

Comments on APEC Saturday 18th January 2025

Remi Cornwall

University of London Alumni Society, Malet Street, London WC1E 7HU

<https://cornwall.infinityfreeapp.com/> <http://ulondon.academia.edu/RemiCornwall>

Abstract

APEC – Alternative Propulsion Engineering Conference is run by Tim Ventura and is a forum that lets all-comers present their researches into fringe science concepts, though mainly those concerned with propulsion. This brief letter will write about two presentations – LENR and “Quantised Inertia”. I may comment on the other later presentations at some point. We find omissions in LENR experimental methodology and candidate theories based on current science but this wouldn’t exclude new science. We also find that McCulloch’s “Quantised Inertia” (and so MOND/TeV_S too) violates the Correspondence, Heisenberg Uncertainty and Strong Equivalence Principles.

Introduction

APEC[1] is commendable in giving people the chance to talk about fringe concepts or concepts frowned on by academia for lack of credentials of the presenters. Ultimately this is good for science, as progress is usually made on the continuum (and Law of Diminishing returns) between knowing too little or knowing too much (and being devoid of ideas from over-education or a too conservative nature[†]). It appeals to cussed/awkward-squad engineers and physicists who are head-strong enough to push forth their ideas against the mainstream and often, from the history of science, such people usher in revolutions. To be fair though, there is a lot of dross...

This report is on the conference[2] available by this link: [APEC 1/18: Catalyzed Fusion, Quantised Inertia & Aether Theory](#)

1. Cold Fusion/LENR – Low Energy Nuclear Reactions/LANR – Lattice Assisted Nuclear Reactions/CMNS – Condensed Matter Nuclear Science

I have already written about this here[3]: [Cold Fusion LENR/LANR/CMNS is back in the news. Is it Pathological Science or just barking up the wrong tree](#) (<https://vixra.org/abs/2401.0062>)

I will not dismiss “Cold Fusion” (or whatever it is – is it a *physical chemistry process*, such as hydrogenation or phase change or even something new that is not nuclear?) because some very good people (some personally known to me but I shan’t divulge) have said there might be something there: sporadic reports come in of excess heat or odd isotope ratios.

The presentation on Saturday 18th January 2025 seemed to be given by a very sincere, nice and rational gentleman in laboratory surroundings. I came away thinking it was more of a

[†] Or the celebrated Hector Belioz bon-mot about Camille Saens-Saint: “Il sait tout, mais il manque d’inexpérience.”

sales talk than an exposition of scientific principles for those wishing to duplicate the findings:-

- No reaction equation showing reactants, products, energy balances, known processes, putative processes.
- No mention of experiments to isolate the effect but surrounding the effect with superfluous(?) or confusing equipment like *engines*. Reductionism helps science.
- No repeatable experiments or those headed to a consensus level of repeatability mentioned.
- Eye-candy graphics and video in the presentation showing a (pink) spark in some mixture of gas and no explanation as to how to reproduce the experiments.
- No clear video or accounts of experiments working. Vague “oh it ran for 4 hours on its own”.
- Eye-candy scale-up graphics showing power plants with no indication that the basic science is all sealed.
- Mention of things like the “Thunderstorm Generator”, a car running on purely atmospheric water vapour, or an engine that could continually cycle the water of combustion and somehow achieve over-unity or an experiment that started with hydrogen and somehow ended up with carbon and boron but no evidence presented or videos, no materials reviewed by professionals (with no confirmation bias or axe to grind), no mass spectrometry or chemical qualitative/quantitative analysis.

I wrote about an Auger-like electron capture process initiated by X-rays from lattice relaxation[3], the new contribution being the bringing in of the Wigner phenomenon into discussions regarding lattice transmutations; the upshot being that similar sentiments regarding Sonoluminescence, high temperatures and X-ray generation could apply in lattices.

I shall now onto the more theoretical aspects discussed in the presentation which dwelled on electron capture but this is at odds with theory because:-

- Electron capture (EC) is governed by the Weak Interaction. That’s just how it is (unless there’s new science that only these guys are seeing randomly, not to mention Jupiter/Brown and White Dwarves fusing). The energetics of such processes are at the 100keV level rather than millions (MeV) of nuclear processes.
- Weak Interaction is a slow process/a rate limiting step (as chemists might say) that cannot possibly explain power densities alleged. EC has low probability.
- Wide ranging electron shell coherence/entanglement and even lattice interactions have no basis in the weak interaction because it is an extremely short-ranged force.
- Pressure/spacing not close enough for coherent overlap of nuclear wavefunctions for either weak or strong force range.
- The hypothesis that neutron rich nuclei are formed from electron capture, that are then compelled to form higher elements by the strong force, requires these nuclei to transport themselves over inter-atomic distances to combine with neighbours in the lattice (or gas or liquid separated by electron clouds) whilst being unstable and prone to beta emission.

- Given above, it is not clear how higher atomic numbers can easily be formed from “scaling the staircase” from hydrogen with electron capture, which reduces atomic number.
- No real account of how plasmoids were relevant to the discussion: how nuclear transmutation was achieved or how direct electrical conversion from these entities could be achieved.
- No explicit showing of how generation of products quantitatively lead to heat production. Surely $Power = \frac{d}{dt}mc^2$ if it’s nuclear? That would require incredibly sensitive mass measurements but isn’t there proxies (neutrons, gamma)? This is an old topic the community has skirted around for *decades* by saying “lattice effects make it different”. There is no theory to account for this.

2. “Quantised Inertia” (MOND/TeVSe hypotheses too)

The next discussion was about “Quantised Inertia” and given by its proponent, Dr Mike McCulloch of Plymouth University, UK.

I have previously written about Mike McCulloch’s[4] work, briefly in the sense that it started my own enquiry about the Galactic Rotation problem and drew together my other thoughts about[5], coming from my own propulsion project[6-8]. Sabine Hossenfelder[9] also said Quantised Inertia was based on shaky theory. Specifically I wrote that if he believes that inertia is caused by radiation pressure from an Unruh horizon, the effect is absolutely miniscule (take the Black Body temperature, plug into Stefan-Boltzmann law to work out intensity, work out the pressure/force from this, you get: $F = -\int_A Pd\vec{A} \cdot \vec{n} = -\int_A \frac{2\pi^4 \hbar a^4}{15c^7} d\vec{A} \cdot \vec{n}$, $\vec{n} = \frac{\vec{a}}{|\vec{a}|}$

where F is your force, a is your acceleration).

Watching the new (18/01/2025) presentation drew out further absurdities: **Inertia was already quantised very early on in the history of Quantum Theory.** As soon as Planck suggested $E = \hbar\omega$ in 1900 and then Einstein explained the Photoelectric Effect *and* co-discovered (or brought together best/most coherently all the ideas kicking around at the time from Maxwell, Lorentz, Poincare, Fitzgerald regarding Special Relativity) in 1905, it only needed a 4-vector transformation to suggest $p = \hbar k$ (de Broglie 1924) – Special Relativity had already sealed that formula.

For a free, unbounded particle k is continuous (just as say the Hydrogen spectrum is continuous above the ionisation energy) and can tend to zero. There is no minimum acceleration figure.

Let’s take McCulloch’s hypothesis and see where it takes us:-

If $p = \hbar k$ then $\frac{dp}{dt} = \hbar \frac{dk}{dt}$ this is an application of Ehrenfest’s Theorem.

The wavenumber, k , would give us a length scale for the process and an idea of δt from the velocity, $\delta t \approx 1/\Delta k \cdot 1/v$. So let us write:-

$$ma = \hbar \frac{\Delta k}{1/\Delta k \cdot 1/v} = \hbar (\Delta k)^2 v \quad \text{eqn.1}$$

Where a is the acceleration, v is the velocity and $1/\Delta k$ is the wavelength or length scale associated with the process changing the wavenumber; dividing this by the instantaneous velocity (indeed, if the velocity is high and the acceleration low) gives the timescale. If constant acceleration is assumed (let alone a minimal “quantised acceleration” figure) we can write the following and call it Δk_{HUP} for the change in wavenumber, directly from the de Broglie relation:-

$$\frac{mv}{\Delta t} = \hbar (\Delta k)^2 v \Rightarrow \Delta k_{HUP} = \sqrt{\frac{m}{\hbar \Delta t}} \quad \text{eqn.2}$$

“HUP” for “Heisenberg Uncertainty Principle” and this would set a limit to how precisely we could measure a change in wavenumber (the number of waves per unit distance) given the mass of the particle and the time scale of the process.

If we substitute in Mike McCulloch’s/MOND[10, 11] suggested minimal acceleration figure of about $2 \times 10^{-10} \text{ m/s}^2$ into eqn. 1, we’d get,

$$\Delta k = \sqrt{\frac{2 \times 10^{-10} m}{\hbar v}} \approx 10^{-5} \sqrt{\frac{m}{\hbar v}} \quad \text{eqn.3}$$

Taking the ratio of eqn. 2 and eqn. 3,

$$\frac{\Delta k_{HUP}}{\Delta k_{McCulloch}} = 10^5 \sqrt{\frac{v}{\Delta t}} \quad \text{eqn.4}$$

Unity would mean the same results as the HUP/Correspondence Principle. A value greater than 1 would mean that **Mike McCulloch’s hypothesis would measure more precisely than the Heisenberg Uncertainty Principle dictates** with no special artifice (such as

statistical averaging): just set $\sqrt{\frac{v}{\Delta t}} > 10^{-5}$ since: $\Delta x = v\Delta t + \frac{1}{2}a(\Delta t)^2$ setting v large and Δt small would decrease the contribution from the acceleration (minimal or not).

The limit in the second term is provided by the HUP: $\Delta p \Delta x \geq \hbar \Rightarrow \Delta x \geq \frac{\hbar}{m \int_0^{\Delta t} a dt}$ and would

become larger with smaller acceleration and more precise with longer measurement time – the latter is the complete opposite of McCulloch’s hypothesis, which is clearly absurd.

(Other matters related to his putative propulsion device neglect all consideration of the scholarly Hidden Momentum literature base, as mentioned before[6-8]).

Of course without a cut-off, as per McCulloch's suggestion and if we return to Milgrom's original proposal[12] with a modified Newton *inertia* law,

$$F = m\mu\left(\frac{a}{a_0}\right)a \quad \text{eqn.5}$$

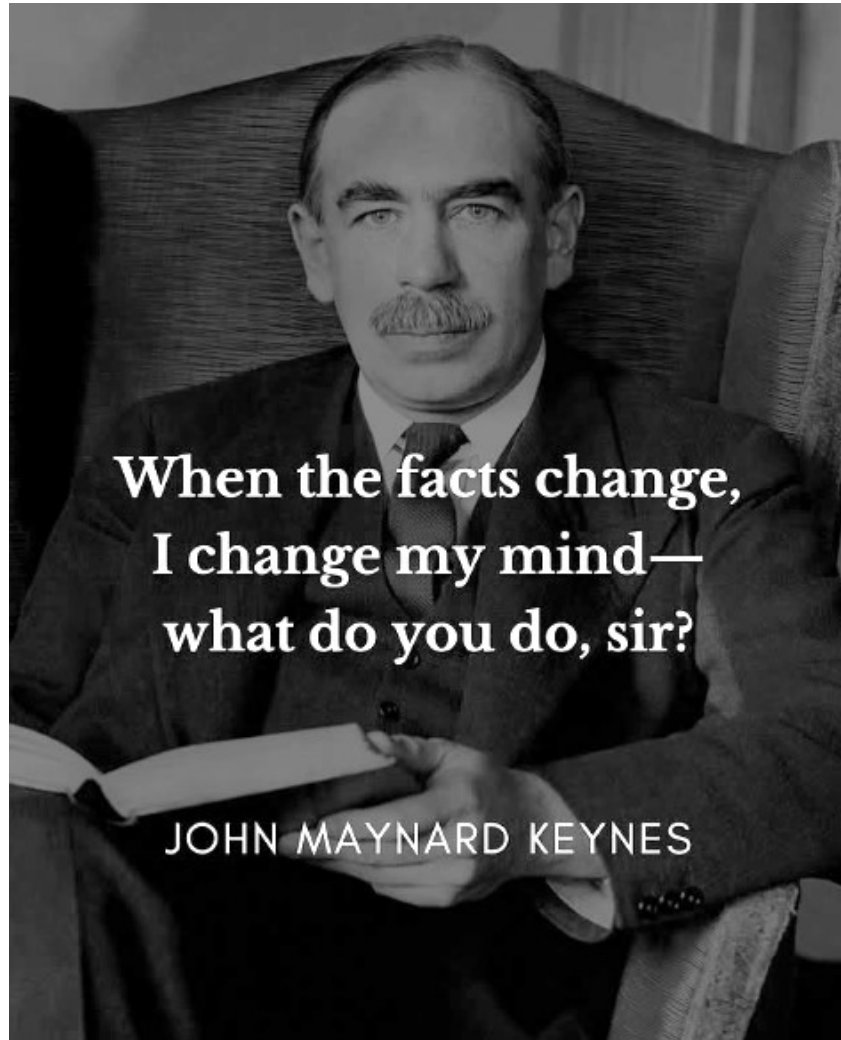
Where a_0 scales when his effect takes over, with $\mu\left(\frac{a}{a_0}\right) \rightarrow 1$ for larger accelerations than observed at the edge of galaxies, normal Newtonian behaviour (and indeed, the de Broglie relation/Correspondence -Principle is recovered).

However this is a non-linear relation and goes against the de Broglie relation/Correspondence Principle at small accelerations, which is just as absurd as McCulloch's suggestion, given that laboratory scale accelerations are measured in torsion balance experiments much less than a_0 . This wasn't picked out in the original peer review at the time (1983), probably for compartmentalisation of research and being viewed as an astrophysics problem.

Perhaps then, this is a misnomer: *Modified Newtonian Dynamics* should be *Modified Gravity*; this is taken as the meaning today. The modified gravitational law follows from the gradient of the potential,

$$\nabla \cdot \left[\mu\left(\frac{|\nabla\phi|}{a_0}\right)\nabla\phi \right] = 4\pi G\rho \quad \text{eqn.6}$$

And this introduces further absurdities of potentially breaking the Equivalence Principle: one would be able discern, without looking out the window, if one was in weak or strong gravity field by whether one had entered the cut-off region/non-linear region. This is the external field effect and violates the Strong Equivalence Principle. However the Weak Equivalence Principle is still obeyed, as all particles regardless of mass experience the same acceleration from the field from the gradient of the potential.



**When the facts change,
I change my mind—
what do you do, sir?**

JOHN MAYNARD KEYNES

References

1. Ventura, T. *Alternative Propulsion Engineering Conference (APEC)*. 2020; Available from: <https://www.altpropulsion.com/>.
2. Ventura, T. *APEC 1/18: Catalyzed Fusion, Quantised Inertia & Aether Theory*. 2025; Available from: <https://www.youtube.com/watch?v=uGauflPpBk>.
3. Cornwall, R.O. *Cold Fusion LENR/LANR/CMNS is back in the news. Is it Pathological Science or just barking up the wrong tree*. 2024; Available from: https://www.academia.edu/113430013/Cold_Fusion_LENR_LANR_CMNS_is_back_in_the_news_Is_it_Pathological_Science_or_just_barking_up_the_wrong_tree <https://vixra.org/abs/2401.0062>.
4. Cornwall, R.O. *The Fisher-Tully Law solely with 1915 General Relativity and Dark Energy*. MDPI Pre-prints 2024; Available from: https://www.academia.edu/117246324/The_Fisher_Tully_Law_solely_with_1915_General_Relativity_and_Dark_Energy <https://vixra.org/abs/2404.0050>.
5. Cornwall, R.O. *"Reconciling the Cosmological Constant with the Energy Density of Quantum Field Theories of the Zeropoint"*. 2021; Available from: https://www.academia.edu/50327052/Reconciling_the_Cosmological_Constant_with_the_Energy_Density_of_Quantum_Field_Theories_of_the_Zeropoint.
6. Cornwall, R.O., *A Mechanism for Propulsion without the Reactive Ejection of Matter or Energy*. Preprints, 2019 (https://www.academia.edu/38062548/A_Mechanism_for_Propulsion_without_The_Reactive_Ejection_of_Matter_or_Energy).
7. Cornwall, R.O., *The Energetics of the an ExB propulsor that avoids the Hidden Momentum pitfall*. Preprints, 2019(https://www.academia.edu/41062130/The_Energetics_of_the_an_ExB_propulsor_that_avoids_the_Hidden_Momentum_pitfall).
8. Cornwall, R.O., *Candidates for EM propulsion - slide presentation*. Preprints, 2021(https://www.academia.edu/49712716/Microsoft_PowerPoint_APEC).
9. Hossenfelder, S. *Quantum Inertia Drive put to Test. It didn't go as planned*. 2024; Available from: <https://www.youtube.com/watch?v=TSMJZmLMwrY&t=495s>.
10. McCulloch, M. *Physics with an edge*. 2024; Available from: <https://physicsfromtheedge.blogspot.com/>.
11. Wikipedia. *Modified Newtonian dynamics*. Available from: https://en.wikipedia.org/wiki/Modified_Newtonian_dynamics.
12. Milgrom, M., *"A modification of the Newtonian dynamics as a possible alternative to the hidden mass hypothesis"*. The Astrophysical Journal, 1983. **270**: p. 365-370.