

# An Armchair Look at ECE Electromagnetic Theory

With An Explanation of LENR and other  
Pathological Science

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AIAS  
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**[www.AIAS.US](http://www.AIAS.US)**

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## What Is AIAS?

Academic institute who's aim is to further the Einstein Cartan Evans unified theory of physics and promote the development of new technologies and science that result from its' study, such as

- free energy devices
- electrogravitation

Web-based

- run on volunteer basis
- 2 - 3 million website visitors every year
- Site hosted by Annexa., of New York State

**[www.AIAS.US](http://www.AIAS.US)**

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The AIAS is an institute of theoretical physics, and is intellectually independent and not affiliated with any political view. It was founded in 1998 and is one of the largest web-based scientific organizations worldwide. It 's purpose is to develop the Einstein Cartan Evans (ECE) unified field theory, and technologies such as free energy devices and electro-gravitation that may result from it.

# What Is AIAS?

Founded Myron W. Evans (1998 ) in Wales-civil list pension (2005), armorial bearings (2008)

## Presidents

- Myron Wyn Evans\*, Gent., Civil List Pensioner, D. Sc., Ph. D., B. Sc. (Wales).
- Gareth John Evans, Ph. D., B. Sc. (Wales)

## Directors

- Horst Eckardt\*, Ph. D., B. Sc. (Clausthal), President of UPITEC
- Douglas W. Lindstrom\*, Ph. D., M. Sc., B. Sc. (British Columbia)
- Robert Cheshire (Liverpool)
- Alex Hill (Mexico City), also a Director of UPITEC.

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The AIAS founder and President is Prof. Myron W. Evans, who has recently received two high honors of the British Government, a Civil List Pension in 2005, and armorial bearings, the crest at the bottom right of the slide, in 2008. He is the author of some 1500 technical publications.

Scientific predecessors on the Civil List or similar include Newton, Herschel, Brown, Airy, Dalton, Faraday, Joule, Adams, Fairfax-Somerville and Heaviside.

# Pathological Science

**Pathological science** “false results ... by subjective effects, wishful thinking or threshold interactions”\*

- **threshold interactions** -"a statistical phenomenon where unforeseen relationships between input variables may cause unanticipated results”\*

\*Irving Langmuir-Colloquium at The Knolls Research Laboratory, December 18, 1953

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Let me start with a bit of a digression into the attitude of mainstream science, especially the academic mainstream, and look at pathological versus so called “real” science. “Pathological science as an area of research where “people are tricked into false results ... by subjective effects, wishful thinking or threshold interactions”, where threshold interactions “refers to a phenomenon in statistical analysis where unforeseen relationships between input variables may cause unanticipated results.” Pseudoscience on the other hand, “is a claim (perhaps fraudulent), belief or practice which is incorrectly presented as scientific, but does not adhere to a valid scientific method, cannot be reliably tested, or otherwise lacks scientific status.”

## Pathological Science

Examples of pathological science include

- Mitogenetic rays
- Biological effects of magnetic fields
- Extrasensory Perception
- Flying Saucers and UFO's
- Water Dowsing
- Martian canals
- Darwin's evolution
- General Relativity
- Cold fusion
- Free energy devices

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Langmuir listed several examples of what he considered pathological science. Notice that some currently well excepted theories were initially branded pathological but are now accepted. Some examples of modern branding include cold fusion and free energy devices. Cold fusion has yet to be accepted into mainstream science although there is some evidence that that is changing. Free energy devices are still outcasts from mainstream science.

# Pathological Science

When is a theory believable?

- Scientific method / testable / reproducible
- Based on rational thought
- Occam's razor
- Science establishment rejects significant advancement at first then claims it unconditionally.
  - Eg. Tesla, Edison...

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From the AIAS standpoint, a theory is acceptable from believability and usefulness standpoint when it satisfies Occam's razor, is rational and testable as dictated by Sir Francis Bacon, and adheres to the scientific method regarding reproducibility. Occam's razor from the 16<sup>th</sup> century has often been reworded as "of all possible solutions, the simplest is the one most likely to be correct."

## Topics Covered

➔ Brief history of physics and a look forward

Explanation of ECE theory

Applications of ECE theory

- LENR
  - ECAT
- Homopolar generator
- Osamu Ide experiment
- ET3M - Mexico

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Let me begin the main portion of this talk with a look at where current physics came from and why a new paradigm is needed.

## Classical Physics - Gravitation

Kepler explained the motion of planets in terms of elliptical orbits



Johannes Kepler  
1571-1630

Galileo improved the telescope and charted motions of planets and discovered four moons of Jupiter



Galileo Galilei  
1564-1642

Newton postulated inverse square law of gravitational force between two bodies



Isaac Newton  
1643-1727

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Source: [www.wikipedia.org](http://www.wikipedia.org)

The sixteenth century was ripe with discoveries about the motion of heavenly bodies. It was still decreed by the church at that time, that the Earth was the center of the universe. With the invention of the telescope, Galileo Galilei, discovered of the moons of Jupiter, and went on to develop orbital theory based on his observations. Johannes Kepler produced the mathematical model for elliptical orbits, and Copernicus put her sun at the center of things About a half century later, Isaac Newton developed the theory of gravitational attraction which still stands as the standard method for calculating mass to mass attractions.



# Classical Physics- Electromagnetism

Coulomb's Law-attraction of opposite charges

$$F = k \frac{|q_1 q_2|}{r^2}$$



Charles Augustin de Coulomb  
1736-1806

Faraday's Law-magnetic induction

$$\varepsilon = -\frac{\partial \Phi}{\partial t}$$

Michael Faraday  
1791-1867



Ampere's Law

$$\mu_0 I = \oint_c B \cdot dl$$

Andre-Marie Ampere  
1775-1836



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Source: [www.wikipedia.org](http://www.wikipedia.org)

Electromagnetism followed closely on the heels of gravitation.

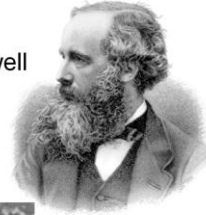
-Coulomb discovering the inverse square law of electrical attraction and repulsion.

-Faraday explored basic electromagnetic induction. He postulated that "the induced electromotive force was proportional to the time rate of change of the magnetic flux. His work was classed as pathological in his time, and remained pretty much that way until Maxwell promoted it.

-Ampere theorized that for magnetostatic cases, that the current flowing in a loop was proportional to the loop length times the magnetic field.

# Classical Physics- Electromagnetism

James Clerk Maxwell  
1831-1879



## Unification of electricity and magnetism

- Quaternion based (Maxwell)
  - 12 equations and unknowns
- Reduced to vectors (Heaviside)
  - Two vector and two scalar equations
- Gauge freedom (Lorenz)
  - Automatic in classical field theory



Oliver Heaviside  
1850-1925



Ludvig Lorenz  
1829-1891

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Source: [www.wikipedia.org](http://www.wikipedia.org)

Maxwell expanded the equation of Ampere and coupled it to Coulomb's and Faraday's Law, and added material properties to form a unified electromagnetic theory.

Heaviside took these equations and put them into the vector form that we use today. This significantly reduced the complexity of the theory, and provided a mathematical formulation that could be solved in some situations with the techniques available at the time.

Lorenz recognized the field structure of the equations and introduced the so called Lorenz constraint removing the necessity of having a zero reference as a basis point for electromagnetic potential.

## Classical Physics – Field Theory

By the end of the 1900's classical field theory explained

- solid mechanics/elasticity
- fluid flow
- heat Flow
- electromagnetism
- acoustics
- gravitation

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By the turn of the century, classical field theory had been applied to electromagnetism, fluid flow, elasticity, acoustics, gravitation, heat flow, diffusion, and probably some others that I have forgotten. The statistical nature of gases had also been developed. Physicists were feel pretty smug about what they had accomplished, much like today.

## Classical Physics - 1900

Maxwell claimed that the only things a physicist needed were paper and pencil and anything could be figured out.

Michelson said in 1894 that all the fundamental discoveries had been made and subsequent developments would be in the sixth decimal place.

Experimental science was obsolete; physicists were feeling pretty smug.



Albert Michelson  
1852-1931

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Source: [www.wikipedia.org](http://www.wikipedia.org)

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# Holes in the Armor

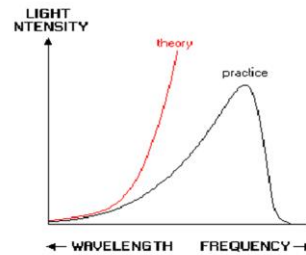
Fraunhofer - spectral lines,  
discrete spectrum for light (1817)



Joseph von Fraunhofer  
1787-1826



Ultraviolet catastrophe



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Source: [www.wikipedia.org](http://www.wikipedia.org)

However, all was not as rosy as physicists believed. Fraunhofer had discovered weird dark bands in the spectra of most visible radiation. This could not be explained.

The Rayleigh-Jeans Law predicted infinite energies for ultraviolet radiation. This was not understood.

## Holes in the Armour

### Michelson-Morley experiment

- speed of light independent of source
- no ether (1887)

### Photoelectric effect (experimental)

- energy of ejected electrons dependent on frequency not intensity of incident light (1902)



Edward W. Morley  
1838-1923

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Source: [www.wikipedia.org](http://www.wikipedia.org)

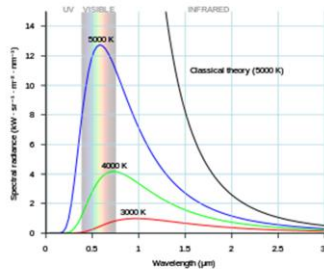
Then two experiments were performed that significantly rocked the foundations of the classical theory.

Michelson and Morley did their famous interferometer studies and concluded that the speed of light was independent of the motion of the source,, meaning that there was no aether as a medium for light to propagate in.

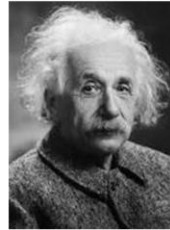
Experimental evidence for the photoelectric effect showed that the energy of the emitted electrons depended on the frequency not the intensity of the light source

## Ushering in the “New Physics”-Quantum Theory

Planck proposed radiant energy is proportional to frequency and is quantized (1900)



Max Planck  
1858-1957



Albert Einstein  
1879-1955

Einstein – photoelectric effect (1905)  
(wave particle duality for photons)

$$E = h\nu$$

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Source: [www.wikipedia.org](http://www.wikipedia.org)

This paved the way for physicist Max Planck to postulate that radiant energy is quantized and is proportional to the frequency of the radiation. This fixed the ultraviolet collapse problem.

Einstein postulated his photoelectric effect in 1905. To explain the experimental he proposed that a beam of light is not a wave propagating through space, but rather a collection of photons, which were quantized particles with wave-like properties. This bundled with Planck's quantization ushered in the quantum age. Incidentally, the quantum nature of light was the only idea that Einstein received a Nobel Prize for.

## Ushering in the “New Physics”-Quantum Theory

When change happens, it happens quickly:

1902 **Phillip Lenard** demonstrates that energy of electron emitted in photoelectric effect depends of frequency of photon.

1911 **Ernest Rutherford** infers the nucleus

1913 **Niels Bohr** constructs a quantum theory of atomic structure.

1919 **Ernest Rutherford** discovers the proton.

1924 **Louis de Broglie** proposes that matter has wave properties.

1925 **Erwin Schrodinger** develops wave mechanics.

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Source: [www.wikipedia.org](http://www.wikipedia.org)

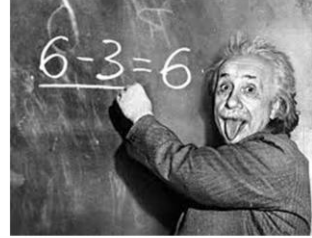
The first quarter of the twentieth century saw the end of classical physics. It had a good run of seventy or more years,, and was thought to explain everything. However when change happens, it can happen quickly, and so the new physics of quantum theory was born in about 25 years.



# Ushering in the “New Physics”-Relativity

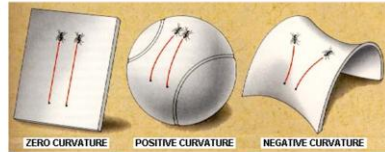
## Einstein – Special Relativity (1905)

- Speed of light is constant irrespective of the speed of the observer
- Time dilation, distance distortion



## Einstein- General Relativity (1915)

- Matter curves the structure of space-time. This curvature is felt as the force of gravity, and is not distinguishable from the inertial force an accelerating body feels.



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Source: [www.wikipedia.org](http://www.wikipedia.org)

In another area of physics, while working as a patent clerk, Einstein published the special theory of relativity (1905) based on the experiments of Michelson and Morley. Through simple geometric principles, Einstein demonstrated such effects as time dilation, distance distortion, mass increase with velocity, and more, as we all have come to accept, this much to the chagrin of the scientific community at the time.

Although he struggled with the mathematics, with the help of his first wife, Mileva, the curved differential geometry developed by Bernard Riemann was found to provide a mathematical framework for the General Theory of Relativity in 1915. I will talk more about this later.

This theory was total rejected initially by the scientific mainstream, and would had been labelled pathological science if the term had been “invented” at that time.

## Ushering in the “New Physics”-Relativity

### Eddington

- bending of starlight (1919) confirmed Einstein's theory
- It's hard to argue with good experimental data

Arthur Eddington  
1882-1944



Eddington's  
photographs of  
the total solar  
eclipse of 1919

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Source: [www.wikipedia.org](http://www.wikipedia.org)

Experimental evidence for general relativity was provided in 1919 by Arthur Eddington. Observing the solar eclipse, Eddington found that light from a distant star was bent a small amount when passing near the sun. He published his correlation of this finding with General Relativity the following year in his book “Mathematical Theory of Relativity” which popularized the theory, leading to its acceptance by the scientific community.

## Then Came the Standard Model

By the mid-twentieth century the groundwork for a new physics was in place

Murray Gell-Mann quark model (1963)

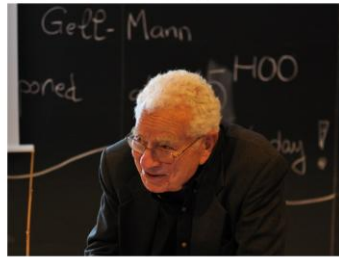
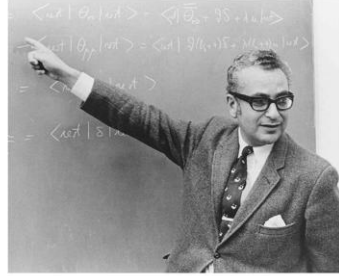
Weinberg-Glashow electroweak theory (1967)

Standard model proposed (1973)

- 61 elementary particles
  - Come in colours and flavours
  - Offshoots include quantum electrodynamics, quantum field theory.

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Source: [www.wikipedia.org](http://www.wikipedia.org)



Murray Gell-Mann  
1929-

I studied physics in the late 1960's. This was about the time that name like Feynman in quantum theory, and Murray Gell-Mann in particle physics were consolidating the field of physics into what has become known as the Standard Model. Gell-Mann developed his Quark model in all their differing colours and flavours. Winberg and Glashow incorporated the electro-weak force arriving at a total of 61 elementary particles. I went into engineering shortly after this. I didn't think I could remember the names of 61 different particles that alone understand what they did.

# The Standard Model

Quarks and Leptons-elementary particles

Force carriers are virtual particles

- gluon-strong force
- photon-electromagnetic force and weak force

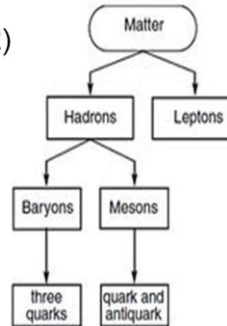
Higgs particle (proposed 1964)

- experimentally discovered (2012)
- explains mass, inertia
- Is it an experimental artifact?

Gravity still not included in standard model



Peter Higgs  
1929-



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Source: [www.wikipedia.org](http://www.wikipedia.org)

Incorporated in this new model were virtual particles which allowed the transmission of a force without actually existing. There was a fundamental particle missing in the picture, as if 61 wasn't enough already, that is a particle that explains inertia. Higg's received Nobel Prize for fashioning this beast and 20 of billions of dollars have been spent sending protons around in a great big metal doughnut in Switzerland, in an attempt to experimentally confirm this. There was much argument two years ago regarding the statistics applied to this experiment - Bayesian statistics, which I don't know anything about, except that they were used by cigarette companies to show that smoking was not harmful were used to show the existence of the Higg's particle. But apparently we need higher energies to prove this for sure.

With all this hoopla and spending, gravity is still not included in this model.

## Holes in the Standard Model

By 1932 it was recognized that the motions of the galaxies didn't fit the relativistic or Newtonian model of gravity

Solution - Patch it up with dark matter and dark energy composed of an as yet undiscovered sub atomic particle. Current thinking is that this universe consists of

- 4.9% ordinary matter
- 26.8% dark matter
- 68.3% dark energy

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Source: [www.wikipedia.org](http://www.wikipedia.org)

Although few physicists will admit it, the standard model has holes in it. For example, by 1932 it was recognized that the motions of the galaxies didn't fit the relativistic or Newtonian model of gravity.

The solution was to patch it up with dark matter and darkenergy composed of an as yet undiscovered sub atomic particle. Current thinking is that his universe consists of

4.9% ordinary matter

26.8% dark matter

68.3% dark energy

There is a lot of stuff out there that we can't see of feel I guess, but because it makes the equations work so well, it must be real. I think Occam was put in the closet for this one.

# Holes in the Standard Model

## Inconsistencies in electromagnetism:

Can not be unified with gravity

- Einstein tried for years, as have others, Hawkins, Penrose,,,

Can not explain homopolar generator adequately

- A rotating disk in a magnetic field generates a current in the disk

Can not completely explain inverse faraday effect

- Circularly polarized light induces a magnetic field in a rotating disk

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There are many inconsistencies in electromagnetism. Maxwell's theory is based on a flat spacetime and cannot be unified with gravity and its curved spacetime. Einstein tried for years, even working with Cartan, as have others, Hawkins, Penrose, Etc.....

Maxwell's equations cannot explain homopolar generator adequately, nor can it explain the inverse Faraday effect, which has been demonstrated experimentally with laser pulses on a metal plate. The inverse Faraday effect is the static magnetization induced in a metal plate by a circularly polarized electric field.

# Holes in the Standard Model

Aharonov-Bohm effect is poorly explained:

- a charged particle passing around a long solenoid experiences a phase shift as a result of the negligible magnetic field in the region through which the particle passes.
- Interaction with the vector potential when no magnetic field is present.

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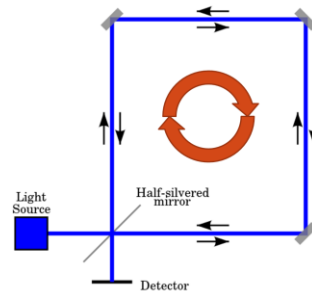
The Aharonov–Bohm effect is a quantum mechanical phenomenon in which an electron for example, is affected by an electromagnetic potential in a region in where both the magnetic field and electric field  $E$  are zero.

This is the vacuum field of ECE electromagnetism, not available in the Maxwell-Heaviside theory. This also means that the vector potential is a real entity, an idea promoted by Faraday but subsequently abandoned.

# Holes in the Standard Model

Cannot explain the Sagnac effect:

- A beam of light is split and the two beams are made to follow a looping path but in opposite directions in a rotating apparatus.
- The relative phases of the two beams are shifted according to the angular velocity of the apparatus.



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Source: [www.wikipedia.org](http://www.wikipedia.org)

The standard model cannot explain the Sagnac effect. This effect is a phase shift observed in laser light when two beams are caused to travel in a loop in opposing directions and the apparatus is rotated relative to the observer. This shift is entirely due to rotation of the local spacetime.



## Are We Due for a New Physics?

The standard model is about seventy-five years old. Is it becoming dated?

What is half life of a physics paradigm?

- Maxwell's electromagnetism survived for about seventy-five years before needing replacement.

What happened to "Occam" and "Francis Bacon"?

- dark matter and energy, multi-universes
- Has the scientific method been abandoned?
- CERN experiments can't be duplicated (due to cost)

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I've presented several examples where the standard model falls short. It is getting onto seventy-five years since it's conception and is perhaps it becoming dated.

Maxwell's electromagnetism model survived for about seventy-five years before needing replacement. If this is a valid half life for a physical theory then perhaps the standard model is living on borrowed time.

For example, the Higg's particle at CERN has had its statistics questioned. Recall that statistics was used by Langmuir in defining what pathological science was. Further, CERN is so expensive that realistically it cannot be duplicated.

## The Rise of the New Priesthood

String theory attempts to incorporate gravity in the standard model (Heisenberg 1940)

M theory or super string theory (1994)

- 11 dimensions some of which are curled up
- experimental verification can't be made
- so goes the scientific method, Occam's razor and reasonableness.
- natural laws understood only by "wiser" mediators.

This is not acceptable. Is there something else?

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In an attempt to incorporate gravity with the standard model, string theory came into being. I call it the rise of the new priesthood, since it seems to be a theory based on some form of pseudoscientific faith. For example it is an eleven dimensional theory, and you thought that four was pushing it. Some of the dimensions may be curled up into tiny balls. Experimental verification is not possible. The mathematics is complex enough that understanding it is relegated to just a few "wiser" mediators. You should be asking yourself, is there something else?

# Topics Covered

Brief history of physics and a look forward

➔ Explanation of ECE theory

Applications of ECE theory

- LENR
  - ECAT
- Homopolar generator
- Osamu Ide experiment
- ET3M - Mexico

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This brings me to the reason why I am here, and that is to explain simply without too many equations I hope, the ECE unified theory and how it offers an explanation for low energy nuclear reactions, and free energy devices such as the homopolar generator, parametric circuits, and finally some commercially available technology.

## Introducing ECE Theory

1925-1950 Einstein struggled unsuccessfully to combine electromagnetism and gravity using a torsion based geometry developed by Cartan.

Building on Einstein & Cartan, and earlier work on the B(3) field, Myron Evans introduced the ECE field theory in 2003.

- B(3) field consists of right and left circularly polarized plus a longitudinal components – basic mathematics but has been disputed by scientists who should know better.

Einstein's premise that "Physics = geometry" is the backbone of the theory coupled to Occam's razor.



Myron Evans  
1950-

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In 2003, based on a previous decade of work studying ways of augmenting existing electromagnetic theory, by building upon the work of Einstein and Cartan, Myron Evans of Wales found what Einstein and Cartan were looking for. He said, and I am putting words into his mouth here, "As matter appears to bend the fabric of spacetime, what if electric charge causes spacetime to twist, and this twisting results in what we perceive as electric and magnetic fields." The current scientific community rejects that idea much like it rejected Einsteins' idea of a curved spacetime.

## What is ECE Theory?

Physical theory that unifies electromagnetism, gravitation and general relativity, strong and weak forces, special relativity, and in so doing includes quantum theory.

Over 320 topical publications and more than 70 supportive publications in refereed journals, university libraries and government archives, and several websites.

2 - 3 million website visitors worldwide every year ( [www.aias.us](http://www.aias.us) )

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The resulting unifying theory became known as the Einstein, Cartan, Evans Theory, or ECE theory for short. It is a unified field theory that is currently worked on by up to 60—70 scientific professionals, engineers, industrialist, IT professionals, etc. on a volunteer basis. It is supported by approximately 320 topical publications and more than 70 supportive papers that appear in refereed journals, government and library web archives, and many separate web hosts, one them the AIAS. This latter site plus its two sister sites receive about 25,000 unique visitors per month that download the publications, and a total two to three million hits per year.

## What Does ECE Explain (that the Standard Model doesn't do well at)

- LENR
- Inverse Faraday Effect
- Faraday disk (homopolar) generator
- Aharonov-Bohm Effect
- Polarization of light due to gravity
- Sagnac Effect
- Spiral galaxy geometry
- Singularity free cosmology (no dark matter)
- Accurate prediction of photon mass
- Incorporates quantum vacuum with interactions
- And the list goes on.....

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Some of the things which the ECE theory accomplishes that has never been satisfactorily accomplished before (see the AIAS website for complete details) are

- Unification of gravity, electromagnetism, and the strong and weak forces as well as wave mechanics

- Explanation for the inverse Faraday effect
- Explanation for the Aharonov-Bohm effect
- Polarization of light due to gravity, and effect which has recently been observed in light emitted from white dwarfs
- Explanation of the Sagnac
- Correct mathematical description for galaxy shape and motion without the need for dark matter or other superfluous concepts such as black holes and the big bang theory.
- It gives a correction to the mass of the photon. Apparently the integral used by Einstein when evaluating the deflection of light when passing near the sun was in error by a factor of  $10^5$ .
- The ECE theory also explains particle-particle interactions without the use of virtual particles, and offers a description of the weak forces without the Higgs mechanism, suggesting that CERN's activity may be futile.
- String theory is also not needed.

From a classical perspective, the ECE theory is much more palatable than any of its newer counterparts.

## ECE Contains the Standard Theories

- Mathematically equivalent to Maxwell in absence of matter
- Mathematically equivalent to Einstein in absence of charge
- Reduces to wave mechanics
- Retains field interactions (em-gravity, etc.) between all fundamental forces

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It should be pointed out that from a mathematical perspective, the ECE is equivalent to the Maxwell-Heaviside theory of electromagnetism, Einstein's general relativity, the Dirac, Proca and hence Schrodinger equations of quantum mechanics while retaining inter-field effects such as electromagnetism and gravity interaction.

## Extending Maxwell's Equations

One way to explain the Aharonov-Bohm effect would be to allow potentials to have a defined (not floating) ground state

$$E = -\nabla\phi - \frac{\partial A}{\partial t} - F(\phi, A)$$

Depending on  $F$ , potentials now require a fixed ground (or zero) point. The simplest  $F$  might be the first term of a power series.

then

$$F(\phi, A) \approx \omega_0 A - \omega\phi$$

$$E = -\nabla\phi - \frac{\partial A}{\partial t} - \omega_0 A + \omega\phi$$

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As a way to see how the ECE electromagnetism is in some ways an extension of Maxwell Heaviside theory, think about the Aharonov-Bohm effect. Recall this was the interaction of an electron for example with the vector potential, when no magnetic field is present.

Since there is no vacuum state in Maxwell's theory, suppose we try to add terms to its electric field that allows this to happen. It could not be time rate or space gradient governed, indicated by the function  $F$  in the middle equation.

Then the field could be zero, but the vector and scalar potentials are not necessarily zero. Adding a simple term that is proportion to potentials, gives the simplest way that could be accomplished. The electric field would take the form shown at the bottom of the slide.

$\Omega$  is an unknown vector and  $\omega_0$  an unknown scalar at this point.

I apologize for the use of equations here and in what follows, but I don't see an alternate way of explaining this.



## Extending Maxwell's Equations

For the magnetic field, assume

$$B = \nabla \times A - G(\phi, A)$$

If we plug these into the Faraday equation

$$\nabla \times E + \frac{\partial B}{\partial t} = 0$$

we see

$$\frac{\partial}{\partial t} G(\phi, A) = \nabla \times (\omega_0 A - \omega \phi)$$

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We also assume some function  $G$  to extend the magnetic field of the Maxwell Heaviside theory, labelled  $G$  in the slide. If we plug this and  $E$  from the previous slide into the Faraday equation, then the partial differential equation at the bottom of the screen results.

This equation means that  $G$  must be perpendicular to both  $\omega$  and  $A$ .

## Extending Maxwell's Equations

We note that

$$G(\phi, A)$$

must be perpendicular to both  $\omega$  and  $A$  making

$$G(\phi, A) = \omega \times A$$

the most likely choice, so that

$$B = \nabla \times A - \omega \times A$$

If one were very clever, the similarity between this and torsion of Cartan geometry would be recognized, which happened in 2003.

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The simplest form for  $G$  is then is given in the middle equation on this slide, making the magnetic field take the form shown in the bottom equation. If one were clever, one would recognize this form as being the same as the torsion in Cartan differential geometry. This happened in 2003; credit going to Myron Evans.

## Properties of ECE Equations

The ECE equations are three well-defined equation systems (each with 8 equations and 8 unknowns); these can be reduced by antisymmetry conditions and additional constraints.

There is much more structure in ECE than in standard theory (Maxwell-Heaviside).

There is no gauge freedom in ECE theory.

Resonance structures (self-enforcing oscillations) are possible in Coulomb and Ampère-Maxwell law

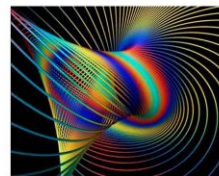
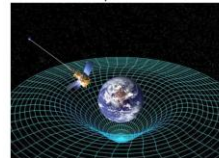
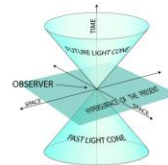
The complete set of equations is very difficult to solve. There are twenty four equations in twenty four unknowns before one introduces the vacuum state equations, and equations similar to the Lorenz constraint of the Maxwell theory. In fact they have only been solved analytically and numerically in a few limited cases so far. The solutions themselves are much richer in structure than the Maxwell system offers. Non-linear oscillations and the potential for resonance highlight this list.

# Understanding ECE Theory-Spacetime

Special relativity introduces four dimensions: three dimensions of space (x, y, z) and one dimension of time.

General Relativity introduces a curved spacetime, objects follow curved geodesics in spacetime.

ECE is based on Cartan's twisted and bent spacetime and the axiom "physics is mathematics".



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Source: [www.wikipedia.org](http://www.wikipedia.org)

To understand the ECE theory one really has to start with Einstein's supposition that physics is geometry....

And if you have a geometry, you need some sort of frame work, called a frame of reference to measure things on. We are all familiar with three dimensional geometry of length width and depth, where the yard sticks or meter sticks depending upon where you are from are straight, as far as you can tell.

The first extension to your thinking is that you have to treat time as just another dimension in this frame work. This is what Minkowski did with a flat coordinate system like the one we are familiar with. This coordinate system became known as the Minkowski spacetime.

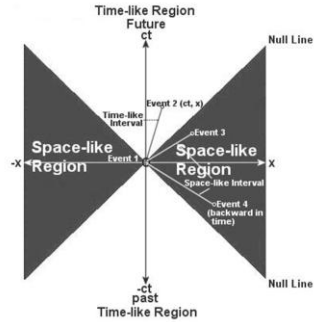
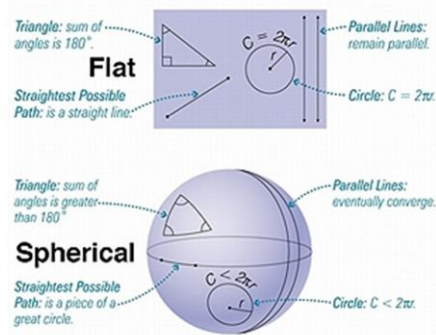
The axes of the spacetime don't have to be straight. They can be bent allowing a frame work for Einstein's general relativity.

The axes can also be twisted, a concept explored by Elie Cartan in the 1920's. This provides the backdrop for the ECE theory.

# Understanding ECE Theory- Flat Space Geometry- Minkowski

Four dimensional  $\{ct, x, y, z\}$

Flat spacetime

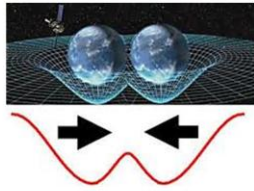


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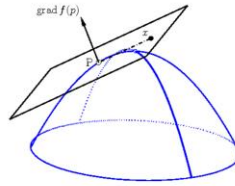
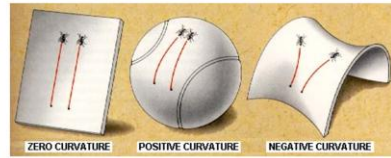
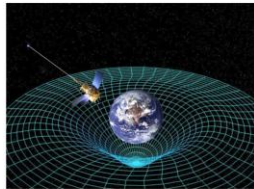
Source: [www.wikipedia.org](http://www.wikipedia.org)

Minkowski spacetime it turns out that it is ideal for expressing Einstein's special theory of relativity in. The only thing I will point out here is that time multiplied by the speed of light is treated the same as any spatial dimension.

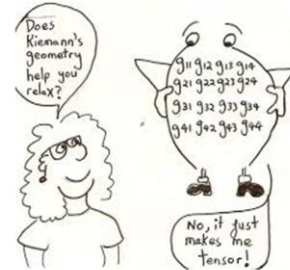
# Understanding ECE Theory- Curved Spacetime - Riemann



Curvature “creates”  
gravitational force.



Tangent plane slides  
along geodesic



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Source: [www.wikipedia.org](http://www.wikipedia.org)

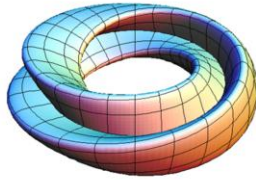
When you get into curved spacetime, it is still convenient to use straight ruler to measure with. To accomplish this, mathematicians introduce what is called the tangent plane that slides around following the hilly structure of the actual spacetime. A means of relating the curvature at the point where the tangent plane touches the curved surface is devised mathematically through a function called the metric.

Knowing the metric, and the coordinate changes on the tangent plane allows the actual coordinates on the curved surface to be calculated

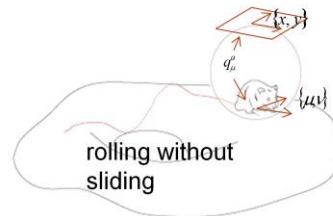
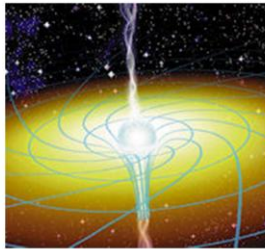
The simplest way to understand general relativity which basically says that matter curves the structure of space-time itself, and this curvature results in the force of gravity that we experience. For example, imagine two explorers at different positions on the equator of this planet. They point themselves towards the true north pole, and have gyrocompasses available to make sure they don't deviate from their correct path. At this point they are travelling parallel to each other. They proceed northward at the same speed. If they follow the gyrocompass path, they will find themselves, getting closer together and have to deviate away from the pole if they want to maintain parallel paths. This Einstein called the force of gravity, and is equivalent to the force felt by any mass undergoing an acceleration. This is known as the “equivalence principle”.

The slide illustrates the curvature of spacetime around a planet like ours for example, and for two in close proximity.

# Understanding ECE Theory- Curved Space with Torsion- Cartan



Klein geometry



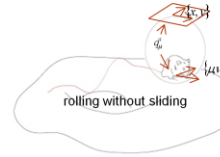
39

Source: [www.wikipedia.org](http://www.wikipedia.org)

Elie Cartan was the first mathematician to develop a complete formal geometry including torsion. Again wanting to have our straight yardsticks, now we have to incorporate a twist into the motion along a curved and twisted surface. The way that this is done is by following the surface with a ball. This not only follows the curvature of the surface, but also any twisting that the surface under the ball may experience. One could picture this twisting for example as being one thread of this surface twisting along its length differently than its neighbors might. There is a tangent plan on the “top” of the ball taking our measurements. We now need mapping from the surface to the ball, then from the ball to the tangent plane.

## How Does This Explain Physics?

Physics is governed by equations.



These equations must have the same form on a tangential plane or on a curved/twisted surface.

$$T^a = d \wedge q^a + \omega_b^a \wedge q^b$$

$$d \wedge T^a + \omega_b^a \wedge T^b = R_b^a \wedge q^b$$

$$R_b^a = d \wedge \omega_b^a + \omega_c^a \wedge \omega_b^c$$

Spin connection  $\omega_b^a$  insures this. The tetrad  $q^a$  maps one surface to the other.

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Source: [www.wikipedia.org](http://www.wikipedia.org)

Physics is governed by equations. These equations must be the same whether one is on a twisted curved surface, or on a nice smooth flat plane. Physicists say that they have to be independent of the frame of reference. The spin connection is a mathematical entity that accomplishes this. The torsion and curvature can be calculated using the equations on the right. Using these, one can map the path of a particle in an arbitrary spacetime, which fundamentally, is all that physics is about.



# ECE Electromagnetism

## Definition of Fields

$$T^a = d \wedge q^a + \omega_b^a \wedge q^b$$



$$B = \nabla \times A - \omega \times A$$

$$E = -\nabla\phi - \frac{\partial A}{\partial t} - \omega_0 A + \omega\phi$$

Magnetic charge and current  
Non-trivial vacuum state

## Field Equations

$$d \wedge T^a + \omega_b^a \wedge T^b = R_b^a \wedge q^b$$

$$R_b^a = d \wedge \omega_b^a + \omega_c^a \wedge \omega_b^c$$



$$\nabla \cdot B = \rho_m$$

$$\nabla \times E + \frac{\partial B}{\partial t} = J_m$$

$$\nabla \cdot D = \rho_e$$

$$\nabla \times H + \frac{\partial D}{\partial t} = J_e$$

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Using Cartan geometry, Evans proposed that electromagnetic tensor be proportional to the torsion. This tensor is a mathematical entity that contains the electric and magnetic fields within it. This equivalently makes the electromagnetic potential directly proportional to the Cartan tetrad. The constant of proportionality is a primordial constant directly proportional to the fundamental unit of electric charge.

This is the magnetic field and electric field appearing as we speculated earlier that they refer to a non-floating ground potential. A magnetic charge and current make their appearance in the equations of Gauss and Faraday.

This extra term adds richness to the magnetic field that is not present in the Maxwell-Heaviside formulation, and has been shown to allow the propagation of a wave perpendicular to the normal magnetic field wave of MH theory. This has been interpreted as a longitudinal wave component that is perpendicular to the transverse components normally seen in standard electromagnetic theory

# Maxwell's Electromagnetism

## Definition of Fields

$$T = d \wedge q$$



$$B = \nabla \times A$$

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

No magnetic charges or currents  
No vacuum state

## Field Equations

$$d \wedge T = 0$$



$$\nabla \cdot B = 0$$

$$\nabla \times E + \frac{\partial B}{\partial t} = 0$$

$$\nabla \cdot D = \rho_e$$

$$\nabla \times H + \frac{\partial D}{\partial t} = J_e$$

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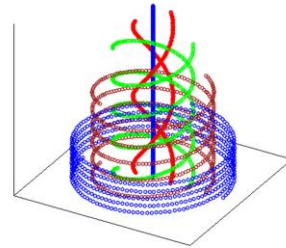
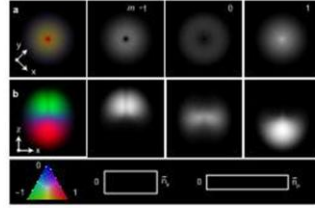
If we compare the ECE electromagnetism to Maxwellian electromagnetism, we see the disappearance of magnetic monopoles and the vacuum state, and much of the nonlinearities which offer resonance possibilities.

# ECE and the Magnetic Monopole

## Magnetic monopoles

• [Arxiv.org/pdf/1408.3133v1.pdf](https://arxiv.org/pdf/1408.3133v1.pdf)

$$\nabla \cdot B = \rho_m$$
$$\nabla \times E + \frac{\partial B}{\partial t} = J_m$$

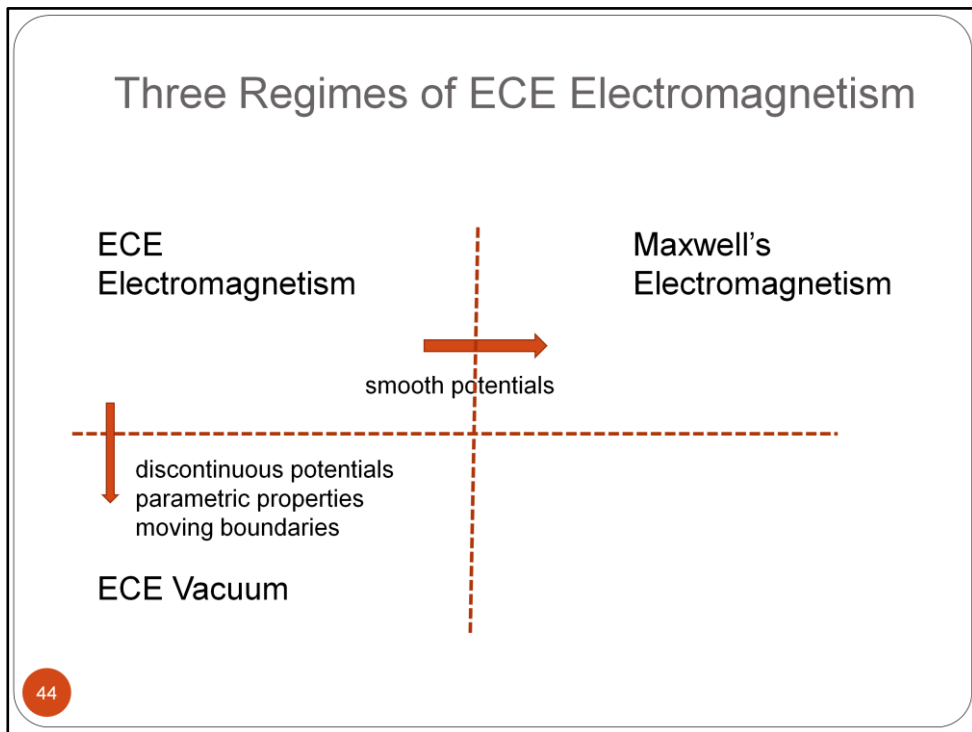


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Note Gauss's Law and Faraday's Law now contain a term associated with a magnetic charge and its associated current. It is shown in ECE theory that these can be directly related to the presence of the gravitational field. Because the gravitation field has so little influence on electromagnetic phenomena, the effects of magnetic charge is seldom if ever observed.

Recently however, experimental evidence suggests that the magnetic monopole has actually been observed.

The spiral solution on the lower right are an example of a Beltrami field, layers of spirals rotating in opposite directions. This type of field is a possible mathematical candidate for the magnetic monopole in ECE theory.



It has been discovered that the Maxwellian state is a very stable sub-state of ECE electromagnetism, and occurs whenever a potential is a continuous mathematical function. For example, a sinusoidal signal dictates an automatic Maxwell state. And once Maxwellian, a solution remains Maxwellian until the conventional mathematics can be broken down or violated in some way.

One way of violating the mathematics is to use pulse or spike potentials (multivalued functions) as the non-Maxwellian solution. The field equations defined in terms of time derivative and gradients don't like this. The mathematics of this is just formally being addressed at the moment

So there seems to be three distinct regimes for the electromagnetic state:

- ECE electromagnetic state with discontinuous or pulse like potentials
- Maxwellian state whenever potentials are nice functions
- ECE vacuum state

We could add a fourth null or nothing state for the Maxwellian vacuum if we wished.

## ECE Electromagnetic Vacuum State

ECE electromagnetic vacuum occurs when electric field and magnetic field, charges and currents are zero. This is not the quantum vacuum.

Supports wave propagation at light speed.

So far studied only for zero matter scenarios.

ECE fields float on the vacuum, and can interact with it only in a non-Maxwellian mode

There is no Maxwellian vacuum state

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It has also been shown that the vacuum state supports wave motion at light speed. It should be noted that the field equations for the most part are not normally affected by the vacuum so that the electric and magnetic fields float upon this vacuum sea without knowing it is there for the most part.

The vacuum state is not the quantum vacuum state, often called the zero point. The zero point represents all that energy that is available below the lowest quantum level of energy, a number that has been estimated to be between zero and  $10^{100}$ . This range of values has been termed the biggest blunder in physics, and if it doesn't make you question the standard model, I don't know what will.

For the vacuum state to be made know in an experiment requires

- discontinuous potentials
- parametric material properties
- moving boundaries

Not sure yet how important the last item is.

# ECE Electromagnetic Vacuum State

$$\underline{E} = 0$$

$$\underline{B} = 0$$



$$\nabla \times \underline{A} = \underline{\omega} \times \underline{A}$$

$$\nabla \phi + \frac{\partial \underline{A}}{\partial t} = -\omega_0 \underline{A} + \underline{\omega} \phi$$



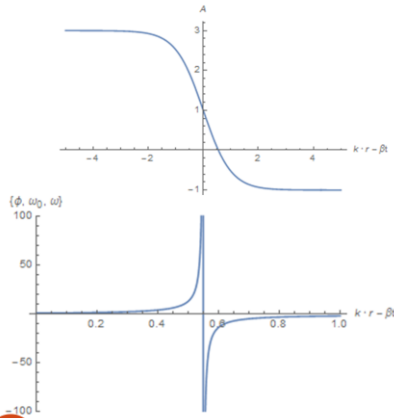
Travelling Waves

$$\underline{A} \propto \underline{k}(a + b \text{Tanh}(\underline{k} \cdot \underline{r} - \beta t))$$

$$\phi \propto \frac{\text{Cosh}(\underline{k} \cdot \underline{r} - \beta t)}{a \text{Cosh}(\underline{k} \cdot \underline{r} - \beta t) + b \text{Sinh}(\underline{k} \cdot \underline{r} - \beta t)}$$

$$\underline{\omega} \propto -\underline{k} \frac{b \text{Sech}^2(\underline{k} \cdot \underline{r} - \beta t)}{a + b \text{Tanh}(\underline{k} \cdot \underline{r} - \beta t)}$$

$$\omega_0 \propto \beta \frac{b \text{Sech}^2(\underline{k} \cdot \underline{r} - \beta t)}{a + b \text{Tanh}(\underline{k} \cdot \underline{r} - \beta t)}$$



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This illustrates some of the field structure of the ECE vacuum. The thing to notice here is not the complicated equations, but the spike-like solutions for the scalar potential, and spin connection terms.

# Spin Connection Resonance

Euler resonance in basic equations

$$m\ddot{r} + 2\gamma\dot{r} + kr = f(\beta t)$$

(1) Resonance within the spin structure of spacetime

$$\frac{\partial^2 A}{\partial t^2} + c\omega_0 \frac{\partial A}{\partial t} + cA \frac{\partial \omega_0}{\partial t} = -c^2 \nabla \times B$$

(2) ECE vacuum field resonance

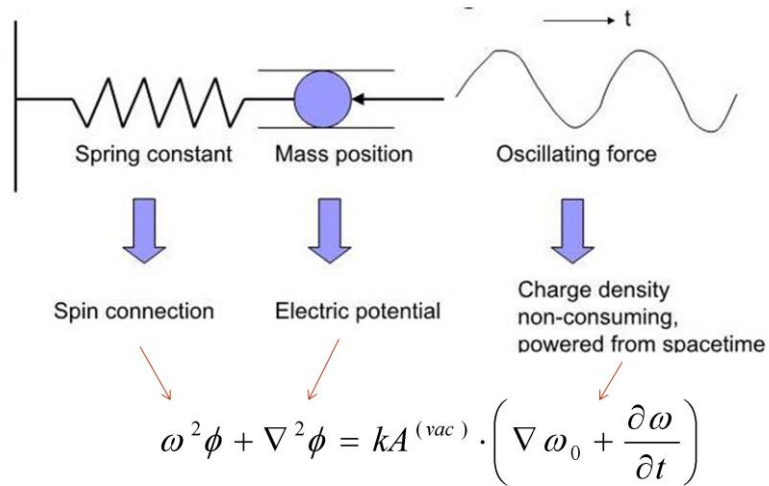
$$\nabla^2 \phi + \omega^2 \phi = kA^{(vac)} \cdot \left( \nabla \omega_0 + \frac{\partial \omega}{\partial t} \right)$$

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Resonance is the key for allowing minute effects that can be overlooked in traditional theory becomes important. Resonance within the ECE framework is basically the Bernoulli-Euler type of resonance with the spin connection dominating the picture. It can be a temporal or time resonance, for example, the pushing a child on a swing where a slight periodic push sees larger and larger amplitude of swing. It could also be a spatial resonance observed when standing waves occurring such as in an organ pipe for example, generated from a tone from a very small input signal.

In a recent ECE paper, it is shown that the structure of spacetime itself can generate a driving . The vacuum state itself can also do the same thing.

# Source of Vacuum Energy



One way of looking at getting energy from the vacuum is to consider a mechanical analog, for example an oscillating mass on a spring. An oscillating driver is provided by the vacuum potential and the restoring force is provided by the spin connection.



# Topics Covered

Brief history of physics and a look forward

Explanation of ECE theory

Applications of ECE theory



- LENR-ECAT
- Homopolar generator
- Osamu Ide experiment
- ET3M - Mexico

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I will now move on to show how the ECE theory is applied to a few experimental claims that have been labeled pathological, but will probably become mainstream hopefully before too long.

## What is LENR?

Transmutation of one element to another using low energy impacting particles

- possible release of other particles plus excess energy
- input energies significantly lower than existing technology

Transmutation of radioactive waste into non-threatening materials

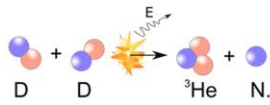
Used to be called “cold fusion” to signify comparatively low (near room) temperature

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Now I 'm going to describe how explains low energy nuclear reactions, or cold fusion reaction as they used to be known. LENR is the transmutation of one element into another using low energy impacting particles. Besides energy production, its use has been proposed for the transmutation of radioactive waste into non-threatening materials.

# Hot Nuclear Fusion

## Deuterium - Deuterium Fusion



● Proton  
● Neutron

<http://fusion.anbar.net>

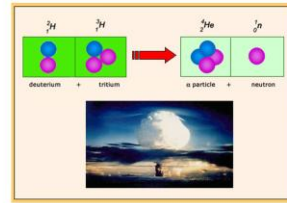
Controlled fusion require density-temperature-time minimums as given by Lawson criterion which have not been achieved yet.

$$nT\tau > 3 \times 10^{21} \frac{\text{keV sec}}{\text{m}^3}$$

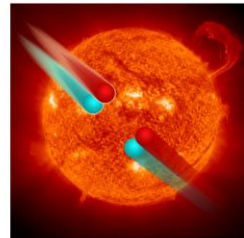
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Source: [www.wikipedia.org](http://www.wikipedia.org)

## Uncontrolled Fusion



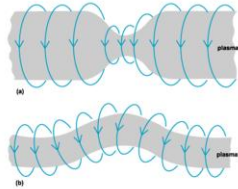
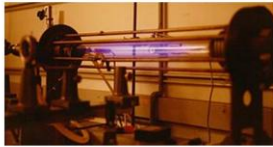
## Controlled Fusion



To get some background on this, let me review the hot nuclear fusion process. In its simplest form it's a deuterium-deuterium fusion yielding helium three plus a neutron. The hydrogen bomb and the fusion reaction in the stars including our own sun are examples of uncontrolled and controlled fusion reactions. The controlled form requires the product of the plasma density the temperature and the time be greater than  $3 \times 10^{21} \text{ keV sec/m}^3$ . This is known as the Lawson criteria and has yet to be achieved, although multiplies billions have been spent over the past fifty years to do so.

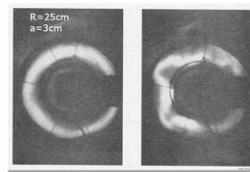
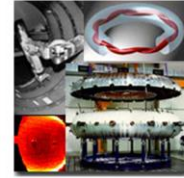
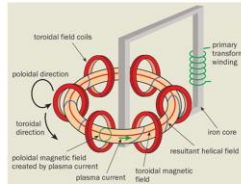
## Hot Fusion -50 and 25 years ago

Pinch effect (50 years ago)



unstable

toroid pinch(25 years ago)



some stability achieved

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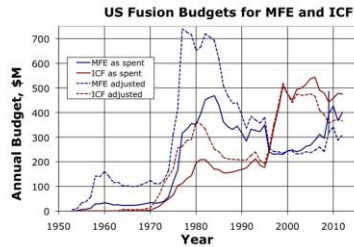
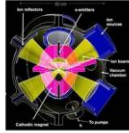
Source: [www.wikipedia.org](http://www.wikipedia.org)

In the early 1970's, I did my Masters degree in plasma physics studying the pinch effect which was one of the mechanisms proposed for achieving a controlled hot fusion reaction at that time. Basically it consisted of running a high current down a plasma column. The result self-generated magnetic field compressed the plasma down to a very narrow diameter. It was dense and hot; if it could only last a little while. It turned out to be a very unstable state lasting just micro-second even with external magnetic field stabilizing.

The toroidal shape came along a about 25 years later with somewhat greater success. The toroidal pinch was some basically a linear pinch wrapped into a donut. The tokomak device is the fallout from this early work and is one of the possibilities for success held up for this technology.

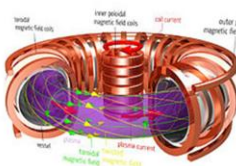
# Current Approaches to Hot Fusion

## Inertial Confinement



<http://focusfusion.org/index.php/site/reframe/wasteful/>

## Tokomac....ITER



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Source: [www.wikipedia.org](http://www.wikipedia.org)

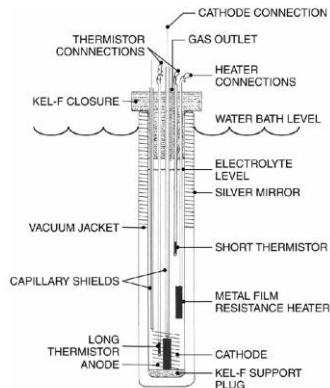
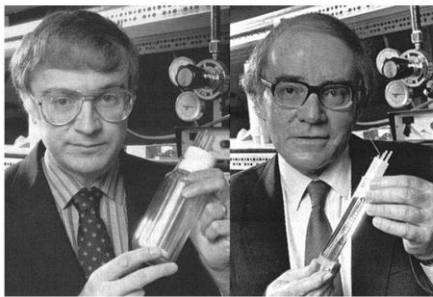
Basically two approaches are being used in the hot fusion research.

Inertial confinement has high-energy lasers fired at a pellet of the deuterium. The energy imparted to the deuterium brings plasma properties close to the Lawson limit. The second method is the tokomak device, a toroidal plasma confinement apparatus.

Spending on hot fusion is immense, about a billion a year in the US . ICF is the initial confinement technology and MFP is the Tokomac technology. A demonstration of a successful working device is not predicted for the near future. This is the same story I heard forty five years ago when I was studying the subject.

## And Along Came Cold Fusion (1989)

“Cold fusion is a hypothetical type of nuclear reaction that would occur at, or near, room temperature” Wikipedia



**BEWARE** if you value your academic career.

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Source: [www.wikipedia.org](http://www.wikipedia.org)

In 1989 Pons and Fleishman working with deuterium in heavy water and palladium electrodes in an electrolytic cell achieved more energy output more than what they were putting in. It wasn't a chemical reaction because the energy densities were much too high. They released the discovery at a press conference in March of 1989 at the University of Utah in Salt Lake City, coinciding with the release of their paper in the prestigious Journal of Electrochemistry.

Pons and Fleishmann concluded that they had discovered a new form of nuclear reaction and coined the term Cold Fusion. There was an immediate uproar, with over 800 replications being attempted at various university and other organizations worldwide. Replication was a disaster with researchers claiming everything from laboratory explosions to nil results. In the end it was concluded that the experiment itself was anomalous and not repeatable. Pons and Fleishman suffered total academic disgrace. The whole affair was labelled pathological with many books and articles written on its pathological nature, with big warning signs BEWARE if you value your academic career.

And so the topic disappeared from scientific scrutiny. Science can be a difficult task master. One significant error can ruin a successful academic career overnight. The need for increasingly large research budgets, coupled with this fear keeps academic science in line.

## Electrochemically induced nuclear fusion of deuterium

**Martin Fleischmann**

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**Stanley Pons \***

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(Received 13 March 1989; in revised form 22 March 1989)

### INTRODUCTION

The strange behaviour of electrogenerated hydrogen dissolved in palladium has been studied for well over 100 years, and latterly these studies have been extended to deuterium and tritium [1]. For discharge of deuterium from alkaline solutions of heavy water we have to consider the reaction steps



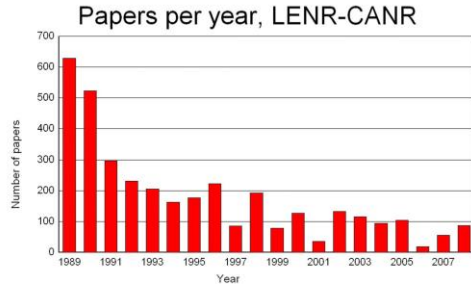
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*Journal of Electroanalytical Chemistry and Interfacial Electrochemistry, Volume 287, Issue 2, 25 July 1990, Pages 293–348*

The proposed reaction scheme gave excess heat that could not be accounted for by any other means than a nuclear reaction. It was proposed that heavy water was separated into heavy hydrogen (deuterium) by electrolysis, which was then fused into a deuterium molecule in a palladium lattice. Over the past twenty five years many mechanisms were proposed for this reaction by those researchers brave enough to study the phenomenon. All seem to be guess work at this point in time.

# What happened to cold fusion?

Cold Fusion never did die. It went underground.



Cold Fusion was relabelled as LENR

- low energy nuclear reaction
- lattice enhanced nuclear reaction

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Rothwell, J., *Tally of Cold Fusion Papers, 2009, LENR-CANR.org.*

With the thorough slamming that the initial attempts at replication of the Pons-Fleishmann experiments received, the technology went underground. Pons and Fleishmann left the US in disgrace and moved to southern France to further their research (funded by Japan).

Research continued however, mostly in corporate Japan, with publications presented at mini-conferences and web-published or published in small esoteric journals with limited audiences. Cold Fusion has over the years become known as LENR which usually stands for low energy nuclear reactions, or it can mean lattice enhanced nuclear reactions depending on the situation.



# LENR Status

Since 1989

- **Numerous (>1500) LENR experiments**
  - Deuterium palladium reaction in electrolytic cell
  - Hydrogen nickel reaction in electrolytic cell
  - Nickel, Lithium, Hydrogen in low temperature plasma or gas
- **No solid explanation that covers all of the phenomena**

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Since 1989 there have been more than 1500 demonstrations of LENR reactions. They fit for the most part into one of three categories

- deuterium palladium reaction in an electrolytic cell
- hydrogen nickel reaction in electrolytic cell
- Nickel, Lithium, Hydrogen in a low-temperature plasma or gas.

There have been a myriad of reaction mechanisms proposed but none has gained universal favor nor has any one satisfactorily explained the many properties observed.

Little attention has been given to the process by mainstream academia. Most work is generated by corporate or military scientist where reputations are perhaps a little harder to tarnish. Not returning budgeted deliverable is a research program is far more serious in this case than a scientific error.

## LENR Status

- Yet be recognized as “legitimate” science
  - **Cold fusion** is a hypothetical type of nuclear reaction that would occur at, or near, room temperature, ... There is currently no accepted theoretical model which would allow cold fusion to occur. Source: [www.wikipedia.org](http://www.wikipedia.org)
- DOE this year allows funding for LENR in a disruptive technology funding program.
- In mid-October in France, Airbus is hosting a conference on anomalous effects of hydrogen in a metal lattice- a LENR conference in main stream science.

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<http://www.e-catworld.com/2015/07/01/airbus-to-host-lenr-workshop-in-october/>

<https://arpa-e-foa.energy.gov/FileContent.aspx?FileID=1c56ac4a-0acd-43ee-a2ec-ab80b33f4146>

According to wikipedia, Cold fusion remains “a hypothetical type of nuclear reaction that would occur at, or near, room temperature, ... There is currently no accepted theoretical model which would allow cold fusion to occur.”

The subject remains to be legitimized by mainstream physics, but last year, the DOE introduced a funding program for demonstrations of economically disruptive energy technologies, where LENR was a distinct category for funding. University activity is now only slowly picking up since the fiasco of 1989.

Even more recently, there has just been a call for papers for a conference to be held in France in mid October this year on anomalous effects of hydrogen in a metal lattice. This is an LENR conference hosted by Airbus, and aimed at main stream science. It will be interesting to see who shows up with what at the mainstream event.

## LENR Commercialization E-Cat

Andrea Rossi (Italy) attempted to commercialize and LENR reactor E-Cat

- Based on the LENR Transmutation of Nickel with the release of energy
- No viable reaction mechanism proposed

Technology rights sold to Industrial Heat of North Carolina (Jan 2014)

Italian Technology Company TSEM to Collaborate with MIT, Texas Tech University and Industrial Heat in the US (June 2015)

Norway's Aftenposten Newspaper: Independent Confirmation Rossi's 1MW Plant Working

- Source with 'Heavy Scientific Background' has Inspected Plant Posted, June 21, 2015

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On a commercial path, despite science, which often happens, efforts are underway to commercialize the LENR process as a stand alone power generation device. I am only going to talk about one path to commercialization that this is taking, and that is the E-Cat device developed by Andrea Rossi of Italy. I won't go into the scam discussions that seem to surround breakthrough technologies, but rather treat things at face value. There have been too many credible scientists and engineers who have studied and reported on the device to do otherwise.

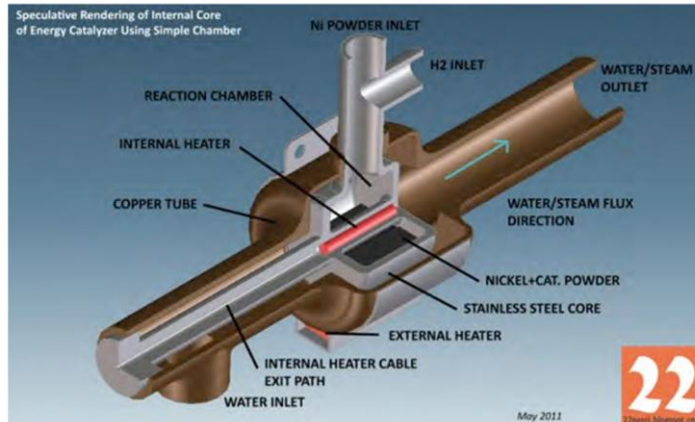
The technology is based in the transmutation of one nickel isotope to another with the resulting nuclear energy being released as heat, far beyond what could be expected from chemistry. No viable reaction mechanism has been proposed yet.

Recently Rossi sold/licensed the technology rights to a North Carolina company, and more recently, that company and Rossi have partnered with an Italian company and some leading US universities to refine, test, and commercialize the device.

Very recently, team of Norwegian scientists have inspected a one megawatt power plant based on Rossi's technology and confirmed that is working as claimed.

# E-Cat Hardware

Italian patent number BO2010E000076



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The Rossi patent was granted for a continuous feed device as shown in this artist's rendition. Ni powder plus hydrogen gas are fed to reaction chamber cooled by water. I don't think this was ever built. Reactors today tend to be one use only devices that could be easily exchanged/replaced in supportive hardware.

## E-Cat Hardware



graphics.se

### Estimated Operation Characteristics

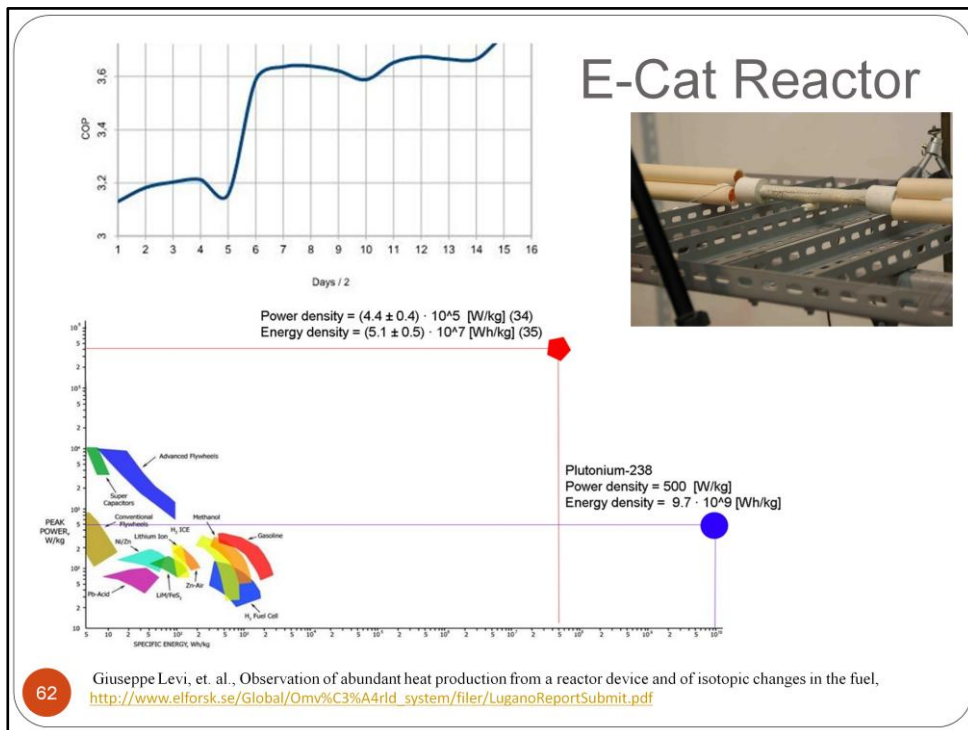
- Fuel Cost \$1/MWhr (0.11 cent/kWhr)
- Recharge frequency: twice per year
- Estimated lifespan: 30 years
- Energy output comparison (100 000 x oil)
- Energy reserves (10 billion years)

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<http://ecat.com/ecat-products/ecat-1-mw>

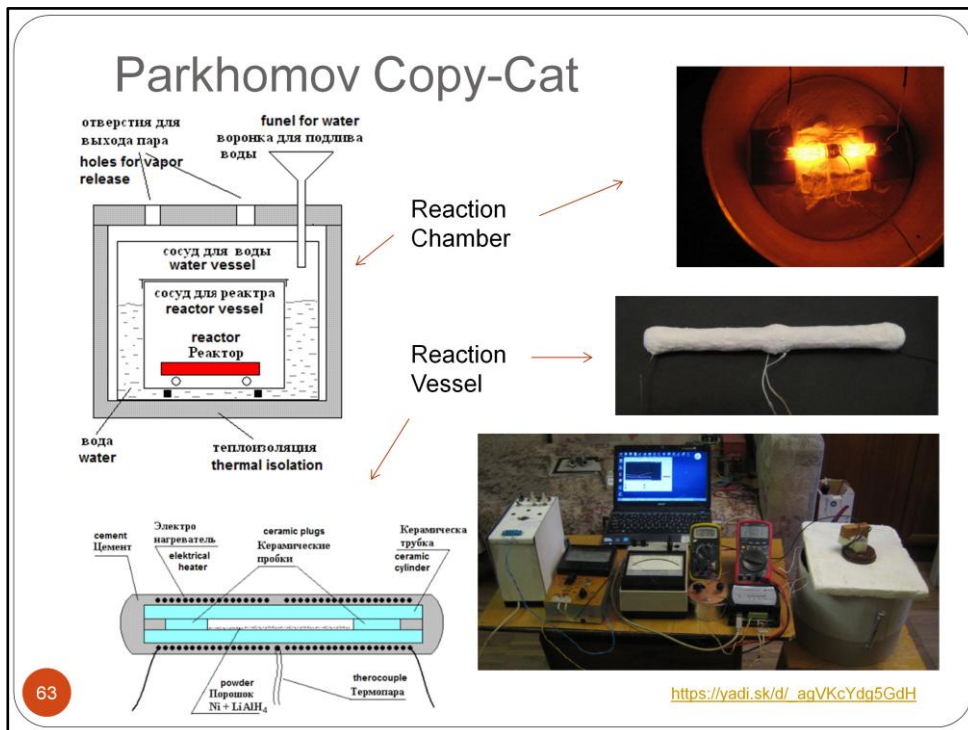
This artist rendition of a one megawatt generator is claimed to have the listed Estimated Operation Characteristics

- Fuel Cost \$1/MWhr (0.11 cent/kWhr)
- Recharge frequency: twice per year
- Estimated lifespan: 30 years
- Energy output comparison (100 000 x oil)
- Energy reserves (10 billion years)



The reactor for the E-Cat device contains a fixed fuel charge of 10 grams in a sealed ceramic tube. . The fuel, a Nickel-Hydrogen-Lithium powder is contained in an electrically heated ceramic cylinder closed and sealed at both ends, as shown in the upper corner of this slide. The temperature of the cylinder is gradually raised to 1350 C or so in small increments. When the reaction is running, the output heat from the reactor is significantly greater than the input heat as illustrated by the coefficient of performance plot in the upper left corner. When running properly, the reactor puts out more than 3.6 times the energy input to the cylinder. The operational pressure of the device is greater than 500 psi. at peak.

From the data collected, a Ragonne plot of peak power output versus energy density shows roughly where the E-Cat fits in. The device puts out more power per kilogram than all of the conventional sources- including standard fission type nuclear reactors.



Several replications have been made of the E-cat device, some aimed at verification, some at fine tuning the fuel mixture. The Parkhomov copy cat is one of the better replicates. The fuel, housed in a sealed ceramic tube contains the lithium aluminum trihydride compound without the addition of the iron, magnesium, etc. that Rossi's device has. The reported power outputs were less than that reported by E-Cat with a maximum coefficient of performance reported at 2.58.

# E-Cat Fuel

## Nickel

- no proof that reducing the particle size enhances the excess heat effect
- 90% Ni - by weight
- 2 to 20  $\mu$  or larger particle size

Lithium Aluminum Hydride -  $\text{Li Al H}_4$

## Non-Essential (?) Additives

- Mg, Fe, Ca, Mn
- Are they non-essential?

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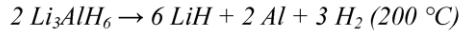
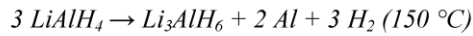
Hank Mills ,Guideline Document for Basic Nickel-Lithium Aluminum Hydride Reactor Based on Rossi's E-Cat,  
<http://www.e-catworld.com/2015/04/25/guideline-document-for-basic-nickel-lithium-aluminum-hydride-reactor-based-on-rossis-e-cat-hank-mills/>

There seems to be little doubt that the E-CAT fuel is dry powder mixture of nickel, aluminum-lithium-hydride plus some additives. The nickel powder probably commercially have an average particle size of a few to several microns (maybe 2 to 20 has been estimated) and represents about 90% of the fuel's weight. It is not known if the particles have been treated to change the surface structure.



## As the Fuel Heats Up

$\text{Li Al H}_4$  begins to melt at 150 °C .

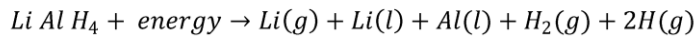


At 400°C the material becomes a lithium aluminium alloy plus gaseous hydrogen.



At 1347°C the lithium boils out of the alloy.

At the operating temperature of the reactor, if above 1350°C, the following is the overall reaction



[http://en.m.wikipedia.org/wiki/Lithium\\_aluminium\\_hydride](http://en.m.wikipedia.org/wiki/Lithium_aluminium_hydride)

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When the power is turned on in the reactor the fuel begins to heat. At about 150 C the  $\text{LiAlH}_4$  begins to melt and the releasing hydrogen. The release and expansion of this gas raises the internal pressure of the reactor to 500 Psi in the case of the Parkhomov device. By 400 C, the hydrogen has totally been released leaving a Lithium Aluminum alloy. At about 1350C, the Lithium boils out of the alloy leaving aluminum liquid and a lithium gas in a hydrogen atmosphere. The presents of atomic hydrogen is present but only in small quantities for this temperature, as will be shown later. (less than 1%) The nickel is still solid.

## Summary of Experimental Findings

Element	Abundance in Fuel	Abundance in Ash
Li	1.17	0.03
Ni	55.0-55.4	95.5-95.6
Al	4.36-4.39	0-0.5
C, Ca, Cl, Fe <sup>(1)</sup> ,Mg,Mn	39.04-39.47	4.32-4.47

\*Iron oxide may be indicated  
Copper may be indicated

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Giuseppe Levi, et. al., Observation of abundant heat production from a reactor device and of isotopic changes in the fuel,  
[http://www.elforsk.se/Global/Omv%C3%A4rld\\_system/filer/LuganoReportSubmit.pdf](http://www.elforsk.se/Global/Omv%C3%A4rld_system/filer/LuganoReportSubmit.pdf)

In a material analysis performed on the E-CAT fuel and ash mixtures it was found that the fuel contains relatively small amounts of Carbon, calcium, chlorine, iron, magnesium, and manganese. A strong peak at the oxygen frequency in the spectroscopic analysis suggests that perhaps some if not all of the iron may have been present as iron oxide.

## Fuel Isotope Analysis

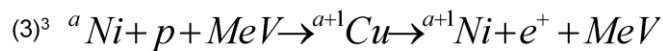
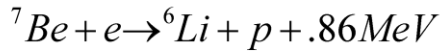
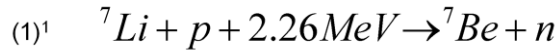
Ion	Fuel (SEM/EDS)	Fuel (ICP-MS)	% Ash	Ash (ICP-MS)
${}^6\text{Li}^+$	8.6	5.9	92.1	57.5
${}^7\text{Li}^+$	91.4	94.1	7.9	42.5
${}^{58}\text{Ni}^+$	67	65.9	0.8	0.3
${}^{60}\text{Ni}^+$	26.3	27.6	0.5	0.3
${}^{61}\text{Ni}^+$	1.9	1.3	0	0
${}^{62}\text{Ni}^+$	3.9	4.2	98.7	99.3
${}^{64}\text{Ni}^+$	1	-	0	-

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Giuseppe Levi, et. al., Observation of abundant heat production from a reactor device and of isotopic changes in the fuel, [http://www.elforsk.se/Global/Omv%C3%A4rld\\_system/filer/LuganoReportSubmit.pdf](http://www.elforsk.se/Global/Omv%C3%A4rld_system/filer/LuganoReportSubmit.pdf)

An isotope analysis of the fuel shows that both the nickel and lithium are present with isotope ratios that are representative of naturally occurring materials. This means that these materials have not undergone any form of nuclear pre-treatment. The rather large amounts of  ${}^7\text{Li}$  present in the fuel has been replaced by  ${}^6\text{Li}$  in the ash. Similarly, the large amounts of  ${}^{58}\text{Ni}$  and  ${}^{60}\text{Ni}$  in the fuel have been largely replaced by  ${}^{62}\text{Ni}$ . This indicates very strongly that some form of nuclear reaction has taken place. No one as far as I know has looked at the residue on the reactor vessel walls after the reaction.

## What May Be Happening



<sup>1</sup>C.L. Lee, X.-L. Zhou, Thick target neutron yields for the  ${}^7\text{Li}(p,n){}^7\text{Be}$  reaction near Threshold, Nuclear Instruments and Methods in Physics Research B 152 (1999) 1-11

<sup>2</sup>Thermal and Resonance Neutron Capture in Copper, Nickel, and Manganese, A. Wasson and J. E. Draper, Phys. Rev. 137, B1175 – Published 8 March 1965

<sup>3</sup>On the Nuclear Mechanisms Underlying the Heat Production by the E-Cat, Authors: Norman D. Cook, Andrea Rossi, <http://arxiv.org/abs/1504.01261>

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The philosophy of the AIAS is to use Occam's razor – in that the simplest solution is the most likely solution. In this case, looking at the fuel and ash products it would appear that both the nickel and lithium undergo a simple transformation reaction at the nuclear level.

It would seem that the lithium undergoes the transmutation given by the first reaction on this slide. This is a standard nuclear reaction for producing a thermal neutron flux, that has been studied since the 1960's. It does take very energetic protons for the reaction to occur. The ones available in the E-CAT reaction change are low on energy by a factor of about one million.

The beryllium isotope has a half life of 53 days so would not be around forever. Its presence in the data was not indicated, but it is not known if it was looked for. This isotope decays to  ${}^6\text{Li}$  with the release of a fairly energetic proton.

In the case nickel, a transmutation from the lower atomic weight isotopes to higher atomic weight isotopes may occur through a transmutation to copper. The copper isotopes involved all have short half lives, so one would not expect much copper in the ash after the reaction. This is reaction (3) on the slide, and has been suggested by Rossi as a possible reaction. An energetic proton is required to cause this reaction to proceed. This reaction requires energetic protons to process, but is energy positive and could account for the output of the E-CAT cell.

The second reaction is suggested also as a means of transmutation of nickel isotopes. This transmutation using thermal neutrons has been studied in the literature for several years. A source of thermal neutrons is available for this reaction to proceed from reaction (1).

# Hydrogen Ion Concentrations

## Temperature Dependence of Hydrogen Species Concentration

Concentration*	1400°C	3000°C	4500°C	6000°C
H <sub>2</sub>	99	99	85	42
H	10 <sup>-4</sup>	0.9	15	58
H <sup>+</sup>	0	10 <sup>-11</sup>	10 <sup>-7</sup>	10 <sup>-5</sup>

\*calculated using Saha equation

### Conclusion

Most likely proton source would be molecular hydrogen

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"An Analysis of Low Energy Nuclear Reactions in the E-Cat Device", Douglas W. Lindstrom, Horst Eckardt, Steven Bannister, to be published

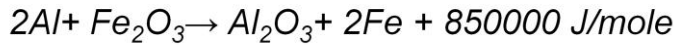
The concentrations of hydrogen in its various forms, diatomic and monatomic gas, and hydrogen nuclei (protons) are shown in this slide for a range of temperatures starting near the operating temperature for the reactor. These have been calculated, and substantiated in the literature, using the Saha equation and can only be considered approximate.

At the operating temperature of the reactor, the hydrogen is virtually all diatomic gas. It is not until the temperature reaches about 4500C does the monatomic form of hydrogen start to appear in reasonable amounts.

Hydrogen ions do not appear in any appreciable amounts up to 6000C. The material is not a plasma, it is a hot mixture of gaseous hydrogen, liquid and gaseous lithium, liquid aluminum, and solid nickel.

## Summary of Experimental Findings

### Thermite Reaction (Reason for Iron?)



- Self-starting above 600 °C
- May get reactor hot spots to 3000 °C



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Source: [www.wikipedia.org](http://www.wikipedia.org)

If the iron present in the fuel is in an oxide form, then it is very likely that hot spots in the reactor will develop through the well known thermite reaction of aluminum and iron oxide. This reaction is self starting when the temperature reaches 600C, and produces a significant amount of heat. Large volumes of the reactant seldom achieve more than 3000C, but in small concentrated areas, higher temperatures are possible. This could happen in the reactor in localized regions without detriment to the reactor tube.

The ceramic tube starts to loose its strength at 1400C so it is vital to keep such a reaction, if presnet, to very small locations.

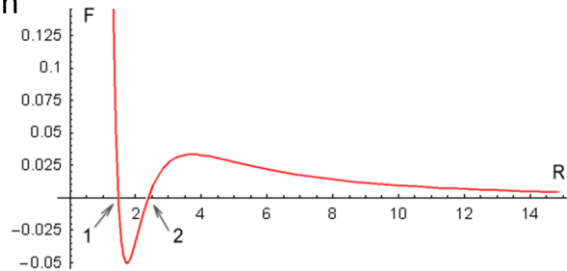
The temperature rise would raise the monatomic hydrogen content, but would not significantly contribute any hydrogen ions to the mixture. It certainly would not generate any one or two MeV proton required for the reactions sited earlier.

I haven't done the calculations, but it is doubtful that this reaction would account for the COP difference between the Rossi and the Parkhomov reactions.

## Standard Model Explanation

Problem is that electrostatic repulsion forces as two nuclei approach are very large until strong force kicks in

- Li + proton
- Ni + proton



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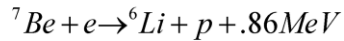
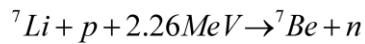
At this point, from a standard physics standpoint, there seems to be no starting point for the reactions. The problem is that as a proton approaches the nucleus of another atom, a strong electrostatic repulsion occurs. Unless the proton has sufficient energy, it can't get close enough for the short range nuclear forces to kick in and allow the proton to penetrate into the nucleus. This is shown somewhat schematically in the graph.

The peak energy needed for Nickel is about 8 MeV, and about 2 MeV for Lithium. Available proton energies are much too small for this to occur.

At this point, standard physics is stumped.

## LENR and ECE - an example

- Consider following tentative LENR reaction



- ECE can explain this on several levels
  - Non-relativistic quantum tunneling of proton dragging a quantized electromagnetic potential into the nucleus with it.
  - Relativistic quantum tunneling with electromagnetic potential again dragging a quantized electromagnetic potential into the nucleus
  - ECE impact theory incorporating change of mass, electromagnetic effects, space time curvature
  - Enhanced proton potential using vacuum state resonance( eg. modified Storms model)

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The ECE theory can explain the LENR reactions on several levels of complexity. We have looked at

Non-relativistic quantum tunneling of proton dragging a quantized electromagnetic potential into the nucleus with it.

Relativistic quantum tunneling with electromagnetic potential again dragging a quantized electromagnetic potential into the nucleus

ECE impact theory incorporating change of mass, electromagnetic effects, space time curvature

Enhanced proton potential using vacuum state resonance.

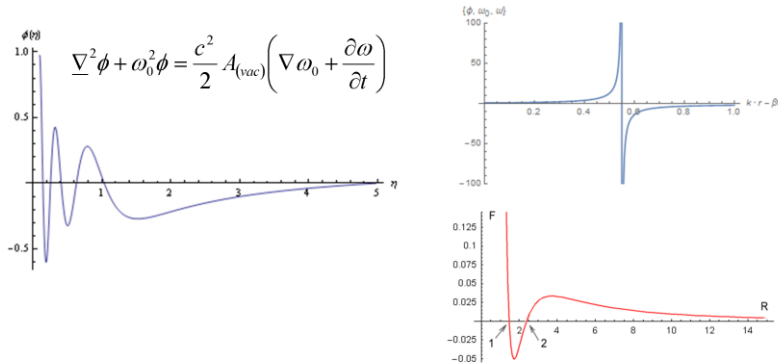
I am going to talk about the last one for a few minutes. Not only does it seem the most plausible to me, but it fits well with the other technologies I want to consider after finishing with LENR.



# Does ECE Resonance Explain LENR?

## ECE explains LENR using a Coulomb resonance

- "Principles of ECE", Evans, Eckardt, Lindstrom, Crouters, soon to be published

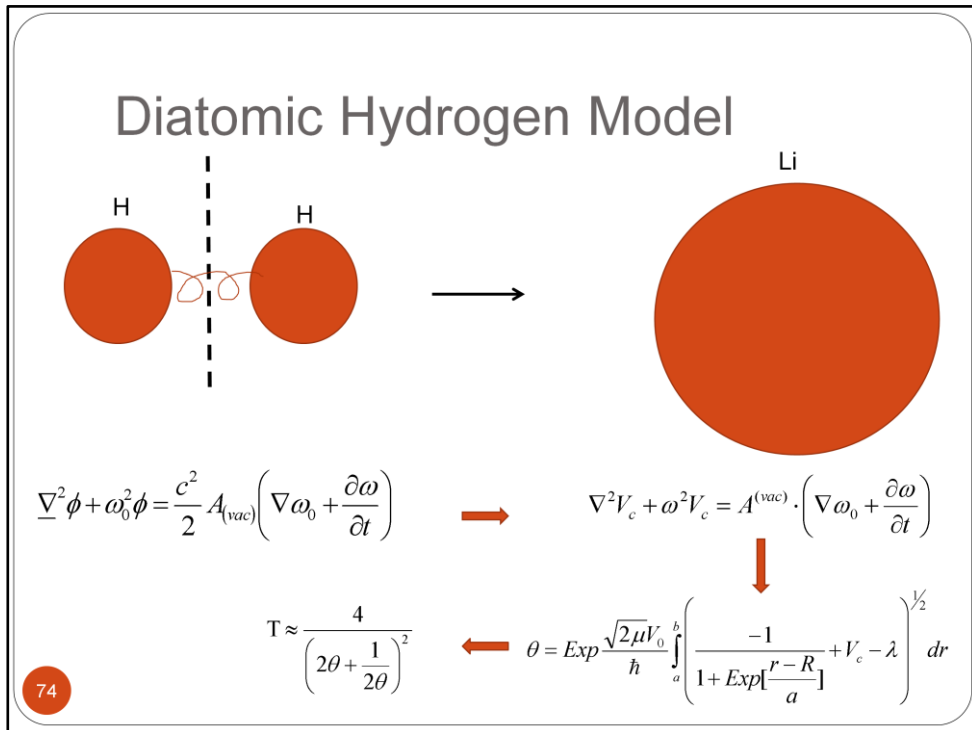


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Resonance of the impacting proton with the vacuum state provides a plausible mechanism by which the proposed reaction could occur. Recall that the ECE vacuum state is a gravitational field enhanced by electromagnetic potential. Potential fluctuations due to Coulomb resonance would appear as indicated in this graph. This would make the "effective" energy driving the impacting proton greater than that predicted by classical means. It is seen that under some circumstances, the force between the nucleons could be attractive for brief periods of time.

The first thing that I want to point out is the spike like character of the vacuum scalar potential and spin connects terms that we saw earlier. This we noted was necessary for any exchange to happen between the working field and the vacuum field.

We also note that because of influence of the vacuum, the Coulomb force between the proton and the target nucleus can become attractive for brief periods of time. This offers the possibility of breaching the Coulomb barrier with a particle of low energy, enabling nuclear fusion of the proton and the target nucleus. The only problem is that there is not much in the way of atomic hydrogen or isolated protons available for this to occur.



The lack of atomic hydrogen in the reactor suggests that we need to look for other means for getting the LENR reaction to proceed. Given diatomic hydrogen, it seems reasonable to look at resonances between the two hydrogen nuclei as a means of getting some of the needed energy for the reaction. A coulomb resonance driven by the vacuum could be occurring between the protons in the hydrogen molecule.

The pair of oscillating protons is directed at the Lithium nucleus setting up a Coulomb resonance between this pair and the lithium nucleus. This is solved subject to the vacuum conditions for the vector potential and spin connections to give the transmission coefficient for the reaction.

What could be expected is that some where near the peak of the Coulomb barrier, the H<sub>2</sub> would split into two hydrogen nuclei, with one going off to do other things, and one fusing with the target nucleus.

# What's Needed For ECE-LENR

Need for more powerful finite element software and hardware

- Comsol, FlexPde, Mathematica

$$\nabla^2 \phi + \omega_0^2 \phi = \frac{c^2}{2} A_{(vac)} \left( \nabla \omega_0 + \frac{\partial \omega}{\partial t} \right) \quad \longrightarrow \quad \nabla^2 V_c + \omega^2 V_c = A^{(vac)} \cdot \left( \nabla \omega_0 + \frac{\partial \omega}{\partial t} \right)$$

↓

$$\Gamma \approx \frac{4}{\left( 2\theta + \frac{1}{2\theta} \right)^2} \quad \longleftarrow \quad \theta = \text{Exp} \frac{\sqrt{2\mu} V_0}{\hbar} \int_a^b \left( \frac{-1}{1 + \text{Exp} \left[ \frac{r-R}{a} \right]} + V_c - \lambda \right)^{\frac{1}{2}} dr$$

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Faster computers and more powerful finite element software. The work currently being done is with limited software packages. These would be to be expanded to full commercial versions . Software packages such as Comsol and FlexPde will solve the equation set shown in this slide using FEA techniques. Mathematica can be used for example, to analyse the individual terms in the equations to see their relative significance. Should desktop computers not provide sufficient computing power, computing time on larger machines will have to be purchased.

We are beginning now to look at funding sources so that this can proceed.

## Topics Covered

Brief history of physics and a look forward

Explanation of ECE theory

Applications of ECE theory

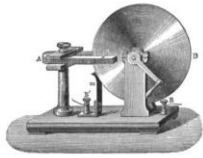


- LENR-ECAT
- Homopolar generator
- Osamu Ide experiment
- ET3M - Mexico

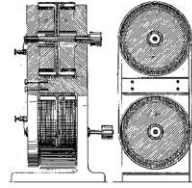
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As a second example of the use of ECE theory, I'd like to show its application to solve the problem of the homopolar generator- a device that the standard model struggles with.

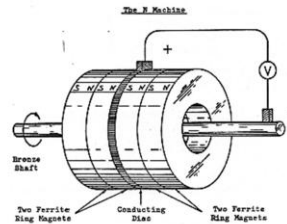
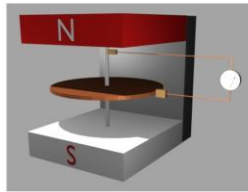
# Homopolar (Faraday Disk)Generator



Faraday Disk Generator



Tesla's Homopolar Generator



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Source: [www.wikipedia.org](http://www.wikipedia.org)

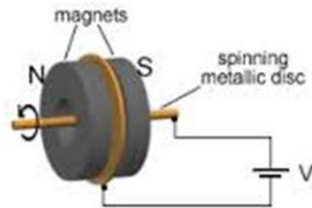
Michael Faraday is the first scientist to report working with the homopolar generator which is basically a rotating conductive plate in a magnetic field which itself may or may not be rotating. When the magnets are fixed, the device is called the Faraday disk generator. Tesla did work on this device and more recently the DePalma N machine has been studied extensively.

The interesting aspect of the machine is that it generates a potential when the magnet rotates with the conductive disk. Conventional models claim that the rotating magnet does not set up a rotating magnetic field, and that the cutting of field lines as proposed by Faraday is old fashioned.

## Homopolar Generator-Modern Experiments

Sir Mark Oliphant

- Australian National University (1951-1964)
- Unsubstantiated accounts of rotor explosions



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[https://en.wikipedia.org/wiki/Mark\\_Oliphant](https://en.wikipedia.org/wiki/Mark_Oliphant)

Perhaps the largest studies, if not the largest generators, were made by Sir Mark Oliphant in Australia, who used them to accelerate particles, much like a mini-CERN for particle physics purposes. It stored up to 500 megajoules of energy and was used as an extremely high-current source for synchrotron experimentation from 1962 until it was disassembled in 1986. Oliphant's construction was capable of supplying currents of up to 2 mega-amps (MA).

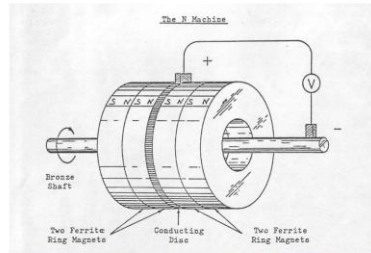
Similar devices of even larger size are designed and built by Parker Kinetic Designs (formerly OIME Research & Development) of Austin. They have produced devices for a variety of roles, from powering railguns and linear motors for space launches. Industrial designs of 10 MJ were introduced for a variety of roles, including electrical welding.

## Homopolar Generator-N machine

De Palma is a name associated with the N machine.

Sunburst was perhaps the largest N machine built and analyzed by independent professional staff

Replication has been underway in several locations for several years now. According to Puthoff, results are still inconclusive.



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N-Machine and Bruce DePalma,  
<http://brucedepalma.com/n-machine>

Sunburst, was built in 1978 in Santa Barbara California. And independently tested by Dr. Robert Kincheloe, professor emeritus of electrical engineering at Stanford University. In his 1986 report (presented to the Society for Scientific Exploration, San Francisco, 6/21/86), Kincheloe noted could produce electricity at around 500 percent efficiency.

“The jury is still out on the DePalma N-Machine,” says physicist Harold Puthoff, a senior fellow at the Institute for Advanced Studies in Austin, Texas. “It isn’t clear where the reported excess energy is coming from – whether out of the electromagnetic field or as the result of some anomaly associated with rotating bodies in terms of inertia.

Traditional physics explains away the machine by saying there are no such things as magnetic or electric field lines so that a rotating magnet in this situation does not have a rotating field.

## Homopolar Generator-ECE Explanation

$$\frac{\partial^2 A}{\partial t^2} + i\Omega \frac{\partial A}{\partial t} + i \frac{\partial \Omega}{\partial t} A = \frac{J}{\epsilon_0}$$

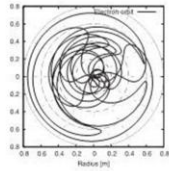


Fig. 14.12. Electron orbit for all force components.

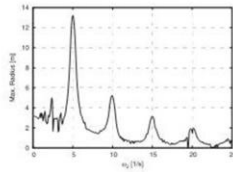


Fig. 14.13. Resonance curve of max. radius for variable current frequency  $\omega_J$ .

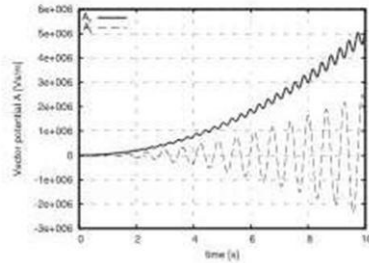


Fig. 14.1. Vector potential for  $\alpha_0 = 5$ ,  $\omega_0 = 10$ ,  $\omega_J = 0$ .

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Myron W. Evans, F. Amador and Horst Eckardt, Spin Connection Resonance in the Faraday Disk Generator, <http://www.aias.us/documents/ufi/paper107.pdf>

The ECE model of the homopolar generator confirmed a resonant instability. Vacuum field feed back was not needed to get an instability however. Coupling of the mechanical rotation to the torsion field itself accomplished.

A resonant model was created that did not require the vacuum state explicitly. It is seen that resonance can only occur when the generator is accelerating or decelerating. During this period, electron motion in the conductive plate can take on unusual patterns. These disjointed spike-like patterns are indicative of the hidden vacuum that we saw earlier as is resonance.



## Achieving the vacuum resonance

For non-Maxwellian state to exist, we need:

- multivalued potentials – pulses, spikes
- boundaries that move in response to the electromagnetic fields
- inductances, capacitances, etc. that depend on electromagnetic field values (parametric)
- Positively (or negatively) biased potentials

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At this point, it is not clear if the homopolar generator exhibits vacuum effects. In fact in numerous examples we seem to find that for large vacuum effects (non-quantum) the following is needed

- multivalued potentials – pulses, spikes
- boundaries that move in response to the electromagnetic fields
- inductances, capacitances, etc. that depend on electromagnetic field values (parametric)

Otherwise, system collapses to Maxwellian with no vacuum state.

However, a system of non-linear differential equations where the non-linearities are hidden can generate unusual phenomenon, that one wouldn't normally expect, such as the unusual electron motions seen in the previous slide.

# Topics Covered

Brief history of physics and a look forward

Explanation of ECE theory

Applications of ECE theory

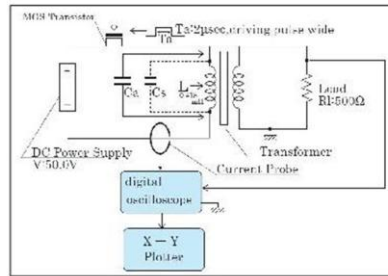
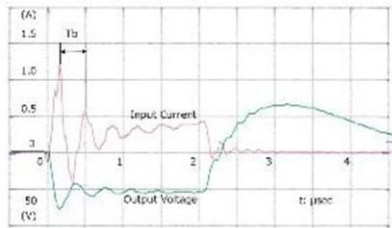
- LENR-ECAT
- Homopolar generator
- Osamu Ide experiment
- ET3M - Mexico



# Osamu Ide Experiment

## Osamu experiment

- Ferrite core inverter
  - anomalies
    - Negative blip at  $t=0$
    - Positive dc output component



Osamu Ide, Canadian Patent Application, CP2793435

Osamu Ide et. al., Consideration of the cause of inverter called ringing, to be published

Osamu Ide et. al., Anomalous rising of input current in the transformer of inverter, to be published

Osamu Ide, Characteristics of DC power output from an inverter driven by sharp spike pulse, to be published

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Earlier this year, the AIAS was approached by a Japanese researcher Osamu Ide seeking the explanation for a device that he had invented that exhibited non-traditional effects. He pulsed a dc power supply in an inverter circuit and saw:

- The first was a small blip at switching that he didn't think was a traditional switch effect
- The second was a dc bias that appeared in the circuit.
- A linear current rise
- Exponential growth term in current

The resonant frequency of the circuit also did not seem to depend on circuit capacitance.

His patent on the device contained many references to segments in the core which his papers reported to be a ferrite material.

This device is well suited for vacuum extraction of energy in ECE theory as indicated by the earlier requirements

- pulse behaviour
- moving boundaries
- inductance that depends on the magnetic field.



## Designing for Unusual Inductive Behaviour<sup>1</sup>

In general a series resonant circuit obeys

$$\frac{d}{dt}(LI) + RI + \int \frac{I}{C} dt = U_0$$

This can be rewritten

$$L \frac{d^2 Q}{dt^2} + \left( \frac{dL}{dt} + R \right) \frac{dQ}{dt} + \frac{Q}{C} = U_0$$

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<sup>1</sup>Horst Eckardt, Douglas Lindstrom, Circuit theory for unusual inductor behaviour, to be published.

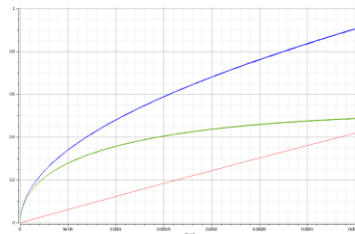
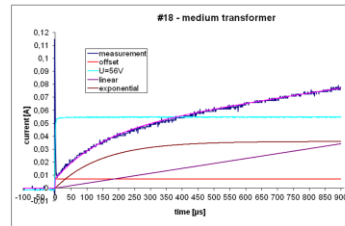
Eckhard has gone on with the help of myself to develop a simpler approach for designing circuits that are possibly over unity. We can then play around with these relatively simple non-linear macro equations until we find a reasonable resonance. We would do this for example by choosing judicious values for the inductance, capacitance, and resistance, in this series resonant circuit for example.

The beauty of the method, is that the calculation of field dependent device properties is separated from the resonant calculation. Since we now have desired values for the component values, we can go back and design the individual elements themselves using ECE theory. This is much more efficient than designing the entire circuit in four dimensional geometry.

# Simulation Results

$$L(t) = L_0 \left( 1 - e^{-\frac{t}{\tau}} \sin(\omega t) \right)$$

- Seems to explain Ide and Arenhold data
- May be way to design parametric circuits
  - find device parameters needed using non-linear circuit
  - design device using ECE equations



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Using an assumed function for the time dependent inductance, Eckardt and myself solved the non-linear circuit equation. The comparison to experiment was great. This is where we are at the moment.

## Next Step

Determine if effects are ground state generated through energy calculations.

Laboratory equipment

- High resolution pulse sampling
- Accurate pulse generating equipment

Computer hardware and software for finite element modelling of components.

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The next step in this project is to determine if ground or vacuum effects are present. Higher resolution pulse equipment is needed for this, as is a detailed finite element solution for the ECE equations in the transformer core.

# Topics Covered

Brief history of physics and a look forward

Explanation of ECE theory

Applications of ECE theory

- LENR-ECAT
- Homopolar generator
- Osamu Ide experiment
- ET3M - Mexico





## Mexico – ET3M

- Who are they
- Affiliation with AIAS
- Video
  - <http://www.et3m.net/Updates.html>

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I want to finish up discussing briefly some devices for power savings developed by a Mexican company.

ET3M is a Mexican company involved in the development of energy devices amongst other things. They have been actively following the endeavours of AIAS almost since AIAS began and participated in AIAS activities wherever possible. Early publishing the UFT papers was financed by ET3M and it still does the translating of papers into Spanish.

“One of our initial developments, was a simple electrical device that would cut the usage of electricity in half, without a loss of performance. This device was studied some years ago by John Shelburne (US Navy) who verified at his lab that these devices extracted energy from "somewhere". He asked Myron to develop some theoretical basis for this phenomenon. Myron did so but stated that the energy produced, according to his equations was not zero, but still very small to be of practical use.

ET3M suggested Myron to consider resonance in his equations, since ET3M made use of it in their circuits. This is how spin connection resonance was discovered as one of the central concepts behind ECE theory and as the fundamental mechanism behind energy extraction form spacetime.” (from correspondence with ET3M)

I have witnessed their devices and everything seems above board- They cut the power bill for large motors and lighting in half. They also demonstrate asn unusual applicationb of the technology, low friction wheel bearings. I’d suggest you watch this video.

## Conclusions

Justified why new physics paradigm is needed

Explained ECE theory in as non-mathematical way  
that I know how to

Demonstrated application of ECE theory to four  
“over unity” devices that are not explainable using  
the standard model of physics.

# Questions?

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**www.AIAS.US**