's reduced quantum angular momentum constant, 1.054×10^{-34} J-s. (Unreduced form: $h = 2\pi\hbar$)
* e = Millikan's quantized charge constant, 1.602×10^{-19} kg/s.
* c = Einstein's light speed constant, 3×10^{8} m/s.
* G = Newton's gravitational constant, $6.67\times10^{-11}m^3/s^2$ kg.
* ε_o = Maxwell's spatial permittivity constant, 8.854×10^{-12} kg/m^3.
* % = White's Dimensional-shift constant, 3.1622776 m.

I have rounded the numbers off to just a few decimal places, because for most of the essays in this collection the purpose is to demonstrate general principles rather than to establish a proof based on laboratory research. We will have to see how things turn out once we have our units firmly grounded in universal constants in a balanced way.

If you define πR^2 as the area of a unit circle, where $\pi = 3.14159...$, and R is a 1 meter unit radius, then $\pi\%^2$ is then a circle with area ten times the unit circle area. The value of % given above is based on using a meter as the "unit" radius R and the base ten number system for calculation. So $\%^2$ happens to be an order-of-magnitude, or dimensional, shifter in this system. It seems like an arbitrary choice, but this value pops up a lot when you study the relationships of the universal constants. So it is not just an artifact of the number system and metric that we chose to use. It has a basis both in geometry and in physics, as we shall see more and more.

Of course, the next question is, if the elementary rest masses are set by these constants, what determines the relative values of these constants? Ah, that is a wonderful question. I believe the answer to that lies in the observer. Mathematics, especially geometry, arises in the mind of the observer as a phenomenon of the flowing and folding of awareness within itself. The constants fall out as a direct consequence of pure geometry. The physical world is a reflection of the mental constructs in the mind of the observer. Thus the world an observer sees conforms to the fundamental belief structures that he harbors in his awareness. So we can describe relationships among the physical constants as relationships among the constants of Euclidean geometry, thereby mapping the mental to the physical. We will demonstrate this principle in our equations.

So things proceed roughly as follows in creation. We will fill in gaps with principles and observations that provide detail and understanding as we go.

* ABC → (C operates on ABC) → AB (self) → other AB's and sub AB's by iteration.... → observer and observed appear → ratio, perspective, comparison → geometry → fixed attention on "universal" ratios → resistance to that stuff → constants of nature → space/time and quanta → forgetting of source → physical world → attention on physical world as an object → Big Bang and inflation → simultaneous deflation of observer viewpoint → little me is "lost in space" → redevelopment of skill at managing attention → start figuring it out → evolve physical body to experience and explore → mathematics and physics etc., mental models of the "real" world → scientific study of consciousness → Avatar, etc. → (C operates on world) → ABC →.(C operates on

ABC) . . . .

The current paradigm of an expanding universe (not to speak of an inflationary one) brings up a major (and fairly obvious) consequence of relativity that nobody seems to have mentioned. If the whole universe appears to expand from a Big Bang startup, then that means **the observer's viewpoint as a local participant in the universe appears to contract** at the same time. As the universe gets bigger and bigger, we seem to get smaller and smaller in comparison, even if we forget the past and only look at "now".

Is that just how it is? Not necessarily so. Meditation practices suggest that we can systematically expand our awareness and reacquire the habit of using an expanded or defocused attention. There may be many other ways of using attention and awareness that we have forgotten about while stuck in certain particular modes of awareness. Some of these modalities persist in our background awareness as "woo-woo" modes of remembrance. The expression "woo-woo" refers here to beliefs that have been disparaged by established "authorities" as "subjective", "unscientific", "unconventional", "superstitious", "cultish", "bizarre", "mystical", "crazy", "stupid", and so on. The discrediting of a belief by negative labeling with qualities people have already been conditioned to avoid is a good way to indoctrinate people into backgrounding it. People then habitually shift attention away from a "woo-woo" idea and ignore it. Or perhaps they get a little riled up at the negative labelers and inspect their own beliefs and those of the naysayers a little more carefully.

Indoctrination is the process of filling someone with beliefs. A belief that is set up as a standard worth believing is called a doctrine.

Exercise: Do **ReSurfacing** Exercise # 22, "Belief and Indoctrination".

The game of indoctrination is a very interesting one. It can become very complex and sophisticated. Many people on this planet are deeply involved in advanced levels of indoctrination games. A large portion of what passes for politics, commerce, education, and entertainment -- not to speak of culture and religion -- is really a cover for indoctrination games. What is the motivation for a person to believe that someone else OUGHT to believe (or not believe) something? I suspect that when you dig deep enough, you'll find a pretty insane game. What do I mean by insane? Not much. But perhaps sanity is governed, as Palmer has suggested, by compassion, harmony, and appreciation.

Discussion Question: What do you think is the motivation for indoctrination? (It may help to do the above exercise on indoctrination first.)

What is a game? A game is a belief system created for entertainment purposes. It is a mental wave guide for achieving certain interesting effects. This definition corresponds to Palmer's definition of a **lie**: "Basically an entertainment device." (**ReSurfacing**, p. 88.) So games arise from the desire to pretend, which is a creative exercise of the imagination. In any case pretty much anything can become a game. But a game is not

nothing. It involves at a minimum certain kinds of beliefs.

Requirements for a Game

* One or more Players.
* Players are organized into opponents and/or teams (optional)
* One or more Observer(s) who watch (optional).
* One or more Token(s) are used (optional in number and type, but at least one token is required, even if it is only an idea. It is something to play with.)
* A Space/Time or other dimensional arena in which to Play forms the Field.
* One or more Rules for playing the game.
* One or more Referees (optional).
* A Goal or Mission of the Game.

A minimal game thus requires a player, an arena for playing, a token, a rule, and a mission. Because solitaire is an accepted form of game, games can be more primitive than communication systems or languages, which, by definition, require a minimum of two players.

Games are Type Four Belief Systems. Although Avatars may enjoy experiencing in belief systems types One through Three, they most of all enjoy Type Four systems and are generally found playing with them.

Here are a few more attention wave guide exercises.

Attention Exercise 1
Part A: Take a walk or go for a ride in a car. Let someone else drive if you are in a car. Let your attention be observing the scenery out a side window. Do not focus on the objects that you pass. Put attention on the **speeds** that "stationary" objects in the scenery seem to go at as you pass them. What do you notice? Which objects seem to move by fastest and which objects move by slowest? If you do this at night with a clear sky, how fast do the stars appear to move relative to you?

Part B: Start this exercise slowly, and only add speed very gradually as you feel confident in performing the exercise. Speed on your part is not necessary, so stay comfortable with it. Stand in an open space where the ground is smooth and free of obstacles, preferably outdoors with a fairly unobstructed view. Wear loose, comfortable clothes and comfortable exercise shoes (or be barefoot if the ground is clear of rough spots and not too hot or cold). Extend your right arm in front of you and lift your thumb upward as if you were going to hitchhike. Put attention on the tip of your thumb. Relax and then slowly begin to turn clockwise keeping your attention on the tip of your thumb. Slowly take small steps while staying in place but allow your body to rotate clockwise. As you slowly turn with attention on your thumb you will find that the thumb stays still in front of you, but the scenery rotates around you in a counterclockwise direction. Once you have adjusted to rotating slowly in this manner, while keeping some attention still on your thumb, notice which part of the scenery moves slower and which part moves

faster as you turn. If you do this exercise with a clear sky at night, you will find that all the stars will be rotating counterclockwise as you turn. How fast are the stars moving? Note: when you wish to stop, do so gradually, keeping your attention focused on your thumb. When you have stopped all turning, keep looking at your thumb and bring your two palms together with arms outstretched and thumbs extended upward. Slowly draw your hands in toward your nose with your eyes focused on the two upright thumbs until you start to go a little cross-eyed. Hold the thumbs in front of your nose for a few seconds up to half a minute and then lower your hand and return to normal. Focus of attention on the thumb during turning and during the ending process helps to prevent any dizziness from the exercise. Do not do the exercise if it makes you dizzy and/or you start losing your balance. Have a friend on hand in case you need support. Most people are not used to turning like this, although it is an ancient form of dance still practiced today by the Sufis. If Einstein had tried this exercise he might have framed his relativity theory a little differently. This simple little exercise reminds you who is master of the universe.

Attention Exercise 2.
Find a laser pointer pen such as is commonly used for slide shows. You will also need a cigarette or a stick of incense. Do not ever point the laser directly at your or anyone else's eyes. Hold the laser pointer in your right hand about a foot or so from your face and point it 90 degrees to your left. Press the button to turn on the laser. Can you see the beam as it passes in front of you? Under normal circumstances it should be invisible. Now light the incense and place it on a table in front of you so that the smoke rises in front of your face in the path you shine the laser. Or you can light the cigarette and blow some smoke into the path of the laser beam. You should then be able to see the laser beam reflected off the tiny smoke particles as it passes in front of you. We can only see light that comes toward us at an angle that allows it to pass directly through the lens in our eyes. Indirect ambient light is also reflected from objects and only can be seen when the resultant beam is at an angle that can pass through the lens of your eye and land on the retina.

Attention Experiment 3.
Pay attention to your attention when you go to sleep tonight. Notice how you lie down and relax. Then you allow your attention to wander with no particular focus. As you drift into sleep, you lose track of your train of thought. When you wake up again, you gradually become aware of your body and surroundings. Then you begin to have more coherent thoughts and gradually shift into waking consciousness with a normal stream of thoughts. On the path to sleep you relax the focus of your attention. During the deepest period of sleep your attention is completely unfocused except for a tiny residual bit of subconscious attention that keeps your body alive on the level of minimal metabolic activity and some internal housecleaning. The phase wave of your unfocused conscious attention expands far beyond the boundaries of your local body. By meditation practice you can learn to function consciously on the level of undefined awareness without the body falling asleep. The ability to function consciously while relaxed at an extremely subtle level of metabolic activity is a very useful and efficient tool. When cultivated it is a powerful way of thinking.

Attention Experiment 4.
Do Perspective exercises #18 (Viewpoints") and #19 ("This and That") in the **ReSurfacing** workbook. After part 2 of "This and That" be sure to spend a good amount of time doing the powerful variation suggested at the bottom of the page. What do you discover from these perspective exercises?

Attention Experiment 5.
Watch OK GO's The Writing on the Wall (and maybe some others).
https://www.youtube.com/watch?v=m86ae_e_ptU
And for fun also try,
https://www.youtube.com/watch?v=qybUFnY7Y8w (The Rube Goldberg Machine)
https://www.youtube.com/watch?v=ur-y7oOto14 (All is Not Lost dance routine)