SIGNIFICANCE OF THE ROMANEK EQUATIONS
By Dr. Claude Swanson
July 1, 2012

INTRODUCTION

The so-called Romanek Equations arose from a UFO contactee case in which Mr. Stan Romanek, who has severe dyslexia and a grade-school knowledge of mathematics, wrote in his sleep and under hypnosis a series of complex equations. There are many aspects to this case, since there are numerous supportive witnesses and a wide variety of anomalous events, including craft seen by multiple individuals, implants and videos of non-human visitors in the house.

Some of the equations have been made available by Stan on the Internet and have been discussed on various blogs, as well as being analyzed by UFO researchers. A number of these equations have been analyzed by University of Nebraska physicist, and consultant to MUFON, Dr. Jack Kasher (Kasher I, II, IIa, III, IV). This present analysis should be considered as an addendum to that excellent research. In this paper we try to understand some of the aspects not discussed by Dr. Kasher. We highly recommend that the reader review his earlier documents to appreciate the many dimensions of the case. There are still several Romanek equations which are not understood, so research is continuing.

While the interpretation of some of the equations is still not clear, it appears that many of them relate to methods of manipulating what Einstein called the "metric of space-time," the curvature of space. The Romanek equations point toward a possible technology for faster than light travel. Some of them relate to theories of "antigravity" and potentially a way of creating what some scientists have called "warp drive" (Alcubierre, 1994).

The notation Romanek wrote beneath one of his sleep equations was later decoded to read "zero point propulsion," indicating that the zero point energy of the vacuum made the propulsion possible. Remarkably, the equations on the same page were found to be consistent with this idea, and may indicate a way to achieve it. We have been able to interpret these equations because several of them have been published previously (Puthoff, 1996, 2001, 2002), (Dicke, 1957, 1961), and (Alcubierre, 1994). Some of the equations may relate to aspects of quantum gravity and zero point energy (Kasher I-IV).

The fact that several of Romanek's equations have been previously published by others has been vital in understanding and decoding them. Without this it would have been impossible to understand their meaning. Unfortunately, this also opens up the question of whether they could have been copied, and whether that may explain their origin. This question must be examined objectively by researchers.

Analyzing a case like this using equations alone is always subject to an interesting conundrum: If the equations confirm existing science, then

<u>copying can be charged. If they differ from existing science, then the meaning and validity of the equations themselves may be difficult or impossible to understand.</u>

In this case the equations are based on published theories which are non-standard, which are not accepted by mainstream physics. Many of them convey a similar theme: the possibility of manipulating gravity and space-time in order to achieve faster than light propulsion and possibly antigravity. **<u>What is most striking is that these equations represent one of the only known alternative physics theories, consistent with experiment, which might allow faster than light travel</u>**.

To me, this is one of the extraordinary aspects of these equations. They appear to be consistent with experimental data, and yet they appear to offer solutions which might allow faster than light travel. These equations may contain a missing secret to twentieth century physics. They imply that it may have taken a "wrong turn" in focusing on the geometrical interpretation of Einstein's equations. Instead, these equations suggest that gravity may have a hidden electromagnetic nature, and this makes it possible to manipulate it in ways not possible if one sticks to Einstein's original equations. In other words, these equations contain remarkable content, which seems to be far beyond Mr. Romanek's ability to invent or even recognize.

As research has progressed in recent years it appears that many of these equations are connected conceptually. There is a consistent theme that runs through many of them: gravity and space-time can be manipulated. This may make faster than light travel possible, which may make it practical to traverse the vast interstellar distances.

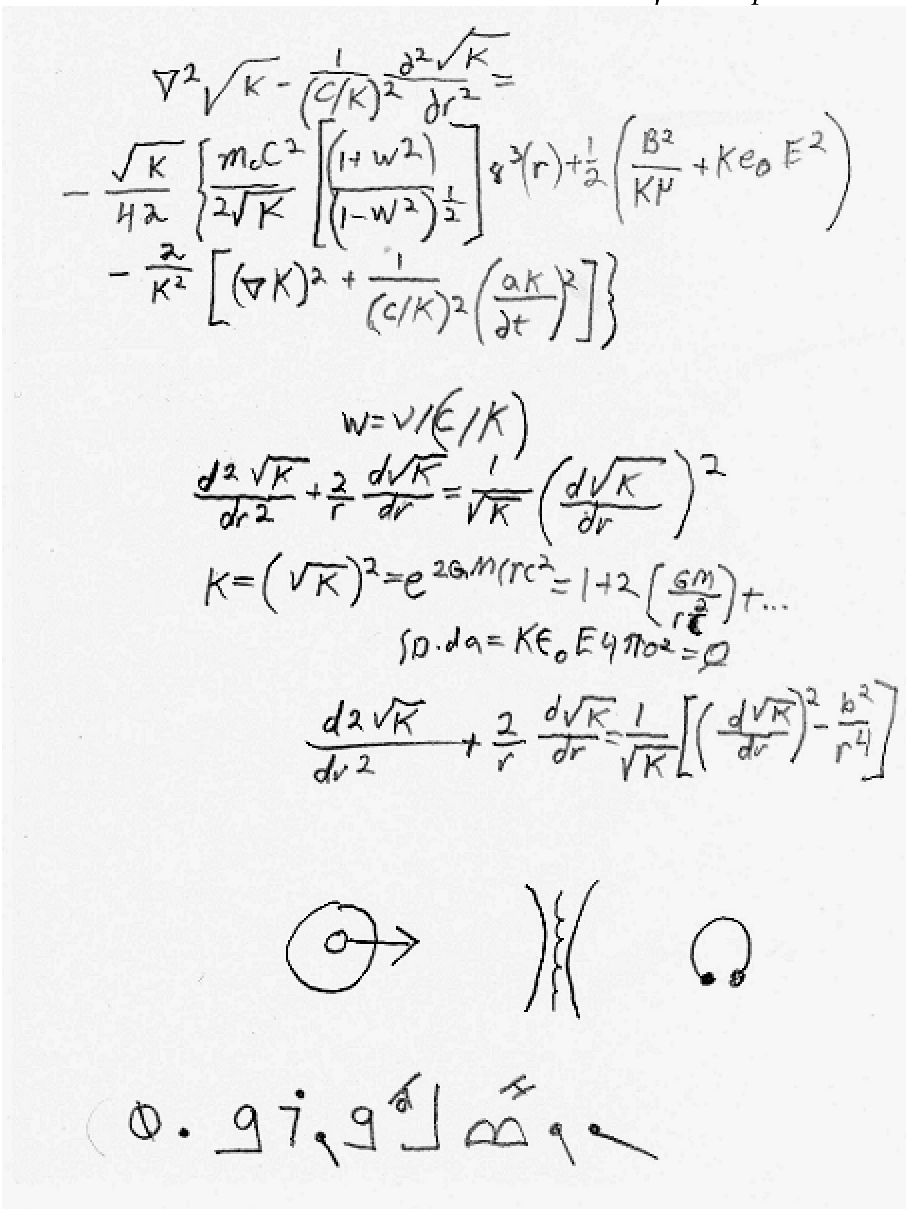
We shall leave aside further discussion of this question, and focus on the interpretation and meaning of the equations. For simplicity in notation, the equations discussed here will be referred to as three sets, which we call Romanek 1, 2 and 3. As noted above, there are other Romanek equations which have been discussed elsewhere (Kasher I, II, IIa, III and IV). The first set we shall discuss, which have also been called the "propulsion equations," we here denote as ROMANEK 1:

ROMANEK 1

Here is the brief introduction and beginning of the analysis by physicist Jack Kasher (Kasher III) of one set of Romanek's equations, the so-called "propulsion" equations. Here is Dr. Kasher's beginning commentary:

> *"Early in the morning of September 28, 2006, Stan Romanek wrote another page of equations in the dark, while he was apparently still asleep. There were two witnesses, his wife Lisa and a friend, Don Millan, who was a houseguest. Stan wrote the page very rapidly, sometimes pausing as if to get further instructions, and made several comments during the process. When he awoke the next day he had no recollection of*

what he had done. Lisa and Don each wrote a summary of what they had seen. Their comments are included at the end of this report.



[Figure 1. Romanek "propulsion" equation, quoted in Kasher III.]

"*The page includes a partial differential equation written in three lines at the top, followed by two shorter ordinary differential equations derived from it. The solution for the first of these two equations is directly underneath it. There are also two other equations. One of these defines a symbol used in the main equation, and the other is Gauss' Law in integral form, an equation widely known in electromagnetic theory. Finally, there are three drawings Stan has sketched previously, and several strange, hieroglyphic-like symbols at the bottom.*

"*The two ordinary differential equations have solutions with clear physical interpretations. The first gives the electrostatic field around a* *charged black hole, and the second the electrostatic and magnetic fields around a charged black hole that has a magnetic monopole. The presence of the monopole changes the electrostatic field around the black hole from the value determined by the first equation. A very unusual property of these fields is that the constants used for the electric permittivity,* $\varepsilon = K_e\varepsilon_o$, *and magnetic permeability,* $\mu = K_m\mu_o$, *are the same:* $K_e = K_m = K$.*" [equations page shown in Figure 1 above]*

END OF ROMANEK 1

The last line at the bottom of Figure 1 has been decoded to possibly read as "zero" and then "period" or "point" and then an expression made up of Aramaic symbols which spell out the word "propulsion" phonetically. This interpretation is highly significant as we will see, since "zero point propulsion" refers to a hypothetical technique in which the curvature and energy of space-time might be used to perform propulsion. As we shall see, these equations indicate a revolutionary means of propulsion which might accomplish exactly that! This will be described in greater detail below.

Several other equations have been written by Romanek, and they have been described in the research documents (Kasher I-IV). Some of them Dr. Kasher was able to explain or interpret. Some, according to Kasher, are "correctly evaluated equations from Quantum Field Theory," and some are "clearly beyond the scope of someone with Stan's background." but others have remained a mystery. One of them, from (Kasher I), is described below:

ROMANEK 2

[Quoting from Kasher I]:

"Above this integral there are two equations, side by side:

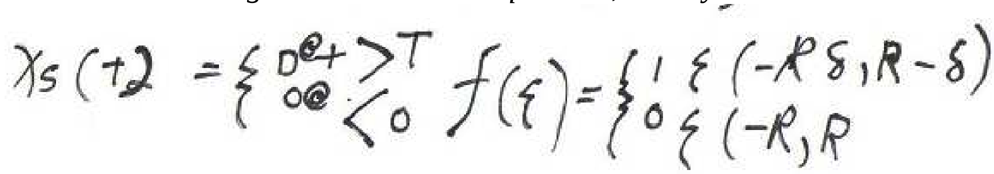


Figure 2. [Figure numbers added]

"The first one appears to be a function of time that is zero when the time is larger than the value T, and also zero earlier than t = 0. It is not clear what the value of $\chi(t)$ *is between t = 0 and t = T. My guess is that the equation should be written*

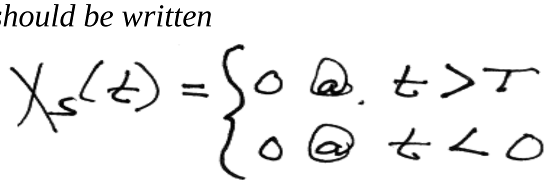


Figure 3. [Figure numbers added]

"The second equation, with the f(ζ) (I assume the symbol in parentheses is the Greek letter zeta), seems to be a step function with the value zero inside a sphere of radius R, and 1 on the outer edge of the sphere. If this is the case, it should be written

$$f(\zeta) = \begin{cases} 1 & \zeta \ (R-\delta, R+\delta) \\ 0 & \zeta \ (-R, R) \end{cases}$$

Figure 4. [Figure numbers added]

where δ is a very small length. I don't know what the sphere might be. Finally, if this is a sphere, I would expect the final parentheses to be (0,R) instead of (-R,R).

"Moving up the page, Stan next writes the following equation:

$$ds^2 = -dt^2 + [dx - v_s f(r_s) dt]^2 =$$

Figure 5. [Figure numbers added]

"This equation appears to be some sort of one-dimensional relativistic metric that I have never seen before. Normally the first term to the right of the equal sign would be written $-c^2dt^2$*, but sometimes the c is suppressed. The equation is more clearly written as follows:*

$$ds^2 = -dt^2 + [dx - v_s f(r_s) dt]^2$$

Figure 6. [Figure numbers added]

where I have guessed that the funny symbol inside the inner parentheses is the letter r. If the symbol f is equal to one (and it appears to be in the line below this one), then the product $v_s f(r_s) dt$ *has the correct dimension of length, as it should, since dx is a length. For reference and clarity, the normal three-dimensional relativistic metric is*

$$ds^2 = -c^2dt^2 + dx^2 + dy^2 + dz^2$$

Figure 7. *[Figure numbers added]*

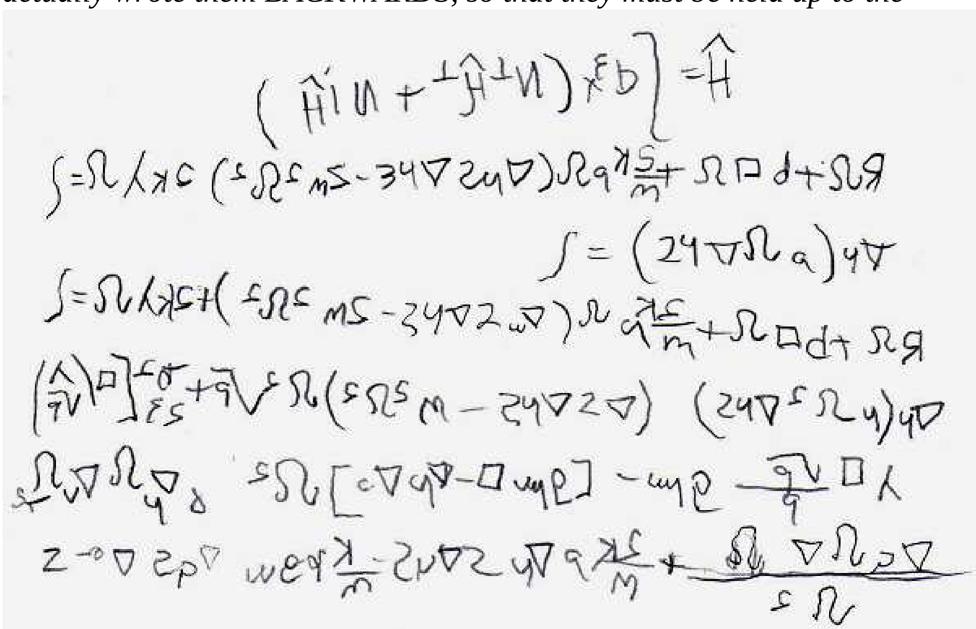
END OF ROMANEK 2 (End of quote from Kasher I).

These equations are discussed in detail below. As we will see, they too relate to a method of deforming space-time to achieve faster-than-light travel. The third set of equations, shown next, is the most complex of all, the so-called "backward equations," because they are written from right to left as though meant to be read in a mirror. Here is part of Kasher's description of these equations, from (Kasher IV). As before, his account is in italics:

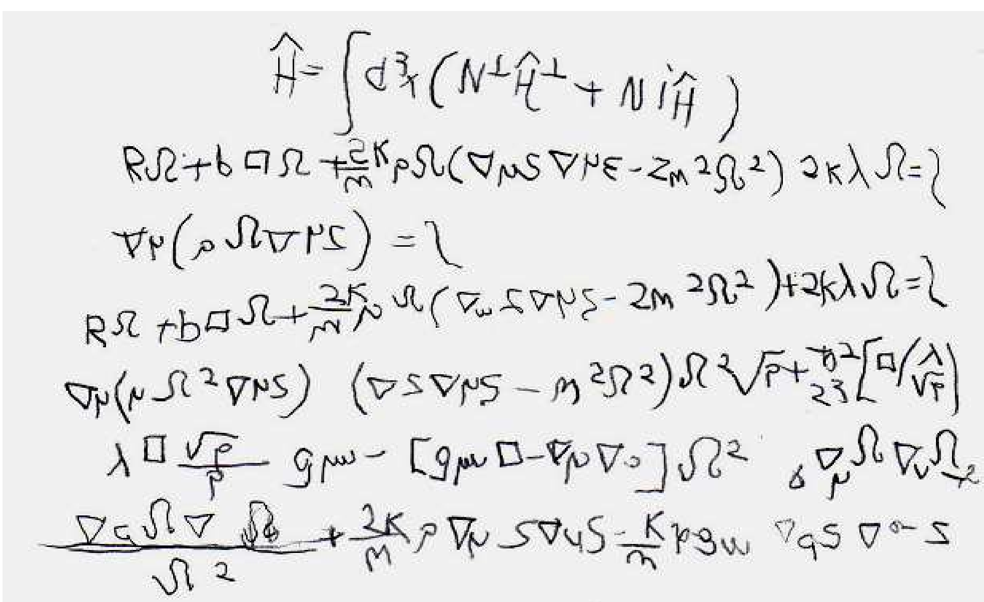
ROMANEK 3

[Quoted from Kasher IV]

"Stan's latest page of equations makes it next to impossible for anyone to claim that he is somehow copying them from the internet. His wife Lisa watched as he wrote them during the middle of the night in darkness, and he actually wrote them BACKWARDS, so that they must be held up to the



[Figure 8. Romanek "backward" equations]



[Figure 9. Romanek "backward" equations reversed by software]

mirror to read correctly. Fortunately, a computer program of one of his friends was able to reverse the equations also, putting them in readable form. The equations as Stan wrote them (without the symbols at the bottom) are[shown in Figure 8].

"I don't know if I could even write my name backwards in the dark, much less a system of equations like these. The reversed equations are [shown in Figure 9].

"Before I try to analyze the equations, I will write them as best I can in the true physics form I think is intended. I'm not completely sure of all the parts, but here goes:

$$\hat{H} = \int d^3x \left(N^{\perp}\hat{H}^{\perp} + N i \hat{H}\right)$$

$$R\Omega + b\Box\Omega + \frac{2K_e}{m}\Omega\left(\nabla_\mu S\,\nabla^\mu \varepsilon - 2m^2\Omega^2\right) + 2K\lambda\Omega = \wr$$

$$= \nabla_\mu\left(\rho\Omega\nabla^\mu S\right) = \wr$$

$$R\Omega + b\Box\Omega + \frac{2K_e}{m}\Omega\left(\nabla_\mu S\,\nabla^\mu S - 2m^2\Omega^2\right) + 2K\lambda\Omega = \wr$$

$$\nabla_\mu\left(\rho\Omega^2\nabla^\mu S\right) \quad \left(\nabla_\mu S\,\nabla^\mu S - m^2\Omega^2\right)\Omega^2\sqrt{\rho} + \frac{\hbar^2}{23}\left[\Box\left(\frac{\lambda}{\sqrt{\rho}}\right)\right.$$

$$\lambda\frac{\Box\sqrt{\rho}}{\rho}g_{\mu\nu} - \left[g_{\mu\nu}\Box - \nabla_\mu\nabla_\nu\right]\Omega^2 \quad \gamma\nabla_\mu\Omega\,\nabla_\nu\Omega$$

$$\frac{\nabla_\sigma\Omega\,\nabla^\sigma\Omega}{\Omega^2} + \frac{2K_e}{m}\nabla_\mu S\,\nabla^\nu S - \frac{K_e}{m}g_{\mu\nu} \quad \nabla_\sigma S\,\nabla^\sigma S$$

[Figure 10. Kasher re-write of "backwards" equations]

"I put in the three red symbols in order to make the expressions consistent. Let me say right at the start that I don't know what these equations mean. But they are very interesting to me, because Stan has correctly used symbols that are widely known to physicists. I will focus most of my comments on these symbols and their meanings.

"The top equation is a three-dimensional integral of several functions. It may be related to the Arnowitt, Deser, and Misner formulation of the dynamics of geometry from Einstein's general theory of relativity. I know next to nothing about the physics involved here, but the symbols seem to point toward this formulation. The H with a carat on top appears to be some kind of mathematical operator."

END OF ROMANEK 3 (quoted from Kasher IV. Additional comments added in square brackets).

Our analysis of these equations is contained in the following sections. However we will summarize our preliminary conclusion here. Like the other equations shown above, this third set of equations appears to describe a non-standard version of gravity theory. It is based on concepts which differ from the "mainstream" assumptions of General Relativity, but which reflect a parallel approach which has been pursued by a small number of physicists. This alternative approach also seems to hold out the possibility of the use of electromagnetism to affect the space-time metric in ways not allowed by mainstream relativity.

ANALYSIS OF ROMANEK 1

As we stated in (Romanek, 2009, Appendix B), the equations in Romanek I are virtually identical to those written by Dr. Harold Puthoff (Puthoff, 2002), and describe a non-traditional form of General Relativity (gravity theory). In Equations (1-11) below we have re-written these equations, correcting the typos, based on Puthoff's paper (Puthoff, 2002). We shall refer to these as the "Puthoff equations," or as "Romanek I."

While a skeptic might propose that Romanek simply copied these equations, there are several factors that argue against this. First of all, these equations are not standard equations accepted by mainstream physics. The odds of Mr. Romanek selecting these specific equations randomly would seem quite small. **What is most impressive is that these equations represent virtually the only known alternative physics theory, consistent with experiment, which might allow faster than light travel**. They may explain how UFOs can traverse the vast distances "from there to here." These equations suggest the kind of knowledge that might actually be possessed by such an advanced civilization.

If deception were behind this effort, it would seem that Romanek should have used different symbols and placed the equations in a different order to disguise their connection to Puthoff's equations. This was not done. **Some of Romanek's equations, in Romanek I above, are exactly the same as Puthoff's, with the same symbols in the same order. Our interpretation is that this connection was meant to be found**. The correspondence makes it possible to identify the symbols and interpret the equation. The message appears to be that we should pay attention to these equations and to this alternative approach to General Relativity. It may offer the key to new concepts in propulsion and understanding aspects of alien technology.

During hypnotic regression Mr. Romanek has acknowledged the connection between these equations and those of Dr. Puthoff (Puthoff, 2002). However, he also emphasized that "Puthoff was not the first." Some of the equations originate with earlier scientists. Upon further examination, this statement turns out to be true. Some of these equations are related to earlier work by Robert Dicke (Dicke, 1957, 1961) and even earlier work by H.A.Wilson (Wilson, 1921).

This line of research appears particularly interesting and promising. It offers an alternative view of General Relativity and gravity offering rich possibilities for practical engineering applications which are unavailable in standard General

Relativity. From all accounts, its predictions are consistent with available experimental data, so why was this approach abandoned for several decades after Wilson first proposed it? The Romanek equations draw our attention back to this line of research, continued in modern times by Puthoff and Dicke, which may hold rich possibilities for future technology.

In Puthoff's equations the effect of gravity appears as a changing dielectric constant of space which differs from the conventional value by a factor K. This provides an alternative understanding of the Eddington experiment, for example, which observed the bending of starlight past the sun (Eddington, 1921). The theory assumes that gravitational effects of this kind are due to the variation of the dielectric constant of space around massive objects, as described by the variable K. When space-time is flat (no gravity) then K=1. As K departs from 1, the speed of light will be different (it varies as c/K) and space will show an effective curvature because the metric of space-time is also affected by K. As Wilson, Puthoff, Dicke and others have shown, this leads to a metric which shows distortions in time and lengths which are consistent with General Relativity, but with a very different interpretation.

Adopting the assumption that the Romanek I equations are exactly the Puthoff equations, we rewrite the first equation from Figure 1 as Equation 1, below, cleaning up the apparent typos. The other equations in Romanek 1 are also found in the same Puthoff paper (Puthoff, 2002), and relate to the static solution of gravity around a charged sphere using this alternative theory, which Puthoff calls the P-V Theory or "polarizable vacuum" theory. They are written below as equations (7 – 11). The amount of polarization is given by the factor K, which in turn can be thought of as proportional to the distortion in the metric (the gravitational field).

The top equation in Figure 1, correcting for typos, is then:

(1) $$\nabla^2\sqrt{K}-\frac{1}{(c/K)^2}\frac{\partial^2}{\partial t^2}\sqrt{K}=$$

$$-\frac{\sqrt{K}}{4\lambda}\left\{\frac{m_0K^{3/2}(c/K)^2}{\sqrt{1-\left(\frac{v}{(c/K)}\right)^2}}\left[\frac{1+\left(\frac{v}{(c/K)}\right)^2}{2}\right]\delta^3(\vec{r}-\vec{r}(t))+\frac{1}{2}\left(\frac{B^2}{K\mu_0}+K\varepsilon_0E^2\right)-\frac{\lambda}{K^2}\left((\nabla K)^2+\frac{1}{(c/K)^2}\left(\frac{\partial K}{\partial t}\right)^2\right)\right\}$$

This is identical with Eqn. 59 of (Puthoff, 2002). In different notation, it is equivalent to Equation (67) of (Dicke, 1957). The term on the left side of this equation describes the propagation of a wave at speed c/K, and the right side of the equation (second line) describes the source terms which create such a wave. The Greek letter lambda λ in Equation 1 represents a constant involved with gravitational coupling:

(2) $$\lambda = \frac{c^4}{32\pi G} = 1.2 \cdot 10^{42} \frac{kg \cdot m}{\sec^2}$$

where c is the speed of light and G is the standard gravitational constant, all in MKS units.

Puthoff's P-V Model treats the vacuum as an inhomogeneous medium which has a varying dielectric permittivity: .

(3) $$\vec{D} = \varepsilon \vec{E} = \varepsilon_0 \vec{E} + \vec{P} = \varepsilon_0 \vec{E} + \alpha_V \vec{E} = K \varepsilon_0 \vec{E} .$$

It assumes the magnetic permeability varies in the same way, by the same factor K:

(4) $$\mu = K \mu_0$$

But since the speed of light in Maxwell's equations is normally defined as

(5) $$c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}} ,$$

then the speed of light in the PV model will vary according to K:

(6) $$c' = \frac{1}{\sqrt{\mu \varepsilon}} = \frac{1}{\sqrt{\mu_0 K \varepsilon_0 K}} = \frac{1}{K \sqrt{\mu_0 \varepsilon_0}} = \frac{c}{K}$$

According to Puthoff (quoting Dicke's earlier paper):

> *"This transformation, which maintains the constant ratio (the impedance of free space) is just what is required to maintain electric-to-magnetic energy ratios constant during adiabatic movement of atoms from one point to another of differing vacuum polarizability." (Dicke, 1957, 1961)*

Referring to Figure 1, the other equations on the original Romanek page are rewritten as follows, shown in equations (7-11). They appear in exactly the same form and order in (Puthoff, 2002):

(7) $$w = \frac{v}{(c/K)}$$

(8) $$\frac{d^2\sqrt{K}}{dr^2} + \frac{2}{r}\frac{d\sqrt{K}}{dr} = \frac{1}{\sqrt{K}}\left(\frac{d\sqrt{K}}{dr}\right)^2$$

(9) $$K = \left(\sqrt{K}\right)^2 = e^{2GMrc^2} = 1 + 2\left(\frac{GM}{rc^2}\right) + \ldots$$

(10) $$\int \vec{D} \cdot da = K \varepsilon_0 E 4\pi r^2 = Q$$

(11) $$\frac{d^2\sqrt{K}}{dr^2} + \frac{2}{r}\frac{d\sqrt{K}}{dr} = \frac{1}{\sqrt{K}}\left[\left(\frac{d\sqrt{K}}{dr}\right)^2 - \frac{b^2}{r^4}\right]$$

In Equation (7) the symbol w is the ratio of the velocity of the mass to the speed of light in the medium (c/K). This is the highly significant relativistic parameter which determines the velocity at which relativistic effects become important, as w approaches 1.

The next equation from Figure 1 is also found in (Puthoff, 2002) as Equation (61a) and is the basis for a static solution for an uncharged mass distribution. Equation 9 above corresponds to Equation (62b) of (Puthoff, 2002). Equation 10 above corresponds to Puthoff's (63a) with a couple of small typos, and (11) corresponds to Puthoff's (64b), all in the same paper (Puthoff, 2002). It corresponds to the solution for the K parameter around a charged mass, of charge q, where b is proportional to the charge.

Puthoff points out that this equation has solutions of the form

(12) $$\sqrt{K} = \cosh\left(\frac{\sqrt{a^2-b^2}}{r}\right) + \frac{a}{\sqrt{a^2-b^2}}\sinh\left(\frac{\sqrt{a^2-b^2}}{r}\right)$$

where the parameter "a" carries the mass information for the gravitating object:

(13) $$a = \frac{GM}{c^2}$$

where

$$b^2 = \frac{q^2 G}{4\pi\varepsilon_0 c^4}$$

As long as a > b, the solution for $\sqrt{K}$ is real, and the allowed solutions are hyperbolic. But if the electric component is larger, then a < b, and the solutions become trigonometric. This may be particularly significant for Equation 1 above, because then it allows sinusoidal wavelike solutions.

In the Puthoff equations **<u>electromagnetic mass often tends to oppose inertia</u>**, so solutions often appear in this form, with the electromagnetic term reducing the term arising from mass. According to Puthoff, cases in which the speed of light is increased (K<1) as well as cases in which it is decreased (K>1) are expected:

> ***"For cases of propagation near a massive body, for example, we have a reduction in the velocity of light [K > 1] by an amount proportional to the gravitational potential, a result first noted by Einstein himself (Einstein, 1911). For the case of propagation between closely spaced conducting boundaries, as in discussions of the Casimir effect, we have an increase in the velocity of light [K < 1] which is associated with the reduction of vacuum fluctuation energy between the plates (Scharnhorst, 1990). In short, as emphasized by Wesson, the speed of light c is context-dependent and not as fundamental as widely believed (Wesson, 1992)." (quoted from Puthoff, 1996; see also Casimir, 1948; Cramer, 1996; Chown, 1990)***

Equation (1) describes the motion of a wave of dielectric distortion. In the Puthoff equations (Puthoff, 2002) it moves along with a mass m_0 defined by a delta function centered at $\vec{r}(t)$. This can represent an object (or craft) which creates the anomaly in the dielectric constant K. A second equation describes the motion of the mass m_0 interacting in such a field. It is (from Puthoff, 2002)

$$(14) \qquad \frac{d}{dt}\left[\frac{m_0 K^{3/2}\vec{v}}{\sqrt{1-\left(\frac{v}{(c/K)}\right)^2}}\right] = q\left(\vec{E}+v\times\vec{B}\right)+\frac{m_0 K^{3/2}\left(c/K\right)^2}{\sqrt{1-\left(\frac{v}{(c/K)}\right)^2}}\left[\frac{1+\left(\frac{v}{(c/K)}\right)^2}{2}\right]\frac{\vec{\nabla}K}{K}$$

where v is the velocity of the craft. Here the object being accelerated has mass m_o and can be electrically charged with charge q. It could also create a magnetic field, which would further affect the equations. On the right side of (14), the first term is the acceleration due to electromagnetism, and the second term the "gravitational" acceleration from the gradient of the dielectric parameter K.

One interesting aspect of these equations is that, if the mass or craft described here is capable of modifying the dielectric field K around itself, then a gradient might be created, $\vec{\nabla}K$, which would contribute to its acceleration.

Another interesting feature is how often the term (vK/c) or its equivalent appears in these equations. Normally in Relativity, the expression for the acceleration of a mass under the influence of a force F looks like this:

$$(15) \qquad \frac{d}{dt}\left[\frac{m_0\vec{v}}{\sqrt{1-\left(\frac{\vec{v}}{c}\right)^2}}\right]=\vec{F}$$

Here $\vec{v}$ is the craft velocity and c the speed of light. When v approaches very close to c, the term on the bottom becomes very close to zero, making the inertia term on the left hand side very large. This is interpreted as saying the inertial "mass" of the object becomes very large as the velocity approaches c, making it impossible to accelerate the craft beyond c.

But in the P-V equation (14), the force equation is modified to the form

$$(16) \qquad \frac{d}{dt}\left[\frac{m_0\vec{v}}{\sqrt{1-\left(\frac{\vec{v}}{c/K}\right)^2}}\right]=\vec{F}$$

Now the equivalent inertial mass is

$$\frac{m_0}{\sqrt{1-\left(\frac{v}{c/K}\right)^2}}$$

This only becomes large when (vK/c) approaches 1. That is, when

(17) $$\frac{vK}{c} \approx 1 \quad \text{or} \quad v \approx \frac{c}{K}.$$

When K is much less than 1, the effective velocity of light is greatly increased, so the limiting velocity is no longer c but c/K. So if we can make K much less than one, then the limiting velocity becomes c/K which can be much larger than the speed of light c. Then the speed of light can be exceeded when K becomes small!

This is a critical aspect of these equations. While they are apparently consistent with known measurements involving gravity, they offer something that General Relativity does not offer: a way to exceed the speed of light, if the dielectric factor K can be reduced below 1.

So the question becomes whether there are solutions of these equations in which K is much less than 1, in which **the K disturbance travels along with the mass at that speed.** If such a solution can be found, involving Equation 1 and 14, then it might be possible for a craft to produce the right kind of dielectric distortion to allow such a solution.

The other question is the "practical" one of how K can be reduced to much less than 1. Davis and Puthoff have reviewed a number of techniques for producing such regions of "negative" energy, which correspond to K < 1 (Davis, 2006). The field strengths required based on these estimates appear to be far beyond what can be achieved today, at least with our present understanding. The key is that, at least in principle, these equations appear to offer the possibility of solutions for traveling faster than light.

While the equations in Romanek I (Puthoff "P-V" equations) are rather complex, we can simplify them to examine some of their qualitative properties. The term on the left side of Equation 1 is called a "d'Alembertian," written sometimes as a "box" or sometimes as a "box squared." We shall use the former notation here. In this case, it describes a propagating wave moving at speed c/K. When the right side of Equation (1) can be set to zero, by achieving field strengths and other conditions so the terms on the right cancel, then it simplifies to:

(18) $$\Box\sqrt{K} = \nabla^2\sqrt{K} - \frac{1}{(c/K)^2}\frac{\partial^2}{\partial t^2}\sqrt{K} = 0$$

This resembles a wave equation for a disturbance propagating at a steady speed *c/K* . In a simple one dimensional solution of this type, the dielectric factor

$\sqrt{K}$ can be described as a wave moving in the x direction at constant speed c/K. However, since the “wave velocity” in the equation involves K itself, the equation is non-linear and its solutions will be more complex.

A rigorous solution of equations (1) and (14) must involve all three space dimensions, as well as time. It may be quite complex, and is beyond the scope of this analysis. Here we will only consider a simplified case which is one dimensional, and the perturbation of K is small. Then K is approximately a constant value K_0, and varies by only a small perturbation $2\delta K$. Then for small perturbations

(19) $$\sqrt{K} \simeq K_0 + \delta K$$

When the right side of equation (1) vanishes, as in (18) then in the limit of small δK this leads to

(20) $$\Box\sqrt{K} \approx \nabla^2 \delta K - \frac{1}{c^2} K_0^2 \frac{\partial^2}{\partial t^2} \delta K \approx 0$$

Then the perturbation δK will have a constant velocity solution:

(21) $$\delta K = \delta K(\xi) = \delta K(x - \frac{tK_0}{c})$$

This describes a perturbation moving along the x-axis at a speed

(22) $$v = \frac{c}{K_0}.$$

When K_0 is less than one, the wave will travel at a speed greater than light. In order to maintain the right side of Equation (1) equal to zero will require that the mass (or the “craft”) also moves along with the wave at this speed, as well as the electromagnetic fields which keep the right side of (1) in balance. Because the constant λ is so large ($\lambda \approx 10^{42}$) there are practical difficulties in achieving this. These issues have been discussed in, for example, (Davis, 2006, 2006a) and (Puthoff, 2010).

In a region where K is less than one, the standard meter stick expands, so the distance measured between two points will be reduced, according to Puthoff (Puthoff, 2001). The isotropic metric in such a region will be given by

(23) $$ds^2 = \frac{1}{K} c^2 dt^2 - K\left(dx^2 + dy^2 + dz^2\right)$$

where ds is the invariant distance. It implies that the meter sticks have expanded by the factor $K^{-1/2}$, where K is less than 1, so the measured distance between two points will be reduced correspondingly (Puthoff, 2001). This may shed some light on a symbol frequently found in Romanek’s drawings, one of which appeared at the bottom of Romanek I, and is shown here for reference:

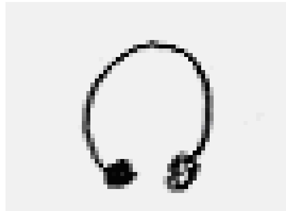


Figure 11. A symbol accompanying Romanek's equations

It seems to imply a foreshortening of the distance between the two end points by curving the space in between. When K is less than one along a path in space-time, it will have the effect of foreshortening the distance. This seems to be consistent with this symbol.

It often accompanies another symbol which is suggestive of a tunnel or a "wormhole."

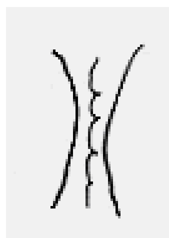


Figure 12. Another symbol accompanying Romanek's equations

As we will see in the next section, one effect of the "warping of space," as it can theoretically be achieved in the P-V model, is that it may produce such a "wormhole." However, as indicated by Equations (1) and (14), it is not a conventional wormhole, because it moves along with the craft. This has sometimes been called a "warp bubble." This may be related to another of the messages which arose from the Romanek case. He was told: "they do not understand the Rosen Bridge," Since the Rosen Bridge is another name for a wormhole, it may mean that such structures cannot exist as stationary objects in space by themselves, but can only be created as dynamical objects of the type implied by these equations.

Without a rigorous solution of (1) and (14), a solution remains speculative beyond this point. However, some of the studies which have addressed this include (Puthoff, 2002a, 2003), (White, 2006), (Desiato, 2003), and (Robertson, 2007). The full solution may have similarities to the Alcubierre solution (Alcubierre, 1994), described below, which also involves a superluminal wave in very non-linear conditions. However, it achieves the curvature of space in a different way, using the dielectric properties of space, through K, instead of by using pure mass.

Altogether these equations appear to describe how a wave of dielectric distortion might be created and move through space. In doing so, it will carry the craft with it at velocity $v \approx c / K$. The strength of the electromagnetic fields required according to these equations is very large and may be beyond our ability to generate in the foreseeable future. There may be nonlinearities and other effects not included in the equations which lower these thresholds into the realm of practicality. If so, these are unknown at this time. However, **<u>it is remarkable that such solutions appear to be possible in principle.</u>**

ANALYSIS OF ROMANEK 2

The Romanek Equations in Figures 2 through 7 comprise the next set for analysis. We have found that they correspond to equations proposed by Miguel Alcubierre in a paper entitled: "The Warp Drive: Hyperfast Travel within General Relativity," (Alcubierre, 1994). This paper presented a solution of Einstein's equations which allows "faster than light" travel, so-called "warp drive." In Alcubierre's solution, a rather unphysical mass source is postulated, a region of "negative energy." This, together with a matching concentration of "positive energy," both very intense, generates a region of space time which moves at high speed. Inside such a region objects may exist even though their velocities exceed the speed of light compared to the outside world.

Figures 5 and 6 above, from the Romanek 2 set of Equations, correspond to Equation (8) in Alcubierre's paper (Alcubierre, 1994). It shows the unique metric derived by Alcubierre, which moves at the speed v_S which can exceed c. The function f describes the shape of this region, the "warp bubble" around the craft. According to Alcubierre:

> *"The center of the perturbation corresponds to the spaceship's position $x_S(t)$. We clearly see how the volume elements are expanding behind the spacecraft, and contracting in front of it."*

Remarkably, those in the craft would not experience the force of acceleration, and no time dilation. Again quoting Alcubierre:

> *"Since coordinate time is also equal to the proper time of distant observers in the flat region, we conclude that the spacecraft suffers no time dilation as it moves. It is also straightforward to prove the spaceship moves on a geodesic. This means that even though the coordinate acceleration can be an arbitrary function of time, the proper acceleration along the spaceship's path will always be zero." (Alcubierre, 1994).*

Some of Romanek's equations here are missing the extra terms in the metric dy^2 and dz^2, but this seems likely to be a typo. The Romanek equations shown in Figure 2 and 4 are close to Alcubierre's Equation 7, which defines the function f. It describes the distorted region, the "warp bubble," around the craft. This region, or "bubble," is illustrated in Figure 11, which plots the variation in the spatial compression around the craft.

The significance of these equations is that they highlight the theme hinted at in the Romanek 1 equations. **<u>They explicitly refer to solutions of Einstein's equations which make it possible to "engineer the vacuum" to travel faster than light, a form of "warp drive." In both cases, a distorted region of space-time which forms around the craft seems to be implied.</u>**

In Alcubierre's solution, the resulting "bubble" of spacetime moves at speed v_S, exceeding that of light. The function f has a "top hat" shape and defines the zone of departure of this region from surrounding space, the "warp bubble." The radius of the bubble is given by r_S. It produces a region of distorted or "York extrinsic" time, which is depicted in Figure 13. It gives rise to an expansion of space behind the craft and a contraction of space in front of the craft (White, 2003, 2006). It is this distortion which gives rise to the motion.

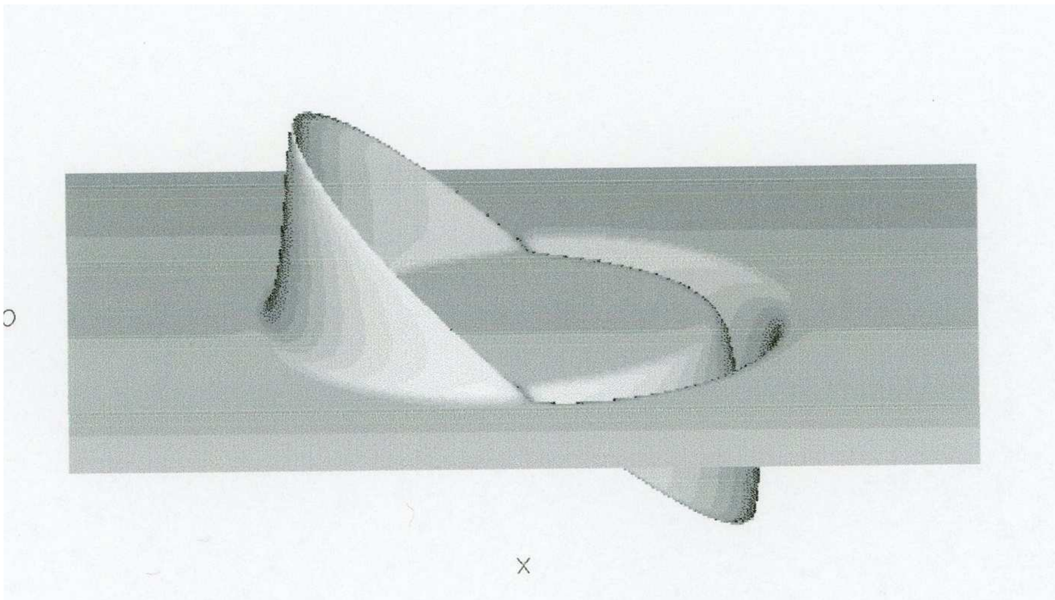


Figure 13. Space-time distortion around the Alcubierre "warp bubble."

The relationship between these equations and those of Puthoff is as follows: Alcubierre needs a region of strong positive energy in front of the craft and a corresponding region of intense negative energy behind it to produce the warp effect. In Puthoff's theory this corresponds to a region where K>>1 (positive energy) in front of the craft and a corresponding region where K is very small, close to zero (K<<1, "negative energy"), behind the craft.

In (Puthoff, 1996) he states that he is endeavoring to apply his formalism to the Alcubierre configuration. He says: "a detailed examination of the Alcubierre warp drive example within the $TH\varepsilon\mu$ type framework is in preparation (to be published)." Apparently this analysis has not yet been published. Such an analysis of moving or "traveling wave" solutions of Equations (1) and (14), in which the dielectric variation of K and the craft move together, would be of great interest.

ANALYSIS OF ROMANEK 3

Romanek's sleep equations would be remarkable if they only served to draw our attention to the Polarizable Vacuum (P-V) or "$TH\varepsilon\mu$" models, as described above. In doing so, they emphasize the notion that our present model of gravity may be overlooking something very important, the possibility that it may be affected by electromagnetism, and that it can be "engineered." This approach is very different from the conventional model of mainstream physics, which holds that only large masses can warp space. If that were the whole story, then it would be impractical to ever hope to travel faster than light. But if the Romanek, or Puthoff-Dicke-Alcubierre equations are closer to the truth, then something like "engineering the vacuum" and perhaps even "warp drive," may be possible.

But what of the other large Romanek equation, the so-called "backward equation" which was written in his sleep as a mirror image? It has to be seen in a mirror to read it. It is longer and more complex than the other equations. Is it mere gobbledy gook, or does it convey relevant information?

Analysis of this equation is more difficult because of the presence of several apparent typos. As Kasher has pointed out, in spite of this, these equations display covariant index notation and the proper use of indices which is consistent with the theoretical physics of curved space-time. The second and fourth lines of Romanek 3 appear to be almost identical, as though the fourth was an attempt to rewrite and correct the second. Without understanding the "backwards integral" symbol, they are lacking enough equal signs, so it may be more productive to compare the indivual terms which appear in the equation(s).

Based on some of the terms, we have found that Romanek 3 may be connected to one of the SAME theories of gravity we discussed earlier, that proposed by R. H. Dicke and C. Brans in 1961 (Brans, 1961). However, there are also differences. Because of the apparent typos in Romanek 3, it is impossible to make a complete correspondence but there are numerous similarities.

It seems highly significant that these equations arise from Dicke's work, since we have already discovered that the equations in Romanek 1 are also related to Dicke's theory. Therefore the equations in Romanek 1 and Romanek 3 are related, even though this is far from obvious. They, too, describe a possible way by which the gravitational constant might be manipulated, and again perhaps make it possible to engineer space-time.

Unzicker (Unzicker, 2007) notes:

> ***"Dicke's paper (Dicke, 1957) attracted much attention with the statement that gravitation could be of electromagnetic origin. While the second term in Dicke's index of refraction (Eqn. 5 there)***
>
> $$\varepsilon = 1 + \frac{2GM}{rc^2}$$
>
> ***is related to the gravitational potential of the sun, Dicke was the first to raise the speculation on the first term having 'its origin in the remainder of the matter in the universe.'"***

Here the "index of refraction" of Dicke behaves very much like the factor K in (Puthoff, 2001) and (Wilson, 1921). Unzicker's statement alludes to Dicke's hypothesis that the first term in the above equation (the unity term) originates from the effect of the rest of the matter in the universe. It implies that if the gravitational potential from all the mass in the universe is added up, it leads to a factor near unity:

(24)
$$\varepsilon_{Dicke} = \sum_{i \neq sun} \frac{2GM_i}{r_i c^2} + \frac{2GM_{sun}}{r_{sun} c^2} \approx 1 + \frac{2GM}{rc^2}$$

Excluding local fields, such as from the sun, leads to an estimate of the background gravitational potential from all the distant matter:

(25)
$$\varepsilon_{Dicke} = \sum_i \frac{2GM_i}{r_i c^2} \approx 1$$

The Brans-Dicke theory arose from the idea that (25) is correct, and that G arises from the influence of the other masses in the universe. Dividing by G defines a new quantity, ϕ:

(26)
$$\frac{\varepsilon_{Dicke}}{G} = \sum_i \frac{2M_i}{r_i c^2} \approx \frac{1}{G} \approx \phi$$

The effect of all the other matter in the universe is assumed to be very nearly constant, and is responsible for the gravitational "constant" G:

(27)
$$\sum \frac{2M_i}{r_i c^2} \square \frac{1}{G}$$

If the mass distribution changes, then G is no longer a constant. It is the result of the fields of all the other masses. The factor "phi," ϕ, was introduced by Brans and Dicke to represent this varying gravitational coupling (Brans, 1961). It is also related to the factor K used by Puthoff and found in Romanek 1, approximately by

(28)
$$\varepsilon_{Dicke} \approx K \approx \phi G$$

Consequently these various theories are based on similar assumptions. Near a mass M, at a distance r, the effect is:

(29) Wilson (Wilson, 1921): $K \approx 1 + \frac{GM}{rc^2}$

(30) Dicke (Dicke, 1957): $\varepsilon_{Dicke} = G\phi = \sum_{i \neq sun} \frac{2GM_i}{r_i c^2} \approx 1 + \frac{2GM}{rc^2}$

(31) Puthoff (Puthoff, 2002): $K \approx 1 + \frac{2GM}{rc^2}$

In the Brans-Dicke theory (Brans, 1961) the variable coupling term reflects the varying coupling strength of gravity due to mass distribution. To satisfy Equation (26) above, the source of the ϕ field will be the mass-energy tensor T.

Therefore the terms in Brans-Dicke and Puthoff are proportional to one another in this approximation. Although not identical, both sets of equations describe a form of gravity in which the gravitational constant can vary, and be affected by electromagnetism and other factors. These two non-standard models are related to one another.

To better understand their possible relationship to Romanek 3, let us review the basic Brans-Dicke derivation, as described in Weinberg's *General Relativity and Gravitation* textbook (Weinberg, 1972). His Equation 7.3.13 is shown first. We will label it according to our numbering system here:

The original idea in the Brans-Dicke model was based on Mach's principle, that the distant matter in the universe should affect the gravitational coupling. A scalar field ϕ was proposed to implement this idea:

(32) $$\Box\phi = 4\pi\lambda T^{\mu}_{M\mu}$$

Here $T^{\mu}_{M\mu}$ is the matter-energy tensor and $\Box$ the d'Alembertian. This ensures that it will satisfy Equation (24) above. When defined in this way, integrating over all the masses in the observable universe, it is found that:

(33) $$\langle\phi\rangle \approx \frac{1}{G}$$

Brans and Dicke (Brans, 1961) proposed to substitute ϕ^{-1} for G in Einstein's equation, arguing that the gravitational effect was due to all the other matter of the universe, based on Mach's Principle. This leads to a modification of General Relativity:

(34) $$R^{\mu\nu} - \frac{1}{2}g^{\mu\nu}R - \lambda_C g^{\mu\nu} = -\frac{8\pi}{\phi}\left[T^{\mu\nu}_{M} + T^{\mu\nu}_{\phi}\right]$$

Here $T^{\mu\nu}_{M}$ describes the energy due to matter and electromagnetism. The other term, $T^{\mu\nu}_{\phi}$ represents the energy due to the scalar field ϕ itself. A cosmological term λ_C has been added. The energy momentum of the ϕ-field can be described generally as (Weinberg, 7.3.7):

(35) $$T^{\mu}_{\phi\nu} = A(\phi)\phi_{;}^{\mu}\phi_{;\nu} + B\delta^{\mu}_{\nu}\phi_{;\rho}\phi^{;\rho} + C(\phi)\phi_{;}^{\mu}{}_{;\nu} + \delta^{\mu}_{\nu}D\Box\phi$$

where A, B, C, and D are arbitrary constants. After applying constraints, the most general allowed form of the coefficients are:

(36) $$D = -\frac{1}{8\pi} \quad ; \quad C = \frac{1}{8\pi} \quad ; \quad A = \frac{\omega}{8\pi\phi} \quad ; \quad B = -\frac{\omega}{16\pi\phi}$$

So the energy momentum tensor of the ϕ field is:

(37) $$T^{\mu}_{\phi\,\nu} = \frac{\omega}{8\pi\phi}\phi^{\mu}_{;}\phi_{;\nu} - \frac{\omega}{16\pi\phi}\delta^{\mu}_{\nu}\phi_{;\rho}\phi^{;\rho} + \frac{1}{8\pi}\phi^{\mu}_{;\;;\nu} - \frac{1}{8\pi}\delta^{\mu}_{\nu}\Box\phi$$

And the Brans-Dicke equations become (Weinberg, 7.3.13 and 7.3.14):

(38) $$\Box\phi = \frac{8\pi}{3+2\omega}T^{\mu}_{M\,\mu}$$ and

(39) $$R_{\mu\nu} - \frac{1}{2}g_{\mu\nu}R - \lambda_C g_{\mu\nu} = -\frac{8\pi}{\phi}T_{M\mu\nu} - \frac{\omega}{\phi^2}\left(\phi_{;\mu}\phi_{;\nu} - \frac{g_{\mu\nu}}{2}\phi_{;\rho}\phi^{;\rho}\right) - \frac{1}{\phi}\left(\phi_{;\mu;\nu} - g_{\mu\nu}\Box\phi\right)$$

Substituting the value for the stress-energy tensor,

(40) $$T_M{}^{\mu\nu} = \frac{1}{\nu}\left[\left(\nabla_\mu S\right)\left(\nabla_\nu S\right) - \frac{1}{2}g_{\mu\nu}\nabla_a S\nabla^a S\right]$$

into the field equation (39), it becomes:

(41) $$R_{\mu\nu} - \frac{1}{2}g_{\mu\nu}R - \lambda_C g_{\mu\nu} = -\frac{8\pi}{\phi}\frac{1}{\nu}\left[\left(\nabla_\mu S\right)\left(\nabla_\nu S\right) - \frac{1}{2}g_{\mu\nu}\nabla_a S\nabla^a S\right]$$
$$-\frac{\omega}{\phi^2}\left(\phi_{;\mu}\phi_{;\nu} - \frac{g_{\mu\nu}}{2}\phi_{;\rho}\phi^{;\rho}\right) - \frac{1}{\phi}\left(\phi_{;\mu;\nu} - g_{\mu\nu}\Box\phi\right)$$

This is the Brans-Dicke equation. Its trace equation is

(42) $$R = -\frac{8\pi}{\nu\phi}\left[\nabla_a S\nabla^a S\right] - \frac{\omega}{\phi^2}\left(\phi^{\mu}_{;}\phi_{;\mu}\right) - \frac{3}{\phi}(\Box\phi) - 4\lambda_C$$

To relate this to Romanek 3, we change notation. The covariant gradient of ϕ can be written

(43) $$\phi^{a}_{;} = \nabla^a\phi$$

And we rename the scalar field:

(44) $$\phi = \Omega$$

Adopting these changes and multiplying the field equations by ϕ or Ω, equation (41) becomes:

(45) $$\Omega\left(R_{\mu\nu} - \frac{1}{2}g_{\mu\nu}R\right) = -8\pi\frac{1}{\nu}\left[\left(\nabla_\mu S\right)\left(\nabla_\nu S\right) - \frac{1}{2}g_{\mu\nu}\nabla_a S\nabla^a S\right]$$
$$-\frac{\omega}{\Omega}\left(\nabla_\mu\Omega\nabla_\nu\Omega - \frac{g_{\mu\nu}}{2}\nabla_\rho\Omega\nabla^\rho\Omega\right) - \left(\nabla_\mu\nabla_\nu\Omega - g_{\mu\nu}\Box\Omega\right) + \lambda_C\Omega g_{\mu\nu}$$

and the trace equation becomes:

(46)

$$\Omega R=-8\pi\frac{1}{\nu}\left[\left(\nabla^{\mu}S\right)\left(\nabla_{\mu}S\right)\right]+\frac{\omega}{\Omega}\left(\nabla^{\mu}\Omega\nabla_{\mu}\Omega-2\nabla_{\rho}\Omega\nabla^{\rho}\Omega\right)+\left(\nabla^{\mu}\nabla_{\mu}\Omega-4\Box\Omega\right)-4\lambda_{C}\Omega$$

This may be arranged as follows:

(47) $$R\Omega+3\Box\Omega+\frac{8\pi}{\nu}\left[\left(\nabla^{\mu}S\right)\left(\nabla_{\mu}S\right)\right]+\frac{\omega}{\Omega}\nabla_{\rho}\Omega\nabla^{\rho}\Omega+4\lambda_{C}\Omega=0$$

Comparing Equations (45) and (47) to Romanek 3, in Figure 4 above, several terms are immediately recognizable, such as the first two terms in Equation (47). At the same time, it is apparent that the term involving Planck's constant in the Romanek equation, if it is interpreted correctly, will not appear in the Brans-Dicke equation, unless perhaps this term is part of the cosmological constant term. There are other terms in Romanek 3 which do not match. While some of these may be due to errors in Romanek's transcription, others may be examples of new information or new physics. It may be that the theory here is related to the Brans-Dicke model, but differs in some way. The appearance of Planck's constant suggests that quantum effects may be have been added.

TABLE I - SIMILAR TERMS

BRANS-DICKE	ROMANEK
$R\Omega$	$R\Omega$
$3\Box\Omega$	$b\Box\Omega$
$8\pi\frac{1}{\nu}\left[\left(\nabla_{\mu}S\right)\left(\nabla_{\nu}S\right)\right]$	$\frac{2K\rho}{m}\left[\left(\nabla_{\mu}S\right)\left(\nabla_{\nu}S\right)\right]$
$4\lambda_{C}\Omega$	$2K\lambda_{C}\Omega$
$\frac{\omega}{\Omega}\left(\nabla_{\mu}\Omega\nabla_{\nu}\Omega\right)$	$\gamma\left(\nabla_{\mu}\Omega\nabla_{\nu}\Omega\right)$
$\frac{8\pi}{2\nu}\left[g_{\mu\nu}\nabla_{a}S\nabla^{a}S\right]$	$\frac{Kp}{m}\left[g_{\mu\nu}\nabla_{a}S\nabla^{a}S\right]$
$g^{\mu\nu}\nabla_{\mu}\nabla_{\nu}\Omega^{2}=\Box\Omega^{2}$	$g_{\mu\nu}\Box\Omega^{2}$

In Table I above we list some of the terms found in Romanek 3 and compare them to the terms found in the Brans-Dicke equations. Clearly there are other terms which don't match exactly, so it is far from perfect, but from the similarities, Romanek 3 does appear to be related to the Brans-Dicke equations to some extent.

Discussion

These equations represent a nonstandard model of gravity, or General Relativity, in which the "curvature" of space is replaced by a varying dielectric constant and coupling strength. These equations can be partially understood by comparing to the series of papers by Puthoff (Puthoff, 1996, 2001, 2002, etc.), as well as to papers by Dicke (Dicke, 1957, 1961), Brans (Brans, 1961), and Wilson (Wilson, 1921).

Wilson's far-reaching insights came only a few years after the original publication of General Relativity by Einstein. He proposed that gravity can be modeled, and perhaps explained, if one assumes it is due to the electromagnetic interactions of the charged particles making up all of matter. If this is the case, then gravity can be represented as a distortion of the dielectric properties of space, rather than by an entirely separate force, as Einstein assumed.

The work by Puthoff and Dicke further explored the implications of this model, including the changes in other physical parameters which would be required for consistency. Puthoff extended the model by computing several explicit solutions in a number of practical cases, and by focusing on methods and technologies which may help implement the theory. In addition to this research, a number of other physicists have considered various aspects of these ideas. A few of these include: (Robertson, 2007), (Riccardo, 2007), (Krogh, 2006), (Unzicker, 2007), (deFelice, 1971), (Evans, 1996), (Davis, 2006), (Everett, 1997), (Vargas, 2004), and (Wesson, 1992).

Puthoff describes the PV equations as examples of "engineering the vacuum." By forcing changes in the dielectric constant using the E-M field, gravitation-like effects are produced. If K is less than 1, then faster-than-light propagation of signals and masses theoretically becomes possible. The remarkable thing is that these equations imply that this is possible, and even prescribe how it may be done.

> ***"In SETI (Search for Extraterrestrial Intelligence) conventional wisdom has it that the probability of direct contact by interstellar travel is vanishingly small due to the enormous distances involved, coupled with the velocity of light limitation. Alcubierre's recent warp drive analysis (Alcubierre, 1994) within the context of general relativistic dynamics, however, indicates the naivete of this assumption. We show here that Alcubierre's result is a particular case of a broad, general approach that might loosely be called "metric engineering," the details of which provide yet further support for the concept that reduced time interstellar travel, either by advanced extraterrestrial civilizations at present, or ourselves in the future, is not, as naïve considerations might hold, fundamentally constrained by physics principles."(Puthoff, 1996)***

By combining the insights from these various authors, it appears that a dynamic foreshortening of space may in principle be allowed, if one creates a traveling wave of dielectric variation ("warp bubble") which travels at the same speed as the mass itself. This would amount to creating a "temporary wormhole" which travels along with the craft.

If such a solution is possible, then variation of the E-M field would first be generated by the craft which causes a distortion of the index of refraction K. This would produce a field similar to gravity and the object will "fall" into it. If the craft continues to create a time and space varying E-M field around it, it will continue to distort space time in front of it. It makes a "temporary wormhole" in the direction into which it is pulled.

As it falls into it, it will continue to distort space in its vicinity. It creates a temporary wormhole which foreshortens space and slows time in that direction. Space behind it will close up and return to normal flat space, but around the object a "bubble" is created in which time and space are altered. In this case, the craft inside the bubble may seem to travel at less than c, but outside the bubble it appears to move much faster so the total time to complete a trip is accordingly reduced by the factor K.

The net effect is similar to A1cubierre's scheme for superluminal travel (Alcubierre, 1994), in that a "bubble" of distorted metric is created around a craft, and this bubble moves at a speed greater than c, carrying the object with it. The difference is that Alcubierre's scheme assumes that General Relativity is correct, and therefore requires highly distorted gravitational fields. It even requires “negative mass” which seems extremely unlikely to become available. By contrast, the P-V model offers a method of distorting gravity which, if correct, may be easier to achieve.

The unanswered question is whether gravity really behaves this way. Although these ideas are still far from the mainstream, since coming to study the Romanek equations I have been astonished to see how many papers have discussed such models. There is very little experimental evidence to support these ideas at the present time, although there are intriguing clues such as the recent interview with long-time Hughes Aircraft and Lockheed Senior Research Scientist Boyd Bushman (Sereda, 2011) who seems to support such concepts. It still represents a minority of scientists at this time. The fact that these ideas have turned up in the Romanek equations, as well, suggests to me that perhaps these ideas are deserving of further investigation.

Conclusion

The Romanek equations were apparently written by someone with a grade school math education (in his sleep or hypnosis according to witnesses) and yet they provide insights into space-time which are far-reaching. They call our attention to a non-standard area of physics which, if confirmed, offers a way to achieve what UFO craft seem to demonstrate: a way to get from there to here across the vast distances of space much faster than allowed by Relativity. If these ideas are verified, it would make long distance space travel a reality. The equations indicate how this might be done.

These equations call our attention to an important and neglected field of physics which may contain little-known connections between gravity and electromagnetism. They call our attention to the important research of Puthoff (Puthoff, 2002, 2010), Dicke (Dicke, 1957, 1961) and Wilson (Wilson, 1921). The Romanek equations have led me to discover for myself numerous surprising papers which shed light on the connection between gravity, electromagnetism, and the nature of space-time itself.

It may never be possible to determine from the equations by themselves whether the Romanek case is genuine. This must be done by considering all the evidence from many sources: videotapes, witnesses, and physical evidence.

To me, the most useful criterion is whether they display evidence of an advanced intelligence. Do they reveal an understanding of physics which seems beyond our current state of science? Can we use these equations to advance our own understanding? Here, it seems to me the answer is yes. The theories highlighted by the Romanek equations, whatever their origin, do take us beyond accepted physics, and they direct our attention to a new physics in which gravity and space-time can be manipulated. It holds the promise for us to understand some of the mysteries of UFOs, how they violate the Einsteinian speed of light barrier, how they cross the great distances of space in a short time.

The full import of these equations may not be understood yet. If there is truly new physics here, then it will take time to fully understand it. But the conceptual insights that are hinted at are far reaching. It is true that some of the Romanek equations were published first by others. If they had not been, we would be hard pressed to understand their meaning. But there are others which we have not yet decoded. Even the ones we think we understand are at the forefront of knowledge and research. Their meanings may become clearer over time.

The Romanek equations highlight certain areas of speculative research which seem to relate closely to the type of technology any space traveling race would need to have. They suggest that there is something very important which is missing from our current understanding. Our present accepted gravity theory does not allow for the types of manipulations and engineering indicated by these equations. They direct our attention to non-standard theories such as those proposed by Puthoff and Dicke, seeming to say “look at these. This is the right way to go if you want to understand how we do what we do.”

The Romanek equations emphasize and lead us to speculative research which may provide deep insights into exciting new areas of physics. This is far beyond the abilities of Mr. Romanek. The new science indicated by these equations sheds light on how UFOs might travel the vast distances between the stars. It may explain how they conquer the “speed of light barrier,” and in doing so it makes contact with distant civilizations much more likely.

REFERENCES

Alcubierre, M., “The warp drive: hyperfast travel within general relativity,” *Class. Quantum Grav*. 11, L73 (1994); also Albubierre, Miguel, Dept. of Physics and Astronomy, University of Wales, arXiv:gr-qc/0009013 5 Sep 2000 (2000)

Brans, C., and Dicke, R. H., “Mach’s Principle and a Relativistic Theory of Gravitation,” *Physical Review*, Volume 124, Number 3, (1961)

Casimir, H. B. G., Proc. *Kon. Ned. Akad. Wetensch*, Vol. B51, 793 (1948)

Chown, Marcus, *New Scientist*, 32, 7 April (1990)

Cramer, John G., “FTL Photons,” *Analog Science Fiction and Fact Magazine*, The Alternate View column AV-43 (1990)

Davis, Eric W. and Puthoff, H.E., “Experimental Concepts for Generating Negative Energy in the Laboratory,” CP813, *Space Technology and Applications International Forum-STAIF 2006*, ed. By M/S. El-Genk, AIP (2006)

Davis, Eric W., “An Assessment of Faster-than-Light Spacetimes: Make or Break Issues,” *42nd AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit*, 9-12 July, 2006, Sacremento, CA, AIAA 2006-4908 (2006)

Davis, E.W., Teofilo, V.L., Haisch, B., Puthoff, H.E., Nickisch, L.J., Rueda, A., and Cole, D.C., “Review of Experimental Concepts for Studying the Quantum Vacuum Field,” *CP813 Space Technology and Applications International Forum-STAIF 2006*, edited by M.S.El_Genk, AIP (2006a)

Desiato, Todd J., and Storti, Riccardo C., “Warp Drive Propulsion within Maxwells Equations,” tdesiato@deltagroupengineering.com, Delta Group Research, LLC, San Diego, CA, January 27 (2003)

Dicke, R.H., “Gravitation Without a Principle of Equivalence,” *Rev. Mod. Phys*. 29, 363-376 (1957)

Dicke, R.H., “Principle of Equivalence and the Weak Interactions,” *Reviews of Modern Physics*, Vol. 29, No.3 (1957a)

Dicke, R.H., “Mach’s Principle and Equivalence,” in *Proc. of the International School of Physics ‘Enrico Fermi’ Course XX*, “Evidence for Gravitational Theories,” ed. C. Moller (Academic Press, New York, pp. 1-49 (1961)

deFelice, Fernando, “On the Gravitational Field Acting as an Optical Medium,” *Gen. Relativity and Grav*., Vol. 2, No. 4, pp. 347-357 (1971)

Einstein, Albert, *Ann. Phys*. Vol. 35, 898 (1911)

Einstein, Albert, "Riemannian Geometry with Maintaining the Notion of Distant Parallelism," *Session Report of the Prussian Academy of Sciences*, pp. 217-221, June 7th (1928)

Einstein, Albert, "New Possibility for a Unified Field Theory of Gravitation and Electricity," *Session Report of the Prussian Academy of Sciences*, pp. 224-227, June 14th (1928b)

Evans, J., Nandi, K., and Islam,A., "The Optical-Mechanical Analogy in General Relativity: New Methods for the Paths of Light and of the Planets," *Am. J. Phys*. Vol. 64, 1401-1415 (1996)

Everett, A.E. and Roman, T.A., "A Superluminal Subway: The Krasnikov Tube," *Phys. Rev. D* 56, 2100 (1997)

Kasher, Jack, Ph.D., Consultant to MUFON, "Analysis of Stan Romanek's Page of Equations Written in August 17, 2005," [done in Stan's sleep, 8/17/05], Kasher I

Kasher, Jack, Ph.D., "Interpretation of Stan Romanek's Two Pages Filled with Symbols, Equations and Drawings; The Page Written 06/25/2002 Under Hypnosis" [done under hypnosis, 8/17/05], Kasher II

Kasher, Jack, Ph.D., "Interpretation of Stan Romanek's Two Pages Filled with Symbols, Equations and Drawings; Page Written 09/03/2002 During the Night," [dome in Stan's sleep, 9/3/02], Kasher IIa

Kasher, Jack, Ph.D., "Analysis of Stan Romanek's Page of Equations Written on September 28, 2006," [done in Stan's sleep with two witnesses], Kasher III

Kasher, Jack, Ph.D., "Stan Romanek's February 28 Page of Equations," [done in Stan's sleep Feb. 28, 2006], Kasher IV

Krogh, Kris, "Gravitation without Curved Space-time," Neuroscience Research Institute, U. of California, Santa Barbara, arXiv:astro-ph/9910325 v23 4 July (2006)

Puthoff, H.E., "SETI, the Velocity-of-Light Limitation, and the Alcubierre Warp Drive: An Integrating Overview," *Physics Essays*, Vol. 9, No. 1, pp. 156-158 (1996)

Puthoff, H.E., "Can the Vacuum be Engineered for Spaceflight Applications? Overview of Theory and Experiments," *Jour. Sci. Exploration* 12, 295 (1998)

Puthoff, H.E., “Polarizable Vacuum (PV) Representation of General Relativity,” Institute for Advance Studies at Austin, http:xxx.lanl.gov/abs/gr-qc/9909037v2 (2001)

Puthoff, H.E., “Polarizable Vacuum (PV) Approach to General Relativity,” *Found. Phys*. **32**, 927-943 (2002)

Puthoff, H.E., Little, S.R., and Ibison, M., “Engineering the Zero-Point Field and Polarizable Vacuum For Interstellar Flight,” *J. British Interplanetary Soc*., Vol. 55, 137-144, (2002a)

Puthoff, Harold E., and Ibison, Michael, “Polarizable Vacuum ‘Metric Engineering’ Approach to GR-Type Effects,” *Proc. Gravitational Wave Conf*., MITRE Corp, McLean, VA (2003)

Puthoff, H.E., Maccone, Claudio, and Davis, Eric W., “Levi-Civita Effect in the Polarizable Vacuum (PV) representation of General Relativity,” *General Relativity and Gravitation*, Vol. 37, 483-489 (2005)

Puthoff, Harold E., “Advanced Space Propulsion Based on Vacuum (Spacetime Metric) Engineering,” *JBIS*, Vol. 63, pp. 82-89 (2010)

Riccardo, T. D., and Riccardo, C. S., “Exotic Matter and Propulsion within Maxwell’s Equations,” http://tprints.ecs.soton.ac.uk/archive/000000030/01 (2007)

Robertson, Glen A., Murad, P.A. and Davis, Eric, “New Frontiers in Space Propulsion Sciences,” www.elsevier.com/locate/enconman, *Science Direct*, Energy Conversion and Management, Vol. 49, 436-452, (2007)

Romanek, Stan, *Messages*, Llewellen Publications (2009)

Scharnhorst, K., *Phys. Lett. B*, Vol. 236, 354 (1990)

Sereda, David, Interview with Boyd Bushman, “From Here to Andromeda,” UFOTV, video.google.com/videoplay?docid=-3874568473252816241 (2011)

Smolyaninov, Igor I., “Metamaterial-based Model of the Alcubierre warp drive,” University of Maryland, College Park, PACS numbers: 78.20.Ci, 42.25.Bs (2010)

Swanson, Claude, *Life Force, The Scientific Basis*, Poseidia Press, Tucson (2010)

Unzicker, Alexander and Case, Timothy, “Translation of Einstein’s Attempt of a Unified Field Theory with Teleparallelism,” arXiv:physics/0503046v1 [physics.hist-ph] (2005)

Unzicker, Alexander, “Mach’s Principle and a Variable Speed of Light,” arXiv:gr-qc/0511038v4, 6 Oct (2007)

Vargas, Jose G., and Torr, Douglas G., “Is Electromagnetic Gravity Control Possible?,” CP99, *Space Technology and Applications International Forum-STAIF 2004*, edited by M.S.El-Genk, American Institute of Physics (2004)

Volkov, A.M., Izmest’ev, A.A., and Skrotskii, G.V., “The Propagation of Electromagnetic Waves in a Riemannian Space,” *Sov. Phys. JETP* 32, 686 (1971)

Weinberg, S., *Gravitation and Cosmology*, John Wiley and Sons (1972)

Wesson, P., *Space Science Review*, Vol. 59, 365, (1992)

White, H., “A Discussion on Space-Time Metric Engineering,” *Gen. Rel. Grav*., Vol. 35, 2025-2033 (2003)

White, H. G. and Davis, E.W., “The Alcubierre Warp Drive in Higher Dimensional Spacetime,” *CP813 Space Technology and Applications International Forum-STAIF 2006*, edited by M. S. El Genk, AIP (2006)

Wilson, H. A., “An Electromagnetic Theory of Gravitation,” *Phys. Rev*. **17**, 54-59 (1921)