Welcome to Superluminal Phase-Wave Civilization

by
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"What is an ansible, Shrevek?"
"An idea." He smiled without much humor. "It will be a device that will permit communication without any time interval between two points in space. The device will not transmit messages of course; simultaneity is identity. But to our perceptions that simultaneity will function as a transmission...."
-- Ursula Le Guin, The Dispossessed, 1974

This article is a wakeup call. There's a little bit of math to get through. But any high school student can handle it. The math helps to make the argument clear and precise.

Life has been evolving on this planet for several billion years, and it seems that human evolution has been underway here for the last 3-4 million years depending on where you see us forking from the other primates. Until recently most life forms, including humans, have functioned primarily in the world of matter waves. At least that is what modern science seems to tell us.

What is a matter wave? We really should speak of a matter-wave **packet**. Matter-wave packets are groups of waves (hence also the term "group" wave) that superpose in such a way that they mutually interfere to form the appearance of localized packets. We call such phenomena "matter" for short. Since our bodies seem to be made from these matter-wave packets, we tend to have a lot of attention on that aspect of the world. And so we find ourselves localized in a habitat on a planet.

The view of western scientists that evolved during the 19th century was that matter is solid stuff made from little particles. Energy was thought of as a sort of fluid with a wave aspect to it. It turns out both views were off the mark to some extent. During the first quarter of the 20th century physicists began to unravel the "classical" view of things for us. Planck discovered that energy comes in quanta. In 1905 Einstein made this even clearer when he showed that the photoelectric effect can only be explained if we assume the energy form we call light consists of little corpuscles that came to be known as photons. Thus, $E = h u$. That is, the energy (E) comes in little photon units defined by Planck's constant (h) times the frequency (u). Below a

certain threshold frequency you won't get any photoelectric effect no matter how intense the light is. For some time before that most scientists believed that light energy was strictly a wave phenomenon because many obvious effects, such as diffraction and interference, supported that view. However, evidence from the lab also turned up to support Einstein's idea, and so mankind took another confusing step into the quantum world.

In 1924 Louis de Broglie turned the tables once more and showed how matter "particles" also could be looked at as waves. He put it this way:

* Lo = h / p = h / Mo Vo.

The de Broglie wavelength (Lo) is the ratio of Planck's constant to the momentum (p) of a particle, where the momentum is described as the product of the rest mass (Mo) times the basic "wiggle" velocity (Vo). Davisson and Germer saw electron interference and diffraction in some scattering experiments. Later Davisson and G.P. Thomson confirmed it and got Nobel prizes in 1937. Thus it now appeared that everything could be looked at either as a particle or as a wave.

Closer inspection showed that the "particles" were really wave packets, clusters of overlapping waves of various wavelengths that taken together have a characteristic spread -- hence the idea of a packet. Furthermore, the tiny wave packets of fundamental particles kept dissipating at tremendous speeds, implying that nothing really sticks around. The only way something could seem to continue to exist as something was to be continually reconstituted by the observer's will power to stay focused on that "something". This is a little problem that no self-respecting quantum physicist would want the general public to get too clear about, so, while everybody argued about particles and waves, it was swept under the rug for the past 80 years. You can dig around in textbooks and find it mentioned here and there in footnotes or little "teaser" exercises and quasi (heh-heh) jokes, but no one wants to come out and say, "You see, physics is the study of dreams." That sounds like parapsychology. Here's an example from an excellent and serious textbook, Radin and Folk, **Physics for Scientists and Engineers**, (p. 777) to show you what I mean:

"...If a wave packet for an electron is initially concentrated within a length about equal to the diameter of an atomic nucleus, it spreads out over the length of a football field in less than a millionth of a second."

Currently the only way we can find out if an electron is "concentrated" within a certain interval is to look at it. That look blows the electron away, like kicking a football 100 meters down a football field. The electron we look at must already be a pretty high-energy electron. If we don't look, the electron may turn out to be a low energy electron quietly whipping around a nucleus in a ground state orbit. We can't see such an electron, because it usually does not emit photons.

* Heisenberg's relation: h <= (Dp)(Dx).
* (Dp) is a momentum shift, and (Dx) is a spatial displacement.
* Planck's constant <=
  (mass of electron)(football field per millionth of a second)(nuclear scale)
* 10^-34 kg m^2/s <= (10^-31 kg)(10^3m)(10^6 s^-1)(10^-12 m).
  (This is a real "ballpark" estimate.)

Good bye sweet world.

The wave packet is made of waves with different frequencies and hence different wave-lengths (L) and different wave numbers (k). So there is no fixed value for the momentum of the particle, regardless of its mass or size. The relation for a particle's momentum is p = h / L. But k = 2 pi / L, so p = (h-bar) k, where h-bar = 2 pi h. We have several different k's in there making up the packet, so we can't measure a particle's position or its speed very precisely. This is Heisenberg uncertainty compounded in a frightful manner. The Schrodinger wave equation shows how the packet moves and spreads as it moves. So you've got various momenta and a packet with a certain width. And then you have it zipping away at a football field per millionth of a second when you try to find it at the atomic level. So you have to widen the displacement to keep the momentum under control or come up with a creative new way of looking at things without disturbing them. The job of the observer becomes to keep shifting reference frames at a pretty good fuzz level so his whole universe doesn't go flying off to kingdom come. Then the Born interpretation (also called the Copenhagen Interpretation after some help by Niels Bohr) ends up suggesting that we can only have mathematical probabilities, the densities of which are given by the absolute square of the magnitude of the Schrodinger wave amplitude at any hypothetical position in space/time. Outside that we have no idea what's going on inside things. The wave packet itself is an arbitrary mathematical approximation since no one so far has told us how an electron is put together. The guts of an electron form a different topic covered in **Observer Physics**, ch. 11. It is surprising how well physics does given the sloppy situation at the microscopic level.

* P = (phi)(phi)*. (P is the probability density, phi is the wave function, and phi-star is the star wave, the complex conjugate of the wave function.)

The 20th century soon turned into a progressive meltdown of the old way of experiencing the world. We could no longer treat the world as a bunch of matter bumping and banging around. The old matter philosophy was anchored in a physical body, and support for that view was conveniently provided by battles and struggles, lots of hard work, physical oppression, and so on. Heavy resistance was the game. Power meant you had lots of weapons and could "force" things to be the way you wanted them to be. The gigantic world wars of the 20th century were the death throes of the matter-dominated view of the world. Quite a lot of that is still around, but things are changing fast.

In his special theory of relativity Einstein declared a major challenge to the scientific world. He claimed that the speed of light is a constant: (c) = 3x10^8 m/s. No matter-wave packet can go faster than (c). Then he showed that matter was essentially the same as energy by the relation E = Mo c^2, where Mo is the rest mass of a particle. This causes a rather depressing situation. We find ourselves trapped here on a tiny planet looking out with our telescopes at a huge universe. However, we are imprisoned in our little bodies made of matter and subject to a speed limit that keeps us here with a bunch of loose cannons who want to use E = Mo c^2 to blow us all up. There' s also another group of hedonists who want to use up all the global resources as fast as they can and foul the environment irrecoverably while they are at it in a kind of race to extinction. How many species can we thoughtlessly wipe out without wiping ourselves out too as a side effect? The nearest star system with a habitable backup planet is way out of our range. And it may be occupied already by creatures that would rather not be inundated with refugees. Furthermore, the speed limit declared by Einstein has been confirmed by many precise experiments from Michelson-Morley on down to today, so we really have to believe it, -- right?

Special Relativity tells us that if you start going very fast, when you get to relativistic speeds, drawing close to (c), things happen that prevent you from ever reaching (c), much less exceeding that speed limit.

* M1 = Mo / (1-(v/c)^2)^1/2. (Mo is rest mass, M1 is moving mass.)

According to this relation of velocity to mass that Einstein derived, the faster a

particle goes, the more mass it has. It takes more and more energy to boost the speed of your little physical particle made of matter-wave packets any faster as it approaches light speed, and to reach (c) would take an infinite amount of mass-energy. When v = c, the ratio becomes unity, and the whole expression in the denominator goes to zero, which renders the equation meaningless unless M1 can become infinite, which is not likely, or the rest mass Mo can become 0, which is the case with light. So Einstein' s equation suggests that whatever moves at c essentially becomes light and has no rest mass, while anything with mass must move slower than c.

But is this really the whole story? What if v>c? For example, suppose v = 2c. Then v/c = 2, and the denominator becomes (-3)^1/2, or (3^1/2 i). The mass M1 of the superluminal object shifts into the imaginary dimension (and so does Mo). This dimension is orthogonal to the ordinary "mass dimension". M1 at zero velocity is equal to Mo. Then it grows toward infinity as its speed increases. At light speed it reaches infinity, but suddenly jumps back to zero rest mass at c. Going beyond c the velocity goes to larger and larger multiples of c, and the mass of M1 goes to smaller and smaller multiples of Mo in the imaginary dimension. Its rest mass must be imaginary, and its moving mass is also imaginary. Sometimes these odd creatures are called tachyons. Tachyons always move faster than c, but no one has seen one -- supposedly. Another interesting aspect of this relativity equation is that it permits the possibility of negative mass in both the real and the imaginary dimensions. Even at subluminal speeds there is no reason that M1 and/or Mo can' t have negative values. Suppose v = .2c.

* Mo^2 / (M1)^2 = 1 - (.2c/c)^2 = .6.
* (+-)Mo / (+-)M1 = (+-) .6^1/2.

What negative mass and imaginary mass are (not to speak of negative imaginary mass!) presents an interesting question. Mr. Einstein never really gave an answer to these funny possibilities. Most physicists simply assume that part of the mathematical model doesn' t fit reality. But what kind of a model is it where you arbitrarily pick out the part you want and throw the rest away? This is the way our throwaway culture works. You go to MacDonald' s and buy a hamburger and fries wrapped in many layers of paper and cardboard. You eat the hamburger and fries and throw away all the bags and boxes and little sauce containers. The trouble is that the trash stays around and comes back to haunt you. Maybe we should put the funny masses on hold until we have explored all the options.

Personally I suspect that the negative masses represent mental phenomena. Negative mass is not the same as antimatter. Antimatter is matter running backwards in time. But it is still ordinary matter. A positron is an electron running oppositely in the time dimension. On the other hand a negative electron or a negative positron mass (not negative charge!) may be a mathematical representation of the notion you have in your mind when you see an electron or think about one. It is a mirror image of physical space in mental space. The imaginary superluminal tachyon mass of the matter or antimatter variety represents the shift of attention by the will in "imaginary" space. The tachyon mass at c is 0 in real mass and infinitely imaginary. As the attention moves faster and faster above c, the mass shrinks, becoming less and less imaginary. At infinite speed, it is no longer imaginary, and becomes real. This is a ninety-degree shift in phase space. The more relaxed you are, the faster you can shift attention (the lighter the imaginary mass is). If you are completely relaxed, you are completely real. The tenser you are (the more energy you expend on attention), the slower attention moves, and the more you move into imagination. Your world becomes less real. It takes a certain effort of attention to hold awareness focused on anything. Play with the equation and imagine how imagination works. Why shouldn' t the mental world follow mathematical laws just like the physical world?

The equations of special relativity use only high school math and the laboratory confirmations of relativistic effects are so ubiquitous, that no one ever questions Einstein' s declaration about the speed of light. He achieves the status of authority, which is fine until it leads us to accept his assertions without question.

But now things are coming to a head. We can no longer avoid the massive evidence that is staring us in the face. Our entire planet, pretty much all of human civilization, is in the process of undergoing a gigantic phase transition. The New-Age people intuitively sense this and speak of alien interventions, ascension, photon belts, Mayan long count transitions, and other strange things. (They believe that angels, aliens, or maybe Jesus, will come and save us from the mess we' re making.) Are these people nutcases? I don' t think so. They just don' t speak the language of science because most people can' t understand that esoteric dialect. Other people are using the transition as an opportunity to spread fear and seize power. (We are faced with a bunch of crazy terrorists, so we need to spend unlimited amounts of money and effort on security. Our organization will gladly help out for a very high price.) Yet another group of smart people is using the transition as an opportunity to make huge amounts of money by exploiting the general ignorance of the populace with regard to what is actually happening. (The media and electronics folks remind us that we need lots of

"handy" electronic tools so we can make a buck at the office. Then we need a little entertainment or life gets pretty dull, so we should go watch a TV show, or a movie, or play video games, or surf the net and grab some sexy pictures.) Strangely enough these three "industries" alone -- (religion/spiritualism, military/security, "communication"/entertainment) have far outpaced farming in the growth of the economy in spite of the fact that a large part of the planet' s population is still hungry.

Let me present a little theory (my beliefs) about the "transition" and then offer some evidence to support it.

To get a handle on the global transition we first have to bring some attention to an important concept in physics called "phase". A few sentences ago I mentioned a "phase transition". Phase is the condition of a system or a portion of a periodic system in space/time relative to some point of reference "external" to the system. Imagine a circle. What is a circle? It is a geometric figure defined in space by certain components with certain properties. One component property is a point that is called the center. Another is a curved line, called a circumference. The curve is equidistant from the center point at all points along its length. Another property of the curved line is that it is a closed curve. So we can think of a circle as a set of coplanar points that are equidistant from another coplanar point called the center that is not a member of the set and that have a phase reference point plus a non-coplanar observer reference point. There may be better definitions, but that will do for now. We can see that a circle has certain properties. A circle has a center point (a singularity), a radius (or amplitude, reflecting the property of equidistance), and it has a possible value in time if we "go around" the circumference. That, after all, is the Latin meaning of the word, "circumference". We can refer to that race as a period, or frequency, because the closed nature of the curve keeps you running around the same track over and over.

The circle' s phase is its position, relative to some reference point. Without that reference point our circle just exists as a potential in an unbounded vacuum. Without the observer viewpoint, we can' t even see the circle. The relative position of the circle is its phase. The phase reference point and the observer viewpoint can be the same point, but then we just see the circle in empty space from a certain viewpoint. If we are moving around on the circle or outside the circle or if we turn the circle somehow, we can distinguish different "seasons" or phases depending on where we are along the circle' s track. In this manner we speak of the seasons of the year or the phases of the moon. The moon looks different when it forms different

angles with the earth and sun. The earth is our observer viewpoint, and the sun is our reference point. You need BOTH these reference points to have phase. Just a reference point alone won't do. This is Observer Physics. The observer plays a critical role in the whole process. He provides a viewpoint from which to observe something.

So now we have a viewpoint for observing a circle composed of a closed curve that has dimensions in the form of amplitude, frequency, singularity (or zero point), and phase. That places it into our "real" world.

Now let's go back to our discussion of Einstein, deBroglie and the funny matter wave packets. Although Einstein declared that (c) is the ultimate, unreachable speed limit for matter-wave packets, he neglected to inform us about the full significance of the simple equations on which the whole edifice of his theory stands. Physicists notice this funny discrepancy, but just briefly mention it and then continue on with their discussions. (For example, see Feynman Lecture I.48 "Beats", sections 4 and 5 where he looks at localized wave trains and probability amplitudes for particles. Feynman works the equations a little differently than I will, but what he sees is the same thing. Then he shrugs and moves on. See also Feynman's II, 24-4, Hecht, p. 299, Harsany, p. 26, Herbert p. 68 et al., and so on.) Yet this critical feature of the equations is of vital importance for understanding what is going on right now throughout human civilization. We can no longer just sweep the math into a footnote or a casual aside and then move on. The equation is swallowing us for breakfast and most people have no idea what's going on, though they intuitively sense something weird is happening. Fortunately, as we shall see, it is a painless process if we relax and enjoy the ride.

So, let's derive the equation in a simple, clear format, and then we'll discuss its effects on our world and on our view of the world. (See **Observer Physics** for more in-depth discussion. The following two pages are based on a passage in ch. 6, "The ABC's of Awareness".)

An oscillation has an amplitude, wavelength (L), a frequency (u) or period (T = 1/u), and a phase. Fourier showed a general way in which we can represent any function as the superposition of a set of periodic oscillations (i.e. pure sine waves). If the oscillation has a time evolution, then it produces a train of waves that move along at a certain velocity. The train's velocity is the wavelength (L) times the frequency (u). Since this represents a displacement of the wave's phase through space over time, it is

called the phase velocity (Vp).

* Phase Velocity = Vp = (L)(u) = L / T = w / k, where (w) = 2 pi / L and k = 2 pi / T.

An electron can be interpreted as a wave packet -- a superposition of pure periodic oscillations with the appearance of a lump or packet that behaves like a localized particle moving about. When de Broglie formulated his notion of matter waves, he based his reasoning on the Einstein-Planck relations that show how the energy (E) of a photon depends on Planck's universal constant of wave resolution (h) times the photon's oscillation frequency (u). He also used Einstein's famous equation showing the mass-energy relation.

* E = h u.
* E = Mo c^2 (Einstein's formula, where Mo is the rest mass of a particle).
* Mo c = h u / c. (We combine the two equations.)
* u / c = 1 / L. (Where L u = c gives us the speed of light in a vacuum.)
* Mo c = h / L (We substitute in the phase velocity of light: Vp = c = L u.)
* L = h / Mo c. (We rearrange to solve for L.)

This is the de Broglie wavelength for a photon.

Now, taking (Me) as the mass of the electron and letting (c) become instead the velocity of the electron (Ve), de Broglie found a wavelength (Le) for the electron.

* Le = h / (Me Ve).

We can turn this around to express the characteristic matter-wave, or group-wave, velocity (Ve) of the wave packet that forms the electron.

* Ve = h / Me Le.

What does this equation mean? Think of an electron in orbit around a nucleus. It has angular momentum (Ln) that is restricted by the orbit to certain whole number (n) values:

* $L_n = n\ h / 2\ pi.$
* $L_n = p_n\ r_n$ (Momentum for the nth Bohr orbit, r is radial distance.)

We use the de Broglie relation as follows:

* $p_n = h / L_n$.
* $2 \pi r = n L_n$.

So simply said the electron moves with n (whole number) wavelengths per orbit and forms a stable standing wave around the nucleus.

Substituting the rest mass of any particle in terms of its energy, we get the matter-wave packet's Matter Velocity (Vm) in terms of light speed and a Phase Velocity (Vp), which simplifies the whole expression into the elegant Einstein-de Broglie Velocity Equation.

* $Vm = (h / L)(c^2 / h u) = c^2 / (L u) = c^2 / Vp$.
* $(Vm)(Vp) = c^2$. (The Einstein-de Broglie Velocity Equation)

Recall that (Vp) is the phase velocity (L u) derived above. This is the Einstein-de Broglie Velocity Equation stated clearly and unambiguously so you can see what is going on behind the smoke and mirrors of $E = Mo c^2$. Despite what people pretend, nobody really knows what mass and energy are. Velocity, on the other hand, is an observable that anyone can verify by simply opening his eyes and observing.

The Einstein-de Broglie Velocity Equation can also be called the Sommerfeld-Brillouin Velocity Equation, because they also derived the relation between group and phase velocities while studying the superluminal behavior of EM waves in plasmas around 1914. They noted that the phase velocity is the inverse of the group velocity. But de Broglie's matter waves make the relation much more general.

We can make a nice graphic representation of the Velocity Equation by going back to our circle. Draw a circle with a compass on paper or with a graphics application on your computer screen, and then draw a diameter. Next choose a point anywhere on the circle and draw a triangle connecting that point to the two ends of the diameter. This will be a right triangle. Now drop a perpendicular from the point you chose on the circumference down to the diameter. This perpendicular line divides the big triangle into two smaller right triangles. All three triangles are similar. Label the perpendicular line "c". Label the short portion of the diameter "Vm". Label the long portion of the diameter "Vp". When (Vm) = (Vp), notice that they are also equal to (c), and the semicircular disc divides into equal quadrants. When (Vm) = 0,

(Vp) becomes the whole diameter, and (c) degenerates to 0. When (Vp) = 0, (Vm) becomes the whole diameter, and (c) again degenerates to 0. Einstein arbitrarily declared that (Vm) had to be smaller than (Vp). Contemplate the little mandala you have drawn. It embraces the whole universe.

In the case of light propagating in an unrestricted vacuum, both (Vm) and (Vp) have the value of (c). However, in the case of light passing through a dispersing medium, or a wave-guide, or in the case of the electron or any other particle of so-called matter -- the maximum "matter" velocity of the matter-wave packet is always less than the speed of light. This makes Einstein happy. We just arbitrarily label the part of the system that appears to go slower than light speed "Vm". Nevertheless, it is simply an optical illusion produced by the interference of the various superposed phase waves (Dw / Dk). When you look carefully at the equation and accept Einstein' s other assertion that the speed of light is a constant (c), then you realize that if (Vm) must be less than (c), then (Vp) must be greater than (c) in order for the equation to hold. Most physicists tend to discount the phase waves as irrelevant, but they are not. They say phase waves are monotonous and lack all information content. Oh yeah? Look again at the equation. Look again at the mandala. Messages are sent with subluminal matter wave packets, right? Yet for every value of a (Vm) packet there is a corresponding value of a (Vp) packet. (We mean a non-local "packet" not an individual phase wave.) Einstein says the c' s are constant, although they seem to change the same as Vm and Vp on our little mandala. But if we **arbitrarily** hold (c) constant (by zooming in close or far away from the circle as observer), then any "message" that is encoded with subluminal matter wave packets has a mirror image superluminal message with the **same content** that is encoded with phase-wave packets. To say that an object or a message is limited only to matter-wave transmissions deliberately ignores the phase-wave reflection of the object or message that is demanded by the equation.

Here' s something else interesting. Suppose we say that the "c" dimension is an imaginary dimension. In our graph let the perpendicular direction be in multiples of (i). The way the Velocity Equation is constructed we always get a real value because (c i)^2 = -(c^2). The direction of (c) can be forward or backward in time. Here is another interesting result. If we consider "negative" mass, we get by Einstein' s mass-energy relation:

* E = (-Mo) (ci)^2 = (-Mo)(-1)(c^2) = Mo c^2.

We get a real and positive result for negative mass and "imaginary c", and the energy is the same as the relation computed with positive mass. The same thing can happen with Einstein's relativistic velocity equation. Because both sides of the equation are squared, the imaginary values may disappear and we can get a real ratio between M1 and Mo with the right combinations. You can work out the various possible combinations of positive, negative, real, and imaginary masses together with superluminal, luminal, and subluminal velocities. Here's an example with FTL velocity and the moving mass in imaginary-land.

* (M1 i)^2 = (Mo)^2 / (1 - (v/c)^2). (v>c)
* (3)(M1)^2 = (Mo)^2. (If v = 2c.)
* 3 = Mo^2 / M1^2.
* (+-) 3^1/2 = (+-) Mo / M1.

By the way, Feynman demonstrates that the appearance of imaginary wave numbers for a wave frequency has a physical interpretation and "means that the form of the wave changes -- the sine wave changes into an exponential." (II, 24-6) So the apparent "cutoff" frequency of a device may mean that it switches into a different modality. If you don't pay attention, you may miss what is going on and just toss out a valid mathematical description of something.

The matter-wave packet represents an object of the observer's perception -- usually. So where is the phase-wave "packet"? What if the phase-wave packet can occur in his consciousness as a thought? Huh? The phase-wave packet is the context within which the matter-wave packet resides. Multiplication of the two wave "packets" could represent the interaction of the two. We can call them thought and experience. In this case the interaction means the process of manifesting the truth. When the product of the diffuse non-local thought and the focused local experience are equal to light speed squared, everything matches. Perception through any of the senses is always an electromagnetic interaction, which means it is mediated by light, by photons. The (c)^2 in the equations represents the signal handshake that occurs between the observer and the object of observation across a separation of space. This is beautifully represented in our mandala. The light forms a spatial interface, and its wave front is orthogonal to the interaction of object and observer. Quantum mechanically this would be written as P = (phi)(phi)*, where P is the probability density and phi is a wave function and phi* is the complex conjugate "star wave" of the wave function. (See Wolf's **Star Wave** for an insightful interpretation of the quantum wave function in terms of consciousness.) We also can turn the entire

mandala into a quantum bubble of 4-wave mixing phase conjugation. But we do not have to go that far into quantum physics to get the gist of how our mandala works in ordinary experience. The Velocity Equation already shows us that we have two photons handshaking with orthogonal wave fronts in the imaginary dimension of our space/time -- a retarded one that goes from object to observer, and an advanced one that goes from observer to object -- all at light speed. The advanced one goes backwards in time, so the two photons (the phase conjugate photon-antiphoton pair) seem stuck together into one "particle" as they travel through space. (m / s) = (-m / -s). The terms retarded and advanced are arbitrary relative terms and not intended to reflect on the intelligence of the observer or what or whomever he is observing.

Our graph of the Velocity Equation does not show ordinary space/time, it shows the relative magnitudes of the velocities of the components of an interaction. When we detect a slow-moving material particle (the so-called "observable" matter-wave packet), we tend to miss the superluminal phase-wave "packet" that is associated with it (not to speak of the handshaking photon pair) because it is often all spread out on a much bigger scale. When we perceive photons, they are nicely superposed on top of each other in pairs. But under the dispersion influence of a wave-guide the two split apart and move at different speeds. We call the slower one the matter-wave packet. The slower the matter-wave packet, the faster the phase-wave packet moves. Most of the time our attention is very focused on slow-moving local matter-wave packets. That means our mind is filled with thoughts (the complementary phase-wave portions.) If our attention holds very still on a matter-wave packet, its corresponding phase-wave "packet" fills the entire universe. The mind expands. If we also are sensitive to the wave front, our imagination expands orthogonally into the "light" dimension. Is this enlightenment? Maybe we should take up meditation. Study the equation. Contemplate the mandala.

Physicists tell us that phase waves are dumb and utterly monotonous and carry no energy or information: "Ultimately it is the monotony of phase waves that prevents them from carrying signals." (Herbert, p. 75) Meditation is boring, too, right? Common examples physicists give of real-world phase-wave packets include moving signs on theater marquees or waves flickering across an oscilloscope screen. There are also interesting phenomena of EM phase waves moving superluminally through plasmas and other dispersion media. This should clue you in to what really is going on. Those devices are neither dumb nor monotonous. Viewed properly they can carry a great deal of interesting information. Our whole information explosion is based on the electronic media. However, to appreciate this, we, as observers, must

shift our viewpoint from focusing attention on the localized temporally modulating matter-wave packets to "defocusing" onto the non-local, spatially modulating, superluminal phase-wave "packets". The phase-wave packets are non-local by nature. So it is of no use to set up experiments based on serial, digital viewpoints, when the message is spread out spatially in a global, parallel transmission. This is the fundamental problem with the EPR experiments and all the other arguments that try to show the impossibility of superluminal communication. From the matter-wave viewpoint we process information serially in the temporal dimension. From the phase-wave viewpoint we process information simultaneously in parallel across the spatial dimension. This requires the observer to take a viewpoint orthogonal to and transcendental to the spatial plane that acts as the wave-guide. I would like to know why the scientific establishment has spent so much time and energy trying to prove that superluminal communication is impossible when it is a common ordinary phenomenon that everyone experiences. They even established a totally arbitrary border guard postulate called COP to keep people away from this unhealthy area.

The observer's awareness is a transducer that can perceive information with equal facility in matter-wave, phase-wave or light-wave format depending on the modality of attention selected by the observer.

If we try to send a message from point A to point B across space with a series of modulations, the message can only travel via the "group" wave packet modulations. Each phase wave that travels between A and B, regardless of its velocity, is completely regular and devoid of information, just as physicists point out. All the information of the phase wave "packets" is to be found distributed spatially across the interval between A and B along the medium of transmission, the wave guide, as a diffuse non-local pattern of wave interference in space rather than a little local bundle. In other words, you must rotate your attention ninety degrees from the transmission medium (or carrier wave) and perceive the entire length of the wave-guide at once rather than trying to pick up impulses as they come out at one end of a transmission link. This may also necessitate a significant shift of viewpoint perspective on the part of the observer. The group-wave packet and the phase-wave packet form a complementary pair. If one is local, then the other must be non-local. Together they fill space. BOTH are made from superpositions of infinite, monotonous sine waves. The message is not on any particular sine wave just like a sentence is not based on a single letter. It is in the combination of a set of such waves arranged in a certain way in space/time. Whether the signal is experienced as temporal or spatial depends on the observer's viewpoint. The timelike signal will always be subluminal

by its very nature. And a lightlike signal will be luminal. Attempts to read a truly spacelike signal in a timelike manner will also fail unless the observer rotates ninety degrees and reads the message subluminally. You can walk down the street and enjoy the view a step at a time, or you can stand back orthogonal to the street at a distance and see the whole street in one glance. It' s just a matter of perspective and personal preference.

The so-called Kramers-Kronig relation that trades off absorption and dispersion is certainly true, but acts as a red herring when used to "prove" that superluminal communication is impossible via temporal, serial communication links. That is a non-issue if we are viewing from a non-local, spatial viewpoint.

An example of how the K-K relation works is as follows. Suppose you flash a light at a certain time. Before and after that flash time the sine waves that make up its wave packet all cancel out. Couldn' t someone awaiting that signal have a special filter that would screen out waves in such a way that he could pick up the light impulse ahead of time? "Yes, you could," say K-K, but their relation says that when his screen absorbs the waves in this way, it will also disperse them in such a way that it changes the phase velocity. His filter is a wave-guide and acts as a dispersion medium. It will adjust the phase velocity so that he ends up seeing the flash precisely at the proper time and not before hand. You can see from this example that the K-K relation is not relevant to our argument. It depends on looking at a signal from the localized, serial, temporal viewpoint.

Go back and reread the passage quoted from Ursula Le Guin about the ansible at the beginning of this article.

We are now experiencing a global phase transition from habitual focus on matter-wave modality to habitual focus on phase-wave modality. And some people are becoming proficient in both modalities and light-wave modality too. What is the evidence for this? Just look around. The evidence is very evident. You are reading this article. Probably you are looking at a computer screen. Movie screens, TV screens, and computer screens are all wave-guides that operate in phase-wave modality when they interface with the observer. Many of you currently spend a major portion of your waking lives experiencing in phase-wave mode, and you don' t even realize it.

How do phase-wave experiences differ from matter-wave experiences? Their

properties are fundamentally different.

* Matter-wave packets are subject to mass and forces. Phase-wave packets are massless and therefore not subject to forces or any of Newton's laws, including gravity.

* Matter-wave packets are subject to the laws of special and general relativity. Phase-wave packets are not, so a phase wave can easily accelerate from 0 to (c) and on up to infinity without blinking an eye. Phase waves, being massless, can also pass right through black holes without getting either trapped or squeezed. Pretty cool, eh?

* Matter waves require increasing amounts of energy for greater accelerations according to the Einstein relations. A phase wave requires no or almost no energy for acceleration, and has no range limits other than the size of its universe and its guide. Its universe can be its guide.

* A phase wave will faithfully follow the direction of its guide, while a matter wave may jump the track.

* Wave functions are deterministic, but particles (matter-wave packets) are randomly distributed, abiding only by the probabilities of the wave function.

* Matter waves always stay under the c speed limit. Phase waves have no speed limit and you can make them jump about as you please on the wave-guide.

* According to the Velocity Equation, the slower the matter waves go, the faster their corresponding phase waves go. In some situations the phase waves can appear to go slower than the matter waves. For example, when a fan turns at certain speeds you will see a ghostlike fan rotating at slower speed, sometimes even backwards. Turn off a fan and watch phase waves alternately rotate forward and backward as the matter-wave fan blades slow down. These are lower harmonics of the superluminal waves that are too fast to see with your eyes. Another example is a caterpillar that moves forward slowly while ripples move backward along his body. Again, our eyes can only perceive a lower harmonic of the interference patterns as a phase velocity.

* Matter waves can hurt your physical body. Phase waves don't hurt but might

cause your body to start looking like a potato if you don' t keep your matter waves in shape.

* Compound matter waves are limited by the phase transition rates defined by their interaction rules (regular physics). Compound phase waves can morph freely with no restrictions as to size or shape other than that they require a wave-guide (phase-wave physics). Matter waves also require wave-guides, but they are much more restricted.

* A very "slow" phase wave packet or infinitely fast "standing" phase-wave packet (viewed orthogonally) becomes a mental image in the observer' s consciousness. When an observer identifies with a slow phase wave (or any phase wave) it becomes either his matter-wave "body" or his object of attention (or both).

Learn to read the future with a crystal ball wave-guide. Place a ball made of clear glass or crystal over a capital letter "W" in a text. Observer the letter from about 15 cm above the ball. (The distance varies with the size of your ball.) Through the ball you will see the letter, somewhat magnified. The letter is in the object plane phase. Now slowly lift the ball straight toward your eye, focusing on the letter in the center of the ball. The letter will expand, bulge, distort, and then explode and disappear into a completely diffused fuzzy gray field or some fuzzy loops. This is the Fourier transform plane phase. If you keep drawing the ball upward toward your eye, you will see the gray field draw back together and reform into a letter "M". This is the image plane phase. Such a simple lens is an optical computer capable of phase-wave spatial modulations. The glass ball moves as a matter-wave packet. The light waves move at c. The object-image transforms and modulates in space as a phase-wave packet. The entire light field moves with all its component waves shifting in concert. Thus the individual bits of information that form the phase-wave image are not subject to speed limitations. Your eye receives all the information in the space at one instant as a holistic image rather than getting a transmission bit by bit at a pokey speed limit.

Each of the three worlds embodied in the Velocity Equation has its value. The imaginary vacuum world of pure light exists eternally beyond time and space and simply is, quietly embracing, interpenetrating, and enlivening all phenomena. At the single photon level it is coherent and always has perfect phase conjugation in space/time. Because the imaginary photon is a gauge boson, any number of photons can become mutually coherent and form macroscopic quantum bubbles of any size.

A photon's supposedly constant "velocity" has no standard and is nonexistent from its viewpoint. Only matter beings perceive light speed as a constant, and they experience it as a pair of overlapping conjugate velocities. They only detect photon velocities relative to absorption and emission terminals such as electrons. Lacking those, a photon's velocity is indeterminate. Denizens of the matter world live and evolve in localized habitats, and bound time frames, undergoing small-scale transformations as a series of vaguely point-like sensory flashes. Due to a special property of nucleons (which is another discussion) matter has the ability to appear as stable physical structures that exist and develop in time. The phase world is a dreamlike shape-shifting fantasy (sometimes called the astral world of thoughts and dreams) with no limitations. Phase beings can morph at will and feel no pain. They can travel and communicate freely anywhere in creation with no boundaries. But if they are to become experiential to a matter being, they must be perceived through the medium of a wave-guide. New-Age people humorously call this mode of perception "channeling". Movie screens, TV screens, and computer screens are nice practical wave-guides that are tuned to phase-wave modality.

Get into your favorite computer action game. The figures in better games nowadays move very realistically. But if you look closely, you will note that Lara Croft does not properly follow the laws of gravity or the other laws of Newton. Also, action figures in cartoons, computer games, and computer-generated films have unlimited morphing ability, unlike your current physical body. Watch a car or a plane on TV. It seems to move at high speeds, but you feel no accelerations or decelerations. When Starship Enterprise activates its warp drive, you observe acceleration to well over light speed, but feel no unpleasant side effects. In your computer game you can even die many times with virtual blood all over the screen, and then your avatar gets up again like a cartoon character and resumes the "fight". Matter beings killed in battle don't just get up and continue fighting. They have to go build another body first, or whatever you believe they have to do. The killed body lies there and decomposes according to the matter-wave laws of chemistry.

Go to an appliance store and observe the shelves of TV screens all showing the same program at once. This is superluminal phase-wave reality. The experience is spatial more than temporal. Watch as the scene changes. Flash! And you are in another place, or time, or viewpoint. All the screens on the shelf change at once, instantly and simultaneously, and in all their details. The cathode ray tube inside each specific TV operates in matter-wave modality. But the observer sees and processes the screen images in phase-wave modality. Imagine millions of people

watching the same show all at the same time, but in different spatial locations all over the country, all over the planet. To say phase waves transmit no energy is a joke. How much energy is transmitted when a million people laugh at a funny scene all at once, or when they cheer a Super Bowl touchdown, or when a late-night infomercial garners 10,000 orders for Golden Hits of the 60' s. Somebody' s taking you for a ride when they claim that phase-wave "packets" carry no energy potential.

Do you get what I' m talking about here? We are already living to a considerable extent in the world of the phase-wave spatially modulating avatars, and most people don' t even know it. The populace is being sold all kinds of media appliances, expensive gadgets and entertainment. The promoters of these clever devices do not let their customers know that the key is just a shift of your own viewpoint and does not require buying all the gadgets and stuff. Once you know how to shift your own attention instead of depending on the network programmers, you' ll have no problem keeping yourself fully entertained.

That' s why Harry Palmer talks a lot about "avatars". That Sanskrit word describes a deity who creates a world and then assumes an identity, jumps into his world, and plays around in it for a while. Palmer is not promoting an Indian religion. Nor is he talking about cartoon characters used on the Internet -- albeit these two examples also fit the definition. He is telling people to wake up and experience the fantastic phase transition that is going on all around them. He has created some mind tools so you can experience it all for yourself and don' t need all the electronic gadgets, high-tech physics, and so on. Of course there' s nothing inherently wrong with the gadgets, but why not be aware of what' s really going on?

Now we have derived an elegant Velocity Equation and found some evidence supporting its reality. Let' s develop the concept further by starting with a simple, but very general, physical model and explore how a wave-guide works and its role in the equation as well as its role in our evolving civilization.

"In a nutshell," Weinbaum said, "ultrawave is radiation, and all radiation in free space is limited to the speed of light. The way we hype up ultrawave is to use an old application of wave-guide theory, whereby the real transmission of energy is at light speed, but a quasi-imaginary thing called phase velocity is going faster...."

-- James Blish, "The Quincunx of Time," 1973

Let' s start with a simple wave-guide called a microwave klystron. We will use a

long rectangular tube. Such tubes are not good as guides for visual light because the wavelengths of light are too short for the tube to disperse the light. Look through any tube or pipe, and you'll see it has no noticeable effect on your vision other than to narrow it down to a small area defined by the dimensions of the tube.

The dimensions of the klystron are important relative to the frequency of the microwave impulse we send through it. We can roughly represent the course of the microwave impulse as a photon zigzagging down the tube, bouncing back and forth from wall to wall. Of course, the photon travels at the speed of light. However, because it is bouncing back and forth as it goes, its actual progress down the tube will be noticeably less than light speed. This is the "matter" or "group" wave velocity. So where is the phase wave? As the photon moves along, it generates a wave front that is orthogonal to the trajectory of the photon. This wave front interacts with the wall of the klystron and strobes up and down the tube's length as the photon bounces diagonally back and forth across the tube's width. (Now you Harry Potter fans know where Diagon Alley is.)

The klystron's walls are parallel. The wave front is at right angles to the photon trajectory. So we get a right triangle with its hypotenuse representing the phase wave's progress along the wall as the wave front interacts with the wall. Take one diagonal zig of the photon at speed (c) as one side of the triangle. The forward progress of the photon down the tube forms one side of a right triangle projected along one klystron wall, and a larger similar right triangle shows the phase wave progress along the other klystron wall. You can use either wall for either measurement; just be consistent. The phase wave's progress along the wall is longer than the photon's forward progress relative to the tube, and is also longer than the photon's diagonal zig. The phase wave progress is the hypotenuse of the triangle formed by the photon's diagonal zig, the wave front, and the section of the klystron wall stroked by the wave front. The relationship of the Velocity Equation is very clearly expressed by the two similar triangles. The ratio of the photon's forward progress down the tube to the photon's diagonal zig equals the ratio of the photon's zig to the phase wave progress along the wall. Work out the geometry and the ratios and you will see the Velocity Equation. Since the time interval is the same for all, the velocities are also just relative spatial intervals.

Actually the klystron operation is not quite that simple. The frequency stays the same as in open space, but when the microwave enters the tube, the wavelength increases by the ratio: u = Vp / Lg, where Vp is the phase velocity and Lg is the

wavelength in the guide. So Vp gets faster than c, and Lg gets longer than Lo (the wavelength in open space) to compensate. Also, in the same tube low frequency has a slower group velocity than a higher frequency. There is a certain cutoff wavelength. At that point the photon pulses just echo back and forth across the tube and make no progress down the tube. When the group velocity becomes 0, then the phase velocity becomes infinite. The orthogonal wave front goes straight down the tube. Since the klystron is designed to carry the signal on the group wave, no signal comes out of the tube when it is in cutoff mode.

Another point to keep in mind is that the microwave impulse arises from a point source that radiates an EM bubble in all directions. Bouncing off the klystron walls, the waves interfere with each other, canceling all but the resultant path that the photon follows. Also, each time the photon packet hits a "wall" it actually is absorbed by an electron and then re-emitted. (This sets up the K-K absorption-dispersion relation.) So the EM waves are actually scintillating back and forth as countless bubbles in the tube. They even propagate backwards to generate the conjugate photon path. That gives us the other (c) in (c c). But, again, as Feynman shows in QED, the bubbles all cancel out leaving the optimum path as the one with the most constructive wave interference. So we can ignore all the bubbles and reflections and look at the simple equation that shows the outcome of it all. But the key point is that if we wish to experience the superluminal signal as more than a superfast strobe and extract a message from it, we must adjust our viewpoint so we look from a non-local perspective. We must rotate our attention ninety degrees and take a viewpoint that is more like the entire klystron tube itself. Then we feel the message as patterns of subtle wave fronts tickling us all over inside our "body" the way the ocean' s waves lick an entire beach. Does that sound crazy, or do you get it?

Go to the movies, and observe the screen. The screen is your klystron wall. The beam from the projector lights up the whole screen at once with little photon scintillations like the photon bubbles that interact with the klystron wall. The frames of film and the shutter move so slowly compared to the photons that we can consider them to be almost at rest (Vm ~~ 0). The photons that go from the projector to the screen and from the screen to your eye travel at light speed c. This is like the zigzag path of the photon in the klystron, except that our movie klystron is in cutoff mode. The beam is essentially orthogonal, simply bouncing back and forth between projector, screen and eye. If the beam is orthogonal, and the matter (group) velocity is close to zero, the phase velocity must be essentially infinite. The images of the movie appear on the screen spatially and virtually instantaneously. The whole screen lights up at

once with a pattern. Phase modulations of the images can appear to pulse across the screen at any speed, far faster than either the film or the photons. For example, a whole line of dots in a row across the screen can light up at once, giving the impression of a solid line. The line across the screen can be thought of as a dot-shaped phase wave moving spatially at infinite speed. The screen is small enough that it becomes your whole universe. At your scale and at a distance of say 10 meters, your eyes can hold the entire space of a large movie screen within your field of vision without any strain. The movie screen was deliberately designed that way by the impresarios of the new phase-wave civilization and their human factors ergonomic engineers. As you watch the movie you have the marquee effect of little dots scintillating all over the screen in different combinations just as they do all over the klystron wall. We interpret the klystron microwave in our generic example as a simple phase wave stroking up and down sections of the tube. We know from close analysis that there is just a glittering array of electrons absorbing and emitting photons on the movie screen. Nevertheless your mind interprets the scintillating screen as a movie, and you identify simultaneously with the whole image, just as Shrevek explains in the passage quoted at the beginning of our discussion.

Physicists are afraid that "causality violations" brought on by FTL (faster than light) activities will disrupt the orderly functioning of the universe, and have declared a COP (causality ordering postulate) to maintain law and order. They say that you can not change the temporal ordering of event pairs (something occurs between point A and point B) when they are timelike (subluminal) or lightlike (at light speed), but spacelike (FTL) event pairs can go either direction and so should not be allowed. Will phase-wave civilization lead to the collapse of causality? In a way, yes. But in another way, no.

You can have as many movie versions of a historical event as anyone bothers to imagine and then record on film. Furthermore, any event pair goes both ways in space/time. Which way it appears to go depends on the viewpoint of the observer. A person made of matter sees antimatter as going backwards in time. A person made of antimatter sees matter as going backwards in time. Actually what you have is a matter-antimatter quantum bubble handshake in space/time. All events go both directions in space/time. We see this clearly in the case of photons that always travel in pairs that handshake across space/time.

An ordinary top provides a "spatial" example of this principle. When a top spins, it has an absolute motion relative to the whole universe that generates the appearance of

a linear axis running through the center of the top. The top's spin is a bubble of kinetic energy in space/time that loops around in a tight circle. The top's axis is a vector normal to the loop that can't make up its mind whether it points up or down. As the top spins on the floor, its axial vector goes simultaneously in two opposite directions. It is a spatial "handshake" just like the handshake of its rotational spin or the handshake of a photon pair. Furthermore, there is no difference with respect to spin orientation between an ordinary kiddy top and a spinning electron. They both have axes that are oriented 50% up and 50% down. The top has no preference for which direction to spin. In free space it would just spin. On earth, however, the gravitational curvature of space/time "causes" a secondary rotation to occur. A rotating object in 3-space has only two possible simultaneous rotations. The secondary rotation is the top pivoting on its axis and falling over. Angular momentum of the top's primary spin (which is much faster) translates the fall of the top into a precession. The top wobbles as it spins. The direction of the wobble depends on its direction of primary spin relative to the secondary rotation. Only then does the top have an idea which way is up and which way is down. Before then it is in equilibrium. If you spin a top clockwise, it precesses clockwise. If you spin it "backwards" (anti-clockwise), it precesses anti-clockwise. If you spin the top clockwise on a glass tabletop and look up from below, you will see the top spinning anti-clockwise and precessing anti-clockwise. **Spinning a symmetrical top "backwards" relative to a secondary rotational influence is the same as turning it "upside down".** Now you can understand the "mystery" of the so-called two-state quantum spin of an electron. It is no different from that of an ordinary top. The mystery is why physicists don't clearly explain the motion of ordinary tops, not why students can't understand the quantum spin of electrons. An electron in free space has no particular orientation. Electrons in a magnetic field behave just like tops in a gravitational field and orient themselves randomly with half spinning one way and the other half spinning the other way. There's more to electron spin, but the key point here is to understand the nature of axial rotation.

The axis of a top is a spacelike FTL structure that manifests instantaneously at all points throughout the top's center of "mass" when the top is set spinning in some orientation. It is a phase-wave phenomenon and represents the spatially extended zero-point of the spinning top. It is "causal" in the sense that you make it happen. You can also determine its orientation by how you spin it relative to any field that influences it. (Unfortunately you can't do that with an electron, because it is already spinning.) The axis is non-local in the sense that its whole length appears at once instantly when the top starts to rotate. You may say it is a mirage, but the top has

mass, and you will feel forces that differ at any distance from the axis if you are on the top. The still point is at the center. (You can use a playground carousel to get a feel for this.) The superluminal axial "vortex" is held in "place" so long as the momenta of the environmental components remain in dynamic equilibrium. The axis also has a vector potential oriented either "up" or "down" with no preference until a secondary outside force is applied to rotate it like a lever.

This is actually the general situation for all phenomena that we experience as "lines". We can interpret any line as a spatially modulated point. Of course solid objects are just extensions of a point modulated in three dimensions of space.

Causality has no problems with spacelike operations. **In order to handle a non-local object (any "point" extended in a spacelike manner) an observer must expand his own viewpoint until it is larger than the object he is observing.** Causality is always preserved because the observer can not violate his own integrity of viewpoint without disrupting his viewpoint with unannounced viewpoint shifts. You can' t pick up a stick if you are sitting on one end of the stick. Try it. If you are standing on the ground and the stick is also resting on the ground and is at a scale within your range of strength and arm reach it is not difficult to pick up a stick. You can travel all you want in time and space, but you can' t kill your grandfather except in a hypothetical phase-wave manner. Killing your own grandfather involves not a causality violation, but an integrity violation. You can' t violate your own integrity (your definition of who you are) without ceasing to be who you have defined yourself to be -- by definition. For example, you could make a video game called "Grandfather Terminator". People could go on endless adventures killing their virtual grandfathers. The connection between the virtual grandfathers and the real grandfathers is one of pretense, hidden, imaginary viewpoint shifts. So the physicists can relax and let the COPs retire from the beat. Causality is a myth and does not need to be protected. Each observer will look after his own integrity. If not, he will experience that his world is very unstable and turbulent. Some people like instability and turbulence, so they do not care much about integrity. From chaos theory we know that we can see moments of turbulence between stable states or moments of stability between turbulent states. It' s just a matter of viewpoint and what you prefer to put your attention on.

Time travel happens all the time in the movies. "Back to the Future" is a nice example. The screenwriters who conceived the film got creative ideas. Where did these creative ideas come from? Creative ideas come from the future. How do we

know? Creative ideas are like seeds and they grow into the future. They don't come from the past, so they must come from the future as a temporal "backflow". The manifestation of the creative idea into physical form is the forward temporal flow. The screenwriters tap directly into the market of the future to figure out a movie script that many people will want to watch. The phase-wave scenarios that they create are virtual realities selected from a field of all possibilities. Some are more suited to a particular space/time environment than others, but all can potentially occur. Therefore quantum causality becomes the total responsibility of each observer. His choices of viewpoint, scale, object of attention, etc. are all his choices.

Local (pointlike) events can be viewed from a pointlike perspective, and are then subject to the limitations of "causality" and timelike-lightlike rules. Pointlike timelike transmissions from A to B are always bidirectional and always handshake in both directions in space/time, but signals sent from A to B always seem to be subluminal or at best luminal. This is nothing more than an artifact of the observer's self-defined viewpoint.

You are now participating in the new phase-wave civilization whenever you watch a movie, a TV show, or play with your computer or otherwise engage with the media. Watch very closely. Observe the whole process of watching TV. Go to your computer and write email, surf the net, play a video game. What's going on here? The photons themselves always travel at (c). The electrons all travel at less than (c). But the phase waves that flicker about on the screen create virtual mental images that modulate spatially and have no speed limit other than the refresh rate of the screen, which can be engineered any way you like. Your eye constructs the whole image in one shot like an optical processor doing global Fourier transforms. In fact that is what it is. So for humans the engineers only have to keep the refresh rate of the wave-guide screen above the threshold of your eye's refresh rate, and the flow of action looks "real".

* (Vm)(Vp) = c c.

Welcome to the amazing world of observer physics and phase-wave civilization. Don't limit yourself to what the electronic media people sell you. Observe your "real" world with full attention. You may be surprised at what you find.

PS: When did this phase transition start? I suspect the deliberate sending of phase-wave messages began with the invention of primitive art and architecture, perhaps 10-

15,000 years ago. The next major step was the invention of writing about 6000 years ago. Look at a page in a book or a picture on your wall. For a long time drawing, sculpture, and writing were about all the phase-wave communication technologies we had, although people have always used their eyes to capture entire fields of environmental information instantaneously. Some cultures were more aware of the phase-wave modality than others. The invention of printing accelerated the growth of phase-wave communication. Books freeze entire highly complex phase-wave messages as standing waves in an area of space so you can review the message many times. Books are spatially modulated wave-guides that you read by setting your line of vision orthogonal to the page. Speed-readers grab a whole page visually at a time. Pokey readers can go a letter or a word at a time. We speed-read now with recordings and fast forward buttons. Ensemble music production is also a phase-wave art form in the medium of sound.

The shift into phase-wave communication really accelerated with the discovery of electricity and of how to manipulate it. The 20th century marked the beginning of the rapid global transformation of life on Earth. We are now going into the critical light-speed phase of the transition, where more and more awareness crosses over the light barrier and shifts into phase-wave mode. In about a decade most of the planet' s populace will be shifted into what the New-Age people call the "ascended" state. Maybe it just means we' ll have lots of couch potatoes sitting around playing video games and watching movies. Maybe our loose cannons will resist the future and blow the planet way back into the struggle-filled matter-wave era of the past. Or maybe we' ll loosen up as a species and create a dynamic real-life phase-wave environment where you can morph into whatever life you would like to experience. What do you think? Any other movies you' d like to watch or be in? What would you really prefer?

PPS: Here' s another little experiment in phase-wave physics that you can do. I bet Einstein never tried it. Put a CD by Ahura on your stereo (optional) and do some Sufi whirling. As you turn, stretch your arms out and put your attention on one hand. That helps prevent dizziness. You are probably not used to this type of motion. Your hand will be relatively motionless. Everything "outside" your body will become a phase wave swinging around you. Do this exercise on a clear night outdoors and you will see the galaxies wheeling about you at millions of times the speed of light, except for one motionless star that is directly overhead. Motion is relative. This experiment allows you to observe the complementary phase wave to the top' s silent axis. You become the top and establish your observer viewpoint in

the silent axis. Then you see the world from a top' s point of view. Relax and enjoy the experience without straining. When you finish, wind down gradually and then stop. Put both hands together and then slowly draw them in toward your eyes. This makes you go cross-eyed for a moment, but helps prevent astronaut sickness. Generally when you move about you see the environment closest to you move by the fastest, and objects farther away appear to move slower. The most distant objects in the universe seem to form a motionless frame within which you move. That is all an illusion. Sufi whirling shows you the other pole of motion where the farthest object moves the fastest and the nearest object becomes motionless. Compare the two poles and feel the difference. Living organisms are anomalies. Most objects in the universe, from the smallest subatomic particles to the largest galaxies rotate all the time. That is their fundamental kinetic modality. Almost all their additional motion is precession derived from a secondary spin. All other motions are due to random quantum fluctuations of the vacuum and perturbations due to interactions with various companion objects, including various orbital motions.

* You may want to read more about phase waves and other superfast aspects of physics mentioned in this article, plus others we didn' t mention. A good starting point is Nick Herbert' s little survey, **Faster Than Light**, especially ch. 3 and 4 (phase waves), 5 (advanced waves), and 7 (tachyons). New York: Signet, 1988. (The sci-fi quotes I used are taken from that book. So special thanks to Nick for collecting them. He has a bunch more in there, as well as a nice bibliography of both real science and sci-fi.)

Some other useful references:

* Feynman, Richard. (With R. Leighton and M. Sands.) **The Feynman Lectures on Physics.** I, 48, 4-5, "Beats". II, 24 "Waveguides". Addison-Wesley, 1963. This three-volume work is a classic.

* Harsany, Stephen. **Principles of Microwave Technology**, especially Ch. 4.4, "Rectangular Waveguides". Prentice-Hall, 1997.

* Hecht, Eugene. **Optics**, 3rd Ed, especially ch. 7.2 "The Addition of Waves of Different Frequency." (7.2.1 = "Beats" and 7.2.2 = "Group Velocity".) Addison-Wesley, 1998.

* Radin and Folk. **Physics for Scientists and Engineers.** Ch. 46. Prentice-Hall, 1983. This is just a pretty good college text that I took the football example from.

* White, D.A. **Observer Physics: A New Paradigm**. (Vol. I, Ch 6, 11.) DeltaPoint, 2002.

* Wolf, Fred Alan. **Star Wave: Mind, Consciousness, and Quantum Physics.** Collier-Macmillan, 1984. Wolf does some excellent pioneering in this book.