

Casimir Force: The irrelevant answer for the wrong reason?

On Oct 11, 2004, at 7:23 AM, Frank Chille wrote:

FYI!

Subject: Nick Cook, Antigravity @ MetroCon 2004
Date: Sat, 09 Oct 2004 10:00:37 -0400

See (<http://www.metrocon.org/keynote.htm>)

On Oct 11, 2004, at 10:17 AM, Jack Sarfatti wrote:

Unfortunately the physics in this Metro-Con URL above by Nick Cook is not accurate. Nick got his physics information here mainly from Hal Puthoff and it is incorrect in some fundamental ways.

Google "Ian Peterson, University of Coventry, UK" Professor Peterson shows that the Casimir force cannot correctly be considered a zero point force at all from virtual photons. What it really is, is a subtle electrostatic force between mutually induced separated charges in neutral atoms on both plates. This means that any energy from any Casimir force nano-device comes strictly from the weak electrostatic energy not from the zero point virtual photon energy. Therefore, in no sense, can one think that the Casimir force can tap vacuum energy. Top physicists like Matt Visser, Cliff Will and Bill Unruh have told me in a face to face meetings at GR 17 in Dublin, Ireland last July 2004 that they do not agree with Hal Puthoff's proposals in this field that are echoed in Nick Cook's statements below and also in the Aviation Week article "To The Stars" and in the now defunct NASA BPP program.

Hal Puthoff's association of the Casimir force as a zero point force from virtual photons of the free radiation field ignoring the electron-photon coupling is a common misconception found even in textbooks like Peter Milonni's "The Quantum Vacuum." Milonni gives three separate derivations of the parallel plates Casimir force, which from simple dimensional analysis and symmetry, without any specific dynamical physics at all, must be of the form

$$\text{Casimir force} \sim hcA/d^4$$

A = area of the pair of parallel neutral conducting plates

d = separation between the plates

You need a specific dynamical model to compute the pure number coefficient of course.

Milonni's first model is the one cited by Hal and is even in Scientific American. It depends on boundary conditions excluding free radiation oscillators of wavelengths longer than 2d along the direction perpendicular to the parallel plates. One also assumes f

= kc that is not true for virtual photons and then simply counts the number of oscillators between the plates and compares them to the number of oscillators outside the plates assuming $kc/2$ ground state energy per oscillator. To be more precise, Milonni actually computes

$$ZPE(d) - ZPE(\text{infinity})$$

The attractive, in this case not in all cases, "Casimir force" is then of the above form from taking the negative gradient of the above difference.

The idea here being that the only physically important observable is the effect of the boundary conditions. Indeed if there is no short-wave cutoff "a", each term in the above difference is infinite and you want to get a finite cut-off independent result from subtracting two infinities. Of course, one does put in a finite cutoff "a" and then takes the limit $a \rightarrow 0$ at the end of the calculation. Invoking various tricks this model does come up with a dimensionless coefficient that is alleged to agree with experiment.

However, this gives the right answer for the wrong reasons. Ptolemy's epicycles did the same BTW. It's not enough to get the right empirical answer if the reasoning contradicts other parts of battle-tested physics, in this case general relativity.

If one were to ignore general relativity one can get away with the above bogus argument accepted by people who have not thought deeply about the problem. The problem here is the cosmological constant problem on how to reconcile the theory of gravity with micro-quantum theory. The answer is that you cannot! You need a more general theory called macro-quantum theory to include Einstein's gravity. The bonus is that you also get both dark energy and dark matter popping out in a natural way along with Einstein's 1915 gravity theory in a way that explains why orthodox quantum gravity is not renormalizable.

Milonni's second argument is using Einstein's 1905 picture of photons carrying momentum hk . Again the problem is that although one gets the correct empirical answer the reasons contradict general relativity! Of course, Milonni's book has no general relativity in it. This second model requires that virtual photons have $w = +1/3$ when in fact general relativity requires that they have $w = -1$ where

$$w = \text{pressure}/(\text{energy density}).$$

Puthoff has just published a wrong Casimir force model of Ken Shoulders EVOs that uses this second model with $w = +1/3$. Ken Shoulders EVOs appear to be hollow charged shells of N electrons held together by a mysterious glue. These EVOs typically are 10^{-5} cm to 10^{-3} cm across. Naive estimates are unbalanced charges of $N \sim 10^{13}$ to 10^{17} e from $N(h/mc)^2 \sim 4\pi(\text{Radius of EVO})^2$ assuming flat space geometry. For example,

$$1. N \times 10^{-22} \sim 10^{-9}$$

$$N \sim 10^{13}$$

$$2. N \times 10^{-22} \sim 10^{-5}$$

$$N \sim 10^{17}$$

$$1 \text{ Coulomb is } N \sim 10^{19}$$

Two 1 Coulomb charges separated by a meter produce an electrostatic force $\sim 1 \text{ million tons!}$

One problem with these EVOs is where is the positive charge left behind? Of course they are stuck on nucleons \sim thousands of times more massive than the electrons.

Of course, if the space of the EVOs is warped from zero point energy density inside the charged shells then N can be a lot smaller and the unbalanced charge problem is not as serious. Indeed, this is what I propose because it also solves the old problem of the stability of the electron as a spatially extended object Bohm hidden variable that appears to shrink down to a point as the resolution of its imaging (scattering) increases at least down to 10^{-16} cm.

The Zero Point Field Equations of Metric Engineering

Puthoff's Casimir force as a ZPF force solution to this EVO problem is entirely Rube Goldberg and contradicts general relativity from his $w = +1/3$ assumption as well as other assumptions. Puthoff misunderstood me. I am *not* trying to explain the Casimir force as a zero point energy induced strong short-range gravity effect from

$$G_{\mu\nu} + \Lambda_{zpf} g_{\mu\nu} = 0 \tag{0.1}$$

I. $G_{\mu\nu} + \Lambda_{zpf} g_{\mu\nu} = 0$ is the exotic vacuum local field equation down to the microscale. This goes beyond using the Einstein cosmological constant only at the large cosmic scale greater than 10^{26} cm. I am the first to propose this to my knowledge. Einstein's large-scale cosmological constant coarse-grained over a huge volume treated as a point for cosmology is fine-grained to a local micro-field consistent with Einstein's Vision explained by John Archibald Wheeler back in the 1950's in his book "Geometrodynamics".

$$G_{\mu\nu}^{;v} + \Lambda_{zpf}^{;v} g_{\mu\nu} = 0 \tag{0.2}$$

II. $G_{\mu\nu}^{;v} + \Lambda_{zpf}^{;v} g_{\mu\nu} = 0$ is the local conservation of geometrodynamical current densities. Sum over repeated pairs of subscripts and superscripts from 0,1,2,3. The semi-colon denotes the curved space-time covariant derivative and the comma denotes the ordinary partial derivative.

Starting from a non-exotic vacuum where the initial $\langle \Lambda_{zpf} \rangle = 0$ the induced local zero point exotic vacuum field is essentially the Josephson Effect “potential”

$$\delta\Lambda_{zpf} = \left(\frac{Mc}{\hbar}\right)^2 V_{overlap} |\Psi_{Higgs}|_0 |\Psi_{Control}| \cos(\arg \Psi_{Higgs} - \arg \Psi_{Control}) \quad (0.3)$$

Where

$$|\Psi_{Higgs}|_0 = \left(\frac{Mc}{\hbar}\right)^{3/2} \quad (0.4)$$

$$a \equiv \frac{\hbar}{Mc} \quad (0.5)$$

M is the regulator mass for this “More is different” emergent c-number macro-quantum coherent zero entropy ODLRO 4D “super solid” vacuum condensate *local* field with short-wave cutoff a . Macro-quantum locality with long-range holographic “phase rigidity” and “signal nonlocality” under some conditions are all associated with the zero entropy. Note that the local macro-quantum order parameters Ψ are normalized like single-particle micro-quantum pilot BIT waves to (Volume)^{-3/2} and $\delta\Lambda_{zpf}$ has the physical dimensions of curvature i.e. (Area)⁻¹. Therefore,

$$\begin{aligned} \delta\Lambda_{zpf} &= \left(\frac{1}{a}\right)^2 V_{overlap} \left(\frac{1}{a}\right)^{3/2} |\Psi_{Control}| \cos(\arg \Psi_{Higgs} - \arg \Psi_{Control}) \\ &= \left(\frac{1}{a}\right)^{7/2} V_{overlap} |\Psi_{Control}| \cos(\arg \Psi_{Higgs} - \arg \Psi_{Control}) \end{aligned} \quad (0.6)$$

III. $\Lambda_{zpf} = a^{-2}(\text{Overlap Volume})|\text{Higgs Ocean}||\text{Control Order Parameter}|\text{Cos}(\text{Phase difference between Higgs Ocean \& Control})$ (Bohm-Aharonov-Josephson-Berry phase modulation control for practical metric engineering of warp, wormhole and weapon)

To repeat this new insight, I am saying, in agreement with Ian Peterson, that the observed Casimir force has a mundane explanation as an integrated retarded electrostatic Casimir-Polder force and, therefore, is of no interest to the practical metric engineering of warp, wormhole and weapon. I have never claimed that the observed Casimir force $\sim hcA/d^4$ is from zero point energy at all! Indeed, I claim the opposite of what Puthoff understood me to claim. I claim that under conditions where this Casimir force is measured the zero point virtual photon energy density (and pressure) is *zero* on both sides of each plate! That is $\Lambda_{zpf} = 0$, there is no exotic vacuum in the actual Casimir force experiments! Any direct gravity effect from exotic vacuum zero point pressure would swamp this weak Casimir force! Note that $hc \sim e^2$ so that hcA/d^4 hides the underlying electrostatic e^2 origin of this force only seen in non-exotic vacuum conditions.

Finally Milonni has the correct model from integrating the retarded r^{-7} force between mutually induced electric dipoles in neutral atoms over the plates.

Note that the electrostatic force comes from virtual photons in macro-quantum coherent states as shown by Roy Glauber at Harvard in the early 1960's and they are different from the random virtual photons one per oscillator in the oscillator ground state.

The distinction between real photons with $w = +1/3$ and virtual zero point photons with $w = -1$ comes from the structure of Feynman propagators in quantum electrodynamics, which is strictly a special relativity theory that does not permit gravity.

Without gravity, you can sweep the large zero point energies under the rug and pretend that they are not there. With gravity you cannot. This is the cosmological constant paradox that I think only I have correctly solved. We shall see. You need to use the coherent Higgs Ocean in a novel way to solve the problem. The point for the Casimir force, is that in conditions where it is measured, the actual ZPF virtual photon pressure is zero on both sides of each plate because of the macro-quantum vacuum coherence out of which Einstein's gravity emerges. Therefore, the observed Casimir force must come from Milonni's 3rd model, which is the one Ian Peterson uses.

Finally Nick's appeal to Feynman in

“This phenomenon is general. Every particle in Nature has an amplitude to move backwards in time, and therefore has an anti-particle.”
- Richard Feynman, “QED”

Is a completely false clue as I explain in detail in my 3 books. The point is that the $w = -1$ ZPF does have a direct strong gravity influence that can either be attractive or repulsive depending on THREE factors

I. The sign of the quantum ZPF pressure

II The power law distribution of the ZPF.

III The local intensity of the post-inflationary Higgs Ocean field

Indeed, these three conditions in different environments explain

1. The acceleration of the universe seen in Type 1a supernovae anomalous redshifts
2. Ken Shoulders EVOs
3. Galactic halo stabilizing the stars in our galaxy

4. Other dark matter gravity lensing.
5. Some gamma ray bursts
6. Deep inelastic electron scattering off protons and neutrons.
8. Universal Regge slopes of hadronic resonances.

Last but not least - to raise the hackles of Mainstream Physics Pundits and Pro Skeptics:

9. Warp, wormhole and weapons seen in the UFO data collected on the NIDS website.

<http://www.nidsci.org/>

Hal Puthoff's Counter-Argument on EVOs

On Aug 29, 2004, at 7:25 PM, Puthoff@aol.com wrote:

In a message dated 8/29/2004 5:20:33 PM Central Daylight Time, sarfatti@pacbell.net writes (re-edited 10/10/04 from original): Hal implicitly uses $w = + 1/3$ in his latest wrong paper on Ken Shoulders charge clusters. See his p.3 with his "1/3" in his

$$(1/3)u_{zpf}(\text{virtual photon}) = u_e-(\text{Coulomb})$$

This is Hal's "greatest blunder". Neglecting the Higgs Ocean vacuum coherence that is essential to solve the cosmological constant paradox in the head-on collision between general relativity and *micro*-quantum theory, Hal has confused far-field transverse polarized *real photons*, which do have $w = 1/3$ with *positive* radiation pressure with *virtual ZPF photons* including longitudinal polarization, that have $w = -1$ with *negative* pressure!

"Wrong again, Jack. You are misapplying cosmological aspects of the ZPF vacuum to a boundary condition Casimir problem. "Real" or "virtual photons" is not the issue here. You need to understand the Casimir effect literature. You may have some traction with the cosmological literature, but are woefully untutored with regard to the vacuum Casimir Effect literature. The type of calculation I use is what generates Casimir attraction. (If you're not careful, Jack, you would predict that the negative pressure of virtual photons would push Casimir plates apart, not attract them together, counter to both theory and experiment!)"

This shows Hal's fundamental misunderstanding to the issue. If one were to forget about general relativity completely, Hal's position would almost be tenable. It's not enough to fit only some of the pieces of the puzzle together. Hal simply handwaves away general relativity.

*"You need to read Milonni, P.W., Cook, R.J., and Goggin, M.E. (1988) "Radiation pressure from the vacuum: Physical interpretation of the Casimir force", Phys. Rev. A, Vol. 38, No. 3, pp. 1621-1623. There you will see that the form of my radiation pressure calculation for the problem at hand (modeling of the charge cluster phenomenon at <http://arxiv.org/abs/physics/0408114>) is correct and of the type that leads to agreement between theory and experiment. The Casimir plate collapse due to reduced ZPF radiation pressure (yes, of virtual photons!) between the plate boundaries as compared with that outside is precisely applied in my case. My case is simply one where the reduction inside the boundary is the extreme case of reduced interior pressure defined by Casimir in his Type II model. Your (incorrect) commentary with regard to my calculation is a misapplication to the boundary-condition Casimir-type effects under consideration here. Based on your misapplication of the $w = -1$ principle to the Milonni, Puthoff et al. type of Casimir pressure imbalance problem, as I said above, you could very well end up predicting parallel Casimir plate repulsion instead of attraction due to negative virtual photon vacuum pressure! So what we're dealing with here is a blunder on Jack's, not Hal's, part. I've done my best to spell it out in detail. If it's still not clear, I recommend you reread Milonni et al.'s paper, then Casimir's paper that is in my references of my arxiv posting, then reread mine. Until you've done that, there is no use discussing this matter any further. (And yes, I have read Peacock many times, understand it well, know all about $w = -1$, etc., etc., so let's not waste any time on that irrelevant Red Herring either. Now it's your turn, you need to read the Casimir calculation literature.)
Collegially, Hal"*

I do not think Hal has understood Peacock's argument. You cannot have $w = -1$ for virtual photons some of the time and $w = +1/3$ for them the rest of the time. Hal may want to argue that the equivalence principle for emergent macro-general relativity does not hold at the micro-level except that experiments with neutrons show that it does hold – if I am not mistaken? I will check the literature on that for the next book. The essential idea that Hal has not understood here is that the total ZPF pressure must exactly vanish under the conditions when the Casimir force is measured. Indeed, any non-zero ZPF exotic vacuum pressures would mask the Casimir force.

On Aug 31, 2004, at 12:54 PM, Puthoff@aol.com wrote:

In a message dated 8/30/2004 7:19:16 PM Central Daylight Time, sarfatti@pacbell.net asks several questions, all of which are answered here:

"I have spotted your source of confusion, so I will carry you through the arguments in detail in order to clear up the confusion. They are implicit in <http://arxiv.org/abs/physics/0408114> , but apparently it was not transparent. The source of confusion is this: Since Casimir suggested the model I evaluate, you may have assumed that we are talking about the (relatively weak) "Casimir force" model. We are not. Just because Casimir suggested this model and therefore his name is associated with it, this does not mean it has anything to do with the "Casimir force." It does not.

The so-called "Casimir force" has to do with partially canceling vacuum fluctuation fields determined by cavity geometries. This other Casimir-suggested model I'm dealing with has essentially nothing to do with cavity characteristics. This should all become transparent as we walk through the math.

BTW, I acknowledge that you offer a cosmological model for charge cluster formation, and that is OK, but this is something different. I am not offering an alternative cosmological model, different from yours. This is a different kind of model, a quantum physics model. In the real world of empirical results my quantum physics model may apply, your vacuum cosmology model may apply, or a combination of both may apply. I have no argument with your claim that my model may not apply. I do have an argument with your claim that I have not done my model correctly because it does not coincide with your take on the problem at hand."

You seem to be saying, correct me if I am wrong, that the *positive* virtual photon ZPF energy density is

$$u(\text{virtual photon}) \sim hc(h/mc)^{-4} \sim 10^{-27} 10^{10} (10^{-11})^{-4} \sim (10^{-17})(10^{44}) \sim 10^{27} \text{ ergs/cc}$$

Yes? No?

"Yes on equation, though for magnitude I get 1.8×10^{23} ergs/cc. (Not a big issue here.)"

You next say that the *positive* virtual photon pressure is

$$\text{pressure}_{\text{virtual photon}} \sim (1/3)\text{energy density}_{\text{virtual photon}}$$

"Yes"

That's a very big pressure of course

"Yes, indeed. That's why it has the potential to balance the the large Coulomb pressure."

You have zero vacuum coherence here in the sense that I mean it.

"Definitely. This is the standard, random vacuum EM ZPF quantum fluctuation field."

OK, a typical EVO has an electron shell of radius $a \sim 10^{-5} - 10^{-6}$ cm says Ken Shoulders.

"Actually, for the witness marks it's 1 - 10 microns, or $10^{-5} - 10^{-6}$ m; however, the 'bomb' that caused the crater may be more on the order of the dimensions you give, so that's OK (a minor point here)"

Now you and I both agree that

$$N^{1/2}(h/mc) \sim d$$

“OK, within an order of magnitude.”

Let's take $d \sim 10^{-5}$ cm, $h/mc \sim 10^{-11}$ cm. Therefore $N \sim 10^{12}$ electrons close-packed to make a thin spherical shell 100 nanometers across that is 10^{-4} nanometers thick. Right? Yes? No? Are we on the same page here?

“You will note from my paper <http://arxiv.org/abs/physics/0408114>, 5th equation in Section 3, that for 10^{12} electrons, the diameter $d \sim N^{1/2} \times (h\text{-bar}/mc) \sim 400$ nm, close enough.”

The electrostatic self energy is

$$\begin{aligned} U_{\text{self-energy}} &\sim +(Ne)^2/d \sim N^2(1/137)hc/d \sim \\ &(10^{24})(10^{-2})(10^{-27})(10^{10})(10^5) \sim (10^{39})(10^{-29}) \sim 10^{10} \text{ ergs} \\ &\sim 1 \text{ kilojoule.} \end{aligned}$$

“OK, I get about half that, close enough.”

Now what virtual photon modes are allowed outside the spherical shell,

“Essentially all, not constrained outside to first order.”

And what modes inside the shell are allowed according to you?

“In Casimir's "Model 2" -- see paper -- only those modes whose frequency > Compton frequency cutoff. This cutoff model is not according to me, it's according to Casimir. Unlike the "Casimir force" model ("Model 1" that you have considered) where interior modes that satisfy the boundary conditions are permitted and thus the problem can be treated as a cavity boundary value problem, Casimir's "Model 2" is one in which cavity modes play no role. Rather, it is a model in which individual electron-ZPE interactions on the surface of the sphere is where the action is, and for the close-packed shell (each surface electron taking up a Compton-sized disk), interior EM modes are taken to be shielded up to the Compton cutoff frequency. Realize that this is Casimir's model, not mine. Don't shoot the messenger! :-)”

Ugh! This model is so ugly, contrived, ad-hoc, Rube Goldberg and implausible, that it is hard to believe that Casimir would have suggested it! In any case, the radial outward electrostatic force F is therefore

$$10^{10} \text{ ergs}/10^{-5} \text{ cm} \sim 10^{15} \text{ dynes}$$

Your extraordinary claim is that dP (virtual photon) cancels this radial

outward force of one thousand trillion dynes!

“Force? ZPE force/unit area $\sim 10^{23}$ dynes/cm² to balance Coulomb pressure.”

$10^{15}/10^{-10} \sim 10^{25}$ and divide by $8\pi \sim 24$ is same thing within an order of magnitude. If the only virtual photon modes allowed inside the N-electron shell have wavelengths less than $d \sim 10^{-5}$ cm, then since both inside and outside have all the same short waves, the short waves cancel out on both sides of the shell and so all we have left is force $\sim hc/d^2$ i.e. pressure $\sim hc/d^4 \sim 10^{-17} 10^{20} \sim 10^3$ dynes/cm². This is very small Hal by 20 powers of ten! Again I am assuming here, like you, positive zero point pressures, which of course is wrong! The pressure must vanish on both sides of the wall if you want to use any type of Casimir force as distinct from the exotic vacuum effect I propose in which the pressures do not vanish. I have the exterior pressure vanish, but the interior pressure does not vanish. That is the EVO has an exotic vacuum core. In this case a dark energy core with a 3D harmonic oscillator potential per unit electron mass of c^2/λ_{zpf}^2 assuming spherical symmetry. I have replaced “d” by “r” because of the spherical geometry.

“Your calculation here (yes, it is small) is based on the cavity model of the Casimir force (Model 1) in which (to first order) only long-wavelength cavity modes are cut off. For Casimir's Model 2 (which is not the more familiar Casimir force cavity model) all modes below the Compton frequency of individual electron-ZPF interactions are cut off. With regard to charge clusters this model may be applicable, it may be inapplicable.... but it IS the model! (And, as I point out in <http://arxiv.org/abs/physics/0408114> , it provides a reasonable match to the charge cluster data. Your model may also. May the best model win!) Hopefully this is now clear from the above discussion. The basis for it derives from my Phys. Rev. paper: H. E. Puthoff, "On the Source of Vacuum Electromagnetic Zero-Point Energy," Phys. Rev. A 40, 4857 (1989); Errata and Comments, Phys. Rev. A 44, 3382, 3385 (1991) wherein it is argued that the vacuum fluctuation fields are not "hard-wired" into the fabric of spacetime, but rather are fields generated by the quantum fluctuation motion of charged particles distributed over cosmological space, and are therefore in principle capable of being shielded from compact regions of space by (as in Casimir's Model 2) electron-ZPF interactions.”

This is false because real charged particles are only $\sim 4\%$ of all the gravitating stuff in the universe. The remaining 96% is virtual exotic vacuum stuff!

Hiding Under The Rug

On Sep 25, 2004, at 12:04 PM, Jack Sarfatti wrote:

Remember, macro-quantum vacuum coherence hides random micro-quantum zero point vacuum energy under the rug. Any random zero point energy that leaks out is exotic vacuum that contributes to the cosmological constant either as dark energy or dark matter depending on the sign of the pressure negative or positive respectively. Dark energy at a distance is a universal repulsive antigravity field. Dark matter at a distance is a universal attractive gravity field. Both fields can be stronger than what is expected from Newton's

constant. That is the effective Planck energy is smaller than 10^{19} GeV. However, as possibly in the case of Ken Shoulders "charge clusters" the effective forces inside an extended exotic vacuum region can change sign! Indeed, that is why the EVO is stable and that is also why the single electron is stable.

Alexander Burinskii in Moscow has rightly raised the issue of the distinction between renormalization and regularization of interacting field Feynman diagrams in special relativistic quantum field perturbation theory expansions in relation to the zero point energy problem. We need to see how all these ideas survive in quantum field theory in a c-number curved space dynamical background like in Birrell and Davies text book "Quantum Fields in Curved Space". The issue of the reality of quantum gravity foam of Einstein metric field Heisenberg uncertainty fluctuations is problematical in the soft condensed matter physics approach to gravity as a bottom-up emergent ODLRO macro-quantum phenomenon. That is gravity is a low energy effective c-number ODLRO macro-quantum coherent field theory that in principle is not to be quantized in the usual way the way QED is done. This feature is now being tested in gamma ray astronomy.

Why do Milonni's two naive free virtual photon field models of the Casimir force $\sim hcA/d^4$ as virtual photon effects give, like Ptolemy's epicycles, closed to the correct empirical answer for the wrong reasons?

In the simple boundary condition model using only free virtual photons Milonni computes

$$E(d) - E(\text{infinity})$$

and he gets the cutoff-independent correct answer.

However, what he should compute is

$$E(d) + E(L - d)$$

Letting $L \gg d$ at the end.

The virtual photon ZPF force is then the negative gradient of this sum. This vanishes in 1 + 1 space-time.

The cosmological constant problem is that $E(d) + E(L - d)$ is directly observable in general relativity. This is why Hal's "Type II Casimir Force" model is unacceptable because it requires a huge cosmological constant vacuum energy filling all space outside Ken Shoulders EVOs which have zero ZPE inside their charged shells at least below h/mc short wave cutoff. This contradicts general relativity that is the covering theory here. Any result from unstable globally flat quantum field theory that contradicts general relativity must be rejected. That is the basic problem with what Hal Puthoff is suggesting for metric engineering of warp, wormhole and weapon. Puthoff's PV version of gravity

is not consistent with Einstein's general relativity as shown by his own assistant Michael Ibison. Lest, there be any confusion, I am not suggesting that the direct warping of space-time by zero point energy density is the explanation of the Casimir force. Indeed, the Casimir force as a direct electrostatic force of mutually induced dipoles in the uncharged conductors is observable only in the *absence* of such strong zero point warping of space-time. I am suggesting that Ken Shoulders EVOs have such strong warping and have nothing to do with the Casimir force at all in the dominating approximation. Therefore, as Ian Peterson says, the Casimir force is not a way to tap the zero point vacuum energy of the virtual photons as the popular literature suggests. The only energy you can recover from the Casimir force is the weak mutually induced dipole electrostatic energies. Using the Casimir force as a pedagogical tool for zero point energy physics is profoundly misleading.

Where is the "PV" in Hal's PV?

On Sep 27, 2004, at 4:32 PM, Jack Sarfatti wrote:

Question for Hal - where is the PV in Hal's PV? Is there any "there" there?

In globally flat unstable quantum electrodynamics (AKA) to leading order in the perturbation series expansion of Feynman diagrams of electrons and photons, both real in the external lines, and virtual in the internal lines, the vacuum polarization tensor in momentum q space is:

$$\Pi_{\mu\nu}(q) = (q_\mu q_\nu - \eta_{\mu\nu} q^2) \Pi(q^2) \quad (0.7)$$

Where using Pauli-Villars regularization, $\Pi_{\mu\nu}(q)$ to leading order in perturbation series is

$$\Pi(q^2) = \frac{1}{2\pi^2} \int_0^1 dy y(1-y) \log \frac{M^2}{m^2 - y(1-y)q^2} \quad (0.8)$$

Debye charge screening in the virtual electron-positron plasma vacuum normal fluid component outside the ODLRO superfluid vacuum coherence condensate is

$$e^2_{\text{physical}}(q) \sim e^2_{\text{bare}} \frac{1}{1 + \frac{e^2}{\hbar c} \Pi(q^2)} \quad (0.9)$$

$$\Pi(0) \sim 1 + \frac{e^2_{\text{bare}}}{12\pi^2 \hbar c} \log \frac{M^2}{m^2} \quad (0.10)$$

where m is the rest mass of the electron and $a \equiv \hbar/Mc$ is the short wave cutoff. If the

cutoff is at $\hbar/mc \sim 10^{-11} \text{ cm}$ as Hal wants in his Type II Casimir force model then $\Pi(0) = 1$. In space-time

$$\Pi_{\mu\nu}(x) \sim \int e^{iqx/\hbar} \Pi_{\mu\nu}(q) \quad (0.11)$$

$$\Pi(x) = \eta^{\mu\nu} \Pi_{\mu\nu}(x) \quad (0.12)$$

OK, then for an isotropic vacuum force fitting QED to Hal's SSS PV model gives

$$c^2 = \frac{1}{\epsilon\mu} \sim \frac{1}{(\epsilon_0 + \Pi(x))\mu} = \frac{c_0^2}{K} = \frac{c_0^2}{e^{2r_s/r}} = \frac{c_0^2}{g_{00}} \quad (0.13)$$

How does Hal justify such a connection between his PV phenomenology and QED? It seems totally adhoc with no deep plausibility? How can Hal use "PV" without at least attempting to connect his model to QED? Furthermore, there is no way to control this with a large enough effect for practical metric engineering of warp, wormhole and weapon.

“The G-Engines Are Coming!”

1956 article by Michael Gladych cited on p.3 of Nick Cook's
“The Hunt for Zero Point”

They really are coming in my opinion. Or, rather, they are allegedly already here. That's what the flying saucers are, if they real and not an elaborate hoax. My physics research suggests more and more and faster and faster as time goes on that they are not a hoax. All scientific rational knowledge about the real world, however, is uncertain (Bayesean probability) and, in principle, must be falsifiable as explained by Sir Karl Popper and applied in the financial markets by his student George Soros. Religious faith in extreme form is simplistic and dangerous as we see in the current war on terror and throughout history.

“ ‘All matter within the ship would be influenced by the ship's gravitation only,’ Lear apparently said of the wondrous G-craft. ‘This way, no matter how fast you accelerated or changed course, your body would not feel it any more than it now feels the tremendous speed and acceleration of the Earth.’ The G-ship, Gladych explained, could take off like a cannon shell, come to a stop with equal abruptness, and the passengers wouldn't even need seat belts.” Nick Cook pp. 3-4.

This is an amazing statement considering it was made in 1956, although Paul Hill had deduced such things purely empirically from the flying saucer evidence. It is in complete accord with my own independent theoretical physics research.

Scientists are not supposed to reject evidence. The prime-time mass media millionaire physicists on John Brockman's client list at <http://www.edge.org> scoff at the kind of hard evidence that Bruce Maccabee, a US Navy physicist and Eric Davis another physicist present below. Little do the mainstream pundits realize that the discoveries of the new cosmology of dark energy since 1998 are consistent with the UFO physical evidence. They would rather sell the public unsubstantiated speculations of "strings" as "vibrations of pure energy" in 10-dimensional space and of radiating black hole. Both of these examples may well prove true in the end, but there is no evidence that they are. There is much more evidence for UFOs performing seemingly impossible maneuvers than there is from strings and radiating black holes.

Negative Zero Point Pressure is the Secret of Anti-Gravity Propulsion

On May 4, 2004, at 7:02 AM, Caryn Anscomb cited
Sunday, May 02, 2004 10:34 PM

RemoteViewing pioneer Dr Hal Puthoff recounts his early days in remoteviewing!
Tuesday, April 27, 2004 9:50 AM

Hal fails to mention the other class of zero point energy from the Pauli exclusion principle's fermions, e.g. the PV (Polarized Vacuum) virtual electron-positron pairs inside the vacuum that he also leaves out in his PV without PV model. Hal fails to mention that virtual photons have positive zero point energy density with equal and opposite negative pressure. The pressure dominates by a factor of three over the energy density, hence virtual photons anti-gravitate. It's amazing that Hal never mentions it! Neither does Bernie Haisch or anyone in the SED school. I can only conclude that they are ignorant of this fact of Einstein's theory of gravity that is obviously relevant to the issue of metric engineering the fabric of space-time for NASA Breakthrough Propulsion. Indeed, no mention of this obviously relevant fact anywhere on the NASA Breakthrough Propulsion Project (BPP) page or in "To The Stars" Aviation Week, March 1, 2004, or in Nick Cook's book "The Hunt for Zero Point." Indeed, this fact seems to be intentionally suppressed in the agit prop over free energy, though it is well known in mainstream magazines like "Physics Today," e.g. April 2003 issue.

By the way, the PV zero point random quantum fluctuations of virtual electron-positron pairs have positive pressure and therefore gravitate if distributed according to an inverse power law. All of this supposes zero "vacuum coherence" that you will find no mention of in the NASA Breakthrough Propulsion Project or the talks of Hal & Co like you see in the Aviation Week, Nick Cook and Richard Dolan interviews.

Excerpt from:

Synopsis of Unconventional Flying Objects

JSE Review by: H.E. Puthoff

Institute for Advanced Studies at Austin, TX 78759

Note for the record, I agree with everything Hal Puthoff writes below about Paul Hill's

book. Indeed, I claim to have the only correct physics explanation for the “acceleration field” based on exotic vacuum zero point “dark energy.” I disagree with Hal’s attempt to explain the facts below and I also say that the debunkers of these facts are being less than intellectually objective in discarding real evidence. On this, Puthoff, Davis and I all agree.

SUBJECT: Synopsis of Unconventional Flying Objects, by Paul Hill, Hampton Roads Publ. Co., Charlottesville, VA, 1995 (ISBN 1-57174-027-9)

“To the degree that the engineering characteristics of UFOs can be estimated by empirical observation, in my opinion the above-referenced, recently-published book by Paul Hill provides the most reliable, concise summary of engineering-type data available. [1] The data were compiled over decades of research by a Chief Scientist-Manager at NASA's Langley Research Center [2] who acted as an informal clearinghouse for UFO-related data. The strength of the compilation lies in its thoughtful separation of wheat from chaff, and the analysis of the former into coherent patterns, including detailed calculations. Perhaps surprising to the casually interested, under careful examination the observations, rather than defying the laws of physics as naive interpretation might suggest, instead appear to be solidly commensurate with them, as the following discussion shows. One of the most consistently-observed characteristics of UFO flight is a ubiquitous pattern in which they tilt to perform all maneuvers. Specifically, they sit level to hover, tilt forward to move forward, tilt backward to stop, bank to turn, and descend by "falling-leaf" or "silver-dollar-wobble" motions. Detailed analysis by Hill shows that such motion is inconsistent with aerodynamic requirements, but totally consistent with some form of repulsive force-field propulsion. Not satisfied with paper analyses alone, ... Further detailed investigation indicates that the particular form of force field propulsion that satisfies observational constraints is what Hill labels a directed acceleration field; that is, a field that is, in general, gravitational-like in nature, and, in particular, gravity-canceling. [3] Such a field acts on all masses in its sphere of influence as does a gravitational field. Corollary to this conclusion is that observed accelerations ~100 g's relative to the environment could be sustained without on-board high-g forces c... supersonic flight through the atmosphere without sonic booms is easily engineered. Manipulation of the acceleration-type force field would, even at supersonic speeds, result in a constant-pressure, compression-free zone without shockwave in which the vehicle is surrounded by a subsonic flow-pattern of streamlines, and subsonic velocity ratios. An additional benefit of such field control is that drops of moisture, rain, dust, insects, or other low-velocity objects would follow streamline paths around the craft rather than impact it. ... UFOs appear to prevent high aerodynamic heating rates, rather than permitting a heating problem, then surviving it with heat resistant materials as is the case of the Shuttle whose surface temperatures can reach 1300 degrees C. The resolution of this potential problem is shown by Hill to derive from the fact that the force-field control that results in the prevention of shockwave drag as discussed above is also effective in preventing aerodynamic heating. In effect the airflow approaches, then springs away from the craft, depositing no energy in the process... the observation that UFO departures are of the dramatically high-angle, high-acceleration type. ... In the final analysis, one must conclude that Hill has assembled as good a case as can be made

on the basis of presently available data that the observation of some "unconventional flying objects" is compatible with the presence of engineered platforms weighing in at something around 30 tons, which are capable of 100-g accelerations and 9000-mph speeds in the atmosphere. ... Recent examples of the discussion of the technical aspects of candidate field propulsion mechanisms of this type are given in M. Alcubierre, "The warp drive: hyper-fast travel within general relativity," Class. and Quantum Grav., vol. 11, P. L73 (1994), and in H. Puthoff, "SETI, the velocity-of-light limitation, and the Alcubierre warp drive: An integrating overview," Phys. Essays vol. 9, No. 1, P. 156 (March 1996)."

Excerpt from
UFO Acceleration Fields
The Evidence

Bruce S. Maccabee, Ph.D.

ABSTRACT

Visual and photographic sightings of UFOs carrying out "impossible" high-speed maneuvers are presented for study. For the first time we are able to quantify the amazing acceleration of these craft.

PROLOGUE

Herbert C., Army private, was stationed at Fort Sill, near Lawton, Oklahoma, in June, 1968. He and another man were standing guard at about 4:30 a.m. near the airport when he noticed a lighted object, which appeared to be over the mountains about 10 miles away. He thought it was an airplane. He looked away from it for a few seconds and when he looked back where the object had been, it wasn't there. Instead, it was flying past the control tower and was within a few hundred feet of him. It had traveled perhaps as much as ten miles in a few seconds. He could see that it was a glowing sphere, perhaps (30 feet) in diameter. It had made no noise so he pointed it out to the other guard. They watched the yellow orb, like a small, hazy sun, as it moved around and lit up ground structures causing obvious shadows. After perhaps 10 - 20 seconds it suddenly rose upward at about a 45° angle for a short distance, made a 90 degree turn and then zipped off "faster than he has seen missiles in the Army."

Lillian Sargent, housewife, was standing in the back yard of her Greenfield, Mass. home in June or July of 1947 (exact date unknown). She was about half a mile west of a steeply rising small mountain that forms the eastern border of Greenfield (home of the "Poet's Seat" tower). Looking to the east, she happened to notice two round, metallic-looking objects suddenly come into view over the mountain, flying westward. From her location on Maple Street, the top of the mountain was at an angular elevation of about 30°, so she was looking upward at a reasonably steep angle. Suddenly, these two objects made a right angle turn, and headed northward away from her

It was hot in the summer of 1956, but during one night no place was hotter than the Air Force bases at Bentwaters and Lakenheath in England. The ground control radar picked up several targets, which were stationary for long periods of time (minutes) and then

suddenly moved away at high speeds. According to the Condon Report, 3 "As we watched, the stationary target started moving at a speed of 400 to 600 mph in a north, northeast direction "There was no slow start or buildup to this speed — it was constant from the second it started to move until it stopped." At another time radar detected an object "making sharp rectangular course changes and this maneuver was not conducted by circular path but (by turning at) right angles at speeds of 600 – 800 mph.." (emphasis added)

During the night of November 16-17, 1986, a 747 jumbo jet freighter was flying southwestward over Alaska. Piloted by a Japanese crew of three and headed for Tokyo after a stop at Anchorage, the plane was entering Alaska air space when Captain Terauchi first spotted lighted craft traveling below and to his left. He thought they were U.S. Air Force jets and paid no more attention. Minutes later the two "jets" had disappeared and two "spaceships" had suddenly appeared in front of the 747, which were traveling at about 600 mph, where the whole crew saw them. The crew reported these ships to the Anchorage Air Route Traffic Control Center and there began a series of incidents and sightings, which have made history. The Federal Aviation Administration eventually investigated the sighting and learned that these "spaceships" maintained a roughly fixed distance in front of the plane for about 10 minutes, at which time they suddenly departed to the left so fast that they seemed to disappear.

It was about 1:15 a.m. on May 1, 1988 and Ed Walters, standing on the shore of the Santa Rosa Sound with his special stereo "SRS" camera, was about to take a second stereo picture of a UFO which he had just photographed hovering over the water. As he sighted through the viewfinder he was surprised to find that it wasn't there any more. He took his eye away from the viewfinder to look for it and realized it was over his head. Suddenly everything went white...an abduction had begun. Subsequent analysis of the stereo pair of photographs showed that the object was about 450' away when he first saw it. Seconds later it was stationary over his head.

INTRODUCTION

What are these things that come and go in the night and in the day so rapidly that we have a hard time seeing them? The Shadow Knows, but he's not telling, so we'll have to figure it out by ourselves. Aside from shape and speed, the most unusual and unbelievable UFO characteristics which have been often reported are the "right angle" turns and the sudden disappearances of apparently solid objects in the clear sky. Of course, the witnesses who make these reports are not perfect observers. Perhaps the turns were not perfectly abrupt, they only appeared to be. Perhaps the objects did not disappear in the sense of material objects vanishing without a trace, perhaps they only appeared to vanish. Physics and technology, as we know it, indicates that it is physically impossible for substantial objects to make instantaneous turns or disappear while in plain view. For this reason, conventional scientists have "solved" the problem posed by these observations by rejecting the UFO reports altogether. Ufologists have accepted the reports, perhaps reluctantly, while making excuses for these seemingly impossible feats of the UFOs. Nevertheless, credible people make these reports. Many years ago (1947) Lillian Sargent, my grandmother, reported to her family that she saw two round, silvery "flying saucers,"

each of which made (what appeared to her to be) a right angle turn. The saucers were at a reasonably high elevation angle as they moved westward and then abruptly turned north, so she was in a good position to see the turn. Now, grandma was not an aerodynamics expert or even a mechanic, but she knew that something was not right here: "things" do not make right angle turns. Turns are curved. Nevertheless, she stuck to her story. Hence, we are left with the quandary of believing a grandmother's report while doubting the "right angle turn." (If you can't believe your grandmother, who can you believe? Rhetorical question, only.) (Footnote: this was at a time when many people were reporting sightings throughout the United States, and the reporting of sightings was considered almost like a patriotic duty. However, because of a lack of "hard evidence," the press began to turn against these sightings, and witnesses were being called crazy or deluded or hoaxers. Initially, Grandpa was happy to have his wife tell people that she saw saucers, but then when the "counter reaction" set in, he told her to shut up and never mention it again. After that she kept silent for over 20 years. I first learned of it from my mother in the late 1960s. I subsequently interviewed my grandmother.) Disappearances in the clear sky are equally enigmatic and have been reported since 1947. The first official reference to the ability of UFOs to travel at high speed, and even to disappear, is in the draft of an intelligence collection memorandum written for Brigadier General Schulgen by Lt. Col. Garrett in October, 1947. (This memorandum, which was released to the public by the Air Force in 1985, was written in response to General Nathan Twining's letter of September 23, 1947, which said that flying saucers are "real and not visionary or fictitious" and outlined reasons for collecting intelligence information about flying saucers.) Lt. Col. Garrett based his statements on sightings, not by housewives, but by "many competent observers including USAF rated officers" and listed a number of "commonly reported features that are very significant." This list includes "the ability to suddenly appear without warning as if from an extremely high altitude" and "the ability to quickly disappear by high speed or by complete disintegration." (emphasis added) Sudden appearance and disappearance could be two aspects of the same capability: extremely high acceleration or deceleration. (Note: the suggestion that a flying saucer could disappear by "complete disintegration" indicates just how puzzled the top Air Force officers were by the sighting reports. For the purposes of this paper, I assume that visual "disintegration," suggesting at the very least the termination of the of the light reflecting or light blocking (opaque) characteristics of a solid, stationary object, does not occur. Of course, I could be wrong!) A high quality report of a disappearance event was made to Dr. James McDonald and later to the American Society of Newspaper Editors in 1967 by William Powell, a general aviation pilot, and his traveling companion, Muriel McClave. According to Mr. Powell, they were flying northward at about 4,500' near Willow Grove, Pennsylvania, on May 21, 1966 at 3:15 P.m. when they saw an unidentifiable object following some jets that had just taken off to the north from the Naval Air Station at Willow Grove. Powell at first thought it was an aircraft, and then realized that he could see no vertical tail fin. "I couldn't determine any tail on this object. And the more I kept peering at it, I sort of whimsically thought it was a flying saucer," he told the newspaper editors. "Hey Mick (Muriel), look at that flying saucer out there," he said and she immediately looked and saw it. Then they saw it make what appeared to them to be an abrupt, flat (no banking, no slewing) right turn of about 160° and head toward their plane. As it approached from the left side of the aircraft, the angular size increased and Powell

tried to "envision some wires or something hanging down from it that looked like a weather balloon or elongated weather balloon, but it was exactly what I had heard and read about...so-called UFOs." The sky was clear except for some cumulus clouds above, and the visibility range was estimated at 15 miles, so they had a clear view of this object. Powell estimated that it came to within about a hundred yards of his aircraft before it passed by to the right. "It was a saucer shape with a slight raised dome on top. It was all, all very defined, very clear," he told the newspaper editors. Powell and McClave independently told McDonald that the disk-like device had a "glistening white rounded dome on top and a red conical apron below, circular platform, and moving with its symmetry axis vertical. It had no wings, tail, propellers or jets. No markings or apertures were discerned." Powell estimated that it closed at airspeed of about 200 mph and passed to their right and slightly below their altitude. He estimated the diameter at 20 feet; McClave thought 40 feet. "It was just like looking at a Cadillac," Powell told McDonald. It passed by in a steady motion with no wake, no exhaust and no smoke. Because of the construction of the cockpit windows in the Luscombe Silvaire he was flying, Powell could not easily see the object after it passed to the right. He told the newspaper editors "Miss McClave actually saw it disappear. It never got out of her vision until it all of a sudden disappeared after the aircraft (i.e., the UFO) was on the right hand side." According to McDonald, "both had the distinct impression that after the object passed several tens of degrees aft of the beam it suddenly vanished from sight. To all of my queries as to whether this seeming instantaneous disappearance might have been only a matter of extremely high angular acceleration out of their field of view, both could only reply that they did not have that impression. They felt that it had instantaneously vanished while in full view."

Bruce Maccabee wrote on Feb. 10, 2004.

"Since you have abstracted only about 20% of the acceleration paper I suggest you add in the URL for people who might be interested in reading the whole thing (complete with video analysis that demonstrates extreme acceleration)."

<http://www.nidsci.org/articles/maccabee/acceleration.html>

Unconventional Flying Objects

<http://entertainment.howstuffworks.com/book129.htm>

Paul Hill wrote his generally excellent technical book about thirty years ago before the discovery of anti-gravitating dark energy exotic vacuum in 1999 or so as the dominating stuff of the Universe on the large-scale. In those ancient primitive times physicists used the imprecise term "negative matter" as in the late Robert Forward's papers on "Negative Matter Propulsion" (1988) that is a primitive form of the free-float time-like geodesic zero g-force Alcubierre faster-than-light warp drive already known to top physicists Herman Bondi (British Intelligence) and Yakov Petrovich Terletskii (Soviet Intelligence under Joseph Stalin) in the late 1950's.

"Personally, I don't believe in "Space Drives", but I am willing to keep an open mind and read what people have to say. I have strong doubts that anything will come from

gyroscopes or other mechanical devices, but if we can find some new physics (like the negative matter I postulate in the enclosed paper, or the conversion of angular momentum that I postulate in "Spin Drive to the Stars"), then perhaps we can make an end run around the laws of conservation of momentum and energy."

Robert Forward

<http://www.space-drives.org/wwforwardrl.html>

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