Candidates for Novel EM Propulsion

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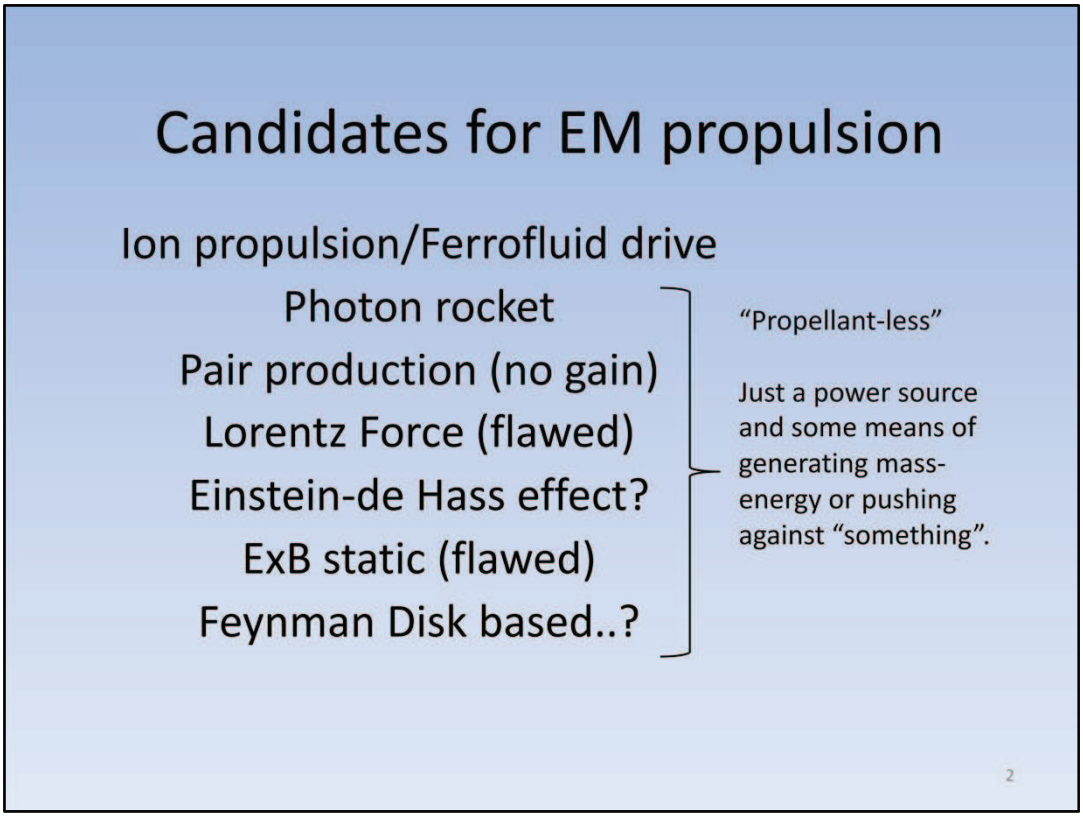
Abstract

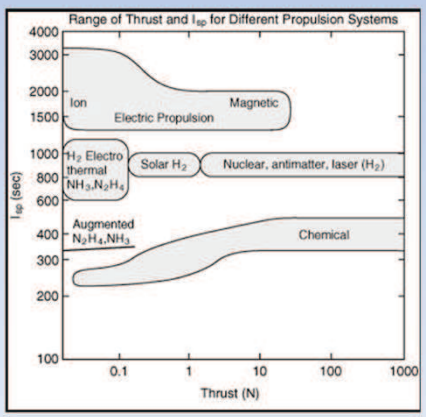
Activities currently falling into 3 main areas – 2nd Law exceptions, FTL exceptions and Electromagnetic propulsion. No intention of having 3 such contentious projects, enquiries just ended up that way. I like things with a "mechanism" (a rationale, in the sense of a chemist – atoms, objects in motion etc.), not just a mathematical proof, something physical a prelude to experiment. Shall focus on EM propulsion today and if there's time, maybe a little bit about the other projects.

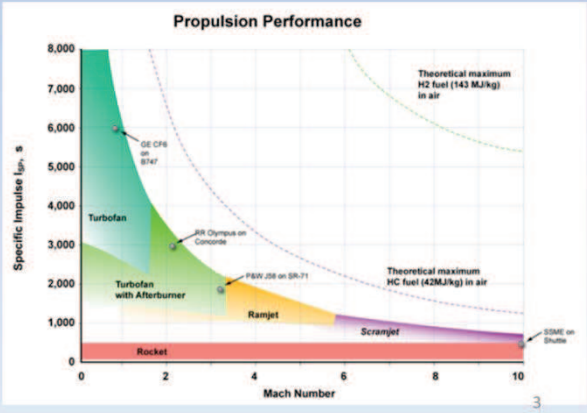


List not exhaustive.
In sense of having a magnetic charge or being magnetisable. Like an ink jet printer nozzle.
Interested in "propellant-less" drives, just a power source and some means of generating mass-energy to expel or pushing against "something".

Ion propulsion

- Specific impulse: $I_{sp} = \frac{Thrust}{\dot{m}}$ N/Kg (m/s for rockets) or $\frac{\Delta p_{exhaust}}{\Delta mg}$ seconds.
- Rockets fare badly, turbofans much better from propelling air around them.
- Ion engines have very high exhaust velocities, best I_{sp} of current tech.





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"Bang for your buck".
Ion Propulsion gives the highest specific impulse, though practically thrusts are very small: one mole of matter requires an integer multiple of a Faraday of electrical charge (fundamental charge multiplied by Avogadro's constant), which is huge. Even a mole of the heaviest naturally occurring element, uranium is of the order of a few hundred grams. Taken that it may be accelerated to high speed, some 96500 Coulombs of charge per second (96500 Amperes) is required per mole of charge. If 238g/s of mono-charged uranium was expelled at 10KeV per particle, that would require nearly 1GW of power, with an exhaust velocity of 90km/s and a thrust of some 11kN (power / velocity).
Ferrofluid/super-paramagnetic particles can have very high spin (each particle can have over 10,000 spin of an electron). Accelerate in a magnetic gradient.
https://en.wikipedia.org/wiki/Nano_electrokinetic_thruster

Photon rocket

- True: comet tails, Crookes radiometer, Teller-Ulam configuration, Optical tweezers.

- The equations: $E = \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}}$, $\mathbf{p} = \frac{m\mathbf{v}}{\sqrt{1-\frac{v^2}{c^2}}}$ so $\frac{\mathbf{p}}{E} = \frac{\mathbf{v}}{c^2}$
- Photon rocket better than using the power source to create pairs from vacuum, might as well just produce photons.
- In ultra-relativistic case (photons) dE/dt = c.dp/dt and so a feeble 1N per 300MW.

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Force very small = ions in blue point away, dust tends to bend away less so.
Relativistic expressions for the energy content and momentum of a body.
Photon rocket has highest specific impulse, “c”! Thrust per mass ejected, so dp/dt / dm.equiv/dt = p/E/c^2 with E = pc so Isp = E/c / E/c^2 = c
Will touch on ideas again a bit later with Poynting vector.

Conservation of Momenergy 1

- How can we do better than ion and photon rockets?
  - We want high specific impulse and high thrust like rockets and jet engines.
  - "Held back" by conservation of momentum, need to push against something, expel something.
- What conservation of energy means at a deep level?
  - Translational symmetry in time.

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At least for inertia motion. I am not talking about warping space. Motion as we commonly understand it.
"Conserved constant of motion". Essentially make an infinitesimal change to Lagrangian or Hamiltonian and it keeps the same form. For an infinitesimal change in time we see the conserved quantity is called "Energy". Intuitively one can think of this as at least locally and for "short" periods of time, the constants of physics stay the same.

Conservation of Momenergy 2

- What conservation of linear and angular momentum mean at a deep level.
  - Linear translational invariance,
    Means space homogeneous
  - Rotational invariance
    Means space isotropic
- Energy and momentum in Relativity.

$$p^{\mu} = m_0 c u^i$$

$$p^{\mu} p_{\mu} = \left(\frac{E}{c} \quad p_x \quad p_y \quad p_z\right) \cdot \left(\frac{E}{c} \quad -p_x \quad -p_y \quad -p_z\right) = m_0^2 c^4 \Rightarrow E^2 - p^2 c^2 = m_0^2 c^4$$

$$\left(E \quad p_x \quad p_y \quad p_z\right) = \left(\gamma\left(E' + v p_x'\right) \quad \gamma\left(p_x' + \frac{v}{c^2} E'\right) \quad p_y' = p_y \quad p_z' = p_z\right)$$

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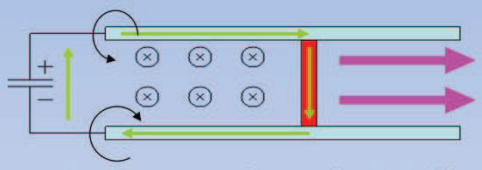
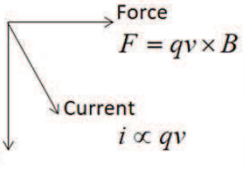
Laws are expressed “locally”. If you violate conservation of momentum in one frame, you will violate conservation of energy in another frame. Once again conserved constants of motion come from infinitesimal changes in H or L, momentum is found by displacement and proves that space is (locally) homogeneous and an infinitesimal rotation gives angular momentum and proves that space is (locally) isotropic.
You don’t get a free ride – it’s not like running around a track and having a tailwind or escalator/rolling road helping you along.
In Relativity energy (temporal part) and momentum (spatial part) are combined into a 4-vector and a boost shows that if you violate momentum conservation in one frame, then in another it will be conservation of energy violation.
This is good cause for believing in such concepts.

Ampere Longitudinal Force/Lorentz Force

- Diagram of forces.

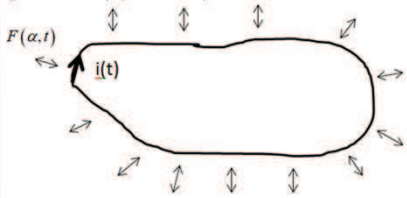


Right hand rule for vector product



- Outline proof on why it is flawed.

Take any arbitrary current loop and work out force at each point (parameterised by α) at some time, t



The force at some point is given by the Lorentz force with normal B field in superposition from each point around the loop:

$$F = qv(t) \times \oint \mathbf{B}(t) \cdot \mathbf{n} dl$$
$$\Rightarrow F \propto i(t) \times \phi(t)$$

And the change in momentum is given by the time integral of the force, such that $\oint_{cycle} P(t)dt \propto \oint_{cycle} f(i(t),\phi(t))dt$. Around a cycle, both the current and flux start and end at zero. There is no way of "gaming" this, such as putting the battery at right angles.

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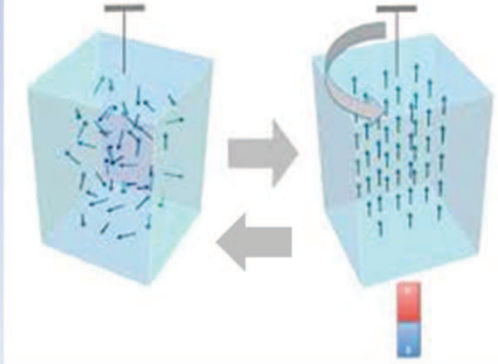
What were called Ampere Longitudinal forces are now called Lorentz forces.
Appears as if the moving red bit has no reaction on the device.
Reaction force is on the left-hand segment with the battery.

Einstein-de Hass effect

- Coupling of EM and mechanical effects (spin).
- But (angular) momentum conserved.
- It is not clear at any point in the cycle how momentum can be dumped.



L(mechanical) + L(∑Spin) = 0
Start: L(mechanical) = 0, so L(∑Spin) = 0
Field on: L(∑Spin) ≠ 0,
so L(mechanical) = -L(∑Spin)
Field off: L(∑Spin) = 0
so L(mechanical) = 0

(Bar negligible higher order effects such as radiation reaction)

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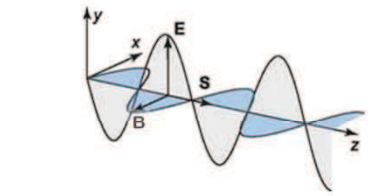
Bare with us. We are looking at electromagnetic methods of generating angular or linear momentum.
We will show later how to convert angular to linear momentum BUT linear momentum must be dumped.

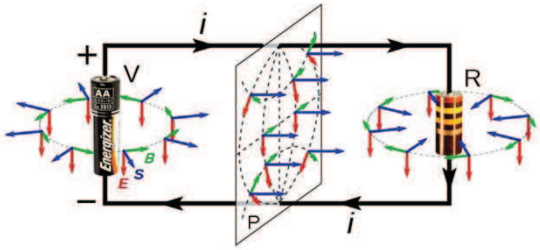
The Poynting Vector

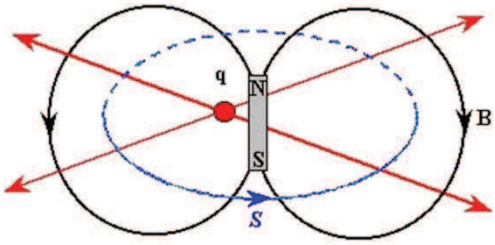
- Accepted definition from energy continuity:

$$-\frac{\partial u}{\partial t} = \nabla \cdot \mathbf{S} + \mathbf{F} \cdot \mathbf{v} \qquad \mathbf{j} \cdot \mathbf{E}$$

$$\Rightarrow -\frac{\partial}{\partial t}\frac{\varepsilon_0}{2}\left(\mathbf{E}^2 + c^2\mathbf{B}^2\right) = \nabla \cdot \left(\varepsilon_0 c^2 \mathbf{E} \times \mathbf{B}\right) + \rho\left(\mathbf{E} + \mathbf{v} \times \mathbf{B}\right) \cdot \mathbf{v}$$







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Interesting discussion by Kirk T. McDonald at Princeton
https://www.physics.princeton.edu/~mcdonald/examples/poynting_alt.pdf
We shall stick to the form used because it is accepted experimentally and theoretically, although some odd notions arise.
Some view it as quirky, alternative and not strictly untrue (fig 1, though wires make boundary conditions for the system) and Heaviside, Feynman and others said for fig. 2 “just nuts” or similar words.
We shall come back to this after a quick discussion on quantum description of fields.
Use “microscopic fields E and B” instead of H and M, D and P so not dealing with any mechanical momentum inherent in M and P.

Static ExB devices - Feynman Disk 1

- Feynman's Disk

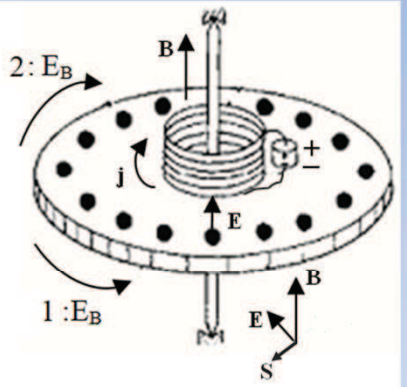
$$L_{system} = L_{mechanical} + L_{field} = 0$$

$$L_{mechanical} = I\omega$$

$$L_{field} = \int_{space} (\mathbf{g}\times\mathbf{r})\,dV$$

$$= \int_{space} \varepsilon_0 (\mathbf{E}\times\mathbf{B}\times\mathbf{r})\,dV$$

E_B is electrical field from the solenoid as its flux changes. It acts first one way then the other when the current is switched on, then off. It reacts against the charged spheres, sending the disk spinning one way first, then the other.



- Graham and Lahoz experiment.
  - Graham Lahoz, *Observation of static electromagnetic angular momentum in vacuo.* Nature, 1980. **285**(154).

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Returning to the last case, Feynman (and Heaviside decades earlier) discussed this scenario and Feynman expressed this in his disk paradox.
His conclusion was that the disk must rotate because of momentum conservation: the mechanical momentum must be equal and negative to the electromagnetic momentum.
Well come back to this in regards to the experiment by Graham and Lahoz and what they said.
g is the momentum density and just the Poynting power density divided by c^2.

Quantised EM fields and Zeropoint Energy - 1

- Appendix 1 and 2 of 1st propulsion paper on my website.
- Usual route:
  - Classical solution to wave equation with vector potential and Fourier modes of field.
  - Obtain B and E fields.
  - Obtain classical Hamiltonian.
  - Relate to quantised Hamiltonian of SHM.
  - Pull momentum operator and relate to creation and annihilation operators.

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Quantised EM fields and Zeropoint Energy - 2

1... $\nabla^2\mathbf{A} = \frac{1}{c^2}\frac{\partial^2\mathbf{A}}{\partial t^2} \rightarrow$

2... $\mathbf{A}(\mathbf{r},t) = \sum_{\mathbf{k}}\left(a_{\mathbf{k}}(t)e^{i\mathbf{k}\cdot\mathbf{r}}e^{-i\omega t} + a_{\mathbf{k}}^*(t)e^{-i\mathbf{k}\cdot\mathbf{r}}e^{i\omega t}\right)$

$\mathbf{B} = \nabla\times\mathbf{A}$

$\mathbf{E} = -\nabla\phi - \frac{\partial\mathbf{A}}{\partial t}$

$\rightarrow$ $\mathbf{E}(\mathbf{r},t) = i\omega\sum_{\mathbf{k}} a_{\mathbf{k}}(t)e^{i\mathbf{k}\cdot\mathbf{r}}e^{-i\omega t} - a_{\mathbf{k}}^*(t)e^{-i\mathbf{k}\cdot\mathbf{r}}e^{i\omega t}$

$\mathbf{B}(\mathbf{r},t) = i\sum_{\mathbf{k}} a_{\mathbf{k}}(t)e^{i\mathbf{k}\cdot\mathbf{r}}e^{-i\omega t} - a_{\mathbf{k}}^*(t)e^{-i\mathbf{k}\cdot\mathbf{r}}e^{i\omega t}$

3... $\rightarrow$ $H = \frac{\varepsilon_0}{2}\int_V\left(E^2(\mathbf{r},t) + c^2B^2(\mathbf{r},t)\right)d^3\mathbf{r}$

$\Rightarrow V\varepsilon_0\sum_{\mathbf{k}}\omega^2\left(a_{\mathbf{k}}^*(t)a_{\mathbf{k}}(t) + a_{\mathbf{k}}(t)a_{\mathbf{k}}^*(t)\right)$

compare with $\hat{H} = \frac{\hat{p}^2}{2m} + \frac{1}{2}k\hat{x}^2 \rightarrow H = \sum_k \hbar\omega\left(a^\dagger a + \frac{1}{2}\right)$

so $\hat{p} = \sqrt{\frac{\hbar m\omega}{2}}\left(a^\dagger - a\right)$

Now

4... $p = \int_V(\varepsilon_0\mathbf{E}\times\mathbf{B})dV$ if classically $\mathbf{p} = V\varepsilon_0\sum_{\mathbf{k}}\omega\mathbf{k}\left(a_{\mathbf{k}}^*(t)a_{\mathbf{k}}(t) + a_{\mathbf{k}}(t)a_{\mathbf{k}}^*(t)\right)$

Then we can relate to creation and annihilation operators in the volume of interest:-

5... $\mathbf{p} = \sum_k \hbar\mathbf{k}\left(a^\dagger a + \frac{1}{2}\right)$ or for continuous case $\mathbf{p} = \int_{-\infty}^{\infty}\hbar\mathbf{k}\left(a^\dagger a + \frac{1}{2}\right)d\mathbf{k}$

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Start from wave equation in vector potential
Linear so we can express all solutions as sum of Fourier coefficients
We can get B and E fields
Relate them to classical Hamiltonian and compare that against quantised SHM
Relate momentum to creation and annihilation operators

Quantised EM fields and Zeropoint Energy - 3

- Zeropoint energy is a joke right? Just a mathematical artefact, can't be real?
- Why doesn't it gravitate? Field theories say it's huge, astronomy (Cosmological constant) says it's tiny.
- BUT… "Non-zero vacuum variance" in EM field perturbs systems. Well-known for Lamb Shift, spontaneous emission, pair-production/Unruh Effect/Hawking Radiation. Zeropoint in general: the ground state (SED), superfluidity of ^{4}He etc.
- Regarding Feynman Disk experiment, Graham and Lahoz wrote:
  - "It is remarkable that no known 'particle' can be identified as the agent of the observed electromagnetic angular momentum in the exchange with the mechanical detector… However, this does not imply that a new entity has to be introduced… already contained in Maxwell's (classical) equations".
- I put it to Graham (Lahoz died over a decade ago) that the zeropoint term was precisely that flow of energy. Counter-intuitive quantum effect in classical physics. He was intrigued…

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Idea that it is isotropic.
Tried to start a paper on discrepancy between size of ZPE and Cosmological constant. I may return to it but I'm not looking for justification that they are the same thing at present. (I forget the exposition but I was trying to have it as some higher order term in a Taylor series expansion of the EFE and hoped it would be quashed by some big denominator, so it can be big but gets quashed when appropriately introduced into the EFE). It's legerdemain stuff and I'm operating in the Engineering-Physics realm at the moment.

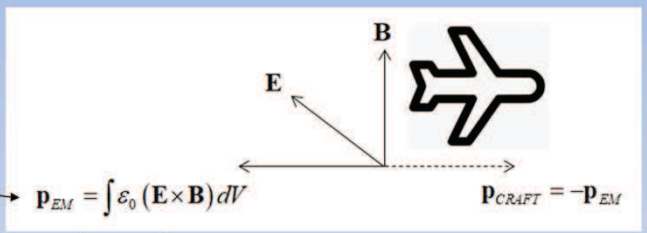
Prof. Graham is in his 90s.

Exists even when wavenumber/wavelength is zero, which is the static classical case. I'll come back to this shortly.

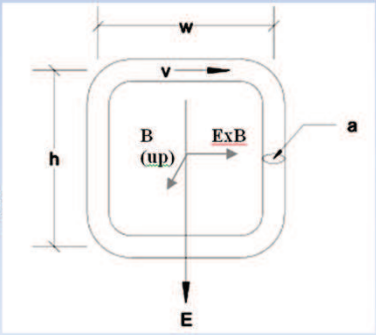
Static ExB devices and hidden momentum

$$\mathbf{p} = \int_{-\infty}^{\infty} \hbar\mathbf{k}\left(a^{\dagger}a + \frac{1}{2}\right)d\mathbf{k}$$

Nice to think the ½ will account for this



- Must sum over positive and negative frequencies as the field gets set up (classical case k->0 at end), half gets cancelled. No ZPE left over to consider.
- Hidden momentum is an alternative explanation:
  - Relativity says that the increase in potential energy of the current carrying fluid by E field makes it become more massive ($E=mc^2$) and this will just cancel the static momentum. Nice simple example (and diagram on RHS) due to Puthoff but general discussion in references of my paper 1.



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Remember S = gc^2 and P = integral(g)dV

Fields get set up by the flow of energy and this is done with REAL photons. In static case, frequency and k tend to zero and the description of the field is then by virtual photons. This does not concern us and not strictly correct to talk about momentum and energy of virtual photons as they can't be measured.

It's nice to think some static arrangement of fields would cause linear propulsion; the zeropoint would account for the momentum in the direction opposite to the craft and momentum would be conserved.
Unfortunately must sum over positive and negative frequencies as the field gets set up the ½ gets cancelled. Two-sided Fourier Transform.

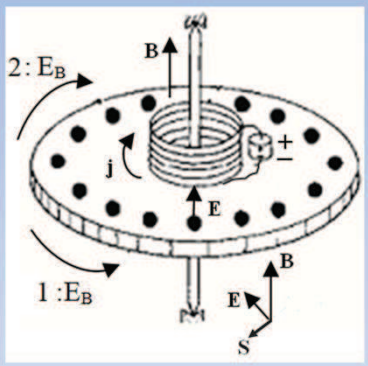
Hidden momentum treatment and diagram given due to Puthoff, references in 1st paper. Plethora of papers on subject. Go via my 1st paper.
Averages out to zero.

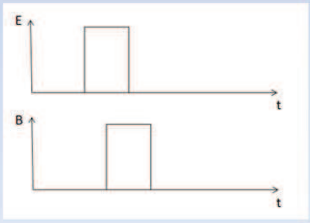
Static ExB devices - Feynman Disk 2

- Use something we know works from experiment.
- Hidden momentum argument doesn't work here because E-potential is uniform and radial across the coil.
- Poynting vector, S is definitely circulating and does so uni-directionally.

$$\mathbf{L} = \mathbf{p} \times \mathbf{r} = \pm \sum_{k>0} \hbar \mathbf{k} \left(a^{\dagger} a + \frac{1}{2} \right) \times \mathbf{r}$$

- Can we use it to build a linear propulsor?
  - Must show how angular momentum can be converted into linear momentum.
  - Must show how momentum can be dumped to zeropoint.





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Hidden momentum argument doesn't work here because E-potential is uniform and radial across the coil.

Remember real photons build up the fields and in the classical case, k->0. You may think then that the field disappears or can't take on any configuration but a "DC" steady case, no, the description of static fields is then by virtual photons.

Angular momentum of zeropoint permitted in this scenario.
One sided transform as not really two sources of waves at +/- inf, just one source with waves in one direction or the other.
(Argument that circle becomes a line in the limit is not true, a circle is still a circle, even if scaled to infinite size.)
Thus the half zeropoint term becomes relevant.

Circular wave vectors (standing waves) must fit around circular coordinate system and so become discrete.
Unlike linear case, wave comes back upon itself (linear case constructed two waves in different directions).
Positive and negative k at same time would cancel to zero and no L, it can only either be +ve or –ve.
So only use positive wave-vectors.

Prof. Graham was intrigued by this and could see how the strange circulation of energy could be real.
What Graham and Lahoz said "We know of no such particle that can explain the flow". I did speak to Prof. Graham, he is very elderly (in his 90s, Lahoz passed on over a decade ago). He was intrigued at this viewpoint…

<u>Cyclical effect (no-one talks about this and I see no argument against it)</u>
Turn on the spheres (consider them columns parallel to axis), a transient B-field circulates around them.
Turn on the solenoid, a transient E field circulates around it and pushes/pulls on spheres.
Turn off the spheres, a transient B circulates in the other direction around them but has no effect on the solenoid.
Turn off the solenoid, no effect on spheres.
Repeat.

Converting Angular Momentum into Linear Momentum - 1

- Along with the hidden momentum and cancellation of the ½ term in the momentum ladder operation equation, there's another one to dispel the linear case:

$$\mathbf{1...}\ \langle \mathbf{p} \rangle = \frac{1}{T}\int_T \left[\varepsilon_0 \int_V \mathbf{E}\times\mathbf{B}\,dV \right] dt$$

$$\mathbf{2...}\ \langle \mathbf{f} \rangle = \frac{1}{T}\int_T \left[\frac{d}{dt}\varepsilon_0 \int_V \mathbf{E}\times\mathbf{B}\,dV \right] dt$$

$$\Rightarrow$$

$$\langle \mathbf{f} \rangle = \frac{\varepsilon_0}{T}\left\{ \left[\int_V \mathbf{E}_{t=T}\times\mathbf{B}_{t=T}\,dV \right] - \left[\int_V \mathbf{E}_{t=0}\times\mathbf{B}_{t=0}\,dV \right] \right\}$$

$$= 0$$

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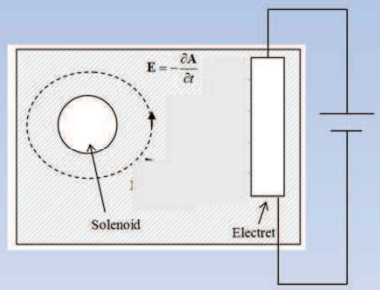
Let compute the average momentum change over a cycle of length T seconds (when the fields are set up)
The average force is the time differential of this.
The differential knocks out the integral of the averaging process.
We compute the average force over the cycle to be the E and B fields at the start minus those at the end.
Of course they are exactly the same and there is no gain.

Converting Angular Momentum into Linear Momentum - 2

- However with the disk, the same argument can go like this:



$$\mathbf{1...}\ \langle \mathbf{L} \rangle = \frac{1}{T}\int_T \left[\varepsilon_0 \int_V \mathbf{r} \times \mathbf{E} \times \mathbf{B} dV \right] dt$$

$$\mathbf{2...}\ \langle \boldsymbol{\tau} \rangle = \frac{1}{T}\int_T \left[\frac{d}{dt} \varepsilon_0 \int_V \mathbf{r} \times \mathbf{E} \times \mathbf{B} dV \right] dt$$

$$\Rightarrow \langle \boldsymbol{\tau} \rangle = \frac{\varepsilon_0}{T} \left\{ \begin{matrix} + \left[\int_V \mathbf{r} \times \mathbf{E}_{t \to T} \times \mathbf{B}_{t \to T} dV \right] \\ -0 \end{matrix} \right\}$$

initially set $r_{initial} = 0$ in $\left[\int_V r_{initial} \times E_{t>0} \times B_{t>0} dV \right]$

before switching on fields

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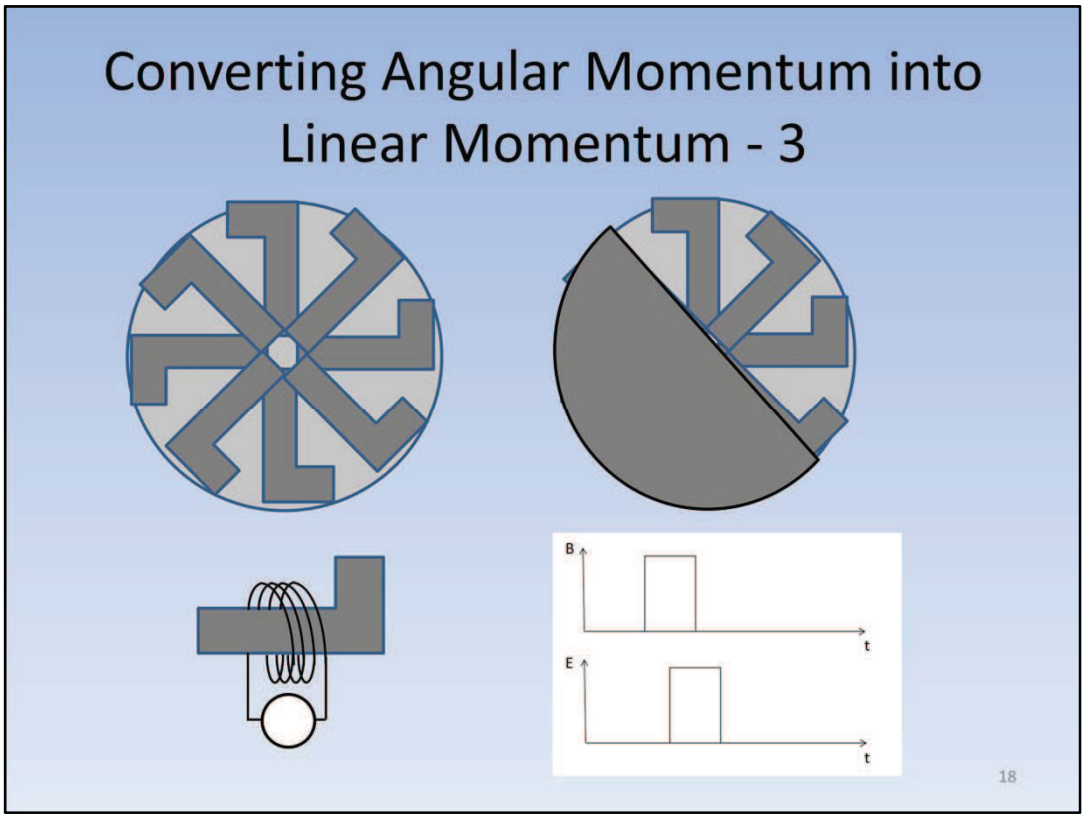
With the angular momentum argument, we still vary the fields over a cycle but this time we can change the radius at the end of the cycle to give a net torque.
We can achieve a cyclical device that can build up a large net torque.
We can send r, B or E to zero at the end of the cycle.
There's an electrical dual to this.



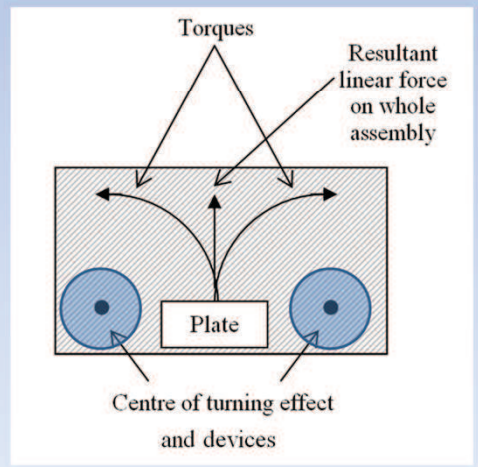
An electrical dual.
These two designs could be implemented with a microwave cavity and klystron.

Plan view.
L shaped segments are magnets or high permeability material such that either a magnetic field exists in it or that it can be modulated.
RHS side shows cutaway with top capacitor plate, there is one on bottom too.
Lower diagram is a segment and the modulating solenoid around it.
Space is filled with high permittivity material (grey hashing) to boost the E field from the capacitor.
We modulate both B and E field (the capacitor).

For electrical dual, the situation is reversed:-
We switch on the field of the segments first, an electric field circulates around them, this has no effect on the capacitor, which isn't charged.
We switch on the capacitor and the transient circulating B field pushes/pulls against the segments sending the assembly rotating.
We switch off the magnetic segments and the circulating E field and most would try to push or pull the capacitor up or down (it won't because E field circulation is in pairs up and down as it circulates), it definitely won't counter the rotation set up.
Then capacitor is switched off and circulating transient B field has no effect because the magnetic segments have been switched off.
Repeat.

Converting Angular Momentum into Linear Momentum - 4

- We need a system to convert the torque into linear momentum.



Forces of the order,

$$F = \frac{\varepsilon_0 BEV}{T}$$

A microwave cavity with a ferromagnet:
B ~ 1 Tesla
E ~ 3×10^4 V/m in air
1/T ~ 10 GHz
Order of 2600N be m^3

Optical cavity with lasers etc.
B ~ 10 Tesla (for a modestly powerful laser)
E ~ 10^4 V/m from E-field generator
1/T ~ 10^{14} Hz
Order of 90MNbe m^3

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There's an electrical dual to this.
Something like a roller belt conveyor.
1st paper gives estimation of the forces.
Last estimate fantastic but shows the possibilities of a technology when matured.

(Plate is not meant to be some device but it's a label saying that the devices are mounted on a solid plate).

Putative mechanism for dumping of momentum in a cycle - 1

- 1st and subsequent papers try to develop the idea of ensemble of oscillators to which the momentum is dumped to the mass-energy of the ZPE.
- A hydrogen atom is considered and its SHM system has a zeropoint which can be set in motion.
- By same token, we argue that the modes of the EM field can be set in motion. Nothing changes as the whole field is Lorentz invariant and looks the same from any frame.

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A Mechanism for Propulsion without the Reactive Ejection of Matter or Energy

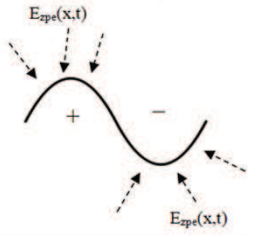
The Energetics of the an ExB propulsor That avoids the Hidden Momentum pitfall - largely concerned with showing momentum and energy are conserved in a round trip, if one considers that the KE (and momentum), as it returns to base, have been dissipated in the ZP. It also shows that in attempting to reach light speed, all the rest-energy of the craft would be used up, as to be expected.

Dissipation of Momenergy to a Bose Gas by An Electromagnetic Propulsion Device
(The Electromagnetic Zeropoint Field Considered as a Supersolid) in work.

Putative mechanism for dumping of momentum in a cycle - 2

- We then argue that hydrogen molecules in a gas experience fluctuations in the field of their electron clouds (van der Waal) and so interact and can thermalize.
- By the same token we say that fluctuations in the EM field causes dipoles and interaction between the modes. Those zeropoint mass-energy terms set into motion can then thermalize too.
- So we want to argue that each mode is in SHM against other modes! The restoring force would be the average field from other nodes.
- A kind of supersolid lattice results for the field that momentum can be dumped to. We believe we can predict a heat capacity for it, a "speed of sound" for it ("c" of course), longitudinal waves in the lattice, dissipation, 2nd sound. Very wild.

The electromagnetic field is modelled as a sum of Fourier modes in three dimensions and as stated earlier, when quantised by the Uncertainty Principle it has a variance at zero photon count. Each mode, as long as it exists as it flips randomly in time on the order of λ/c, can be thought of as a dipole (figure 1) acted upon by a random electric field from all the other dipoles modes:



Work is in progress to make this rigorous in an incomplete paper.

Other projects pertinent to UFOs/UAPs

- On my website you can see the other projects.
- I shan't spend too much time as they are really other whole presentations.
  - Entanglement project relevant to propulsion for showing how to send information FTL and breaks the space-time construct.
  - Thermo-project showing how to achieve greater than Carnot Efficiency. There are accounts that UFOs "run cold"/use power in a much more efficient way that we do.

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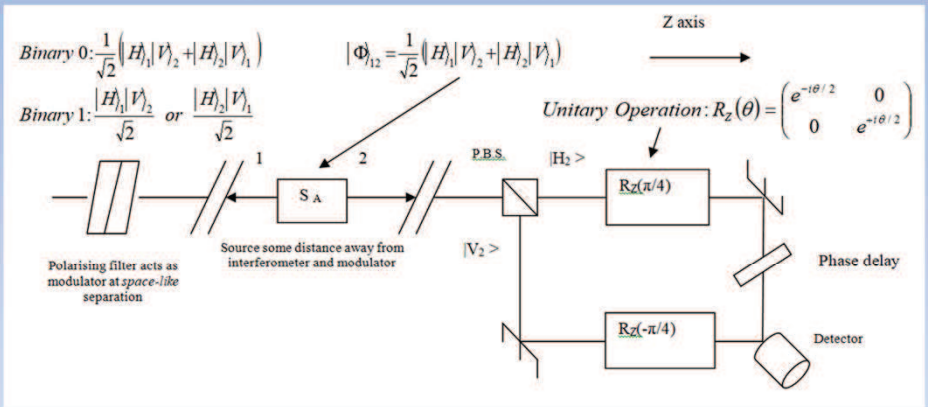
Entanglement signalling - 1



- See paper - "The misuse of the No-communication Theorem“
- The question is whether we allow joint evolution before taking the trace: $U_1U_2\left|\psi_{12}\right\rangle\rightarrow\left|\psi'_{12}\right\rangle$

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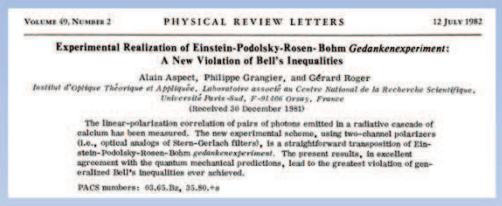
No communications theorem requires us to trace out one system just for even thinking about it. If joint evolution is not allowed we couldn’t entanglement wouldn’t even exist. The act of taking the trace is the same as performing a measurement on the system.

Entanglement signalling - 2

1) Bell's Theorem and Aspect's (et al) 1981 experiment now known to >10 standard deviations.



VOLUME 49, NUMBER 2 PHYSICAL REVIEW LETTERS 12 JULY 1982

Experimental Realization of Einstein-Podolsky-Rosen-Bohm *Gedankenexperiment*: A New Violation of Bell's Inequalities

Alain Aspect, Philippe Grangier, and Gérard Roger

Institut d'Optique Théorique et Appliquée, Laboratoire associé au Centre National de la Recherche Scientifique, Université Paris-Sud, F-91406 Orsay, France

(Received 26 December 1981)

The linear-polarization correlation of pairs of photons emitted in a radiative cascade of calcium has been measured. The new experimental scheme, using two-channel polarizers (i.e., optical analogs of Stern-Gerlach filters), is a straightforward transposition of Einstein-Podolsky-Rosen-Bohm *gedankenexperiment*. The present results, in excellent agreement with the quantum mechanical predictions, lead to the greatest violation of generalized Bell's inequalities ever achieved.

PACS numbers: 03.65.Bz, 35.80.+s

2) Zbinden's (et al) 2008 experiment measuring the speed of wavefunction collapse as > 10,000c.

Vol 454|14 August 2008|doi:10.1038/nature07121 nature

LETTERS

Testing the speed of 'spooky action at a distance'

Daniel Salart[1], Augustin Baas[1], Cyril Branciard[1], Nicolas Gisin[1] & Hugo Zbinden[1]

Correlations are generally described by one of two mechanisms: either a first event influences a second one by sending information encoded in bosons or other physical carriers, or the correlated events have some common causes in their shared history. Quantum physics predicts an entirely different kind of cause for some correlations, named entanglement. This reveals itself in correlations that violate Bell inequalities (implying that they cannot not follow here, is to speculate that there is a tachyonic field[6] that couples specifically to entangled particles.

Bohm's[7] pilot-wave model of quantum mechanics is an example of a theory containing an explicit spooky action at a distance, which requires the assumption that there is a universally privileged frame[8]. Also, if the spooky action at a distance propagates at finite speed, then an experiment like the one presented below could possibly falsify the

3) That the No-communications theorem **is** wrong:

a) Take the partial trace ***after*** joint evolution, **not** before
b) The trace/measurement is a space-like operation
c) Pure and mixed states can be discerned by interferometer
d) Creation operators can be mapped outside apparatus, causal delay is irrelevant
e) In relation to (b) and (d), trace removes global phase factors anyway

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Why we think the effect is superluminal.

Entanglement signalling - 3

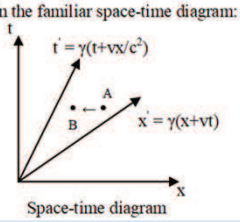
Describes the transformation between inertial frames for different observers of mass-energy phenomena. All information about the co-ordinates is sent as mass-energy too so inevitably our measurement of space and time is affected (a bit like kicking a soccer ball whilst the goal posts are moving!).

This view point leads to the space-time construct, destruction of simultaneity in space and time (events A and B below) and the consideration of co-ordinate transformations as hyperbolic rotations in 4-space (hyperbolic 'angle' α in analogy to θ in 3-space rotations).

Hyperbolic rotation matrix

$$u = (x_1\ x_2\ x_3\ ict)$$
$$u' = L(\alpha)u$$
$$L = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & \cosh\alpha & i\sinh\alpha \\ 0 & 0 & -i\sinh\alpha & \cosh\alpha \end{pmatrix} \quad \text{Where } \alpha = \tanh^{-1}\frac{v}{c}$$

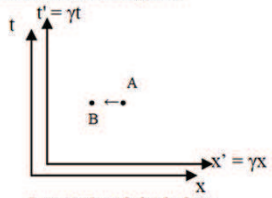
Thus we obtain the familiar space-time diagram:



Space-time diagram

The terms in the Lorentz transform $\Delta x = \gamma v\Delta t'$ and $\Delta t = \gamma v\Delta x'/c^2$ can simply be understood as the delay in sending the information about the co-ordinates to the non-primed frame. For instance if it takes the primed frame $\Delta t'$ seconds to perform a measurement then the frame will have moved a distance $v\Delta t'$ which we correct back to the un-primed frame, $\gamma v\Delta t'$ in addition to any other distance measurement. As regards the time: the frame will have moved $v\Delta t'$ once again so the light signal will require an extra $v\Delta t'/c$ seconds to reach the source, now $\Delta t' = \Delta x'/c$ so the extra time is $\gamma v\Delta x'/c^2$ in the un-primed frame.

Sending information superluminally knocks out the terms $\Delta x = \gamma v\Delta t'$ and $\Delta t = \gamma v\Delta x'/c^2$ in the Lorentz transform giving the following transformation diagram:



Lorentz's original view

- viXra:1311.0074 viXra:1405.0303

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Vixra, Academia.edu or preprints (you'll see links on my website)
In SR at least, get rid of the retarded time terms in Lorentz transform and you find one frame running absolutely slower than the other.
Simultaneity is preserved.
Not a transform you can do physics in as such but a means of distributing rods and clocks so everyone can discern their absolute time dilation and length contraction.
In GR we extend it to communicating length and time standards far from gravitating sources.
Builds up a picture (2nd paper) of Relativity merely being an effect of change in mass – it explains all the length contractions and time dilations, even in gravitational field.
Might offer a means of countering these effects by stopping the mass changes.

Violations of 2nd Law "Maxwell Zombies" - 1

- In homage to Prof. Daniel Sheehan who uses the term instead of Maxwell Demons.
- By accounts, UFOs "run cold", they don't dump excess heat like our level of technology does.
- You'll find a citation to a scholarly survey of the field on my website by Capek and Sheehan.

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Violations of 2nd Law "Maxwell Zombies" - 2

- Phase changes are sorting processes.
- 1st order hygroscopic system.
- 2nd order ferromagnetic system that directly would convert heat into electricity from one reservoir.

Paper 4 on the website under Thermo-electric conversion is a good survey of what I've done.

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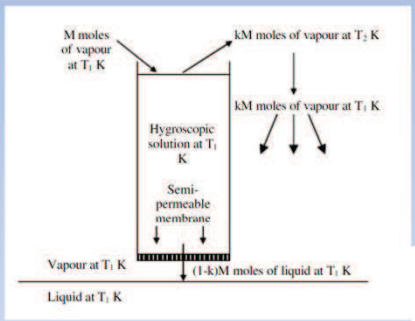
Violations of 2nd Law "Maxwell Zombies" - 3



1st order system

2nd order system

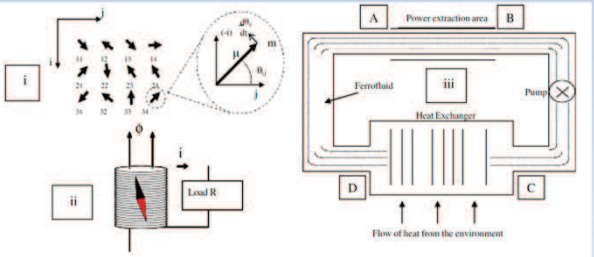


Figure i,ii,iii – The basic flux collapse power generation method and plant diagram

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END

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