

Charles Chase

UnLAB Director / CTO

retired Lockheed Martin Sr Tech Fellow

<https://unlab.us/>***Energy of Thought***

My premise is that there are unexplored, undiscovered, and probably unexpected ways of generating forces and energy. This is based partly on the fact that there are many fundamental questions remaining in physics, observational data we do not understand, and phenomena we observe and experience that we cannot explain. Abundance is unlimited. Mankind has consistently developed new conceptions and technologies through our thoughts and resources; think of fire makers, agriculture, electromagnetism, fission, penicillin, etc. The Advanced Propulsion and Energy get-togethers are focused on striving for a breakthrough by bringing together free thinkers and creating an environment like an old-fashioned salon where people come and go as they can, and the discussions are real and varied with freedom to speculate and be an explorer. The hope is to encourage collaborations, provide inspiration, and perhaps enable aha moments. I will focus on the UnLAB's current work on generating forces and energy from vacuum fluctuations and I will also cover several of our current questions, explorations and speculations.

Dr. Mike Fiddy

Professor of Physics and Optical Science and of Electrical and Computer Engineering

University of North Carolina Charlotte

Started QUEST program when he was a DARPA/DSO PM

<https://pages.uncc.edu/michael-fiddy/>***Nascent fields and forces***

Recent work on structured materials, inspired by progress in metamaterials, has indicated that one can control the emission, absorption and propagation of electromagnetic waves. Field modes and wave velocities are dictated by the proximity of matter, even in the dielectric (vacuum) of space. These light-matter interactions can be modeled by both classical and quantum theories and continue to yield some surprises. Metal cavities may not always behave quite as expected and nanopatterned structures can drive forces and radiation reaction phenomena in unusual ways. In this presentation, I will dig deeper into nascent light-matter interactions as they relate to harvesting energy and momentum for propulsion purposes. Energy is a combination of an object's mass and momentum, $E^2 = (pc)^2 + (mc^2)^2$. For massless "particles" of electromagnetic energy, $E = pc = hf/c$ suggests energy is related to reciprocal time but time contractions and dilations apply to objects with mass at high velocities close to c , i.e. energy identified directly with matter. However, with appropriate structures of matter, we can control velocities and under some circumstances c . Small gaps between materials or narrow slabs of material change c , i.e. "tunneling" can occur. We can cloak certain fields and forms of energy. We know we can design phase, group and energy velocities to differ from or exceed c with appropriate choice of materials but, by consensus, not information velocity. So can suitably engineered material constructions provide some insights into developing (and enjoying) new advanced propulsion opportunities, even if we retain no information about the journey itself!

Dr. Nathan Inan

Lecturer in Physics

California State University, Fresno

<http://www.fresnostate.edu/csm/physics/people/faculty/nathan-inan.html>***Generating and detecting gravitational waves via superconductors***

Applying the Helmholtz Decomposition theorem to linearized General Relativity leads to a gauge-invariant formulation where the transverse-traceless part of the metric describes gravitational waves in matter. Gravitational waves incident on a superconductor can be described by a linear London-like constituent equation characterized by a “gravitational shear modulus” and a corresponding plasma frequency and skin depth. The Cooper pair density is described by the Ginzburg-Landau theory embedded in curved space-time. The ionic lattice is modeled by an ensemble of quantum harmonic oscillators coupled to gravitational waves and characterized by quasi-energy eigenvalues for the phonon modes. The formulation predicts a dynamical Casimir effect in which the zero-point energy of the ionic lattice phonons are modulated by the gravitational wave. Applying periodic thermodynamics and the Debye model in the low-temperature limit leads to a free energy density for the ionic lattice. Lastly, we relate the gravitational strain of space to the strain of matter to show that the Cooper pair density is far less responsive to gravitational waves than the ionic lattice. This predicts a charge separation effect which may lead to the possibility of reflection of gravitational waves by a superconductor.

Dr. Mike McCulloch

Lecturer in Geomatics

University of Plymouth

<https://www.plymouth.ac.uk/staff/mike-mcculloch>***Quantized Inertia***

A new theory (quantized inertia, see ref 1) states that the phenomenon we know as inertia arises because an acceleration in any direction produces a horizon in the opposite direction that damps the quantum vacuum there and pulls the object back against its acceleration. This theory has excellent support from astrophysical data (ref 2). It further predicts that if we confine energy into a small volume and add a synthetic horizon (a metal plate) to damp the vacuum asymmetrically, then we can produce silent/propellant-less propulsion (refs 3 & 4).

Since 2018 DARPA has funded tests of this proposal. So far, the results are mixed, and contested, but they and the theory both indicate that the thrust can be maximised by using higher accelerations and very close shields. For example, a group, unfunded but advised during this project, used discharges in capacitors and achieved a thrust-power ratio of 100 N/kW (ref 5): close to that needed for propellant-less launch. In phase 3 of the DARPA project we aim to utilise this pattern to produce thrusts big enough to be compelling.

References

1. McCulloch, M.E., 2007. Modelling the Pioneer anomaly as modified inertia. MNRAS, 376, 338-. <https://arxiv.org/abs/astro-ph/0612599>

2. McCulloch, M.E., 2012. Testing quantised inertia on galactic scales. *A&SS*, 342, 2, 575-578.
<https://arxiv.org/abs/1207.7007>
3. McCulloch, M.E., 2013. Inertia from an asymmetric Casimir effect. *EPL*, 101, 59001.
<https://arxiv.org/abs/1302.2775>
4. McCulloch, M.E., 2018. Propellant-less propulsion from quantised inertia. *J Sp Expl.* 7(3).
<https://www.tsijournals.com/articles/propellantless-propulsion-from-quantized-inertia-13923.html>
5. Bhatt, A.S. & F.M. Becker, 2018. Electrostatic accelerated electrons within symmetric capacitors during field emission condition events exert bidirectional propellant-less thrust.
<https://arxiv.org/abs/1810.04368> (unpublished)

Dr. Jim Gimzewski

Distinguished Professor of Physical Chemistry
UCLA
<http://jim.chem.ucla.edu/>

Power of Intention

Dr. Sonny White

Director, Advanced Research & Development
Limitless Space Institute
<https://www.limitlesspace.org/sonny-white/>

New Findings in the Quest to go fast

Dr. Ido Kaminer

Assistant Professor, Electrical Engineering
Technion – Israel Institute of Technology
<https://kaminer.technion.ac.il/>

Controlling physics phenomena by shaping quantum wavefunctions

Experimental breakthroughs over the past decade have provided us with new capabilities to control the quantum wavefunctions of fundamental particles. Examples for wavefunction shaping include special phase masks that imbue free electrons with orbital angular momentum, and electron-laser interactions that transform an individual electron into a train of attosecond pulses.

These capabilities inspired novel concepts for controlling light-matter interactions by shaped wavefunctions. I will present several of these new theoretical concepts and the experimental capabilities that enable them. The concepts that I will discuss include

- the control of spontaneous emission and forbidden transitions by shaping electron wavefunctions
- the control of quantum electrodynamical processes wave nature of electrons
- Dirac particles that self-accelerate in free space
- free-electron sensors of the coherence of atoms and of their decoherence rates

Dr. Lance Williams

Konfluence Research Institute

<https://www.konfluence.org/>

Inertia in GR: mining momentum from the gravitational field of the universe

We will summarize historical results relating inertia to gravity, and its implications for propulsion. Conceptual limitations and challenges of the past work are discussed. Generalization of these concepts suggests new ordering principles for this work: local gravitational phenomena, and mining momentum from the gravitational field of the universe. I will overview the research and approach I am taking in 2021 on this question.

Dr. Garret Moddel

Professor, Department of Electrical, Computer, and Energy Engineering

University of Colorado at Boulder

<http://ecee.colorado.edu/~moddel/QEL/index.html>

Casimir Photoinjector

After pondering ways to tap vacuum energy for almost two decades, we have recently found a method that appears to work. It makes use of femtosecond tunneling in a structure where an asymmetry in vacuum energy is induced by an adjoining Casimir cavity. The fast capture is consistent with a model that an energy ΔE may be accessed from zero-point fluctuations for a time Δt , following a $\Delta E \Delta t$ uncertainty-principle-like relation governing the process. I present an array of experimental results that support the conclusion that real power is being generated.

Nick Cook

Author

<http://www.nickcook.works/>

Anomalous Phenomena & Reality Shifts: The Need for Experimentation

After 18 months of data-immersion, Nick Cook shares some of his latest research on consciousness and what a multi-disciplinary approach to a test-based programme of anomalous phenomena would tell us about the nature of our 'morphing reality', its potential to open up pathways to a new science paradigm and consciousness shift that would herald breakthroughs in game-changing technology.

Micah Karahadian

UnLAB Research Engineer

<https://www.linkedin.com/in/micah-karahadian-717922123/>

Information and Time

Information is an intriguing quantity that represents nothing physical, but describes the relationship of how we interact with our surroundings. Without it everything would appear to be the same and nothing would be unique. How our consciousness interacts with the information provided by the environment can be understood through the relationships between information theory, probability theory, and the concept of Bound Time. This is represented mathematically as a field through which a point of

consciousness flows. Treating Bound Time as a field opens up many interesting mathematical insights into how our consciousness interacts with reality. Utilizing applied statistics and vector calculus, a theory of information and time is developed under the axiom that the flow of information creates our perception of time while the flow of time mandates information transfer. Furthermore, this introduces new concepts such as perception, causality, and the force of compulsion which prove to be fundamental aspects of a subjective experience.

Richard Banduric

Independent Researcher

<https://electric spacecraft.org/index.html>

Convection Current Reference Frame Forces

This presentation will derive today's electromagnetic vector equations from the potentials as a Clifford Algebra using relativity to calculate the convection current forces. This new derivation will remove the magnetic field equation from the resulting vector equations. We will show how to derive the magnetic field equation using a material's properties. We will then explore under what conditions today's equations are valid for charges in different inertial reference frames and how this new mathematical model can describe a whole new set of forces that were "gauged out" in today's vector equations. Today's electromagnetics lumps the forces from electric charges in different reference frames that compose an electric current into a simplified mathematical abstraction known as the magnetic field to model the magnetic forces observed from an electric current. This mathematical abstraction turns out to be just a special case in a larger mathematical framework based on coevolving the electric current as a convection current inside a conductor using the material's properties and relativity to calculate the magnetic forces.

This new expanded mathematical framework produces the magnetic field equation by coevolving the electric current as a copper conductor's convection current and will show how the magnetic field equation is only valid for conduction currents in copper conductors. We will then explore the new field components that arise from this new model and describe under what conditions these new field components can be observed.

Finally, we will discuss how these new field components alter the forces from a convection current inside different materials and structures. If we have time, we will model these new field components for a simplified hydrogen atom model and show how these new field components can give a verifiable and simplified path to unify gravity with the electric force mathematically.