TESLA'S WIRELESS POWER TRANSMISSION
MARCH 24, 2011 © 2010 Steve Jackson
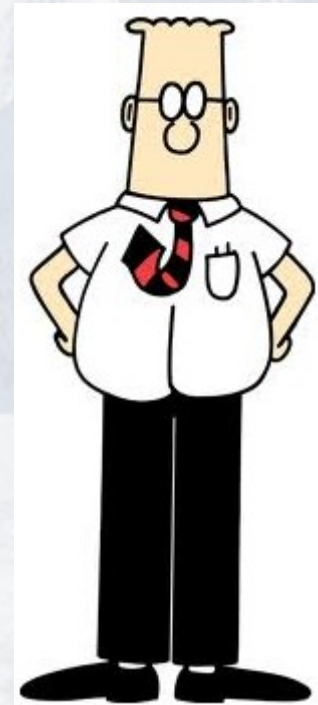
"The present is theirs.

The future, for which I really worked, is mine."

Nikola Tesla

Define "Engineer"

1. The *Ingenious* ones

2. Applied Scientist - B.A. Sc.

3. The <u>Responsible Party</u>, when things go wrong. Professional Engineers Ontario is NOT a Union!

4. The Left-Brained ones

Applied Scientists

We <u>apply</u> the Science that we are given.

Tonight we will discuss some startling New Science, which was given by Nikola Tesla, but subsequently lost.

Our subject is U.S. Patent 645,576

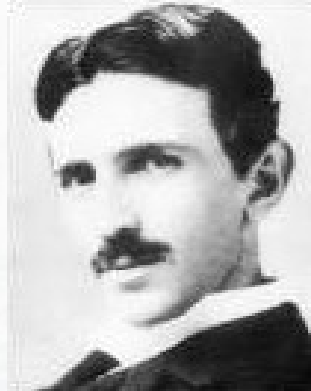**SYSTEM OF TRANSMISSION OF ELECTRICAL ENERGY**

THE PLAYERS

Maxwell

J.D. Jackson

Meyl

Tesla

.

Us

Nikola TESLA

NIKOLA **TESLA**

1856 - 1943

Born in Smiljan, Croatia.

Emigrated to New York 1884 aged 28

EDUCATION

Tesla completed his elementary education in Croatia.

1875: Tesla enrolled at the **Austrian Polytechnic School** in Graz, Austria on a Military Border scholarship. In his first year, Tesla never missed a lecture, made the highest grades possible.
During his second year, Tesla came into conflict with Professor Poeschl over the Gramme dynamo when he suggested that commutators weren't necessary. At the end of the second year, Tesla lost his scholarship and took up gambling.
Near the end of the third year, Tesla stopped attending lectures and Dropped out the following year.

http://www.teslauniverse.com/nikola-tesla-timeline

Self Taught

1880 (Age 24): Tesla's uncles came to his rescue and put together enough money to help him escape from Gospić. Tesla travelled to **Prague**, but arrived too late to enroll in Karl-Ferdinand University. Even if Tesla had arrived early enough, he would have not been permitted to enroll as he had no Greek and did not speak or write Czech.
Tesla spent most of his time at the Klementinum Library and Narodni Kavarna (People's Cafe).
Tesla did attend lectures at the University as an auditor, but did not receive marks for the courses.

AIEE LECTURE - MAY 20,1891

**EXPERIMENTS WITH ALTERNATE CURRENTS OF VERY
HIGH FREQUENCY AND THEIR APPLICATION TO METHODS
OF ARTIFICIAL ILLUMINATION**

There is no subject more captivating, more worthy of study, than nature. To understand this great mechanism, to discover the forces which are active, and the laws which govern them, is the highest aim of the intellect of man.

Nature has stored up in the universe infinite energy. The eternal recipient and transmitter of this infinite energy is *the ether*. The recognition of the existence of ether, and of the functions it performs, is one of the most important results of modern scientific research. Phenomena upon which we used to look as wonders baffling explanation, we now see in a different light. The spark of an induction coil, the glow of an incandescent lamp, the manifestations of the mechanical forces of currents and magnets are no longer beyond our grasp ... we can in a certain measure explain them, account for them, and we are hopeful of finally succeeding in unraveling the mystery which surrounds them.

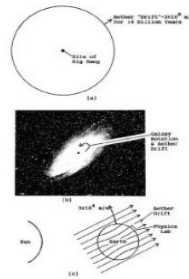http://www.tfcbooks.com/tesla/1891-05-20.htm

Aether

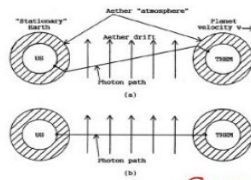**Return of the Ether** — When Theory and Reality Collide — SID DEUTSCH

Einstein's Greatest Mistake — The Abandonment of the Aether — SID DEUTSCH

Sid Deutsch Ph.D.

Get your Physics from an Engineer!

WORLD'S COLUMBIAN EXPOSITION 1893

Above: The Tesla/Westinghouse display at Electricity Hall.
Tesla Polyphase Alternating Current Sign on Display, Westinghouse Exhibition.

Tesla & Westinghouse triumph over Edison

Honorary Doctorates

Nikola Tesla received the "Doctorem in Legibus" honor from Columbia University in 1894 (Age 38). Honorary doctorates were subsequently conferred upon Tesla by more than a dozen other universities in Europe and in the US. [Columbia, Yale, Paris, Vienna, Sofia, Poitiers, Graz, Beograd, Brno, Bucharest, Grenoble, Zagreb, Prague, etc.]

http://www.teslasociety.com/columbia.pdf

Niagara Falls Hydro 1895

"We have many a monument of past ages; we have the palaces and pyramids, the temples of the Greek and the cathedrals of Christendom. In them is exemplified the power of men, the greatness of nations, the love of art and religious devotion.
But the monument at Niagara has something of its own, more in accord with our present thoughts and tendencies. It is a monument worthy of our scientific age, a true monument of enlightenment and of peace.
It signifies the subjugation of natural forces to the service of man, the discontinuance of barbarous methods, the relieving of millions from want and suffering"
 - Nikola Tesla's speech at the opening ceremony of the hydroelectric power station, January 12, 1897.

Niagara Falls

Niagara Falls power Co. 1895
The first major hydro-electric power plant in the world
Adams Station, power houses #1+ #2 and transformer building

Tesla & Westinghouse

TESLA - ENGINEER'S ENGINEER

"Before I put a sketch on paper, the whole idea is worked out mentally. In my mind I change the construction, make improvements, and even operate the device.
Without ever having drawn a sketch I can give the measurements of all parts to workmen, and when completed all these parts will fit, just as certainly as though I had made the actual drawings. **It is immaterial to me whether I run my machine in my mind or test it in my shop.**
The inventions I have conceived in this way have always worked. In thirty years there has not been a single exception. My first electric motor, the vacuum wireless light, my turbine engine and many other devices have all been developed in exactly this way."

http://www.lucidcafe.com/library/96jul/tesla.html

1895 Fire

MR. TESLA'S GREAT LOSS

All of the Electrician's Valuable Instruments Burned.

WORK OF HALF A LIFETIME GONE

Firemen Unable to Save His Laboratory in South Fifth Avenue—He Loses $50,000; Gillis & Geoghegan $80,000.

"I am in too much grief to talk. What can I say? The work of half my lifetime, very nearly; all my mechanical instruments and scientific apparatus, that it has taken years to perfect, swept away in a fire that lasted only an hour or two. How can I estimate the loss in mere dollars and cents? Everything is gone. I must begin over again."

That is all that Nikola Tesla, the renowned electrician, had to say about a fire that utterly wiped out his laboratory at 35
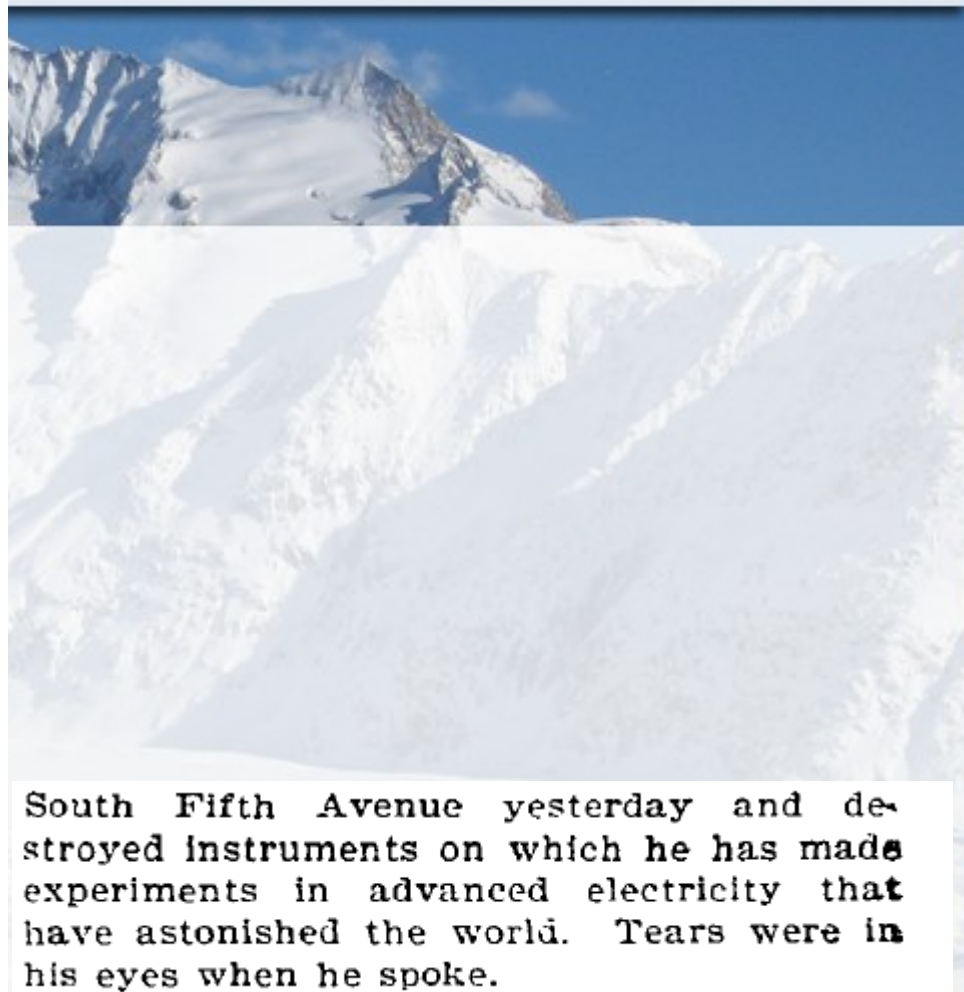
South Fifth Avenue yesterday and destroyed instruments on which he has made experiments in advanced electricity that have astonished the world. Tears were in his eyes when he spoke.

Tesla quoted Inductance in cm.
LENGTH² / LENGTH

$$L = \frac{r^2 N^2}{(20r + 28d)}$$

- L = inductance (µH)
- r = mean radius of coil (cm)
- N = number of turns
- d = depth of coil (outer radius minus inner radius) (cm)

Inductance of a Flat Spiral Coil
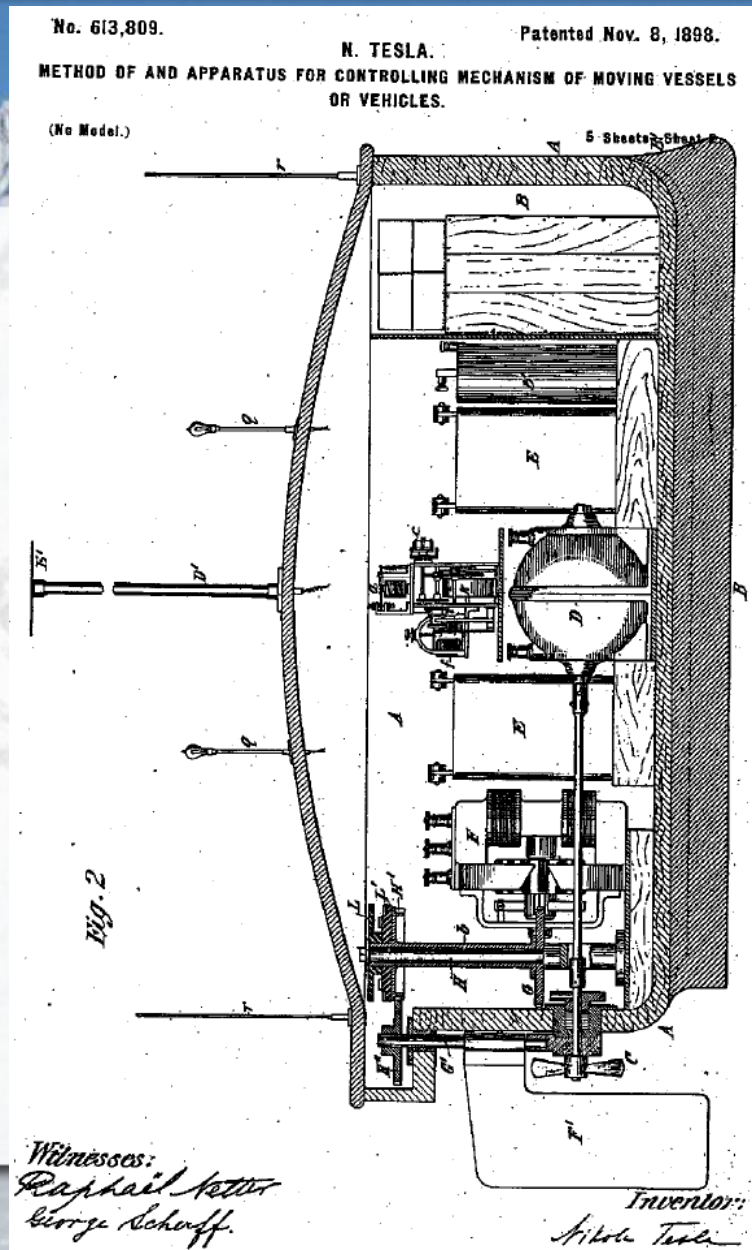http://en.wikipedia.org/wiki/Inductor

INDUCTANCE = ML^2/Q^2 (Halliday & Resnick)

TESLA Remote Control 1897

In 1897, Tesla demonstrated a radio controlled boat to the US military, believing that the military would want things such as radio controlled torpedoes.
Tesla developed the "Art of Telautomatics", a form of robotics.

In 1898, a radio-controlled boat was demonstrated to the public during an electrical exhibition at Madison Square Garden.
These devices had an innovative coherer and a series of logic gates.
Radio remote control remained a novelty until the 1960s.

http://peswiki.com/index.php/PowerPedia:Nikola_Tesla#Robots_and_Telautomatics

Patent 613,809   1898

No. 613,809.

N. TESLA.

Patented Nov. 8, 1898.

METHOD OF AND APPARATUS FOR CONTROLLING MECHANISM OF MOVING VESSELS OR VEHICLES.

(No Model.)

5 Sheets—Sheet 2.

Fig.2

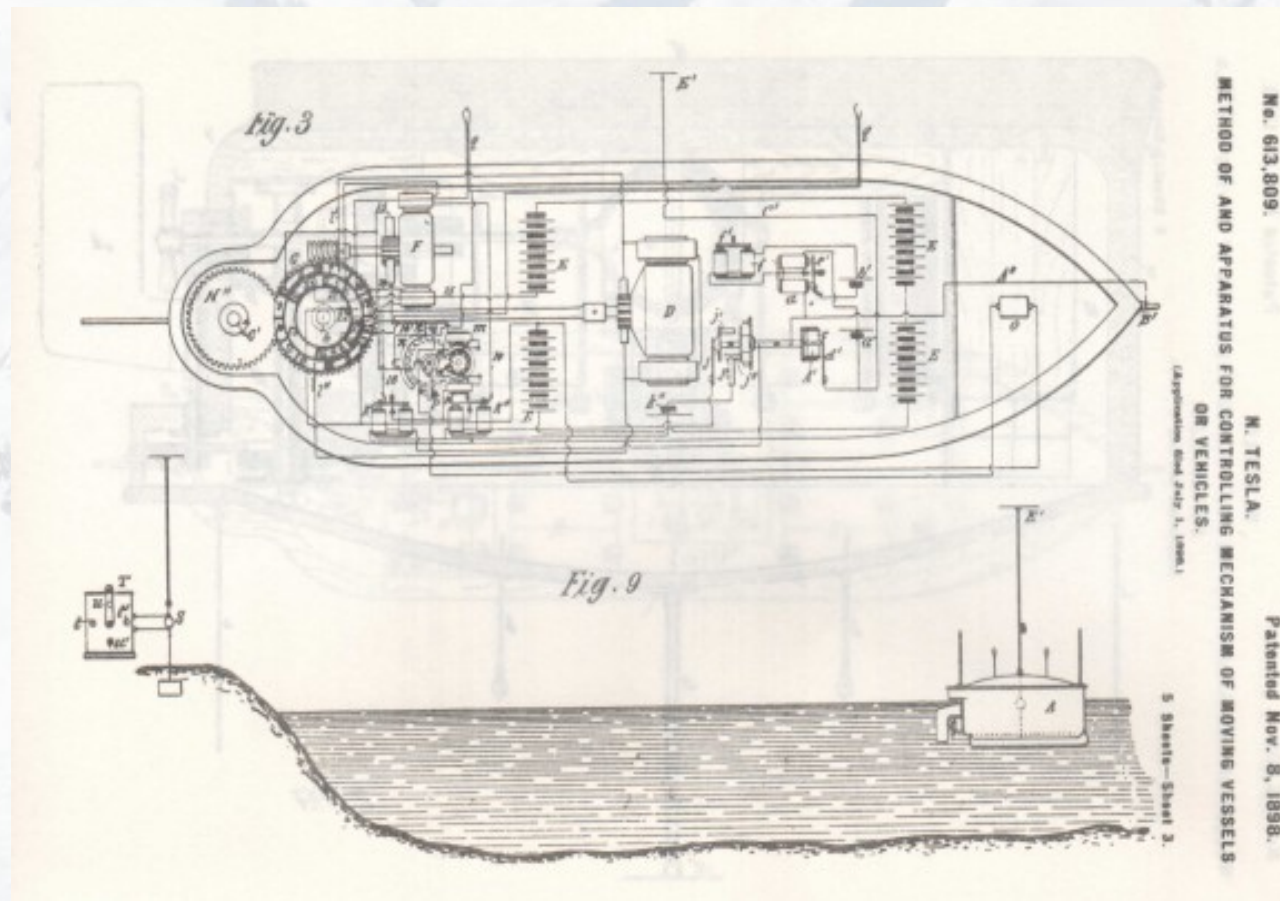Witnesses:
Raphael Netter
George Scherff.

Inventor:
Nikola Tesla

George Scherff

Tesla worked with brass, wood, glass, steel, carbon, tin, copper, cotton, etc.

613,809 Nov 8, 1898

Colorado Springs Notes

Colorado Springs Notes, 1899–1900

Nikola Tesla
Colorado Springs Notes
1899–1900

Here we can see Tesla's mind at work.
His "notes to self".

Magnifying Transmitter

Tesla's behemoth tower, to be used for trans-Atlantic wireless communications and the demonstration of wireless power transmission, was erected in 1901 at Wardenclyffe (now Shoreham) on Long Island. Built almost entirely of wood, with a 55-ton skeleton spheroid of steel at the top, it was designed so that every spar could be taken out at any time and replaced if necessary. Photo by Lillian McChesney, circa 1916.

What was Magnified?

1931 Pierce-Arrow Car

In 1931, a Pierce-Arrow was selected to be tested at the factory grounds in Buffalo, N.Y.
The standard internal combustion engine was removed and an 80-H.P., 1800 RPM
electric motor installed to the clutch and transmission. The A.C. motor measured
40 inches long and 30 inches in diameter and the power leads were left disconnected.

Nikola Tesla arrived from New York City and went to a local radio store and
purchased 12 vacuum tubes, wires and assorted resistors. A box measuring
24 x 12 x 6 inches was assembled housing the circuit.
The box was placed on the front seat and had its wires connected to the air-cooled,
brushless motor. Two rods 1/4" in diameter stuck out of the box about 3" in length.

Mr. Tesla got into the driver's seat, pushed the two rods in and stated, "We now have power".
He put the car into gear and it moved forward! This vehicle, powered by an A.C. motor, was
driven to speeds of 90 MPH. and performed better than any internal combustion engine of its day!
When asked where the power came from, Tesla replied, "**From the ethers all around us**".

http://keelynet.com/energy/teslafe1.htm

THE RADIO PATENTS

Tesla filed his basic radio patent applications in **1897**. They were granted in 1900.

Marconi's first patent application in America, filed on November 10, **1900**, was turned down. Marconi's revised applications over the next three years were repeatedly rejected because of the priority of Tesla and other inventors.

http://www.pbs.org/tesla/ll/ll_whoradio.htm

THE RADIO PATENTS - 2

The Patent Office commented in 1903:

"Many of the claims are not patentable over Tesla patent numbers **645,576** and **649,621**, of record, the amendment to overcome said references as well as Marconi's pretended ignorance of the nature of a "Tesla oscillator" being little short of absurd... the term "Tesla oscillator" has become a household word on both continents."

http://www.pbs.org/tesla/ll/ll_whoradio.htm

RADIO PATENTS

Both Edison and Andrew Carnegie invested in Marconi and Edison became a consulting engineer of American Marconi.

- Tesla: "Marconi is a good fellow. Let him continue. He is using seventeen of my patents."

- In 1904, the U.S. Patent Office suddenly and surprisingly reversed its previous decisions and *gave Marconi a patent* for the invention of radio.

http://www.pbs.org/tesla/ll/ll_whoradio.htm

PATENTS

WIRELESS TELEGRAPHY AND TELEPHONY SIMPLY EXPLAINED

A PRACTICAL TREATISE

Embracing Complete and Detailed Explanations of the Theory and Practice of Modern Radio Apparatus and its Present Day Applications, together with a chapter on the Possibilities of its Future Development

By ALFRED P. MORGAN

EDITOR MECHANICAL AND ELECTRICAL DEPARTMENT OF THE "BOY'S MAGAZINE," AUTHOR OF "WIRELESS TELEGRAPH CONSTRUCTION FOR AMATEURS," ETC.

VERY FULLY ILLUSTRATED

NEW YORK
THE NORMAN W. HENLEY PUBLISHING CO.
132 NASSAU STREET
1915

TO

NIKOLA TESLA

WHOSE GENIUS HAS HARNESSED ELECTRICITY TO THE DAILY WORK OF MAN AND WHOSE INVENTIONS ARE THE BASIS OF ALL MODERN WIRELESS TRANSMISSION, THIS BOOK IS DEDICATED.
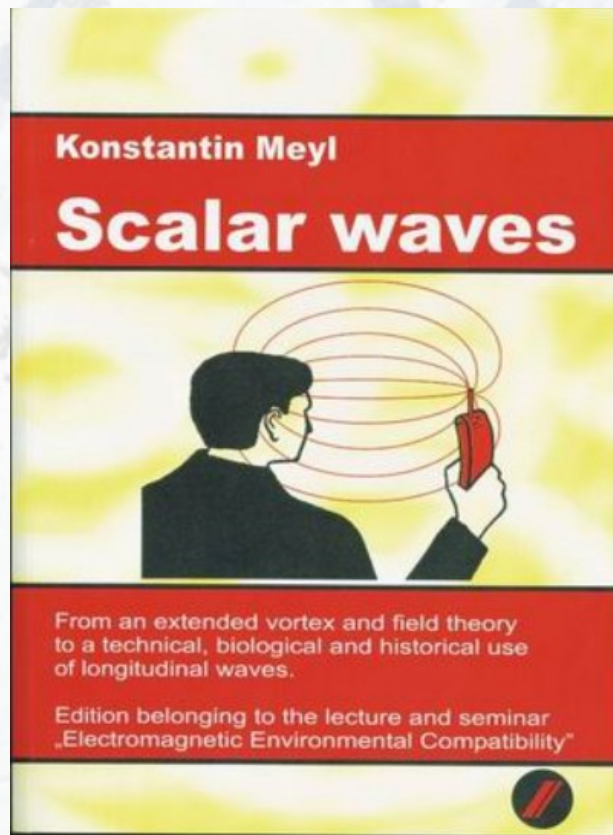
RADIO PATENTS

In 1943—a few months after Tesla's death— the U.S. Supreme Court upheld Tesla's radio patent number 645,576.

Why is Marconi's photo on the wall outside ITB-A113, and not Tesla's photo?

Prof. Dr.-Ing Konstantin **Meyl**
University of Applied Sciences in Furtwangen

Konstantin Meyl

Scalar waves

From an extended vortex and field theory
to a technical, biological and historical use
of longitudinal waves.

Edition belonging to the lecture and seminar
„Electromagnetic Environmental Compatibility"

*The Black Forest
Copernicus!*

http://www.meyl.de

Get your Physics
from an Engineer!

Tornado = Dual Vortices

Inner **Expanding** Vortex
+
Outer **Contracting** Vortex

MEYL - Black Forest Copernicus?

DER SPIEGEL 21/2001

ESOTERIK

Black Forest Copernicus

By Dworkin, Manfred

What causes cancer? Why do volcanoes erupt? How does the mind reading? A professor in Furtwangen will have solved the Riddle of the largest.

Amazing questions are opening up in the lecture by Professor Konstantin Meyl. For example: How do I read during the physics test, the thought of my neighbor clever bank? What is the key to all energy problems? Or: Why do people always just like that, without visible cause, in flames?

At the University of Applied Sciences Furtwangen in the Black Forest, the electrical engineer Meyl protrudes from under it all colleagues. The others have to offer only the structure of the moving coil or the secret effect of watt-hour meter. Meyl but has solved a number of world puzzle.

They are the neutrinos, says the professor, the drive across their secret nature. This almost inconceivable elementary maintain its doctrine, the whole of nature in motion. Who catches, has energy in abundance. Who restrains mentally read, fluent in foreign heads. Who but they innocently get in the way, can catch fire.

Particle physics on the other hand knows that neutrinos produce almost nothing. They rush to trillions by the world does not slow down even. They permeate all matter as if it were not present. The ghostly particles are not charged, and they have, if anything, only a vanishingly small mass. Therefore, it is hard enough to prove it.

This book now ▶▶ Read Issue

Discuss the current cover

story

DER SPIEGEL

DAS SCHWARZ-ROT-GOLDENE HIMMEL-BETT

Wie faul sind die Deutschen?

Eine neue RAF?

On the Existence of K. Meyl's Scalar Waves

GERHARD W. **BRUHN**
Darmstadt University of Technology, Department of Mathematics

Abstract—In the fall of 2000, several talks were delivered by K. Meyl. These talks described his theory of so-called Tesla's scalar waves (e.g., "Longitudinalwellen-Experiment…" (2000)]. In the following article, we shall mainly discuss the theoretical part of these publications, although the experimental part would deserve a detailed discussion in its own right

In addition, Meyl's proof for his claim will turn out to be a **simple flaw of thinking.**

Meyl reports on the 7.0-MHz waves he observed at the receiver during his experiments, while his (shielded) emitter worked at 4.7 MHz. He explains the appearance of the higher frequency at the receiver with a higher velocity of the signal; hence, he concludes, his signal is faster than light.

But an emitter frequency of 4.7 MHz means that the emitter sends 4.7 millions of waves per second; then by no means can 7.0 millions of waves per second can arrive at the receiver, independent of the signal velocity. **Where should the additional number of 2.3 millions of waves have come from?** The number of waves per second at the emitter and at the receiver must agree, whatever the signal velocity might be. Hence, Meyl's conclusion of a higher signal velocity is baseless and a flaw of thinking.

GERHARD W. BRUHN

http://www.scientificexploration.org/journal/jse_15_2_bruhn.pdf

Dr. DIETRICH KUHLKE sees problems

‘'Scalar Wave Effects according to Tesla''[3] and
‘'Far Range Transponder''[4] by K. Meyl
DIETRICH **KUHLKE**
Department of Computer and Electrical Engineering
Furtwangen University, Germany

Abstract—In the recent past a hypothetical waveform, longitudinal electric or magnetic waves, shortly denoted electric scalar waves or simply scalar waves, is discussed. To give a theoretical proof of the existence of such longitudinal electric waves K. Meyl starts with an approach that he calls a ‘'new and dual field approach''(3,4) and that should be more general than Maxwell's equations.

http://www.scientificexploration.org/journal/jse_22_2_kuhlke.pdf

Faraday or Maxwell

Faraday or Maxwell?
Do scalar waves exist or not?
Practical consequences of an extended field theory
by: Prof. Dr.-Ing. Konstantin Meyl

What is the Maxwell approximation?

• How could a new and extended approach look like?
• Faraday instead of Maxwell, which is the more general law of induction?
• Can the Maxwell equations be derived as a special case?
• Can also scalar waves be derived from the new approach?

http://www.k-meyl.de/go/Primaerliteratur/Faraday-or-Maxwell.pdf

What is involved?

Special passive Antenna that:

- Resonates with Receiver

- Transmits Power from Transmitter to Receiver

- No loss, no dispersion!
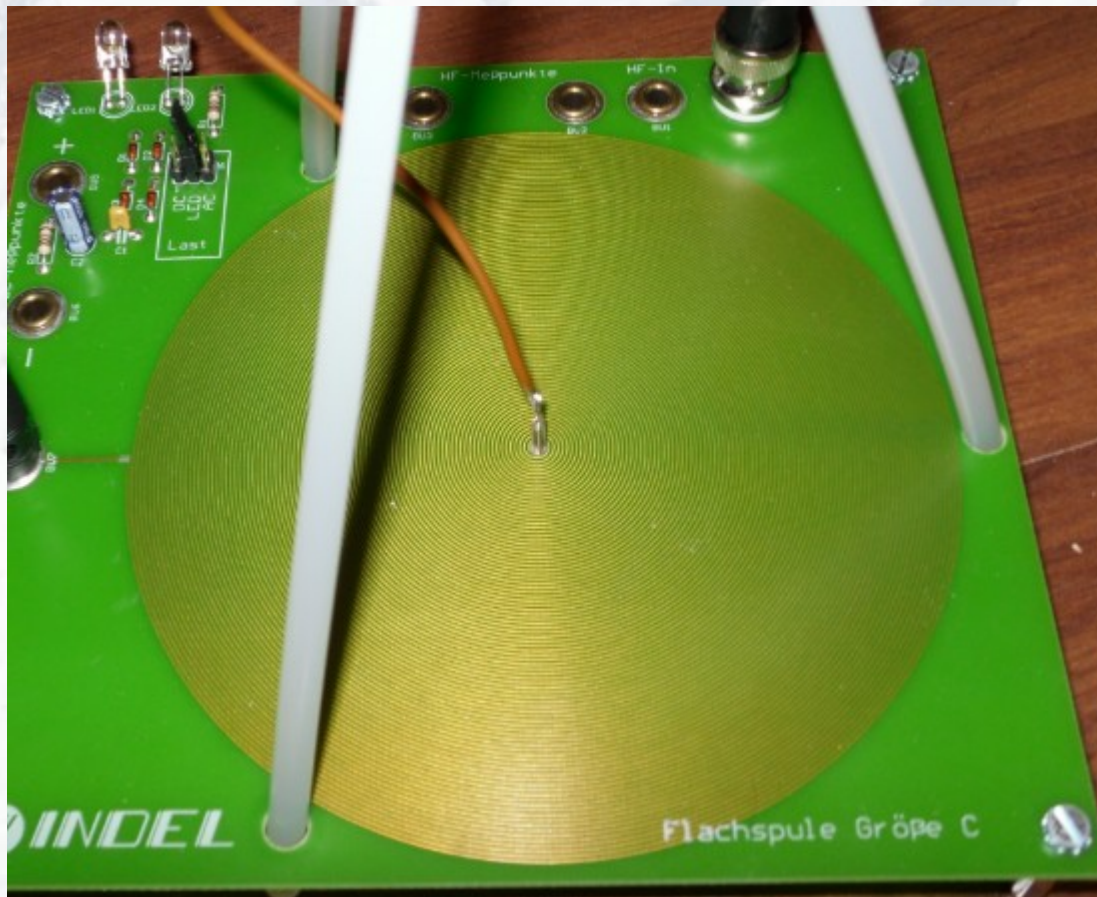
- Bidirectional - Transmitter can hear the receiver!

BUT - We have no Electrical Physics for this!

Spiral Primary
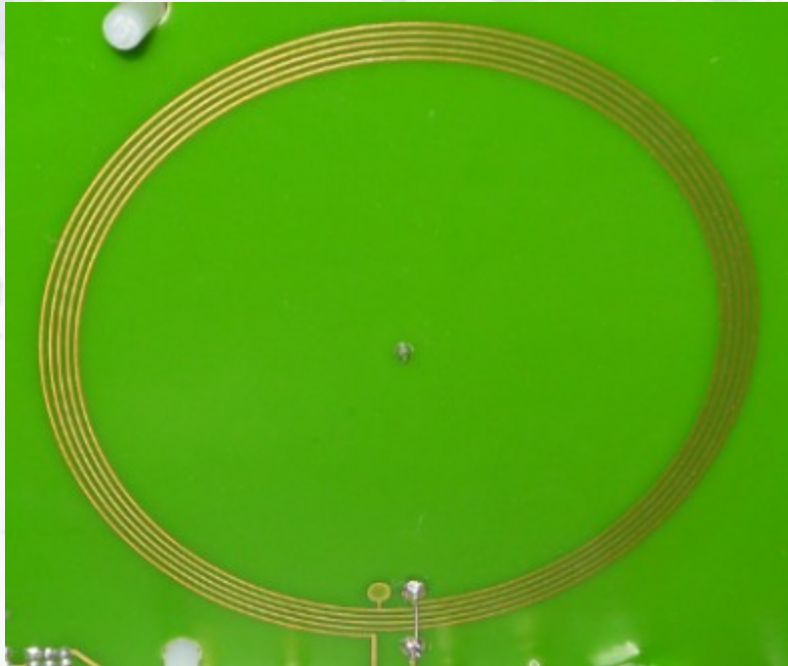
4 or 5 TURNS
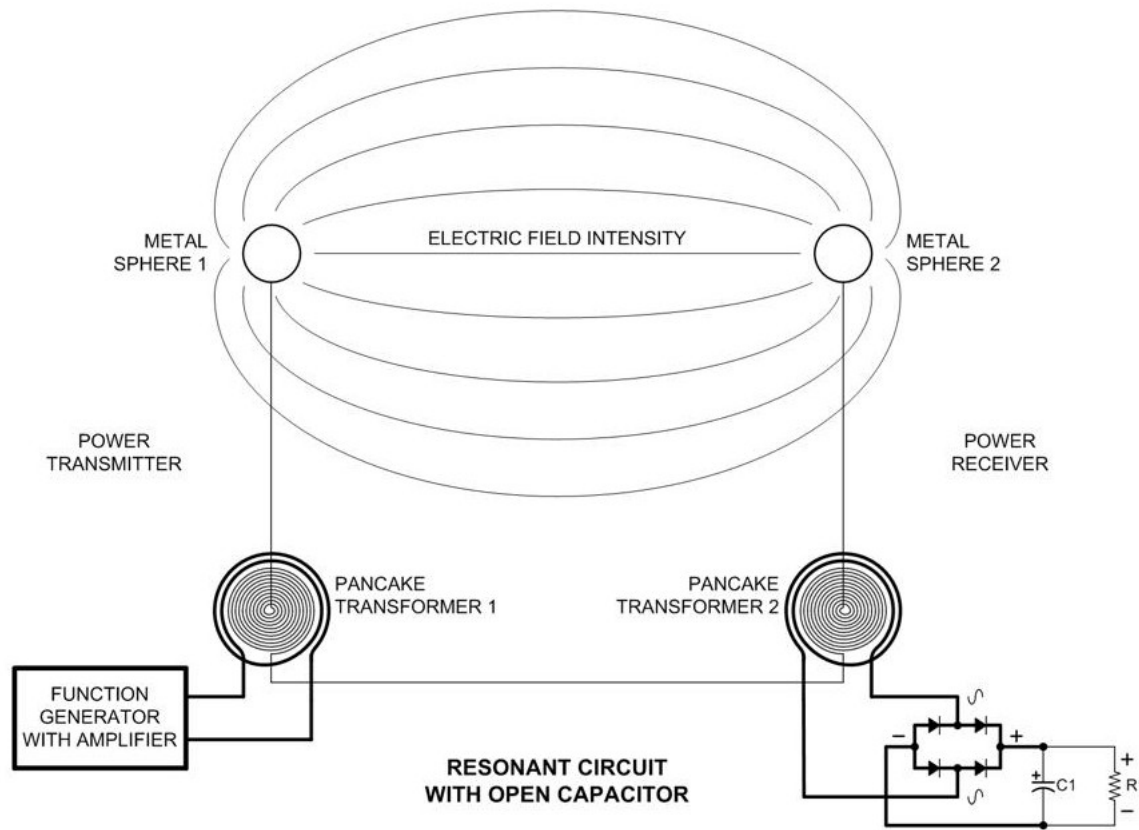
Spiral Secondary

APPROX 100 TURNS
For 3.2 MHz

DEMONSTRATION

- TRANSMITS POWER WITH:
  - NO LOSSES
  - NO DISPERSION
  - NO 1 / R² LOSS OF POWER

SCHEMATIC of the FAN DEMO

METAL SPHERE 1 — ELECTRIC FIELD INTENSITY — METAL SPHERE 2

POWER TRANSMITTER

POWER RECEIVER

PANCAKE TRANSFORMER 1

PANCAKE TRANSFORMER 2

FUNCTION GENERATOR WITH AMPLIFIER

RESONANT CIRCUIT WITH OPEN CAPACITOR

C1 R1
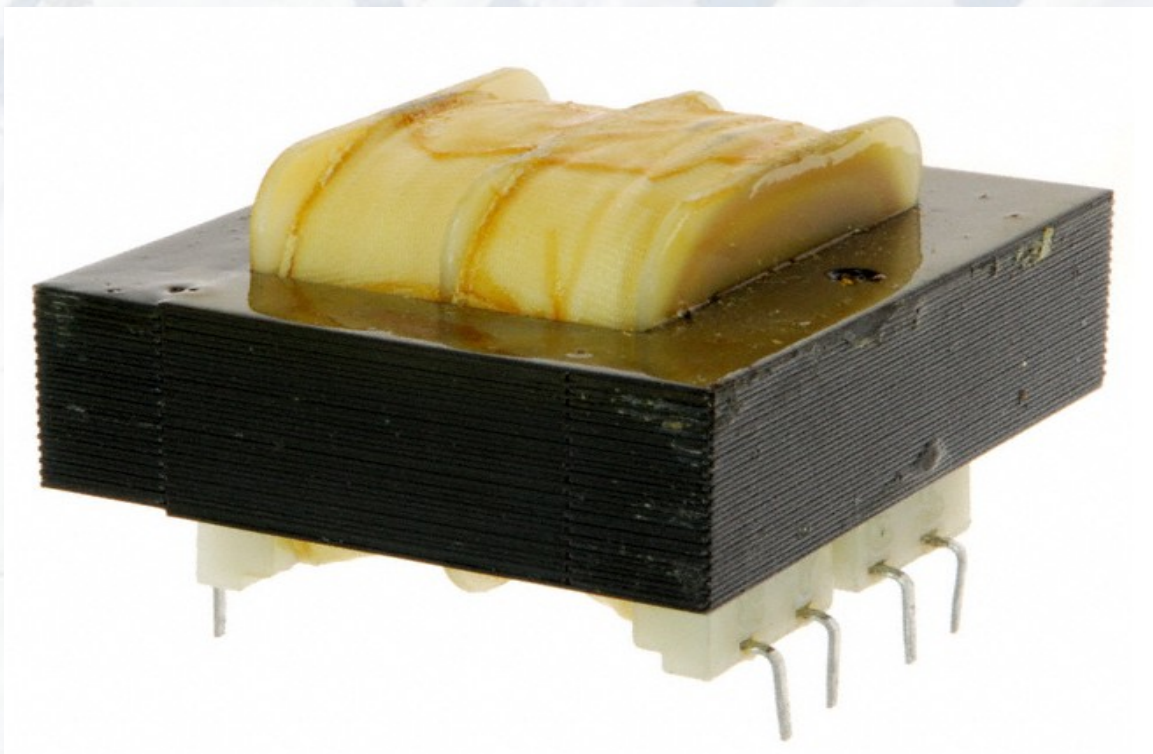
© INTALEK, INC., 2007

LOOSE COUPLING

"The Primary and Secondary windings must be loosely coupled!"

Notice the black Primary winding

Close Coupling

In designing our Transformers, We *Minimize* The leakage flux!

DEMONSTRATION

This wave PENETRATES A FARADAY CAGE so IT IS *NOT* A TRANSVERSE (HERTZIAN) WAVE

DEMONSTRATION

BIDIRECTIONAL INFORMATION FLOW - TRANSMITTER CAN HEAR THE RECEIVER!

RADIATION WAVES DO NOT DO THIS!

DEMONSTRATION

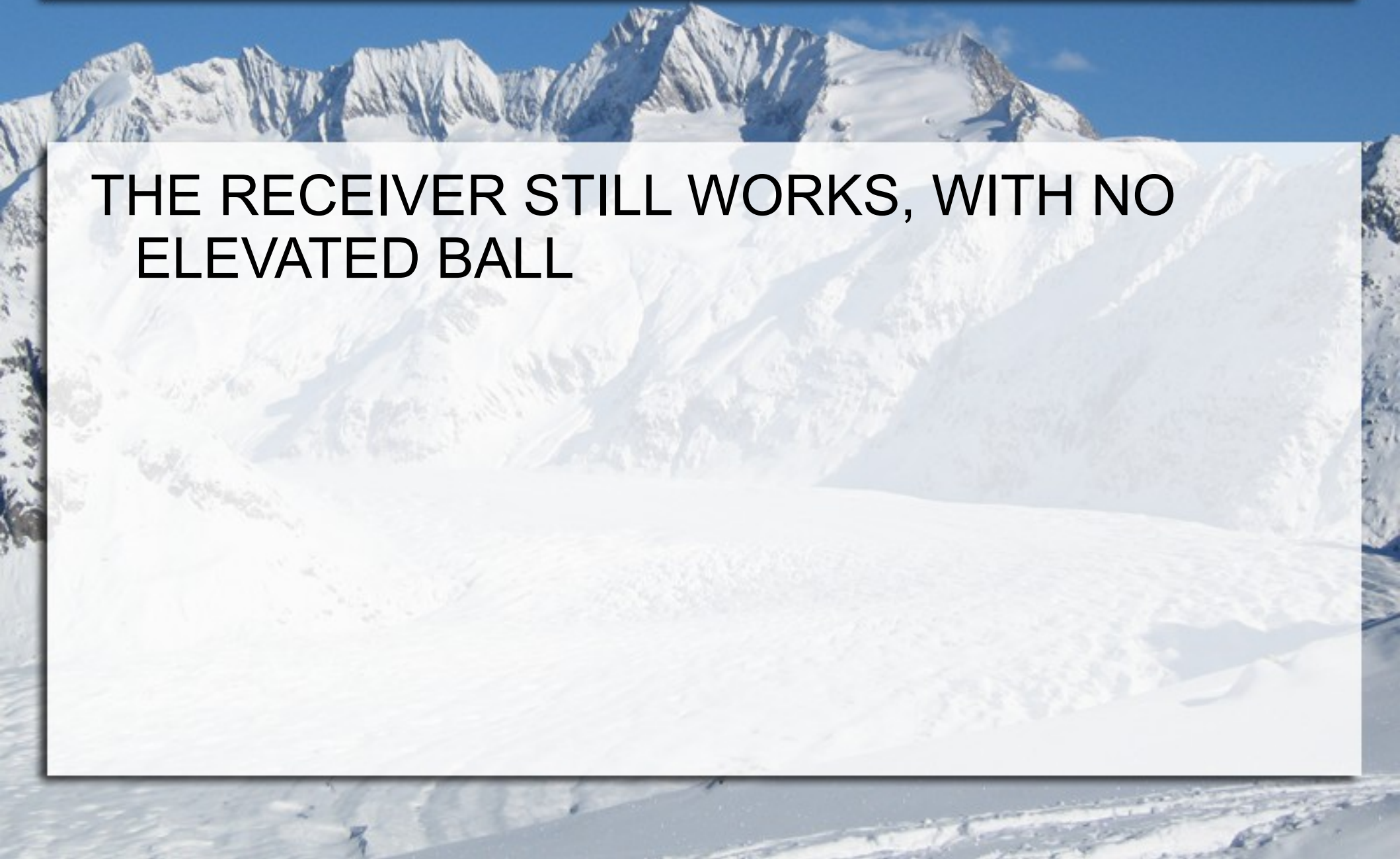TRANSMITTER CAN COUPLE TO MULTIPLE RECEIVERS.

ENERGY IS DELIVERED TO EACH RESONANT RECEIVER COIL.

DEMONSTRATION

THE RECEIVERS CAN HEAR EACH OTHER!

IT IS A "PARTY LINE!"

DEMONSTRATION

THE RECEIVER STILL WORKS, WITH NO ELEVATED BALL

DEMONSTRATION

EDDY CURRENTS + FARADAY + LENTZ

- COPPER PIPE WITH MAGNET

VECTOR CALCULUS

WARNING -

HERESY

AHEAD!

CALCULUS

TESLA RIDICULED EINSTEIN!

- "You are wrong, Mr. Einstein - Aether does exist!"

- "I think the material bodies do not gravitate between each other but it is the aether that makes one material body to press to another."

DIVERGENCE of **E** and **B**

Divergence of the electric field is charge density on ε_0. Divergence of magnetic field is, however, zero, meaning there are no magnetic monopoles.

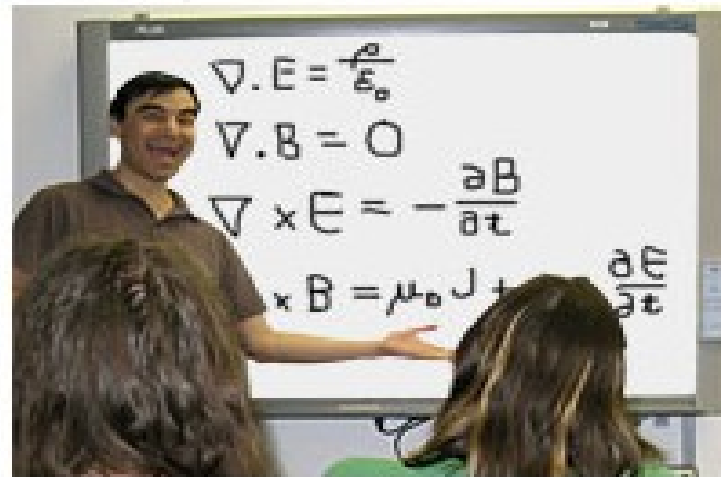Divergence is non-zero
in the presence of a field source.

+ div is a hose
- div is a drain

http://www.irregularwebcomic.net/1420.html

Curl of E and B

Formulaic ?

Prof. J.D. Jackson
CLASSICAL ELECTRODYNAMICS

b. 1925 London, ON

$$\nabla \cdot B = 0$$

$$\nabla \times E + \partial B/\partial t = 0$$

$$\nabla \cdot D = \rho$$

$$\nabla \times H - \partial D/\partial t = J$$

maxwell's equations

John David Jackson: physicist

Berkeley Lab

http://videoglossary.lbl.gov/2009/maxwells-equations/
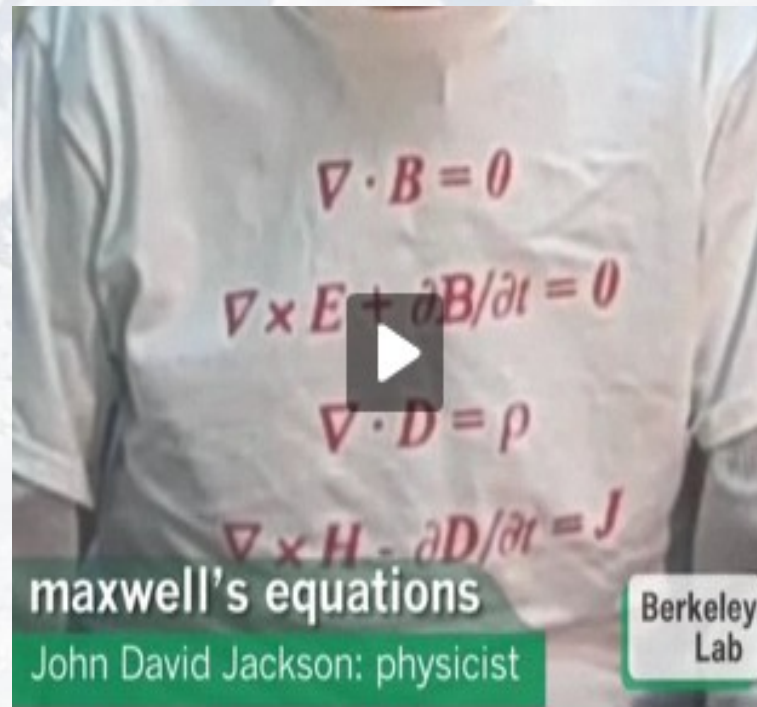
Heaviside's Contribution

4 Equations in 2 Variables (E, B)

MAXWELL'S EQUATIONS
Hugh Hildreth Skilling, 1942

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

$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$

$$\nabla \cdot \mathbf{B} = 0$$

$$\nabla \cdot \mathbf{D} = \rho$$

$$\mathbf{D} = \epsilon \mathbf{E}$$

$$\mathbf{B} = \mu \mathbf{H}$$

$$\imath = \gamma \mathbf{E}$$

AMPERE

FARADAY

GAUSS B
GAUSS D

Effect <--- Cause

Ampere has 2 Causal terms while Faraday has 1!

Asymmetric Universe

Maxwell's Equations in 1865

http://www.mathematik.tu-darmstadt.de/~bruhn/Original-MAXWELL.htm

Eq.	Maxwell's original equations in [1]	Transcription	Vector notation
(A)	$p' = p + df/dt$ $q' = q + dg/dt$ $r' = r + dh/dt$	$(F, g, h) = \mathbf{D}$ $(P, q, r) = \mathbf{j}_0$ $(P', q', r') = \mathbf{j}$	$\mathbf{j} = \mathbf{j}_0 + \partial\mathbf{D}/\partial t$
(B)	$\mu\alpha = dH/dy - dG/dz$ $\mu\beta = dF/dz - dH/dx$ $\mu\gamma = dG/dx - df/dy$	$(F, G, H) = \mathbf{A}$ $(A, \beta, \gamma) = \mathbf{H}$	$\mu\mathbf{H} = \text{nabla} \times \mathbf{A} = \text{curl } \mathbf{A}$
(C)	$d\gamma/dy - d\beta/dz = $ **p? '4π?** $d\alpha/dz - d\gamma/dx = $ **q? '4π?** $d\beta/dx - d\alpha/dy = $ **r? '4π?**	$(F, G, H) = \mathbf{A}$ $(P', q', r') = \mathbf{j}$	$\text{nabla} \times \mathbf{H} = \text{rot } \mathbf{H} = \mathbf{j}$
(D)	$P = \mu(\gamma\, dy/dt - \beta\, dz/dt) - dF/dt - d\Psi/dx$ $Q = \mu(\alpha\, dz/dt - \gamma\, dx/dt) - dG/dt - d\Psi/dy$ $R = \mu(\beta\, dx/dt - \alpha\, dy/dt) - dH/dt - d\Psi/dz$	$(P, Q, R) = \mathbf{E}$ $(A, \beta, \gamma) = \mathbf{H}$ $(F, G, H) = \mathbf{A}$ $\Psi = \varphi$	$\mathbf{E}\,v = \mu \times \mathbf{H} - \partial\mathbf{A}/\partial t - \text{grad }\varphi$ $(\text{Nabla }\varphi = \text{grad }\varphi)$
(E)	$P = kf$ $Q = kg$ $R = kh$	$k = \varepsilon^{-1}$ $(P, Q, R) = \mathbf{E}$ $(F, g, h) = \mathbf{D}$	$\mathbf{E} = \varepsilon^{-1}\mathbf{D}$
(F)	$P = -\rho p$ $Q = -\rho q$ $R = -\rho r$	$-P = \sigma^{-1}$ $(P, Q, R) = \mathbf{E}$ $(P, q, r) = \mathbf{j}_0$	$\mathbf{E} = \sigma^{-1}\mathbf{j}_0$
(G)	**? -** $E + df/dx + dg/dy + dh/dz = 0$	$e = \rho$	$-P + \text{nabla} * \mathbf{D} = -\rho + \text{div }\mathbf{D} = 0$
(H)	$de/dt + dp/dx + dq/dy + dr/dz = 0$	$(P, q, r) = \mathbf{j}_0$	$\partial\rho/\partial t + \text{div }\mathbf{j}_0 = 0$

DIVERGENCE $\nabla \cdot E$

- The symbol for divergence is the upside down triangle for gradient (called del or nabla) with a dot. $\nabla \cdot E$ The gradient gives us the partial derivatives (dx, dy, dz), and the dot product adds them together (x*dx + y*dy + z*dz).

- Divergence is a single number, like density.

- Divergence and flux are closely related – if a volume encloses a positive divergence (a source of flux), it will have positive flux. ex: HOSE

- "Diverge" means to move away from, which may help you remember that divergence is the rate of flux expansion (positive div) or contraction (negative div). Ex: DRAIN
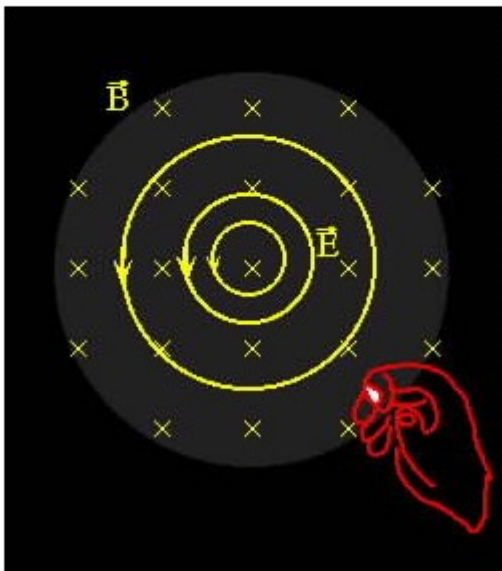
http://betterexplained.com/articles/divergence/

CURL OF E and B

- http://www.irregularwebcomic.net/1420.html
- http://maxwell.ucdavis.edu/~electro/faraday/ans4.h

CURL E

Induced E-Field

Created by an Increasing B-field

The E-Field lines form a vortex or "eddy".

http://maxwell.ucdavis.edu/~electro/faraday/induced_efield.html

MAGNETIC MONOPOLES

There's no strong theoretical reason why magnetic monopoles shouldn't exist. They just don't seem to. We've never seen one. If they do turn out to exist, it's no disaster. All we need to do is add a "magnetic charge density" to Maxwell's second equation, in place of the zero.

You could probably do some cool things with them, if you could just find one.

http://www.irregularwebcomic.net/1420.html

Potential Density
-**v** div **B**

- A comparison of the coefficients of both field equations

$$\text{rot } \mathbf{E} = -d\mathbf{B}/dt + \mathbf{v} \text{ div } \mathbf{B} = -d\mathbf{B}/dt - \mathbf{b} \qquad (27.12)$$

$$\text{rot } \mathbf{H} = d\mathbf{D}/dt - \mathbf{v} \text{ div } \mathbf{D} = d\mathbf{D}/dt + \mathbf{j} \qquad (27.13)$$

with the Maxwell equations results in:

- for the potential density $b = -v \text{ div } B = 0$, (27.14)
  (eq. 27.12 = law of induction, if $b = 0$ resp. div $B = 0$)

- for the current density $j = -v \text{ div } D = -v_x \cdot \rho_{el}$, (27.1a
  (eq. 27.13 = Ampere's law, if j = with v moving negative
charge carriers (ρ_{el} = electric space charge density).

Fig. 27.9: ____ Derivation of Maxwell's field equations as a
special case of the equations of transformation

CALCULUS

- WE NEED TO ***ENHANCE FARADAY'S LAW,*** (JUST AS MAXWELL ENHANCED AMPERE'S LAW!)

  - IT NEEDS A 2ND CAUSAL TERM

  - POTENTIAL DENSITY

  - NOW MAXWELL IS SYMMETRICAL!

  - MAGNETIC MONOPOLES!

  - VIDEO CLIP from Meyl's DVD

ALBANIA

Cheers title screen

http://www.youtube.com/watch?v=yrz1q_zk-SU

- **v** div **B** SONG

Minus **v** div **B**,

Minus **v** div **B**,

You're the missing term in Maxwell

You belong on the right side of Faraday,

And the truth is known at last!

CALCULUS

- WHY IS THIS A SCALAR WAVE?
    - TESLA'S TERM
    - LONGITUDINAL WAVE
    - FIELD IN DIRECTION OF PROPAGATION!
    - SPEAR vs UMBRELLA

CALCULUS

- THIS IS *NOT* NEW!
    - NEAR FIELD
    - ANTENNA NOISE
    - COMPLEX PERMITTIVITY
    - COMPLEX SPEED OF LIGHT

Faraday Cage

- An enclosure formed by conducting material or by a mesh of such material.
- Blocks out external static electric fields. Faraday invented them in 1836.
- An external static electrical field will cause the electrical charges within the cage's conducting material to redistribute themselves so as to cancel the field's effects in the cage's interior.
- Cannot block static and slowly varying **magnetic fields**, such as Earth's magnetic field (a compass will still work inside).
- They shield the interior from external electromagnetic radiation if the conductor is thick enough and any holes are significantly smaller than the radiation's wavelength. Electromagnetic **shielding**.
- The reception of external radio signals, a form of electromagnetic radiation, through an antenna within a cage can be greatly attenuated or even completely blocked by the cage itself.

Eddy Currents + Lentz

- Eddy currents (Foucault currents) are currents induced in conductors, opposing the change in flux that generated them.

- Lenz's law: "An induced current is always in such a direction as to oppose the motion or change causing it"

- Self-induced eddy currents are responsible for the skin effect in conductors.

- Transformer laminations.

NEAR FIELD

- The near-fields only transfer energy to very near-by receivers, and when they do, the result is felt as an extra power-draw in the transmitter. As an example of such an effect, power is transferred across space in a common transformer or metal detector by means of near-field phenomena (in this case inductive coupling), in a strictly short-range effect.

http://en.wikipedia.org/wiki/Near_and_far_field

CALCULUS

- A PHYSICS WITHOUT POSTULATES!

  - MEYL DERIVES ALL FROM 1ST PRINCIPLES

  - DOES NOT NEED POSTULATES

  - A UNIFORM PHYSICS APPLIES NANO TO ASTRO SCALE

  - NOBEL PRIZE for the **BLACK FOREST COPERNICUS**?

CALCULUS

- POISSON, SCHRODINGER, ETC.

APPLICATIONS?

- LIKE POWER-OVER-ETHERNET
- BEAM POWER TO REMOTE LOCATION
- VEHICLE TIRE PRESSURE MONITOR
- PWR & COMMUNICATIONS IN A MINE
- SUBMARINE COMMUNICATIONS?
- MEDICAL - THERAPY - HOMEOPATHY

Start with Ridicule

All truth passes through three stages:
First, it is ridiculed;
Second, it is violently opposed; and
Third, it is accepted as self-evident.

-- Arthur Schopenhauer (1788-1860)

Crackpot. Crank.

"When you're one step ahead of the crowd you're a genius. When you're two steps ahead, you're a crackpot."

-- Rabbi Shlomo Riskin, (Feb. 1998)

He flies . . . we know not how

Bee Vortices

Insects fly in a sea of **vortices**, surrounded by tiny **eddies** and **whirlwinds** that are created when they move their wings."

Insects depend on **vortices** to keep them aloft, especially when they are hovering. An important key to solving the mystery of insect flight, Wang said, is the understanding of the vortex "shedding" and how the vortices behave when they separate from the moving surface that created them.

Cornell University physicist Z. Jane Wang
    http://www.news.cornell.edu/releases/March00/APS_Wang.hrs.
    html

Bee Vibrations

Bees beat their wings approximately 200 times a second. Their thorax muscles do not expand and contract on each nerve firing, but rather **vibrate like a plucked rubber band**.

The sound is actually the result of the bee vibrating its flight muscles this can be achieved while the **muscles are decoupled from the wings** — a feature known in bees but not other insects.

http://en.wikipedia.org/wiki/Bumblebee

Fan blows . . . We know not how.

RECEIVER STATION

**UNLESS
 we know Tesla!**

HOW COULD THIS BE NEW?

It's NOT new!

1. Near Field

2. Complex dielectric constant

3. Complex speed of light

4. Noise in antennas

5. Noise in components

Eric Dollard

Let us turn to the Heaviside Equation which is the most fundamental equation in all of Electrical Engineering:

(RG + XB) + j (XG – RB) = propagation constant squared

Where: R resistance in Ohms, G conductance in Siemens, X reactance in Henrys per second, B susceptance in Farads per second

So: RG is the scalar or DC component that is NOT A WAVE, XB is the longitudinal or AC component and is an alternating electric wave

XG is the transverse component and is a **forward** moving oscillating electric wave.
RB is the transverse component and is a **reverse** moving oscillating electric wave

This equation allows for all electrical conditions in time and or space and combinations thereof.
The example equation is the dimensions of time (see: Steinmetz Theory of Transient Electric Waves and Phenomenon
and also my paper: Symbolic Representation of the Generalized Electric Wave.)

Example: The air in the room; the room is filled with air at atmospheric pressure of 2998 mB, your stereo speakers are creating
longitudinal waves having length and frequency and exert a oscillating force centered on 2998 mB (+ or – 10 mB). RG is the
air pressure, a scalar. XB is the sound of the stereo, a longitudinal wave.
XG = RB, thus **no transverse waves exist** (XG – RB) = ZERO.

Hence (RG + XB) is what is going on in the room, the disinformers have convinced you that this whole quantity (RB + XB)
is scalar, RG is the only scalar component. It is DC and has NO FREQUENCY, no WAVELENGTH and thus NO WAVE!
SCALER = NO WAVE - GET IT???
If people don't get this fundamental concept – my time is better spent talking to my pet Coyote… I have nothing further to say…
http://www.energeticforum.com/90344-post94.html

Near Field Communications

Developed in 2002 by NXP Semiconductors, Infineon and Sony.

NFC operates in a frequency range centered on 13.56 MHz and offers a data transmission rate of up to 424 kbit/s within a distance of approximately 10 cm.

Powercast

Powercast brings remote, wireless power capability to micro-power devices such as wireless sensors, data loggers, active RFID and RTLS tags, and more.

The company's RF energy harvesting technology breaks new ground in remote, wireless power by increasing the efficiency of converting RF energy (radio waves) into DC power and enabling that efficiency over a wide operating range.

With Powercast's embedded wireless power technology, battery replacement can be reduced or eliminated by trickle charging rechargeable batteries or using super-capacitors and thin-film energy cells.

WiTricity

Resonant Magnetic Coupling: Magnetic coupling occurs when two objects exchange energy through their varying or oscillating magnetic fields. Resonant coupling occurs when the natural frequencies of the two objects are approximately the same.
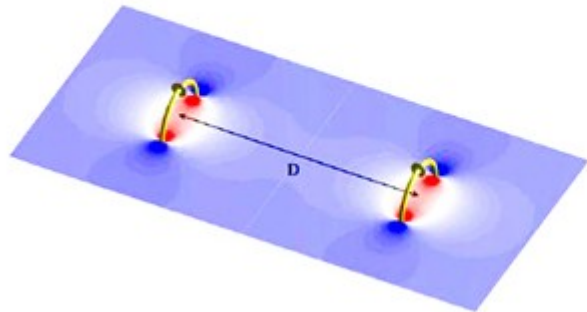
Two idealized resonant magnetic coils, shown in yellow. The blue and red color bands illustrate their magnetic fields. The coupling of their respective magnetic fields is indicated by the connection of the colorbands.

Marin Soljacic

WiTricity

## Efficient wireless *non-radiative mid-range* energy transfer

Aristeidis Karalis [a,*], J.D. Joannopoulos [b], Marin Soljačić [b]

We investigate whether, and to what extent, the physical phenomenon of long-lifetime resonant electromagnetic states with localized slowly-evanescent field patterns can be used to transfer energy efficiently over non-negligible distances, even in the presence of extraneous environmental objects.

In the early days of electromagnetism, before the electrical-wire grid was deployed, serious interest and effort was devoted (most notably by Nikola Tesla [1]) towards the development of schemes to transport energy over long distances without any carrier medium (e.g. wirelessly). These efforts appear to have met with little success.

http://www.mit.edu/~soljacic/wireless-power_AoP.pdf
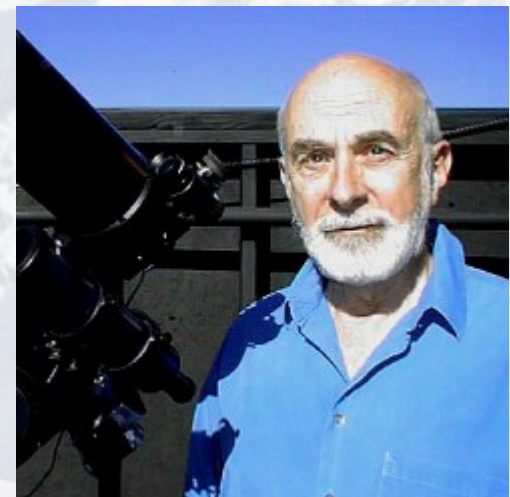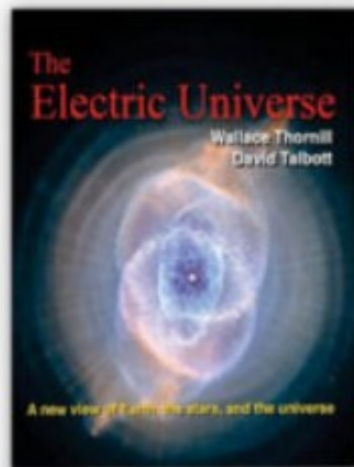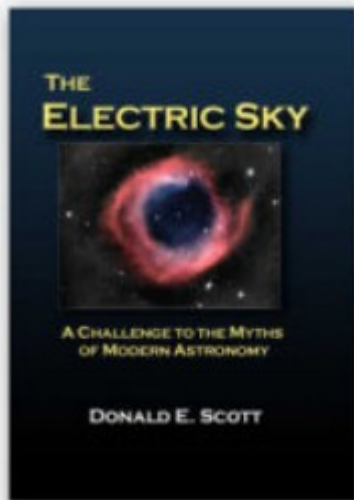
Prof. Eric Laithewaite, Heretic

The most celebrated Engineer in Britain, shunned.

Things that spin are magic - wheels, electrons, Galaxies.

The absence of a force, where it ought to have acted.

http://www.youtube.com/watch?v=KnNUTOxHoto

Get your Physics
from an Engineer!

Photosynthesis Antenna

The critical step of the light cycle is the absorption of electromagnetic radiation by a pigment molecule. The most famous pigment is chlorophyll , but other molecules, such as β- carotene, also absorb light (see Figure 1). Together, **these pigment molecules form a type of light harvesting antennae** that is more efficient at interacting with sunlight than would be possible with the pigments acting alone. When the light is absorbed, electrons in the pigment molecule are excited to high energy states.
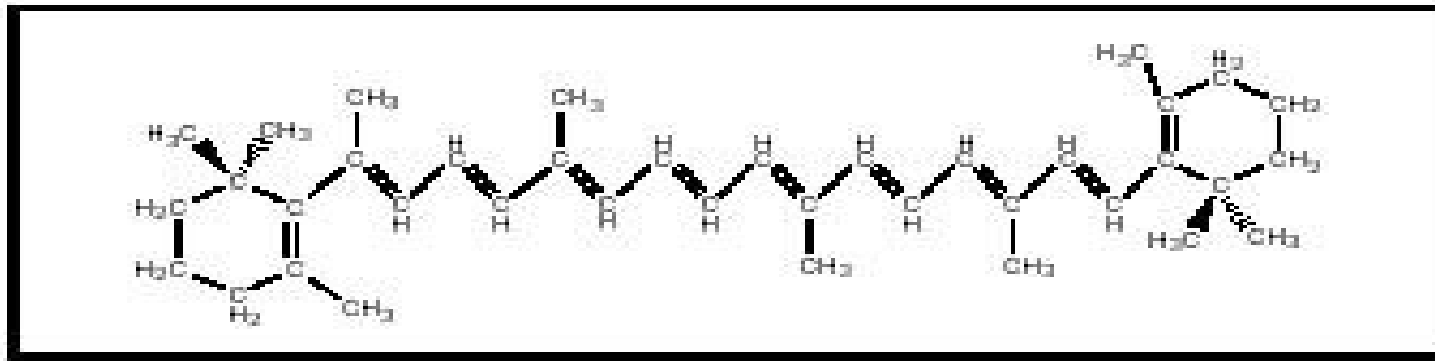
OPEN SOURCE PROJECT

QTY	DESCRIPTION	MFG	MPN	VENDOR	TOTAL
10	THREADED ROD 6-32 X 6 IN. UNC STEEL	HILLMAN	H880996	LOWE'S	$16.00
100	NUT HEX 6-32 ZINC PLATED	B&F FASTENER	HNZ632	DIGI-KEY	$1.62
10	ACRYLIC DISC 4 IN DIA. 1/8 IN THICK 1/8 IN DIA CENTER HOLE	PRO-FAB PLASTICS	IT100		$30.00
100'	#24 WIRE-WRAP WIRE	OK INDUSTRIES	R24R-0100	DIGI-KEY	$21.87
1000'	WIREWRAP KYNAR 30AWG BLACK 1000'	OK INDUSTRIES	KSW30BLK-1000	DIGI-KEY	$94.88
	PRESSBOARD 4.5 X 4.5 X 1/8 IN			HOME DEPOT	$5.00
100	SCREW MACHINE PHILLIPS 6-32X3/4	B&F FASTENER	PMS 632 0075 PH	DIGI-KEY	$2.67
1	USB ARBITRARY FUNCTION GENERATOR	HANTEK	DDS-3X25	VISTATECH	$150.00
10	STANDOFF HEX 6-32THR .500"L BR	KEYSTONE	1451C	DIGI-KEY	$7.09
10	CONNECTOR, LUG TYPE TERMINAL STRIP, 0.375 SPACING, 5 LUGS	CINCH	54C	ALLIED ELECTRONICS	$14.00
1	ALLIGATOR JUMPER LEAD SET, 10 PC 20"	SAYAL ELECTRONICS	216396	SAYAL	$3.00
10	TERMINAL LOCKWASHER LUG #6	KEYSTONE	914	DIGI-KEY	$1.72
1000'	WIREWRAP KYNAR 30AWG BLACK 1000'	OK INDUSTRIES	KSW30BLK-1000	DIGI-KEY	$94.88
				TOTAL	**$442.73**
100'	4-CHANNEL STORAGE OSCILLOSCOPE 200 MHZ 2 GS/s	TEKTRONIX	TDS-2024C	ELECTROSONIC	$2,513.00

YOUR BASEMENT

- EASY TO WIND COILS
  - JUST AN ANTENNA
  - SPIRAL WOUND
  - 1-WIRE DIAMETER HIGH

YOUR BASEMENT

- ARBITRARY FUNCTION GENERATOR
  - HANTEK MODEL DDS-3X25
  - USB POWERED
  - 25 MHZ (75 MHZ SINE WAVE)
  - YOU NEED ONE ANYWAY!