

However, the rocket's exhaust gas will be just putzing around in the upper atmosphere. It will get drawn into the rest of the atmosphere and join the gang of loose air particles and just float around. Eventually some of the heavier elements may even settle down as dust and get back to earth.

So we have here a fundamental principle of observer physics that thermal equilibrium, far from being an energy "dead-end", is the ideal **starting point** for gravitational "work" to begin creating new things. Gravity does "work", because it creates a directionality that organizes particles with respect to an arbitrary singularity point, and starts them moving in that direction. Entropy does work, because it is the conjugate of gravity, and therefore performs "conjugate work". Entropy and Gravity form a team.

A system in thermal equilibrium has all its kinetic energy randomized. It has no kinetic bias. The only thing that keeps it in gaseous form is the relative amount of kinetic energy with respect to its mass density. Thus thermal entropy is anti-gravity, and gravity is thermal anti-entropy. The two are a conjugate pair. Cooling has the same effect as gravity. It draws particles closer together.

As a dilute ideal gas in space contracts under the attraction of gravity, it begins to heat. Actually it is not really heating up. As long as the density is not too high, this is an adiabatic contraction. The appearance of heating is just that the gas is compacted into a much smaller space with the same number of particles and the same kinetic energy. The particles begin to bang into each other more and more. This appears to "heat" the system up. It really only heats up more when more particles are sucked into the contracting mass -- thus adding more mass and kinetic energy -- or more energy of other type(s) is put into the system.

We notice a fundamental difference between an "open" system that is not sealed, and a "closed" system that is sealed off. A closed system experiences "pressure" from containment and particles bang on the container walls. An open system has no such containment and so the only pressure results from the gravitational attraction of the particles. In a dilute gas collisions between the particles are pretty rare. Therefore the ideal gas equation does not hold in the same way for a gas in free space. Our previous derivation of the pressure in terms of particles colliding with walls must be abandoned.

* $P = (1/3) N M \bar{v}^2 / V$. (The value 1/3 indicates one of three equal spatial dimensions.)

We imagine the gas cloud is in open space and is undisturbed by external influences. If it is not rotating, it takes a spherical shape. As Newton discovered, the center of gravity will emanate from the center of the sphere, and, in spite of the various random motions of the individual particles, the gravity well (M1) will appear to be located at a point in the center of the cloud. We assume that the particles are all of the same type, say molecules of hydrogen. Then each individual particle, regardless of where it is in the cloud, will be effectively orbiting the center of gravity of the well in some roughly elliptical orbit with occasional collisions here and there that we will ignore. The gravitational effects of individual particles on individual particles also will NOT be negligible and will

average in all directions, effectively modifying the value of (G) in the system. A particle at the very center of the cloud will experience zero G-force, because the gravitational influences of all the particles on it reach equilibrium. However, the particle will have a certain kinetic energy that will cause it to move through the center, in which case it will have a degenerate elliptical orbit like the ball bouncing (or jiggling) through the center of the earth that we described earlier. Since there may be other particles at other angles in such orbits, these particles will tend to collide from time to time and then remove themselves from the center, allowing other particles to slide into central orbits.

We can treat an individual particle (M2) as if it were alone in an orbit around a well that has the total mass of the cloud focused at the singularity in the center. As long as the density of the gas in the center remains fairly low, we can argue in this manner. We let $\langle R_o \rangle$ be the average radius of the cloud, though the cloud itself has a very fuzzy "boundary". It makes a difference whether (M2) is outside the sphere defined by $\langle R_o \rangle$ or inside it. So we define an "external" radius $\langle R_e \rangle$ and an "internal" radius $\langle R_i \rangle$ such that $\langle R_i \rangle < \langle R_o \rangle < \langle R_e \rangle$. We let $\langle F_g \rangle$ represent the average gravitational force experienced by any particle that participates in the cloud. However we will also need $\langle F_{g_} \rangle$ to represent an anti-gravitational force experienced by the particle.

$$* \quad \langle F_{g_} \rangle = (M_x) (A)^{-1} = (\text{kg}) (\text{s}^2 / \text{m}).$$

The anti-gravitational force is a mass (Mx) times an anti-acceleration (A)⁻¹. If we consider a particle that has wandered outside the average radius of the cloud, then we can treat the whole cloud as a particle with mass (M1) centered at its CM, and Newton's usual law of gravity holds (approximately).

$$* \quad \langle F_g \rangle = G M_1 M_2 / \langle R_e \rangle^2.$$

Since the masses are constant, and (G) remains constant, the force changes as the inverse square of the distance between (M2) and (M1)'s CM. As the particle moves farther from the cloud, the gravitational force becomes weaker. However, when the particle finds itself somewhere inside the cloud's $\langle R_o \rangle$ "boundary", then the situation changes. When $\langle R_e \rangle$ reduces to the point that it becomes equal to $\langle R_o \rangle$, it becomes a fixed value of $\langle R_o \rangle$ at that point. Once (M2) is "inside" the cloud, the value of (G) begins to change.

To see how this works we must take (G) apart into its components. First let's consider the case where the radial distance is less than $\langle R_o \rangle$, ignoring density considerations.

$$* \quad G = \langle R_i \rangle^2 \langle F_{g_} \rangle^{-1}.$$

This gives us a new formula for the gravitational force experienced by let's say a hydrogen molecule inside a spherical cloud of hydrogen molecules in space.

$$* \quad \langle F_g \rangle \langle F_{g_} \rangle = (M_1) (M_2) (\langle R_i \rangle^2 / \langle R_o \rangle^2).$$

This new version of Newton's law reveals that when the particle is outside the cloud, we actually have a ratio ($\langle R_o \rangle^2 / \langle R_e \rangle^2$), where

$$* \quad G = \langle R_o \rangle^2 \langle F_{g_} \rangle^{-1}.$$

In this situation $\langle F_{g_} \rangle$ is held constant, $\langle R_o \rangle$ is not changing, and (G) is therefore constant. Thus the usual Newtonian law holds. However, as the value of $\langle R_i \rangle$ gets smaller and smaller, the value of $\langle F_{g_} \rangle$ also shrinks until it becomes zero at the center of the cloud, because **$\langle F_{g_} \rangle$ stays constant as $\langle R_i \rangle$ and $\langle F_{g_} \rangle$ shrink!** Thus (G) changes inside the cloud, and we find the odd situation that, in the case of a cloud in space, the gravitational force is maximum at the average radius $\langle R_o \rangle$ where $\langle R_i \rangle = \langle R_e \rangle = \langle R_o \rangle$, and therefore the ratio becomes $(\langle R_o \rangle^2 / \langle R_o \rangle^2) = 1$. The force then decreases in either direction as a particle moves in toward the center or away toward infinity. At "infinity" the ratio becomes equivalent to zero, and $\langle F_{g_} \rangle$ also "disappears". At the center, $\langle R_i \rangle$ becomes zero, so the ratio is also zero, and $\langle F_{g_} \rangle$ goes to zero. This explains why there is no gravitational force inside a black hole. The value of the singularity at the center expands to the event horizon. Outside the event horizon, the gravitational force drops off as the inverse square of the distance as with other objects.

The above equations assume that the density is constant. This is not the case, and certainly is not the case for black holes. So we must include some consideration for density. If we have a gas in a spherical container in space, the gas generates an even pressure on the wall of the container in all directions. This outward pressure derived from the kinetic energy of the gas particles is evidence that the kinetic energy generates an anti-gravitational "quasi-Coulomb" force -- that is, an average generation of mass per second times an average velocity. When we take away the container, the cloud persists only by virtue of the gravitational relationships of the particles (discounting van der Waals forces, etc.)

The total mass density of the cloud is (M#), where (N) is the total number of particles, (M2) is the mass of an individual particle, and (V) is the volume occupied by the particles. The average particle density $\langle \# \rangle$ is just the number of particles per a given volume.

$$* \quad (M\#) = N (M2) / V = M1 / V.$$

$$* \quad \langle \# \rangle = N / V = 3 N / 4 P R_i^3. \quad (\text{Here we take } R_i \text{ to mean we are inside the cloud.})$$

If we choose a sub-volume within the cloud, we can find a local density that will vary according to the number of particles in that chosen locality. We can also form a ratio of a local mass density to the overall average mass density. To study this we further dissect our "constant" (G) as follows:

$$* \quad G^{-1} = (M\#) s^2. = (M1) / \langle R_i \rangle^2 \langle A_i \rangle = (M1) / \langle R_o \rangle^2 \langle A_o \rangle.$$

$$* \quad \langle A_i \rangle = G (M1) / \langle R_i \rangle^2.$$

Here $\langle A_o \rangle$ is the average acceleration of a particle at the edge of the cloud, and $\langle A_i \rangle$ is the average acceleration corresponding to the position of the particle at a certain radial

distance in the cloud. Since we hold the total mass constant, we find that $\langle A_o \rangle$ is a minimum acceleration. As $\langle R_i \rangle$ reaches zero, $\langle A_i \rangle$ becomes infinite. It is impossible for a particle to stay put in the exact center. It is never exactly there except for an instant that goes below the Planck time. The whole system becomes undefined at that point, and the particle is spread out everywhere beyond space-time. Heisenberg uncertainty ensures that a particle can never be found exactly there.

For example, let's imagine a cloud consisting of 10^{51} hydrogen molecules for a total mass equivalent to a planet a bit smaller than earth. The cloud has an $\langle R_o \rangle$ of 10^7 meters for a "Jovian" size. The average particle acceleration will be around $4.5 \text{ m} / \text{s}^2$.

$$\begin{aligned} * \quad G^{-1} &= 1.5 \times 10^{10} \text{ kg s}^2 / \text{m}^3 = (10^{51}) (3.33 \times 10^{-27} \text{ kg}) / (10^{14} \text{ m}^2) \langle A_o \rangle. \\ * \quad \langle A_o \rangle &= G (M_1) / R_o^2 = 2.22 \text{ m} / \text{s}^2. \end{aligned}$$

Although there will be fluctuations, generally the density is greatest at the core of the cloud, with a density gradient from the "edge" to the center. The "edge" will not be well defined either. It will fade away into empty space just as earth's atmosphere does. Thus the value of $\langle R_o \rangle$ is not very precisely defined except as a statistical average.

We can multiply a particle's average kinetic energy times the average particle density to get the average "pressure". $(M_1) = N (M_2)$.

$$* \quad \langle E_k \rangle \langle \# \rangle = \langle P \rangle = N k T / V = (M_1) \langle R_i \rangle \langle A_i \rangle / V.$$

Since the density is generally greatest at the center, the pressure is also greatest there. When (R_i) is minimized at the core of the cloud, (A_i) and (P_i) have maximum values.

$$* \quad (P_i) = .75 (M_1) \langle A_i \rangle / P R_i^2.$$

Here (P_i) is the local "pressure" for a reduced sphere inside the cloud, (N) is the total number of particles in the cloud, $\langle A_i \rangle$ is the average local acceleration in that smaller sphere, and $(1.33 P R_i^3)$ is the volume of the smaller sphere. The "height" parameter (R_i) cancels out one of the (R_i) 's in the volume. With this formula we can find the pressure at any point in the cloud. Obviously (R_i) can not be less than the radius of one particle, so we can get an idea of the maximum pressure at the core -- about $1.77 \times 10^{78} \text{ kg} / \text{m s}^2$. We find that the mass of (M_2) , the number of particles in the cloud, and the excitation acceleration level $[(A_i) = G (M_1) / \langle R_i \rangle^2]$ of the core determine the core pressure. The microscale core temperature comes to about $5 \times 10^{20} \text{ K}$, well above electroweak unification, but that temperature drops off rapidly as the radius grows.

Thus, for example, at one meter from the core of our sample cloud, we get:

$$\begin{aligned} * \quad \langle A_i \rangle &= (3.33 \times 10^{24} \text{ kg}) (6.67 \times 10^{-11} \text{ m}^3 / \text{kg s}^2) / (1 \text{ m}^2). \\ * \quad \langle A_i \rangle &= 2.22 \times 10^{14} \text{ m} / \text{s}^2. \end{aligned}$$

As we move further outward from the core, the acceleration continues to drop off, as do

the pressure and the temperature. Here is a chart showing the scale gradient rounded off to powers of 10. The ideal gas equation [$T = P V / N k$] tells us the temperature.

Radius (m)	G-Force (Fg)	Acceleration (m / s ²)	Pressure (kg / m s ²)	Temp (K)
10 ⁰	10 ⁻¹⁴	10 ¹⁴	10 ³⁸	10 ¹⁰
10 ¹	10 ⁻¹²	10 ¹²	10 ³⁴	10 ⁹
10 ²	10 ⁻¹⁰	10 ¹⁰	10 ³⁰	10 ⁸
10 ³	10 ⁻⁸	10 ⁸	10 ²⁶	10 ⁷
10 ⁴	10 ⁻⁶	10 ⁶	10 ²²	10 ⁶
10 ⁵	10 ⁻⁴	10 ⁴	10 ¹⁸	10 ⁵
10 ⁶	10 ⁻²	10 ²	10 ¹⁴	10 ⁴
10 ⁷	10 ⁰	10 ⁰	10 ¹⁰	10 ³
10 ⁸	10 ²	10 ⁻²	10 ⁶	10 ²
10 ⁹	10 ⁴	10 ⁻⁴	10 ²	10 ¹
10 ¹⁰	10 ⁶	10 ⁻⁶	10 ⁻²	10 ⁰
10 ¹¹	10 ⁸	10 ⁻⁸	10 ⁻⁴	10 ⁻¹

We see that before we get to a radius the size of a Venus orbit the average temperature has already dropped to below 1 K. The core that is hot enough to initiate nucleosynthesis (10¹⁰) is far too small (with a radius of only about 1 meter or so) to make a star. The drop-off of temperature is called the "lapse rate". The average decrease of temperature in earth' s troposphere is a little under 2* C per 300 m.

There is no outer wall containing the gas, so there really is no outward pressure. There is nothing to press against. So these numbers represent an anti-pressure. There is only the tendency of the particles to gravitate together. This reflects the innate remembrance of a fermion that it is really half a boson. It instinctively wants to get as close together with its comrades as it can. Thus we find an expression for the average pressure in the cloud in terms of the relative masses of an individual particle and the cloud as a whole. In Chapter 15 we' ll look at the relevance of our gas cloud analysis to Milgrom' s MOND hypothesis.

If we have a spherical dilute gas cloud in space, we only need to know its total mass and its radius and we can know the average kinetic velocity of the particles in the cloud. Oddly we don' t need to know the number or the mass of the individual particles. On the other hand, if we want to know the average temperature of the cloud, then we need to know the mass of an individual particle and the number of particles.

As the cloud sits there in space, some thermal energy radiates away, the temperature drops, and the cloud contracts. As it contracts, the density increases, collisions increase and the cloud may begin to undergo phase state shifts. At some point the temperature and density reach a threshold that initiates chemical and then nuclear processes, and we have the birth of a star -- if the overall mass is large enough. Otherwise it may remain a cloud or become a ball of dust, ice or rock depending on its constituents. Entropy still holds, because the thermal radiation from the cloud has effectively expanded its phase space even while the cloud contracts. Nevertheless we also have a nonlinear anti-entropy fluctuation that has occurred and continues to occur over and over within the

time span of the universe. Also, the thermal radiation that is lost into space may be balanced by thermal radiation that is absorbed from other sources. The thermal radiation from one cloud eventually is absorbed by another cloud somewhere else in the universe. Therefore, we must temper our idea of the inexorability of entropy and equilibrium and the "heat death" of the universe with the notion that gravity is the counterpoint to random kinetic energy and the two work together as a process echoing in the resonant cavity of our gravity cone.

Our discussion of the thermodynamics of gravity also brings up the possibility of deliberate manipulation of gravity and entropy. Our model shows that the lower nappe of the gravity cone is the mind of the observer. Erwin Schroedinger coined the term "negative entropy" to refer to biological systems and the growth of consciousness. The physical world in the upper nappe is a reflection of the mental belief system in the lower nappe. The lower nappe is below the vacuum zero point state, so positive entropy dominates in the upper nappe and negative entropy dominates in the lower nappe. Thus the observer/participant can set up a resonant cavity to resonate any way he pleases. If the physical world appears subject to entropy and a tendency toward increasing random disorder, the conjugate mental world can be directed by gravity -- the reflection of will -- and deliberate organization of beliefs.

We recall the exercise we did in which we practiced "connecting the dots". The ability of the observer's awareness to direct his attention to deliberately connect a random collection of particles into an organized structure is an example of negative entropy. It is the conjugate opposite of the collapse of the wave function in which a continuous function generates a series of dots in space/time. Projections into the World space, once abandoned, become mindless automatons that can only follow the patterns of the beliefs that created them. Projections in either Mind space or World space, unless abandoned, are subject to the deliberate intelligent direction of the will in its defining of beliefs. The will can decide the level of excitation and the level of organization of the Mind space. The World space is an exact reflection of the Mind space -- a replica.

Exercise: Have someone take you through the "Expansion Exercise" # 26 in **ReSurfacing**. Practice this exercise until you can easily expand your awareness to contain your entire World space and Mental space. What happens to scale? What does this imply with regard to the second law of thermodynamics?

Finally, let us consider the third law of thermodynamics. This law deals with the observation that as temperature is reduced, the various parameters of a thermodynamic system, including the entropy, tend toward zero. Theoretically, at absolute zero Kelvin, all parameters are at zero.

However, just as we saw with our condensing cloud, the actual situation is not quite that simple. For example, systems have various phase states, such as gas, liquid, and solid states. They go through transitions in various patterns depending on the components of the system. Also, density increases as temperature drops. If density increases and kinetic motion also drops off, other components of the system come to the fore. This

includes molecular structure, spin, magnetic moment, and so forth.

Therefore, especially when we get to extremely low temperatures, it becomes somewhat misleading to think of temperature only in terms of average kinetic energy. It is possible to have negative temperatures, but not negative kinetic energy. It is possible to cool materials by manipulation of magnetic moments. Many interesting phenomena occur in super-cooled materials. These include superfluidity, superconductivity, and the ability of fermions to behave as if they were bosons.

Let us get a general statement of the third law. This law is also known as Nernst' s Law, although Planck and others contributed a lot to its understanding.

- * No process can take a system to zero Kelvin in a finite number of steps.
- * The entropy goes to zero as the temperature approaches zero, and the entropy may reach zero before the temperature reaches zero Kelvin.
- * As temperature drops to zero Kelvin, the entropy change in an isothermal process goes to zero.

One thing we notice in these statements is a complementarity between the second law and the third law. The second law tells us that entropy increases as the heat content of a system increases. The third law tells us that entropy decreases as the temperature decreases. Temperature is a measure of heat content. So rising temperature means more entropy. Lowering temperature means less entropy. Entropy is also associated with disorder, so the notion arises that higher temperature leads to more disorder, and lower temperature leads to more order. We definitely see that crystals are much more orderly than liquids, and liquids are more orderly than gases.

The second law tells us that any system with a multiplicity of mindless components left to itself will go to its macrostate of greatest entropy and stay there. Systems interacting tend to expand the entropy of the totality of the interacting systems. It seems that, in the case of mindless systems of particles, entropy always tends to stay still or increase, never to decrease by itself.

On the other hand, the third law tells us we can lower the entropy by lowering the temperature. But this apparently involves work, even if it just means thermal radiation dissipating into the void. And so even if a process decreases the entropy inside the system, it increases entropy outside the system. The whole system of systems experiences increasing entropy.

However, a space with no particles, or only one particle, has no entropy and no heat. Let' s apply observer physics.

Exercise: Redo the expansion exercise and imagine a space in which the universe effectively becomes an infinitesimally small particle in a huge empty space.

If we treat the whole universe as a single tiny particle in a vast space, entropy disappears,

and so does temperature. All random kinetic motion effectively disappears -- reduced to an imperceptible level, relatively below the Planck scale compared to our expanded observer viewpoint. Thus expanding of awareness lowers the mental temperature. Undefined awareness has no temperature. If we really establish undefined awareness as the core belief in Mental Space, it will automatically reflect in World Space and -- from that viewpoint -- entropy will be erased from the universe.

The third law tells us that if we have a way to lower temperature, that will lower the random kinetic motion and other contributions to the heat of the system. The entropy of a system can be removed. Furthermore, cooling of a system has the effect of time dilation. It slows the clock just like fast relative kinetic motion also slows the clock. Zero entropy stops the clock. Anyone using a refrigerator or freezer understands this principle -- that cooling slows aging processes in materials. At zero Kelvin, if we could hold the system there, the clock stops, just as the clock stops at the velocity (c). This is odd. You can slow or even stop the clock by going fast, and you can slow or even stop the clock by slowing down!! The difference is that the clock that slows when going fast is an orderly periodic oscillation of a coherent structure involved in work, whereas the clock that slows when "going slow" is an entropy clock that slows by reducing its random thermal kinetic fluctuations.

The question then arises: if we can slow a clock, one way or another, can we reverse a clock? The view of Observer Physics is that this is a meaningless question. What we call time is really an awareness of change. Change proceeds in various ways. Change is a sign of energy transformations. Generally it either is cyclical or developmental (non-cyclical). Equilibrium is a very stable cyclical state. Systems tend toward cyclical states, and only behave non-cyclically as they move turbulently through phase transitions. Yet a sequence of phases separated by transitions amounts to another kind of cycle.

Rather than speaking of running the clock backwards, we really should speak of achieving a preferred state of equilibrium in which the system cycles within a specific desired range. Or we can think of reversing one or more sequences of phase transitions back to a previous equilibrium. Just running the clock "backwards" does not make much sense.

One Monday morning I went to my high school and found that a student had broken into the classrooms over the weekend and adjusted all the clocks so they ran backwards. The student was expelled, but I always admired his sense of humor. Our clocks go around and around. We just choose to tell time in a particular direction by convention. A system for telling time is a "type two" conventional belief system according to Palmer's typology of beliefs.

Given a high multiplicity of microstates, the recurrence of a specific unique configuration of microstates is also probably meaningless, since we do not experience life with that degree of resolution. Therefore, a good working definition of time reversal might be --

Time Reversal: "Shifting the macrostate phase of a system into a condition that matches the macroscopic parameters of a prior phase state to a desired degree of resolution."

This is obviously quite doable, since we only desire a reasonable match and not exact duplication. Exact duplication may be possible too, but seems rather overly perfectionist, since the total detail of a prior **microstate** multiplicity is not likely to be known, and the microstate transition rate is pretty swift and ongoing. At any rate, the procedure is simply to identify the primary components of the desired prior macrostate and then to insert those into the belief system of the Mental Space. Then adjust the Lens Modulator to project those beliefs into experiences in the World Space. The detailed technology of Lens Modulation procedures are included in sections II and III of the **Avatar Materials** as the Creation Handling Procedure for anyone who is really interested in exploring such procedures. Since that becomes a laboratory experience rather than theory, I leave that project for the reader to follow up on as an exercise.

A state of maximum equilibrium with maximum entropy is an ideal unbiased starting point, and gravity provides a good example of a recipe for effortlessly turning states of maximum entropy such as clouds of dust and gas into shiny new stars and planets ready to evolve. The will as the prime mover can turn undefined awareness effortlessly into a fascinating set of beliefs to explore and experience.

Is it possible to lower temperature and remove entropy without doing work? The problem with using work is that work tends to generate more entropy and heat.

Experiment: Put your hand inside a refrigerator. It feels cold. Now put your hand behind a refrigerator while its pump is running. The heat you feel is the heat pumped out of the refrigerator plus the extra heat generated by the pump.

So the key here is NOT to **pump** the system like we do with a refrigerator or a laser, but to **relax** the system. Slack can be useful under the right conditions. For example, we can relax a system physically by isolating it in free space, exposing it to the vacuum state. It will definitely cool. The ambient temperature in free space (not exposed to sunlight) is about 3 degrees Kelvin. Space is a good refrigerator. But, from our conical gravity model we also get some other ideas.

The lower nappe of the cone represents Mind Space. It is a field of negative physical energy, located below the vacuum state. It precisely reflects the contents of the upper nappe, the World Space. However, both nappes can be manipulated from the (O) point in the middle. In fact they can be completely controlled from the quantum foam at the Planck level.

Phase waves are superluminal and massless. Photons travel at (c) and are massless. The World Space phenomena project onto the quantum foam via photons that arrive at the speed of (c). Luminal attention photons and superluminal graviton particles can be manipulated deliberately by the will.

There is a process known as flash freezing that allows material to be frozen almost instantly. Recently some physicists announced they had succeeded in "flash freezing" photons. They did not elaborate in the news release because the public does not yet understand what is going on in such processes, but this experiment was accomplished using four-wave mixing phase conjugation techniques. A nonlinear gas medium at low temperature was pumped with conjugate lasers until highly energized. Then a third light source was introduced as a flash of light. This was the third beam added to the system. As the flash entered the coherently resonating gas, it achieved quantum correlation with the gas particles. Its quantum mechanical "signature" became holographically "entangled" in the quantum bubble of the coherent gas. The pump lasers were then damped, and the quantum information of the flash of light was left recorded in the gas. After some time, the lasers were turned up again. The flash reformed and continued on its way as the fourth beam of the phase conjugation system. As you can see, this is just a delayed reaction four-wave mixing system. A photographic hologram is another way of "freezing" an entire 3-dimensional light field on film. It can later be unfrozen and restored as a light field by scattering a laser off the hologram film's interference pattern recording.

The principle here is that **anything** can be frozen instantly -- even the whole universe. The freezing of a material involves finding an appropriate method of sucking out the kinetic energy (and any other expressions of entropy) in the system. Perhaps the simplest way to do that is to shift attention. All of thermodynamics is based on multiplicities of microstates. If we eliminate all the microstates of the system, then we automatically eliminate all entropy and all temperature. Rather than trying to invent a giant vacuum cleaner to suck the microstates out of a phase space, why not just shift to a viewpoint from which the microstates are no longer viewed as microstates?

Microstates are ensembles of particles. Remember how we created particles by curling photons up into little tops? Run that process backwards. We simply relax the energy of attention that goes into juicing up the photons and curling them into particles. Matter is made from photon energy. Photon energy is in frequency. Photon velocity is the same for all observers, so the (wavelength / frequency) ratio must be dependent on observer viewpoint.

* $c = \lambda_0 / f$.

Shift to a viewpoint where the wavelength stretches out and the frequency drops down. This relaxes the system, and the particles stretch and yawn and return to their modality as potential energy.

Basically we have to dissolve the observer viewpoint bias that hardens the energy into matter. That takes a little exploration to find the hidden assumptions and transparent beliefs that generate the bias. Then the matter simply dissolves back into energy with no mass or resistance. From the state of Source, established in a field of All Possibilities with no resistances, we can decide what we would like to do next and

effortlessly accomplish it.

Maharishi Mahesh Yogi has compared this process to "lowering the Mental Temperature." I believe he was the first person to bring up the notion that one could reduce entropy in the world deliberately by lowering mental temperature. For him this means relaxing the awareness through meditation. But the principle is general.

The state of Absolute zero temperature and zero entropy says nothing about zero energy. You can have as much energy as you like at Absolute zero. It is like the common misconception that a black hole must be very dense and crunch you out of existence. Actually large black holes could have the density of dilute gases. And the universe as a whole has a density of about one proton per cubic meter or even less and yet it almost certainly qualifies as a black hole. Take another look at the ideal gas law.

* $PV = N k T$.

If the pressure goes to zero, the temperature goes to zero, and the entropy goes to zero. If the volume goes to zero, the temperature goes to zero, and the entropy goes to zero, regardless of how much mass is hanging around. If the number of particles goes to zero, the temperature goes to zero, and the entropy goes to zero, regardless of the space the system occupies. The observer can achieve all of these without work simply by shifting his viewpoint.

Exercise: Have someone take you through the "Expansion Exercise" (**ReSurfacing**, Exercise # 26). When you have done it a few times with a coach' s guidance, you can do it yourself. Alternatively or additionally, explore the ideal gas equation in the light of the laws of thermodynamics using the advanced Avatar tools.

Having discussed some of the fundamental principles regarding thermodynamics and gravity in the light of observer physics, we have one other topic to consider in this chapter -- density.

Archimedes was asked by his king to find out whether a certain craftsman has properly made a crown from pure gold. One day while Archimedes was relaxing down into a warm bath, the answer came to him in a flash. According to the legend Archimedes was so surprised and excited that he jumped out of the tub and ran around naked shouting "Eureka"!! "I got it."

He had discovered Archimedes' Principle, the law of density. The force that buoys an object equals the weight of the material that it displaces. Archimedes realized he could weigh the crown in air and then put it into a tub of water, and then weigh the water that it displaced. Then he could weigh out the same amount of gold as the crown weighed in air and then place the gold in the tub. If the weight of the water displaced by the crown were the same as that displaced by the known sample of pure gold, then the crown would be made of pure gold. If it were not, then the density of the crown would be different

and some alloy would have been added.

This is one of the great insights in the history of science. And it is so simple, elegant, profound, and general.

If the weight of the material an object displaces in a medium is greater than the object' s weight, then the object will tend to "float".

This is where the principle of gravity comes into play with regard to density. The general principle of gravitational environments is that the denser material usually (on average) tends to locate near the center of mass (CM), and the least dense material locates the farthest from the CM. If the particles have equal density, then the ones closer to the CM singularity will be more closely crowded together. Thus each gravity-well is actually a mass-energy gradient.

Why is this so? Nobody ever explains this. From observer physics we understand that a CM singularity indicates a focus of attention. The greater the focus of attention, the more mass-energy density will manifest. Hence, when attention is fixated at a certain point with a great deal of focus, matter particles form and collect there. The gravitational attraction is the conjugate reflection of the focused attention. Will controls focus.

Every inhabitant of planet Earth is in an "orbit" determined by the relative density of the person or object. There are some variations due to phase state, but generally this is how it works. For example, water in its liquid phase resides in the oceans and lakes, but in its vapor phase, it resides in the atmosphere. As we move about the planet we generally follow orbital trajectories. Periodically we rebound off objects or ideas and change direction, but we generally stay within the average density orbit trajectory "shell" for particles made mostly from water, but slightly less dense than water -- at the earth' s or water' s surface.

Most people think of transportation in terms of the use of kinetic translational devices such as cars, or airplanes, or other vehicles. Actually there is another efficient form of transportation that involves the use of Density Modulators. Primitive examples of vehicles that operate using density modulation are submarines and hot air balloons.

The major bottleneck to the development of our space program is the lack of an efficient density modulator to shift men and material from Earth Surface Orbit to Earth Near Space Orbit. From Earth Near Space Orbit to outer space and beyond is easy given our current technical development. The second great bottleneck to exploring the World Space universe "first hand" is the speed of light. Even the nearest star systems are light years away. Travel to other galaxies is no more than a fantasy without the development of a superluminal density modulator. Such a device is akin to the "Beam me up, Scotty" device used in Star Trek, but works on an intergalactic scale. The sci-fi technology called the "warp drive" is an example of a superluminal density modulator.

How could we conceive of such a device on a practical level? The first step is to develop the Ansible, Ursula LeGuin' sci fi idea of an FTL communicator device. Our cone model allows us to envision the principles for the development of an Ansible Technology. The gravity cone is like a star map of the universe that connects the dots precisely into a Mental Map inside our consciousness. The principles are simple, although the development of applications may involve some research and development -- if you believe it will:

- * We formulate the "message" we want to "send" as a set of beliefs, and project them into our Mental Space.
- * The "message" includes a space/time "to" and "from" address.
- * Then we use our Lens Modulator to transform the Mental "message structure" into a physical form in the World Space.
- * This happens instantly and superluminally. The message appears at the intended space/time destination in World Space as soon as it is properly established in Mental Space.

The physical apparatus involved with this is not of great consequence, as there could be a number of feasible approaches. One possibility includes the use of quasar signal beacons as carrier frequencies for time-reversed phase wave modulators. The main priority before we can make progress as a civilization in this area is the development of skills in the management of belief systems in Mental Space.

If you do not believe that what I am talking about in this book or in the above proposal makes sense or is possible, you are welcome to your opinion, and I stand corrected wherever I have erred. But I stand by my own experiences. On the other hand, diversity of opinion is a basic principle of observer physics. I suggest that you take ten days and experience the **Avatar Materials**. Why not? The materials give you all the basic tools you need to understand this body of ideas, or anything else you like, and then to actually transform your ideas into an experiential reality. Go online to AvatarEPC.com and check it out. For a start, get a copy of **ReSurfacing** (if you haven't already) and do the exercises with careful attention. That little book is the "laboratory" text for this introduction to observer physics.

The Density Modulator Transport Device follows the same basic principles as the Ansible Communicator Device but transports objects and individuals as well as information.

How do I know the Ansible technology works? Well, this discourse was written by the use of a prototype version of the Ansible Technology. The material of Observer Physics came from the future and was projected down through my "working model" of a quantum foam Lens Modulator. Aside from my own personal errors of transcription, for which I apologize, take full responsibility for, and will make every effort to correct, this material on the subject of Observer Physics is entirely accurate and verifiable. Observer Physics must match with the World of experience or change. It is not difficult or obscure. You need to read the materials with some attention, but both the mathematics and the

theory are easy enough for any alert student to follow.

The Mental Space we have modeled may contain anything you can imagine. It contains the complete set of your beliefs, and is nothing but your beliefs. Your World Space is a perfect reflection of your Mental Space. Whatever you experience is a verification of what you really believe. If you do not like what you see, then you may want to change your beliefs. There are tools for doing that. If you imagine a World that does not match your experience, your attention is fixated on a localized behavior loop. But that still is your World -- a World in which the underlying belief structure is that "Certain things that I imagine, are not true in the World Space I live in."

Observer Physics embraces the current state of modern physics with just a few modifications and greatly expands the vision of physics into the future. It also provides models for the experimental physicists to verify the theoretical principles and models provided in the discourse, with the caveat that experimental verification is nothing more than evidence that a particular belief or set of beliefs is true. Assertion of a particular belief does nothing to invalidate any other belief, except from the viewpoint of the belief in "invalidation". It is always possible to assert a belief and then marshal evidence that that belief is true, so long as you truly believe what you assert. In any case, if you truly believe something, not much is going to convince you otherwise.

With this material we have found a precisely defined direction for the string weavers and other supersymmetry theorists to apply their skills, and we can peer directly into the original Cosmic Boson particle of creation by probing deeply into the proton itself. This suggests not only experiments that can be done with high-energy proton colliders, but also subtler probing into the nuclear resonances. It also suggests an urgent need to study the detailed behavior of neutrinos and their oscillations. All the key oscillations should be carefully studied. The internal mapping of the proton-neutron structure will reveal the perfect balance of matter and antimatter in the universe. It will also reveal the secrets of high-energy dynamics and unlock the door to controlled use of mini black holes to resolve our energy needs and open up many new technologies.

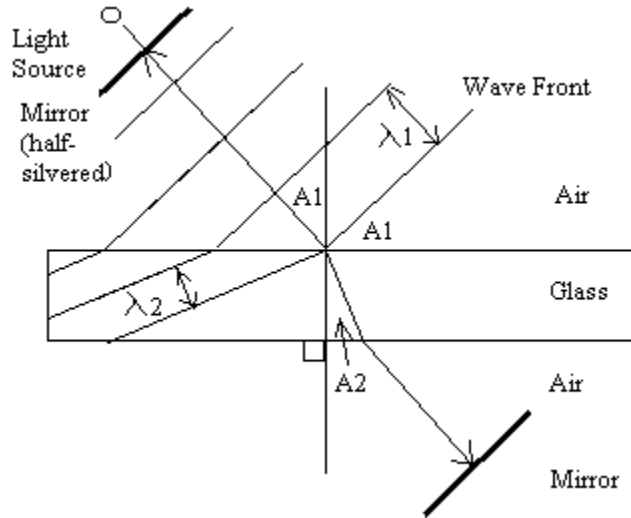
We began by proposing that Observer Physics orients us in the direction of a new paradigm in physics. This is a belief. This belief is true in the Mental Space. And it is true in the World Space whenever and wherever the World accepts it as a paradigm. If someone believes it is science fiction, then in that person's World it will be science fiction.

The paradigm of Observer Physics can lead to the development of new sources of virtually unlimited "clean" energy and many other new technologies. Eventually it may give way to a new and broader paradigm. Study of the quantum energy windows for neutrino oscillations, the electron-positron system and for the proton-neutron oscillation system will lead us to the ability to deliberately shift particles back and forth between their mass phase state and their energy phase state. It will also lead to a clear understanding of the relationship of awareness and consciousness to all physical systems and to a full appreciation of the vital role of the Observer in the play and display of our

wonderful physical universe.

Above all, Observer Physics will contribute to the evolution of a more enlightened planetary civilization.

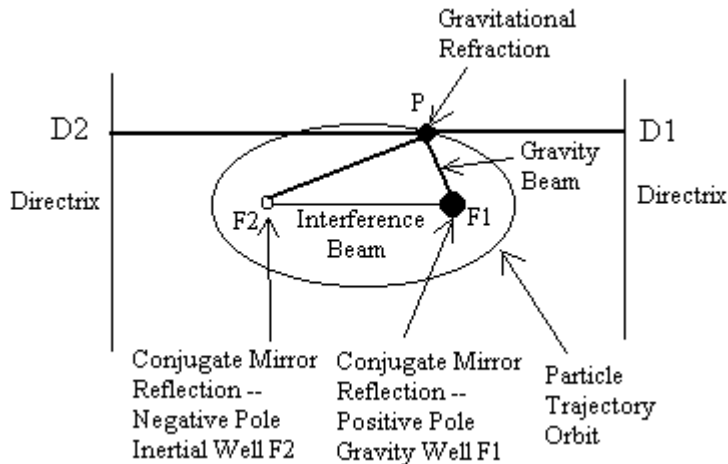
Enjoy!!



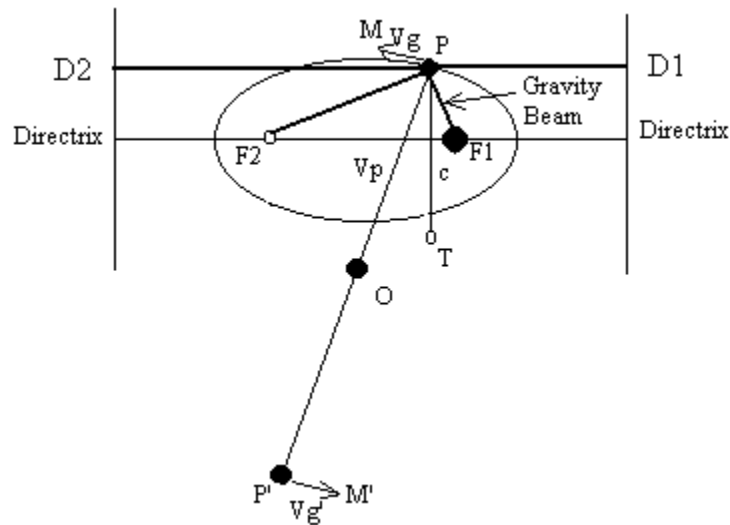
Refraction of a Light Beam as it Passes Through a Pane of Glass

When the beam enters the glass at angle A_1 , it bends to angle A_2 . Its frequency remains constant, but the wavelength shortens. Thus the velocity slows.

Satellite Particle in Elliptical Orbit Around a Gravity Well



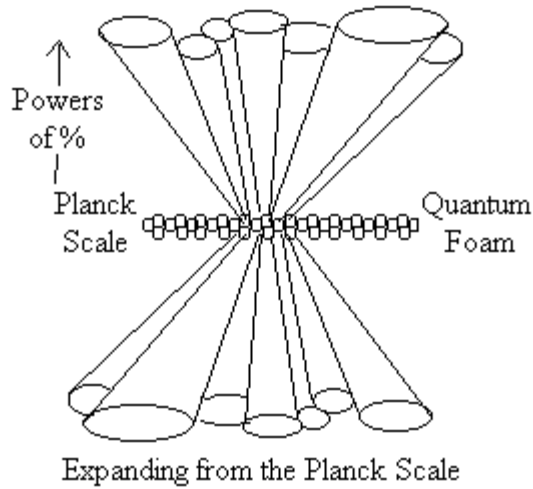
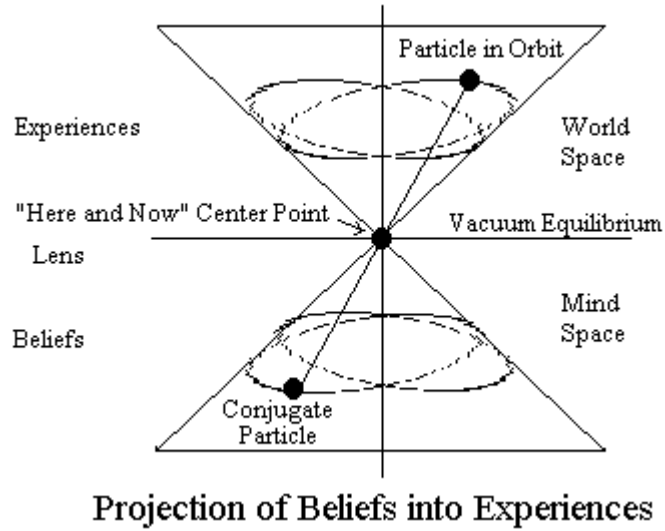
The elliptical orbit forms between two hyperspatial directrices with the gravity well as one focus (F_1) and the inertial well as the other focus (F_2). The two foci form a particle pair with a resultant beam running between them. The gravity beam forms between the particle and the gravity well. The inertial beam forms between the particle and the inertial well. The beams between particle and the two wells reflect as in phase conjugate mirrors. The beam reflecting between the directrix "mirrors" refracts at the particle. The interference beam between the two focus wells is parallel to and displaced from the directrix beam in the same way that the light beams on either side of the glass are parallel and displaced.



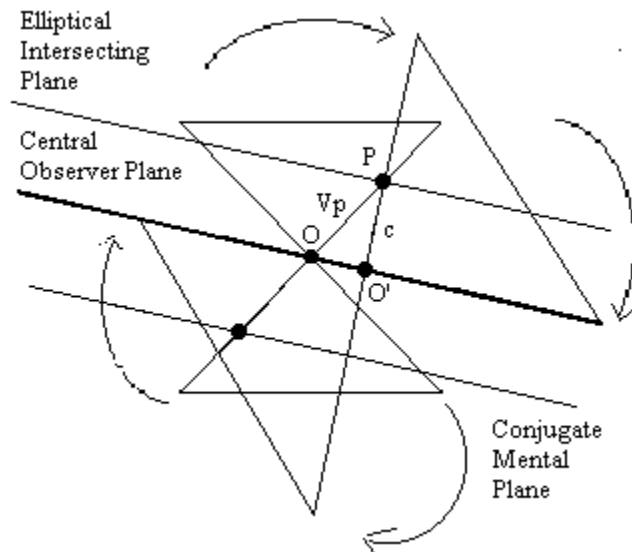
Beam Components of a Gravity System

- OP = R-beam (Resistor) -- (V_p)
- PO = A-beam (Attractor) -- (V_p)
- PF1 = G-beam (Gravity)
- F1P = I-beam (Inertia)
- PF2 = K-beam (Kinetic)
- F2P = D-beam (Detractor)
- (D1PD2) = P-beam (Pump)
- PT = C-beam (Retarded) -- (c)
- TP = C-beam (Advanced) -- (c)
- PM = M-vector (Motion) -- (V_g)
- P' M' = M' -vector (Mental) -- (V_g)

The pump beam sets up a resonating gravity bubble in the cavity between the directrices. The orbiting particle acts as a moving reflector. The gravity well serves as the nonlinear conjugate medium. A gravitational "probe" beam forms between the particle (P) and the gravity well focus (F1). A kinetic beam forms with the inertial well focus (F2). The beams form according to the phase conjugation auto-tracking principles. The focus is split, so the resultant attractor/resistor beam "lases" between the particle (P) and the origin point (O). The conjugate wave of this is the observer's will. In a circular orbit the two foci are combined and you see a simple 4-wave mixing phase conjugation auto-tracking system. The visual perception proceeds by the shortest (normal) path from the particle to the observer's perceptual plane that is parallel to the orbit. It then matches with the mental image that is projected in the observer's mind (lowenappe) to the observer's perceptual plane. There is a lag time as visual data passes from (T) to (O) in the observer's plane.



A Multiplicity of Gravity Cones Projects from Quantum Foam

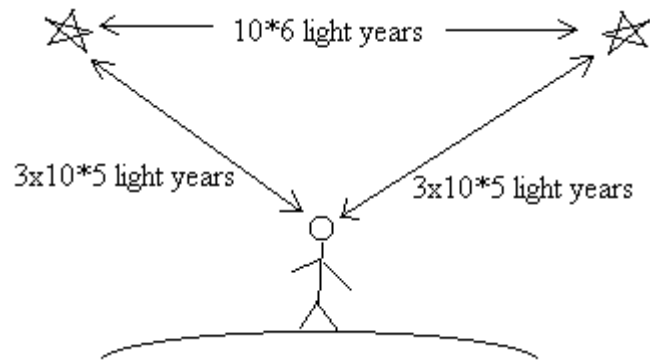


Tilt and Slide of Ellipse into Parabola for Pure Light Direct Perception

Exercise: On a clear night go outside to a place where you have an unobstructed view of the sky. Select a faint star in some quadrant of the sky and put your attention on it. This star may be thousands of light years away. As you look at it, the retarded photons that strike your eye left that star thousands of years ago, or even millions of years ago, and traveled forward in time and across space to reach your eye. As you look at the star, your advanced attention particles travel backward in time and across space to reach the star where it was thousands of years ago. The huge space/time qwiff bubble thousands of light years in diameter pops when you observe each photon.

Shift your attention to a different star located in the opposite quadrant of the sky. Now you are popping qwiffs from a different star that is also many thousands of light years distant from you and much farther than that from the previous star you observed.

Your advanced attention particles travel at light speed backward in time to this new star you selected. In free space attention travels at (c) , and light travels at (c) . But your will is a phase wave that travels at the vastly superluminal Planck Velocity -- up to roughly 10^{42} m / s. In a moment you can decide to send attention particles to one star or another over vast ranges of space/time and into opposite ends of the universe. This is the phase wave quality of the will. You can make non-local quantum mechanical modifications to your universe on any scale of space or time by the exercise of your will.



An Observer Pops Very Large Qwiffs and Wills His Attention
To Range Across the Universe at the Planck Velocity