

# DE PALMA GENERATOR



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## *Bruce DePalma*

*Bruce DePalma* graduated from M.I.T. in 1958.

He attended graduate school in Electrical Engineering and Physics at M.I.T. and Harvard University. At M.I.T.

He was a lecturer in Photographic Science in the Laboratory of Dr. Harold Edgerton and directed 3-D color photographic research for Dr. Edwin Land of Polaroid Corporation.

He commenced his work in Free Energy through his studies on the gyroscope and the nature of motion.

He invented the N-machine, a free energy electrical generator in 1977-78.

His recent scientific papers are available on the Internet and in this book.

He resided near Auckland, New Zealand.

DePalma went to search deeper for the experience of God and passed in 1997.

## Publisher's Introduction

I'm J. Nayer Hardin of the Computer Underground Railroad, publisher of this e-book. I've been typing since the 60's, on computers since 1977, home computer since 1984, am a patent holding inventor, CompUrest, (pictured), an environmentalist and a cyber advocate.



While researching low to no cost energy alternatives as a result of learning about “peak oil” from Matt Savinar’s Life After The Crash site, I was introduced by David Crockett Williams to the work of one of his mentor friends, Bruce DePalma. David’s extensive work, plus the website left by Bruce DePalma, are the inspiration and source of this powerful e-book. DePalma explains: how, with magnets channeling the force, we can use the free energy existing in the space in which matter resides to run machines and many other evolutionary concepts - “*Truth has a ring to it which is unmistakable to those in search of it.*” (Fundamental Discoveries of the New Physics and Mathematics and their Relationship to the UFO Flying Saucer Observations and Encounters.)

When I understood what David was teaching me, I ran onto the information super highway, to amazon.com and found there were no books by or about DePalma. The closest I could find was spoken of in a paper by DePalma (**A Review of the Homopolar Handbook by Thomas Valone**), which he says “*Comments about a first rate, world class, scientific invention often reveal much more about the critics than they do about the invention. In the argot of contemporary language Thomas Valone could be summed up as a science groupie wherein the admonition, "a little knowledge is a dangerous thing" finds realization.*”




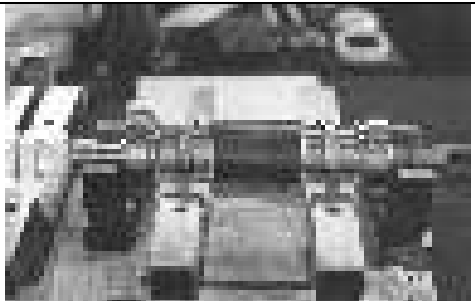
Free energy is a subject that has sparked my imagination for awhile. Back in 1985, I shared a computer renaissance center with Bernard Hirschenson (photographer and producer of the original Keep America Beautiful commercial) and other dear friends and family on West 55th Street in Manhattan. While there, a man brought a script about the life of Nicholas Tesla. In that script there was a scene where Tesla and Edison were arguing. Edison wanted to charge monthly for delivered electricity. Tesla asked why would one charge for electricity when it’s all around us, demonstrated by the many static shocks we all receive from time to time. With the right equipment, Tesla said, energy can be pulled from the air. Like many great scripts in the 80’s and 90’s, it didn’t get made, but the story stuck with me. Pull the energy from air? Could it be done cleanly? Safely? Free?

“*The availability of free energy from as simple an experiment as colliding a rotating object with a non-rotating one opens up the development of other machines for energy extraction and propulsion...*” (Gravity and the Spinning Ball Experiment) *The extra, free energy is “achieved by the balancing of equal and opposing similarly derived forces.”* (The Secret of the Force Machine), Bruce DePalma’s N-Machine uses spinning rare earth magnets and brushes to create electricity to run cars, homes, etc. The N-Machine with a Faraday Motor is a way to pull that extra free energy. Nick Tesla said it could be done. DePalma did it. So have others.

The U.S. government financed the, Super Collider yet would not let DePalma use his machine to power his home. He was self published, and a maverick in traditional physics. He died before a publisher could pick up his work. This e-book is an attempt to help the late Bruce DePalma make his case by presenting some of his papers, a lifetime’s work. Minimal editing has been done to this material, no more than a secretary whose boss died before she got this phase of the work. DePalma asked for help getting the word out. This e-book is a response to his request.

# PRIMORDIAL ENERGY PHOTOS

## Sunburst Machine & Faraday Motor

	<p><b>N-1 Homopolar Generator</b></p>
<p><b>Quadropole N-Machine Under Test Conditions</b></p>	
	<p><b>The Astounding Effects of the Quadrapole N-machine</b> Pulling enough energy to hold a wrench in place without any other visible support.</p>
<p><b>The Inner Workings of the Quadrapole N-machine</b></p>	

# **INTRODUCTION BY DAVID CROCKETT WILLIAMS**

The following was originally prepared as an information offering for the network of collaborators associated with the Internet Science Education Project, by Bruce DePalma's mentor and friend, David Crockett Williams, who tirelessly works to make the world a better place.

8May99 (205th anniversary of Lavoisier execution)

Homepage Global Emergency Alert Response

**DePalma, Free Energy, Anti-Gravity, Space-Drive and the Future of Science**

Recent work in theoretical physics to evaluate the potential of new energy technologies may be furthered by more careful evaluation, replication, and expansion of the experiments done in the 1970's by the late Bruce DePalma, experiments which document anomalous influences of rotation on the gravitational, inertial, and electromagnetic properties of rotating objects.

The following is an overview of some of these results presented on the DePalma website with some additional information from personal experiences of this writer with DePalma in Santa Barbara, California, beginning in May of 1979.

Bruce DePalma graduated from the Massachusetts Institute of Technology in 1958. He attended graduate school in Electrical Engineering and Physics at M.I.T. and Harvard University. At M.I.T. he was a lecturer in Photographic Science in the Laboratory of Dr. Harold Edgerton and directed 3-D color photographic research for Dr. Edwin Land of Polaroid Corporation. He commenced his work in Free Energy through his studies on the gyroscope and the nature of motion. He invented the N-machine, a free energy electrical generator for which he is most widely known. To the physicist though, it may be his earlier experiments that led him to this discovery which are of even more significant interest. Some of these will be summarized here after a review of the circumstances by which DePalma came to Santa Barbara in 1978 to verify his prediction of the n-Machine, a prediction made as a result of his understanding of the "energy field in space itself" which he felt interacted with rotating objects to produce his previously observed anomalous rotation effects.

During the 1970's the third largest "new age" community in the U.S. was located in Santa Barbara, the Sunburst Community founded by Norman Paulsen who previously was a close disciple of Paramahansa Yogananda but whose philosophical perspective was deeply influenced by his purported multiple encounters with "UFO's" including direct interactions as he reported in his autobiography published in 1980 "Sunburst: Return of the Ancients". Based on his experiences Paulsen is convinced that his encounters were with beings responsible for ancient and future civilizations on Earth whose "spacecraft" also have the capability of time travel. Normally I would not bring such a story to the attention of theoretical physicists but this might be appropriate here because of its connection to the history of DePalma's N-machine experiments.

Paulsen was the one who brought Bruce DePalma to Santa Barbara in 1978 and sponsored the first quantitative tests of DePalma's n-Machine over unity homopolar generator. According to Paulsen's autobiography, during one of his numerous encounters with either advanced or non-human intelligences of superior technological capabilities, he was taken aboard a spacecraft on a round trip to Jupiter during which time he communicated telepathically with the piloting beings who communicated to him how the power-plant on their ship worked. From his description of this information I believe that the reason he sponsored DePalma was because of how the n-Machine idea correlated with what he was "told" on that journey. In addition, if one takes seriously the authenticity of DePalma's preceding carefully measured anomalous influences of rotation on the physical properties of material objects, it seems likely that in the deeper understanding of these results may lie keys to the development of spacedrive and/or antigravity technologies as well as devices to extract usable energy as electricity or heat from the "energy field inherent in space itself" that he felt his experiments measured. If one believes that DePalma was either incompetent or

dishonest in his work, it is very easy to dismiss the enormous implications of these experiments, but having known him fairly well over a period of 13 years in Santa Barbara and being acquainted with several of his research colleagues with whom I am still in contact, I am convinced that he was both capable and honest in all of his scientific research so I would like to offer the following summary for consideration.

To finish with the Paulsen connection here I will relate what Norman wrote in his book about the power plant of this "spacecraft". The information conveyed to him was that the ship's propulsion was due to the effect of two magnetic discs rotating in opposite directions. The relationship of their axes of rotation was not mentioned. The interesting "coincidence" was that he was "told" that "if you take one half of this propulsion system, with it can be made a device to produce power for the people on Earth which would be far better than technologies in current use". Apparently when DePalma's schematic for the n-Machine prediction was brought to Paulsen's attention he recognized it as fulfilling this message.

The rest of this document may be considered independent of the "twilight zone" aspects of this story as I will attempt to briefly describe some of the relevant keystone experimental results which led DePalma to the prediction and verification of what he called the n-Principle behind this "over unity" electric power generator which turns out to have been an independent rediscovery and expansion on Faraday's homopolar (or unipolar) motor/generator principle (apparently different from induction) first entered in his diary at Christmastime 1831. Faraday's diary diagram and DePalma's discussion of this effect are in his 1 February 1995 notes on "**The Secret of the Faraday Disc**".

Again, the big presumption here is that these experiments were carefully and honestly done by a competent researcher, which I believe they were. The pity is that the results seem to be so contradictory to the established body of knowledge in theoretical physics I have yet to find anyone beside Dr. Paramahansa Tewari of India and Dr. Shiuji Inomata of Japan who have any kind of theoretical interpretation of how the "over unity effect" of n-Machine works (whose performance they have each verified), let alone anyone at all who can offer explanation of the numerous preceding experiments documenting previously unsuspected influences of rotation on physical objects, some described below having potential applications to space drive engineering. It is my hope that some qualified experimenters will take the following seriously enough to allocate the time and funding to replicate these results and that during the same time frame some integrated theoretical understanding may be developed to enable their publication in the peer reviewed literature without their apparent contradiction of certain cherished "fundamental laws" of physics.

Two chapters of Dr. Tewari's book **[PHYSICS OF FREE POWER GENERATION (BEYOND MATTER)**, by Paramahansa Tewari, Published by Crest Publishing House, New Delhi, INDIA, 1996 ISBN No: 81-242-0113-7] describing his "Space Vortex Theory" interpretations of related physics, including his view on the structure of the electron, can be found in GENESIS OF FREE POWER GENERATION, and in LIMITATION OF THE LAW OF ENERGY CONSERVATION whose abstract on space power generation mentions Tewari's n-Machine Space Power Generator test results, explains that "The energy-balance shows that the output exceeds input by 3690 watts, which is in violation of the law of conservation of energy in this specific experiment involving electro-magnetic induction effect", and discusses gravity field production, gravity field variation due to oscillation, light from atomic vibration, and electromagnetic interactions between atoms.

The turning point in DePalma's scientific career came while he was a lecturer at MIT in the late 1960's and he began pondering the inadequacies of explaining the physics of the gyroscope and he began wondering if there was a deeper principle operating in the behavior of rotating objects.

One of the first experiments that DePalma did in this area was to test to see if there is a difference in the gravitational behavior of a spinning vs. non-spinning ball bearing. After an extensive literature search prompted by a question from one of his students at MIT, they could not find any evidence that this experiment had ever been done and so it became an educational exercise to see if in fact this variation on Galileo's "big rock vs. small rock" experiment would show any variation in the rate of fall.

At that time Bruce was a senior scientist specializing in photographic sciences with the Polaroid Corporation and lecturing part time at MIT on photographic science, physics, and electrical engineering over a period of several years in the late 1960's. He set up this experiment using two one-inch diameter pinball machine ball bearings where one was not spinning and one was made to spin at 18,000 rpm by a hand held router motor with cups to hold the balls, one on the spinning shaft and one affixed to the casing of the motor. He then he gave the assembly a thrust at an appropriate angle and in the dark with a 60 cycle strobe light and open camera lens he photographed the parallel trajectories of the two ball bearings. Repeating this numerous times and analyzing the photographs, this experiment showed that there is indeed a variation in the gravitational behavior of the spinning vs. non-spinning ball bearing. The spinning ball, given the same thrust, went to a higher point in its trajectory, fell faster and hit the bottom of the trajectory before the non-spinning ball. Later he made a device with a magnetic release which could test this small but significant, reproducible, and clearly visually perceptible effect with a stationary vertical drop over a height of just six feet.

After years of reflection on these results he wrote an evaluation on 3 May 1977 called **"Understanding the Dropping of the Spinning Ball Experiment."**

The essence of this experiment was duplicated with another setup using spinning vs. non-spinning enclosed gyroscopes to control for aerodynamic factors and these results are posted in **"Gyro Drop Experiment"** Performed by Kenneth Gerber, M.D., Richard F. Merritt, Analysis by Edward Delvers.

An overview of some of these rotational anomalies is discussed in DePalma's 4 November 1974 "Fundamental Discoveries of the New Physics and Mathematics and their Relationship to the UFO Flying Saucer Observations and Encounters"

"1) Rotating objects falling in a gravitational field are accelerated at a rate greater than "G", the commonly accepted rate for non-rotating objects falling in a vacuum.

2) Pendula utilizing bob weights which are rotating, swing nonsinusoidally with periods increased over those of pendula with non-rotating bobs.

3) A precessing gyroscope has an anomalous inertial mass, greater than its gravitational mass.

4) An anomalous field phenomenon has been discovered, the OD field, which confers inertia on objects immersed within it. This field is generated by the constrained forced precession of a rotating gyroscope."

One of the early devices that DePalma used to observe these effects consisted of an apparatus that he called the "force machine" which consisted of two counter-rotating gyroscopes described in **"The Generation of a Unidirectional Force, 22 April 1974"** as "The archetypal gravitational engine or Free Energy machine is a combination of two counter-rotating gyroscopes with axles parallel and rotors co-planar. The original Force Machine was constructed in 1971, figure (1). The total weight of the apparatus was 276 lbs. The "active" mass at the rim of the flywheels was 10 lbs. The assembly was suspended from a spring scale and the gyroscopes driven counter-rotating at 7600 r.p.m. Under these conditions the support cylinder was driven at 4 r.p.s. to precess the gyros. A consistent set of experiments repeatably showed 4 - 6 lbs. of weight loss."

A variation of this device also described in this paper is called the "Linear Force Machine" and even a small model provided enough of a propulsion "force against space itself" or "space-drive" effect that he was able to propel himself across the floor on a wheeled cart or wagon. This device is diagrammed in that article and described, "The machine of figure (4) becomes a fundamental drive unit, capable of generating a thrust against "space" itself, and thus may replace all earlier methods of generating unidirectional motion, i.e. gears wheels transmission units for road travel, and propellers and jets for airborne vehicles."

These "force machine" experiments are discussed further in the 29 April 1995 article "**The Secret of the Force Machine**" which includes Anti-gravitational Effects and Electrical Force Machines like the N-machine, explaining how "Space power is developed out of distortion of the normally isotropic space, the amount of distortion being represented by the reflected internally constrained forces explicitly developed in these machines" and showing diagrams of the force machine, Anti-Gravitational Force Machine, Sunburst N-Machine, fully compensated n-machine with twin contra-rotating magnetized rotors, etc.

In one his experiments showing the properties of an "inertial field" created in the proximity of a rotating object, the frequency of a tuning fork in an Accutron watch is changed by this field effect as demonstrated by a variation in the time shown on the watch. This experiment is discussed in Appendix 1 of the later write up dated 18 June 1975 "**Simple Experimental Test for the Inertial Field of a Rotating Real Mechanical Object**"

After these and other experiments including those showing increased inertia and momentum in the collisions of rotating vs. non-rotating objects in the 1970's, and then a number of different configurations of n-Machine devices in the 1980's during which time some of the n-Machine experiments were replicated by Tewari and Inomata, by early in the 1990's DePalma finally got published a peer reviewed article on his work, "**Magnetism as a Distortion of a Pre-Existent Primordial Energy Field and the Possibility of Extraction of Electrical Energy Directly from Space**", Bruce de Palma; the proceedings of the 26th Intersociety Energy Conversion Engineering Conference (IPECAC), August 4-9, 1992, Boston, Massachusetts; sponsored by The Institute of Electrical and Electronic Engineers (IEEE). Among its references this paper cites the results of a 1986 independent testing of the original Sunburst n-Machine by then Stanford University EE Professor Emeritus W. Robert Kincheloe, "Kincheloe, Homopolar 'Free Energy' Generator Test, presented at 1986 meeting of the Society for Scientific Exploration, San Francisco, CA, U.S.A., 21 June 1986, revised 1 February 1987. Contains references to earlier [DePalma papers re N-machine.](#)"

About this time others began writing about integrating these ideas into an understanding of the "cold fusion" anomalies first reported in 1989 by Pons and Fleishmann, such as [1] "[Hypothesis of Homopolar Atomic Model for Cold Fusion Energy](#)", by Emidio Laureti, whose abstract explains "By the means of a macroscopic structure, which reproduces homopolar induction, it is defined a form of interaction which might offer an hypothesis of atomic models, for a possible explanation of cold fusion energy", and [2] "[NEW APPROACH TO COLD FUSION \(LOW-TEMPERATURE NUCLEAR FUSION\)](#)" I. L. Cerlovin, R. Kh. Baranova, and P. S. Baranov (Translated from Zhurnal Obshchei Khimii, Vol. 62, No. 1, pp. 230-232, January, 1992. Original article submitted December 15, 1991) 0022-1279/92/6201-0193, 1992 Plenum Publishing Corporation. "This is the first communication giving the results of a fundamentally new approach to low-temperature nuclear fusion, based on a new unified fundamental field theory, together with experimental corroboration of predictions of the theory and illustrations of possible practical uses of the results."

After DePalma moved from Santa Barbara to Australia and then to New Zealand where he died in late 1997, some of the papers that he wrote reflect his continued re-evaluation of the implications of this "new knowledge".

28 July 1993 "On the Nature of Electrical Induction" begins with the quote "It is the conceptualizations which are important" (from A. S. Eddington in *Fundamental Theory*, 1944) and proffers "The phenomena of electrical induction which are fundamental to electrical science have long since passed into everyday experience. Recently the nature of this fundamental principle has been re-examined in the light of experiments with electrical machines, which, in their operation violate the conservation laws of charge and energy." Diagrams include (1) Toroidal Model of the universe (space orthogonal to time flow) correlating geometrically the direction of time flow with the movement in spacial dimensions (3 space), (2) Cross section diagram shows direction of time flow from future to past, (3) Interpretation of magnet showing direction of time energy flow through the magnet, (4) n-Machine or One-Piece Faraday Homopolar Generator.

16 July 1993 "**Where Electrical Science Went Wrong**" discusses Michael Faraday's performance of the initial experiments resulting in the discovery of the one-piece homopolar generator of December 26, 1831, in figure (1), diagram reproduced from Faraday's notebook. Also at that url is the paper of 4 January 1994, "**On the Nature of Electricity**" which includes diagram "Rotation of a magnetize gyroscope, the N-Machine" showing relationships between directions of magnetic polarity, rotation, and current flow.

DePalma's paper of 1993 "**FREE ENERGY The Political, Social, and Economic Implications of The N- Machine / Space Power Generator**" opens with the thought: It is said, "The whole Universe and created world is a thought in the mind of God", from The Gospel of Sri Ramakrishna, and then Bruce's counterpoise "If that be the case, wouldn't He want it to be the finest show in town?"

By 1994 DePalma wrote about some deeper evaluations of Alternating Current in 20 September 1994 "**Power Output of A.C. Induction Machines**" which discusses "Slip of a.c. motors: The parameter of importance in this discussion is the a.c. motor slip frequency which is the difference between the unloaded motor speed, governed by the frequency in c.p.s. of the mains supply, and the speed at which the motor rotates under load. The torque of a polyphase motor varies almost directly as the magnitude of the rotor slip r.p.m." and explains "The Method of DePalma for characterization of polyphase a.c. electromechanical energy converters consists of the measurement of rotor slip frequencies with sinusoidal and non-sinusoidal motor excitation and at constant motor loading."

In his paper of 14 March 1995, "**The Problem of Free Energy**", he says "Some inventions are good inventions, others are bad inventions. We all know what the good inventions are, the bad ones are guns, atomic bombs, poison gases, germ warfare, etc. I am not advocating my machine or any other machine in particular to be 'the solution'. What is needed is a change of attitude. Our theories of Nature must take into account the transcendence of all things that exist, and the possibility of an energetic principle latent in Nature. With this we may survive."

In his piece of 18 July 1995, "**That is Science**", he concludes that "The development of insight, and observational instincts to discriminate between the real and the unreal. That is Science."

In the 27 February 1997 "**On The Nature of the Primordial Field**: "For those of us who consider ourselves sophisticated we amuse ourselves with a pastime called Science. This the application of logic (the self-defining reasoning process in Nature), to Nature. This self-examination in itself has the limitation of the manifest in attempting to describe the un-manifest."

From 17 July 1996 "**The Absurdity of Knowledge**: "The Absurdity of Knowledge relates to the fact that Knowledge is an interpretation of reality. What was known to be true at a certain time can be replaced with 'new' knowledge resulting in a different interpretation."

From 6 August 1996 "**The Experiment of Existence**: "Is God an a priori condition for the existence of reality? What is prior before prior? The cosmic primordial field exists because it exists. I

am because I am is the first statement of God. God is exploring the inner anatomy of himself. Dive deep into the sea of mind and find the gem of love."

And in an article dated a few months before his passing, 27 July 1997 "**Physics without DePalma**" concludes, "Science without philosophy is as empty as philosophy without science... The best instrument for the exploration of this question is the human mind... I didn't make it this way, I found myself here. Awakening on the sandy beach of time, which pretty pebble shall I pick up."

For more information on Bruce DePalma's work and legacy one may contact Andrew Mount [andros@peacenet.org](mailto:andros@peacenet.org), who was DePalma's assistant for the last decade of his life, is a trustee of DePalma Institute, and one who is continuing to archive DePalma's numerous papers on the "Primordial Energy" website <http://www.depalma.pair.com> whose introduction states "We designed this page to disseminate knowledge and accurate data relating to the Pre-Existent Primordial Field of the Universe - a sea of 'free energy' which permeates all. The N-1 Homopolar Generator -- invented by Bruce DePalma -- is an example of the type of device which is able to "plug in" to this Free Energy and eliminate the "need" for the continued use of fossil fuels and the consequent destruction of our only home - Earth. This device - and many others like it - have been proven to possess "over-unity" characteristics, i.e.: the power output is more than 100% of the input. It is our hope that in the near future Free Energy will enable mankind to progress from a state of dependence to one of abundance."

Among the yet-to-be-posted papers in this site's listed bibliography is a letter from the US Department of Energy, 9 May 1978, acknowledging their receipt of the N-Machine diagram. On page 57 of the US DOE Comprehensive National Energy Strategy of 1998 it mentions, in the section summarizing public comments, that "One commenter recommended that the DOE look into zero-point energy and mentioned a specific device for harnessing this energy source called the "N" machine. He challenged the Secretary of Energy to fully investigate this technology and let the American public know about it."

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# SUMMARY

# Extraction of Electrical Energy Directly from Space: The N-Machine

## Introduction

The extraction of energy directly from space has been suggested as a viable process for the solution of the energy problems of society. The accessibility of this energy has been limited by the necessity for the formulation of new energy paradigms. In the past, energy in space has been suggested by thoughts such as Orgone, Od, Prana, Bio-cosmic, Neutrino energy sea and so on, but the useful extraction of such energies has always awaited more explicit formulations of these ideas which could suggest the construction of simple practical energy extraction machinery.

## Variable Inertial Mass

Experiments performed by this author have suggested a picture of space which is perfused with a "fine substance". This concept is one which lies between the ineffability of a space-time construct such as Einstein and the tangibility of gross matter. The important part about this "fine substance" is that it is shown that this substance confers inertia on physical objects. The substance of inertia can also be shown to have the property of polarization.

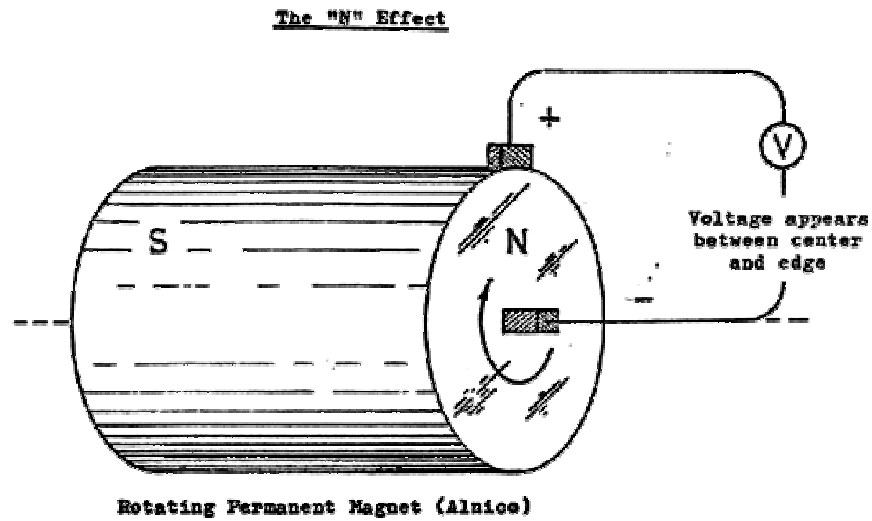
Normally the inertial mass of an object is anisotropic --- that is to say, an inertial measurement performed by applying a force vector to the object and measuring the resulting acceleration; the inertial mass obtained in this measurement would be a constant independent of the direction of the applied force vector. The important discovery is that the inertial mass of a rotating object becomes polarized and anisotropic --- in terms of the real behavior of a rotating object the inertial mass is found to increase for measurements performed in the direction of the axis of rotation, and perforce the inertial mass is found to decrease for measurements made in the direction of the plane of rotation. Complete inertial polarization of the rotating object takes place when the inertial mass taken in the direction of the plane of rotation of the test object decreases to zero with increasing rotational speed.

## The "N" Effect



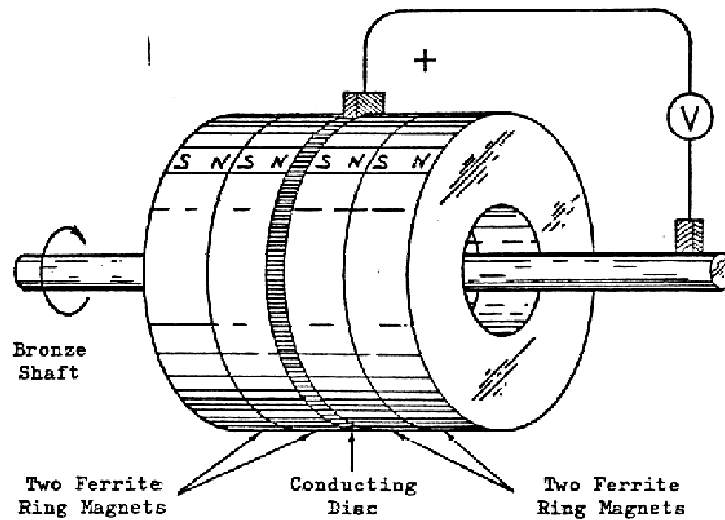
The interesting combination would be to combine the effects of inertial and magnetic polarization for the extraction of electrical energy directly from space.

Figure A: N- Effect



With reference to the two diagrams, Figure A and Figure B, the "N" effect is demonstrated quite simply. A cylindrical bar magnet of alnico or other magnetized electrical conductor as shown is rotated around an axis passing through the two magnetic poles and perpendicular to the polished pole faces as shown. What is found is a cylindrically symmetrical electric field is established within the magnet through rotation. Electrical current is simply extracted by placing the probes or sliding contacts of the appropriate ammeters and voltmeters, one on the axis of rotation and the other on the outer surface of the rotating magnetized conductor.

Figure B: N-Machine



## The "N" Machine

In order to make full use of the current capabilities of an N generator and to accommodate the use of non-conducting "ferrite" permanent magnets or electromagnets, an N-machine is constructed as in Figure B. The N-machine utilizes a copper or bronze conducting shaft and disc and ferrite ring magnets cemented together as shown. A typical machine constructed with ordinary loudspeaker ring magnets of dimensions o.d. 2-7/8", i.d. 1-1/3" and 1/2" thickness, two of each epoxy-cemented on either side of a conducting disc 1/8" thick, delivers 30 millivolts at 3450 rpm. The field strength of the magnets as supplied is about 1000 gauss. The current obtainable from the machine is limited only by the resistance of the leads and sliding contacts. Since the aforementioned 30 mv can be developed across a heavy copper wire shunt of resistance less than .001 ohm, a current in excess of 30 amperes is developed by this simple toy.

Electrical energy developed out of centrifugal extraction of the electrical positive and negative poles from the free energy field of space is supplied in useful and controllable form from N generators which are scaled in order to supply requirements. Experiments show the voltage polarity depends on the sense of rotation. Output voltage goes directly as speed and magnetic field strength. Geometrically the output voltage increases as the square of the machine radius,  $r^2$ .

## Discussion

It was in the 1830s that Michael Faraday working in the basement of what is now the Royal technical College in London, discovered that a conducting disc held between the poles of a magnet with the lines of force perpendicular to the surface, would generate current if rotated and the current extracted between the center and the edge of the rotating conducting disc.

Conversely, if a voltage were applied between the center and the edge of such a disc it would rotate as a motor. These effects are presently known as the Faraday unipolar dynamo and Faraday motor respectively.

If Faraday had rotated the whole combination, magnets and disc together, he would have discovered as this author did in 1977 that the voltage output remained constant regardless of whether the disc was rotating independently of the magnets or not. Of course, if Maxwell or Faraday had known of the "N" effect, things would have been different. But it is probably true that such a discovery had to wait until the availability of strong, lightweight permanent magnets, a development that didn't take place until the 1930s.

What is important about the N machine is that unlike a conventional generator which exhibits a rotational drag when current is drawn, an N generator exhibits no such drag. All of the currently used electrical generation rotating machinery has the property of being both motors and generators simultaneously. That is to say, an electrical machine which is used as a generator will operate as a motor when excited with the appropriate voltages and currents. With the foregoing in mind, we interpret the situation as follows.

In the conventional electrical power generation system we have an electrical generator coupled to an engine of some kind which supplies mechanical power which is interpreted in accord with present understanding to be converted from mechanical to electrical energy with a conversion efficiency not to exceed 100%. If we were to suppose however that that the energy obtained was extracted from some heretofore unsuspected property of magnetism; then it is simply apparent that the slowing down of the drive engine is due to the "generator" having the aspect of a motor also, and that is the slowing of the drive engine with electrical load is simply the effect of the motor aspect of the generator energized by the load current. The generator being a motor also elicits a

torque output in opposition to the drive engine torque. This is why an engine-generator combination slows down when an electrical load is thrown on the generator.

An N generator is only a generator and does not possess the dual aspects of presently used machines. Electrical loading of an N generator produces an internal torque between the conducting electrical disc and the attached ring magnets. However, since they are firmly cemented together, this torque cannot escape from the machine and load the drive motor or engine. Thus the N machine is a non-reciprocal machine, which, if a voltage were applied to it in the fashion of motor excitation between the center and the edge of the conducting disc, no motor action could result since the generated torque is constrained within the body of the machine.

### **Directions for Future Work**

The discovery of a new physical phenomenon, the N effect, which relates phenomena of magnetism, inertia, and rotation together in a new machine for the liberation of electrical energy directly from space is a pregnant development of a new age in science which will energize the civilization of the 21st century. Although many ideas may have suggested themselves in the minds of the readers of this information, I would like to suggest a few possibilities which have occurred to this author in the time that he has been working and experimenting with N generators of various kinds.

1. Control of Very High Currents at Low Voltage: Simple calculations will show the N generator to be characterized as a very high current, low voltage electrical generation machine. For the sizes and rotational speeds normally associated with conventional automotive or electrical traction purposes it is easy to show that voltages of up to 100 or so vdc can be generated at currents limited only by the brush technology and the machine internal resistance. Standard texts detail methods whereby high currents have been conducted through liquid conducting metal electrodes. In this fashion, currents of 50,000 amperes have been conducted from Faraday unipolar generators for the excitation of ultra-high field strength magnets for physical experiments (Francis Bitter Magnet Laboratory Publication, MIT, Cambridge, MA).

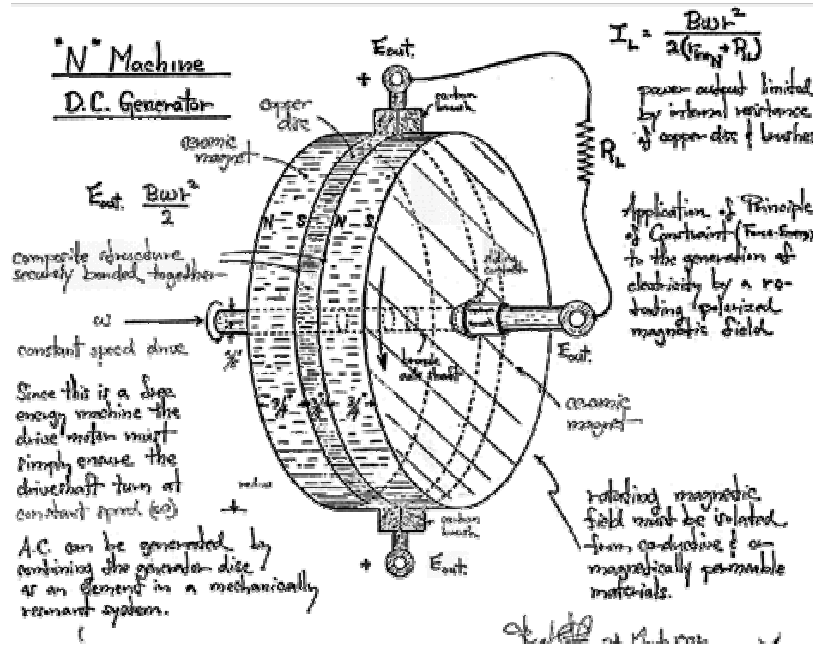
The important fact about the N generator is that once the appropriate brush technology has been adopted for the ultra-high currents, the control of the voltage becomes very simple. The N generator is constructed as an N machine with the permanent magnets replaced by a pair of electromagnets on either side of the conducting disc. Excitation of the electromagnets can vary the N generator output from zero to full in either polarity. Thus a current of thousands of amperes can be controlled in voltage and polarity by a few amperes or less of excitation current necessary to saturate the electromagnets in the chosen direction of magnetization.

It is easy to see that an operation is possible if the electromagnets are built of laminations stacked in a cylindrical build with the direction of easy magnetization parallel to the axis of rotation of the machine.

2. Self-Contained Power Generation Systems: Since the N generator can generate many times the power needed to overcome bearing friction, windage losses and frictional losses in sliding contacts, the N generator can be combined with an electrical drive motor forming a self-sustaining combination. Reflection will show the appropriate motor for such a purpose is a Faraday motor; a simple copper disc rotor between the poles of strong field magnets. The ultra-low voltage, high current characteristics of this machine combine perfectly with the low voltage, high current output of the N generator. Such a combination, an N generator on a common shaft with a Faraday motor, with the motor excited with a fraction of the generator output regulated through an appropriate series resistor (to prevent machine speed runaway) forms a power generation system. The basic

power generation system then consists of a self-sustaining combination of N generator and Faraday motor which provides a mechanical and an electrical output.

Figure C: The N-I Power Generation System



An interesting line of development begins here since once the basic power generation system is constructed the mechanical output can be used to drive conventional generators – which may be to some advantage since these machines are presently articles of commerce and can deliver higher output voltages than the basic dc generator. The point of all this is that once the free energy is liberated from space and converted into rotational form by a combination N generator-Faraday motor, the resultant energy is directly applicable economically, and with known conventional technology and machines.

3. Inertial Guidance: The N generator concept of the direct centrifugal extraction of the electrical poles from the spatial energy field has direct application to the field of inertial guidance. It is not necessary to have sliding contacts if the N generator is to be used to sense  $do/dt$ . Wires can be soldered to the ends of a diameter of an N generator disc and a voltage obtained between the two diametrical ends connected together and at the center. The polarity of this voltage will reflect the sense of rotation and its magnitude will be proportional to  $do/dt$ . Appropriate integrators on the output of a 3-axis combination will provide all the information necessary for an inertial guidance system replacing cumbersome mechanical gyroscopes spinning at fantastic speeds together with excessively sophisticated and expensive ancillary mechanical and electrical instrumentation.

## Conclusion

The powerful physical principle resulting from the interaction of rotation, inertia, and magnetism, for the liberation of unlimited controlled energy directly from the energy medium of space, the N effect, opens the door to the continued social development of a society freed from the limitation of the present energy conservation paradigm.

Freedom from the limitations imposed by the present formulations, the so-called Laws of Physics, is important since it allows the upward spiraling of free thought which eventually expresses itself in new forms of machinery. In terms of 1979 science, it is an unexpected pleasure to be reminded that the present closed system of equations of electricity, Maxwell's equations, do not represent all there is to know about electricity and magnetism.

The Laws of Thermodynamics and the so-called conservation of energy relationships are 150 years old. Of course, the discovery of the inertial anisotropy of rotating objects taken together with new information this author has elicited regarding the elastic collisions of rotating objects impacting on identical non-rotating controls – free energy is liberated in the collision of a rotating object with a non-rotating one [sic]. New information such as this imposes new degrees of freedom in the thermodynamic interactions of colliding atoms and will help explain much of the anomalous new information which is being accumulated in the present search for more “efficient” ways of liberating or extracting energy from Nature.

A thorough intelligent analysis of the N generator will show that to produce any voltage whatsoever, such a combination of magnets and a conducting disc in rotation as shown, invalidates the physical interpretations of Newton and Einstein, special relativity and general relativity. The loss of these ideas I do not regard as a terribly great tragedy since in their overcoming we shall eventually perfect the anti-gravity space drive and will send humans to the stars. In this short paper I can only suggest some of these ideas.

Closer to what is at hand, I would like to suggest that the presently conceived ideas regarding the operation of the magnetron radio frequency transmitting tube can be re-examined in the light of the N effect. In such a tube a rotating disc electronic cloud excites a series of resonant chambers around its periphery at microwave frequencies. The very high power microwave impulses obtained in this way form the basis of radar transmitters in current use.

Interpreting the magnetron operation as a higher order property of the Faraday unipolar dynamo, we can suspect that we might be able to obtain an excitation of a series resonant LC circuit connected between any two separate points on the periphery of a rotating N generator conducting disc. For most of us who have spent our lives in the conventional applications of electricity and electrical rotating machinery, it may be enlightening to obtain alternating current in this way. What is important is, anyone can say that a certain formulation or set of ideas is invalid, i.e., the Einstein geometrical interpretation of space. The important thing is what we have to offer in terms of new machinery, i.e., free energy or anti-gravity to substantiate new ideas.

Experiments performed by this author have obtained 2-3 millivolts ac (p-p) generated in this way employing a 1 microfarad capacitor in series with the appropriate inductance to obtain a resonance between 100 and 600 cps. In consideration of the utilization of this effect for the generation of megawatt power levels at power line frequencies (60 cps) the size of the components becomes important since a resonant circuit must be employed in conjunction with the N generator. The L and C elements would have to be fabricated to reach the megawatt power levels with suitably low internal impedance. Such limitations do not appear to assert themselves at the magnetron

operating frequencies, so the possibility of the liberation of megawatt power levels of microwave power radiation from an N machine in a UHF cavity suggests itself.

Without becoming prolix it is interesting to consider all the ramifications of the electricity which originally was known in the Galvanic wet cell or the lightning arrestor. Now pictures are sent through the "air" (television), and sound is recorded (magnetism). Many other things are done. We live in an age where the conceptualization of such a development has taken place in many fields. Thus there is some basis for understanding of the possibilities which can result from the evolution of a new basis of understanding. With this in mind, I have tried to indicate what some of the thoughts I have had that have led me to in consideration of the newly discovered inertial anisotropy of rotating objects and the interaction of magnetism and rotation, the N effect.

# EXPERIMENTS

(17 March 1977)

## **Gravity & The Spinning Ball Experiment**

### **Introduction:**

The spinning ball experiment consists of the observation of the interaction of gravitational and inertia forces on a rotating material object.

In the interaction of material force on a rotating physical object, four experiments are possible:

- 1) Inertial forces acting on non-rotating material objects in field-free space;
- 2) Inertial forces acting on rotating material objects in field-free space;
- 3) Inertial forces acting on non-rotating material objects in a gravitational field;
- 4) Inertial forces acting on rotating material objects in a gravitational field.

### **Discussion of the Experiments:**

In experiments (1) and (2), we would expect the normal inertial forces summarized by Newton's Laws of mechanical motion. In experiment (3), there is reason to believe there will be (supported by experimental evidence), a slight enhancement of inertia by the gravitational field. The cases of experiments (2) and (4) have not been adequately treated in the literature.

### **Behavior of Rotating Material Objects:**

Certain theoretical considerations justified the belief by the author that the mechanical properties of objects would be altered by rotation and that this would be the basis of the gravitational interaction. A series of experiments has been carried out supporting this basis of action. The report of some of these experiments has been appended to this theoretical dissertation. The results will be presented here.

- 1) Experimental evidence supports the fact that a rapidly rotating material object will gain in inertia.
- 2) The form of the gravitational interaction is that the additional inertia property, of rapidly rotating real material objects, represents an additional repository for the extraction and supplying of work from or to a gravitational field. This means a rotating mass will fall more rapidly (with greater acceleration) than a corresponding no-rotating object under the influence of a gravitational field.

### **Form of the Gravitational Interaction:**

The complete description of physical phenomena depends on the result of many experiments. Together with the behavior of the spinning ball experiments, there is another series -- force machine pendulum experiments -- which have been reported elsewhere. Basically the phenomena reported here are summarized by these results:

- 1) A force machine pendulum, i.e., a pendulum composed of two identical flywheels contra-rotating, for the cancellation of gyroscopic forces, swings with a period slightly increased over that

of the non-energized force machine. This indicates a net increase in the inertia of the rotating system.

2) The swinging of the energized pendulum is non-sinusoidal, with a foreshortening (flattening) of the peaks of the swings.

3) Mechanical energy of motion, stored in the created inertial property, od, appears as an inertial field. This inertial field has the property of conferring inertia on surrounding material objects -- and a reduction in the frequency of oscillating electrical circuits placed in the vicinity of the energized machine.

When we examine the behavior of the spinning ball in relation to the above phenomena we can extract the following behavior.

When the spinning ball is thrown upwards it leaves the cup with some vertical velocity  $v$ . In order to attain this velocity the spinning ball had been accelerated vertically prior to the time of leaving the cup. Acceleration of a rotating material object requires greater energy than a corresponding non-rotating one since some energy is supplied to the od field. When the spinning object leaves the cup, the kinetic energy of motion is divided between the  $1/2mv^2$  of the "real" mass of the object, and the energy stored in the created inertial property, od. The sum of these two energies allows to attainment of a greater height reached, in the doing of work against the gravitational field, in comparison to a non-spinning object moving with the same initial vertical velocity.

When we examine the behavior of the falling non-spinning object versus the spinning object, we notice the spinning object falling faster (with greater acceleration).

We infer that the behavior of the falling non-spinning object, falling in accord with Newton's Laws, is a special case of the motion of objects in general. The more general case, involving rotation, is obscured by the gravitational interaction.

We would expect, if we could increase the inertia of an object (through rotation or by some other means), that the object would fall more slowly in a gravitational field. Let us consider however that while a conferred inertial property, od, would reduce the acceleration of a given body acted on by a given force in outer space, in the presence of a gravitational field, the conferred inertial property would be an additional mechanical "dimension" for the extraction of energy from the gravitational field in falling. Conversely, enough energy could be delivered from this "dimension" to cancel, or overcome, the mechanical energy extracted from an object raised in a gravitational field.

On this basis we may write:

$$\text{For the spinning ball: } mgh = \frac{1}{2} m_o v^2 + K_{od}v$$

$$\text{For the spinning ball falling: } \frac{1}{2} m_o v^2 = \frac{1}{2} m_o v^2 + K_{od}v$$

In a strict sense, the precise application of Newton's Laws would have to be restricted to non-rotating mechanical objects in field-free space. In a gravitational field, the possibility of extraction of greater energy by a new mechanical dimension opens the possibility of an anti-gravitational interaction. In a rotating force machine, od energy can be supplied:

$$\text{Driven force machine: } mgh = \frac{1}{2} m_o v^2 + K_{od}w^2$$

Where,  $w$  is the angular velocity of the force machine drive axis.

Here is the possibility of the conversion of rotational energy to work done against the gravitational field. What is not determined at this point is the necessary increment of energy required to neutralize the weight of a given object, viz., it might take 1.1 foot pounds of work to lift a one

pound object one foot. The incremental field necessary to establish neutral weight, or the hovering condition, represents the inefficiency or lack of perfection of a real force machine. The important fact is the establishment of the od field as the mechanism for a mechanical interaction with the gravitational field, in addition to the mechanical interaction expressed as Newton's Laws of the falling non-spinning mechanical body.

### **Interpretation of Physical Laws:**

The fact that Newton's Laws do not distinguish between the spinning and the non-rotating object represents the state of mechanical knowledge at the time. But because Newton did not distinguish between rotation and non-rotation, Einstein did not distinguish between the so-called inert and "gravitational mass". The fact that rotation affects the mechanical properties of objects paces Newton's Laws as a special case and invalidates a geometrical interpretation of space.

Many questions have been asked about the nature of the gravitational-rotational interaction and its theoretical prediction. Basically the theory can be looked at in the following way. If we consider a force, such as that engendered by the action of the gravitational field on a non-rotating real object, we find we can make a measurement of that force on what we know as a scale. If we examine the reading on that scale, say one pound, we can conduct our examinations to that degree of accuracy where we can reach uncertainty, i.e., 1.000000000???. It is not clear at that point whether the uncertainties in the measurement are due to properties of the experiment, or that which is being experimented upon. The level of causes and effects, uncertainty.

If we consider the results of any experiment we find this phenomenon.

If a real material object is rotated, it is found that within the body of the object are manifested the centripetal forces of rotation. If we consider a measurement of these forces we could find the same defect, that is, the measurement could be made precise enough to reach the noise level, i.e., causes and effects, and it would not be discernable whether the fluctuations were being caused by the experimenter or that which is being experimented upon. This level is the level of defect of forces and represents the connection between rotation and gravitation. Once there is established a connection, the transfer of energy follows a controllable orientation, viz: the spinning balls falls more rapidly because such an object can extract more energy from a gravitational interaction than can a normal one, and as well, the storage of energy in a force machine as an od field results in direct application of this energy to do work against the gravitational field and provide lifting force.

The concept of defect (of a field or force) was originally elicited epistemologically, forming the basis of the author's theory of Similarity, a theory of Reality based on the properties of measurement.

What is considered is the real properties of the level of causes and effects. What this represents physically as a form of inertia and a connection between rotation and gravitation. The "connectivity" of defect and the other real properties of inertia fields is better left to discussions to begin with the data presented herein. The theory's more properly left to the serious students of these ideas. As apprehension of the theory of Similarity necessarily entails the dropping of certain restrictions on the mind of the experimenter.

What can be said is this:

In the further refinement of the art of physical conceptions, there are certain points reached, wherein it is in the proper ordering of things to drop certain concepts when they have reached the end of the usefulness. In the search for the gravitational interaction, we have long been hampered by

the erroneous equation of inert and gravitational masses. We could better say: force is an element in the performance of two separate experiments -- the force of gravitational attraction of a test mass, and, the force necessary to cause a test mass to accelerate at the same rate at which it falls.

Now that we have distinguished between the inert and gravitational mass by means of rotation, there are two principles involved:

- 1) The connection between all experiments through the mechanism of defect.
- 2) The resolution or distinction of experiments, one from another, on the basis of differing procedures. There is no basis to believe that two experiments involving a common element (ingredient) have any basis to be comparable in their results, viz., the particle and wave hypothesis of light. It is also reasonable to suggest that we not apply mundane concepts of "size", "weight", "mass", "spin", "sign", etc., without precise explicit reference to the experiment being performed. Since many of the ideas we have about "matter" are conditioned by the models we construct, we may have reached a point of development where the "model" as a concept may have to be discarded.

It is not inconceivable to this author, to regard physics as a collection of experiments, some of which may involve one or more common elements. No one experiment ever gives the results of another separate and distinct experiment. Thusly stated:

A different experiment gives a different result.

We can see that to take the common element of two distinct experiments, that is to take force, and then take the results of the experiments and then equate -- having found them "equivalent" -- such a dilemma can only resolve itself in a curvature of geometrical representation of space. In final analysis, the invariance of physical laws is replaced as a concept by defect, a real property elicited by the spinning ball experiments, and which now replaces the invariance of physical laws as the unifying concept of all experiments.

[Editor's Note by R. Nelson: Consider also N.A. Kozyrev's experiments with time = od = defect]

(3 May 1977)

## Understanding the Dropping of the Spinning Ball Experiment

The beginning of this author's work with rotating objects began with moment of inertia measurements of constrained gyroscopes undergoing forced precession. The increased moments of inertia discovered for precessional motion were translated into a series of measurements on pendulums with rotating bobs. Although the discovery of the inertial effects associated with precession and pendulum oscillations were highly suggestive, this author greatly resisted attempts to force him to drop a rotating object for two reasons.

Firstly, he had no reason to be able to predict the motion of a freely falling object on the basis of the inertial alterations he had measured which had concerned themselves with constrained situations of rotating objects. Second, there was no reason to expect inertial alteration to affect the rate of fall of a released object, and there was no available theory which could in any way be applied to the situation of a falling object in a gravitational field. This is a situation known in religious terms as a "leap into the dark".

Since the author and his assistants are experts in the application of stroboscopic lighting techniques to the study of high speed motions, the first experimental cut at the situation was to photograph the trajectories of a steel ball bearing rotating at high speed together with an identical control object moving at similar initial velocity. The result of the experiment was so startling and anomalous as to have taken me 5 years to understand.

The original results of our experiments were circulated as a report in 1974 (Ref. 1). Two years later, the experiment was published in an appendix to a book of Christian exegesis (Ref. 2). In 1977, one of my former students performed a high precision verification of the dropping of a rotating object: "The Gyro Drop Experiment" (Ref. 3). Actually, the experiment has two parts, the spinning ball going up, and the spinning ball falling. Since I would rather be thought a fool than misrepresent results of experiments, I only attempted to analyze the portion of the experiment I thought I understood. Basically, the spinning object going higher than the identical non-rotating control with the same initial velocity, and then falling faster than the identical non-rotating control, presents a dilemma which can only be resolved or understood on the basis of radically new concepts in physics -- concepts so radical that only the heretofore un-understood results of other experiments (the elastic collision of a rotating and an identical non-rotating object, et al.) and new conceptions of physics growing out of the many discussions and correspondence pertaining to rotation, inertia, gravity, and motion in general. We should remember the pioneers in this field: Wolfe, Cox, Dean, Laithwaite, Rendle, Searl, Kummel, DePalma and Delvers, to name but a few.

In the beginning, I developed the concept of variable inertia to explain the behavior of rotating material objects, but variable inertia in itself contravenes the laws of physics in the sense of contravention of the laws of conservation of mass and energy. Of course, the destruction of one thing is interesting, but of course this is in itself not a creative act and does not take us any closer to the truth.

Because man is so interested in the universe, and the motions of the universe depend so much on gravity, the study of gravity takes us to the deepest foundations of human thought. I think it is a mind-bending experience to see every stone fall at the exact same rate as any other stone. And when you spin an object, why does it fall faster? And most mind-boggling of all, why does it go higher than the identical non-rotating control released to go upward at the same initial velocity? Of course, the experiment could be wrong, but also perhaps we could develop a hypothesis which would fit all experiments.

We know that when we can alter the properties of mechanical objects, i.e., change their inertia, we have contravened the conservation of energy because we have associated the properties of an object with the space which contains the object. The space which contains the object also contains energy and we can go at the project in two ways: we can attempt to extract the energy without worrying where it came from, or we can attempt to understand physics, ourselves, and the universe by a new formulation of reality.

Part of the difficulty of accepting free energy is the feeling that we're getting something for free, and that automatically makes it suspect. On the other hand, however, we can accept what we know as "energy" as something which is a natural part of our environment and can be reached if we have the key.

Most of the difficulties in the location of this energy lie in the comprehension of where it's coming from. If this can be comprehended, then the understanding of the free energy experiment can be believed.

When reality came into existence, the time energy of the Universe was concentrated into a single form, the exactitude with which a single atom gave off a beat of frequency when excited as a spectral line. We have come to regard this as the only way of measuring time. The true way of measuring time is in the inertia of objects. Thus, a tuning fork watch or oscillator is a more natural way of measuring which can only exist and not be measured. In the case of Time, we can know the existence of it, but for whatever measurement we take to be indicating it, we make our own determinations as to whether this measurement is more suitable or "accurate" for our purposes (we might prefer a crystal clock to a tuning fork, but for what purposes or measuring is this "time" being used?). If, for instance, we were interested in inertial processes, i.e., the motion and the orbits of the planets, and we knew these were sensitive to inertial influences, we might consider a "time" which was also sensitive to these inertial influences to be more "accurate" than a time derived from another experiment which might have no relationship to the phenomena of importance.

Time is a manifestation of a much deeper and basic force that we have a concern for here. The point of connection I want to make is: the inertia of objects relates to the time energy flowing through them.

The rotational quanta drawn to a rotating body induce in that body a feeling of inertial anisotropy as well as increased inertial mass. Could this "mass" be thus somehow translated into energy for mass consumption? The first indications of that came when we dropped our spinning ball experiment, but we were unwilling to interpret the increase in energy of a spinning to a non-spinning object dropped to fall over a controlled distance to some kind of energy principle we did not understand.

We also had a second series of experiments, elastic collisions of rotating and non-rotating identical controls which we could not interpret. It took a paper, "The Cause of Gravitation", by Bernard Rendle (Ref. 4) to jar my mind into comprehension of the facts as I saw them. We can only conceive of the inertia of objects, or inertial mass to be exact, to be representative of the time energy created when the Universe was created. Naturally the question of how old is the Universe becomes invalid then because a possible interpretation is that the Universe existed forever because inertial mass exists at all. Measurements of the age of the Universe are also invalid. All the time in the world is summed up in the inertial mass of an object.

How this relates to the spinning ball experiment is that the spinning of an object draws to it the quanta of inertial motion of rotation which are accumulated in the body of the flywheel and account for the altered inertial properties of the rotating object. These inertial quanta,  $R_0$ , draw the time energy to themselves in proportion to the number of them present in the flywheel at a given time. If a rotating object is collided with an identical non-rotating one, the non-rotating object is rebounded a greater distance than it would have traveled if it had been struck with the same identical

object non-rotating. A rotating object struck by an identical non-rotating object rebounds less than it would had it not been rotating (Ref. 5).

This explains why the spinning ball went higher than the identical non-rotating control (moving at the same initial velocity), and also explains why the spinning object falls faster than the non-rotating control. The momentous fact is that there is no special interaction between rotation and gravity. The behavior of rotating objects is explained simply by the addition of free energy to whatever motion the rotating object is making. The spinning object goes higher and falls faster than the identical non-rotating control.

I like the understanding of inertia growing out of the statement of Rendle: "The immaterial medium of space itself is in motion". If we dispose of any special connection between rotation and gravity, the constancy of "G" then becomes the inertia of objects. The fact that all objects fall at the same rate (earth normal acceleration) means that the substrate space is moving all objects along at the same rate. This we can define as Earth normal standard inertia, a unity factor to which all other conditions are compared. Thus rotating an object does not change its inertia (under the new standard) since the mechanical alterations in behavior of rotating object do not affect their inertia but are the result of the additional (free) time energy flowing through the rotating object by virtue of its accumulation of rotational quanta, Ro.

The question to be answered: is there any gravitational effect from rotation, or is gravitation a special interaction of mass with its environment? I would tend to believe gravitation is a special interaction of real mass with its environment. This is not to say that artificial gravitation fields cannot be created, but they would always be distinguishable from the real thing through some physical test. An artificial gravitational field would be non-isotropic and anisotropic.

In terms of the dropping of the spinning ball, the understanding of the experiment involves the results of many other experiments as well as the resolution of a mind picture of the Universe which is our best approximation to understanding at the present time. What makes it difficult for other experimenters to understand the experiment is that it is not simply the results which are important. Without a theoretical foundation of understanding to make the experiment comprehensible -- to fit the results into a context of rational understanding and harmony with the facts of other experiments -- the data become trivial and worthless and, worst of all, subject to misinterpretation.

The availability of free energy from as simple an experiment as colliding in a rotating object with a non-rotating one opens up the development of other machines for energy extraction and propulsion which may be more convenient to handle than the extraction of energy from the collision of a rotating object with a non-rotating one.

6 August 1996

## The Experiment of Existence

Is God an a priori condition for the existence of reality? What is prior before prior? The cosmic primordial field exists because it exists. I am because I am is the first statement of God. "The T.V. screen is the retina of the mind's eye." God is exploring the inner anatomy of himself. Dive deep into the sea of mind and find the gem of love.

By approaching that which we seek we lose the sense of reason and bewitch our minds. The circle is closing and we are no further ahead. God is power and with power you have no choice. The endless bargain of infinity turns us round again.

For the sake of argument we must assume that consciousness in Nature is the essence of the mind of God. The why of the why, the sine qua non. This reminds me of the Platonic dialogue where, Socrates demonstrates the existence of geometric forms, a priori, i.e. square, circle, triangle in the mind of the student, - without the necessity for the existence of written diagrams. Socrates shows certain geometric forms are innate in the mind, preordaining the written diagrams.

So we must accept the natural elements which are given to us as the building blocks of our world. I would rather serve in Heaven than rule in Hell. I accept the concepts given to me as the elementary constructions of the mind. God is trapped in his own existence as no mere mortal can imagine. Why is this true? I have no answer to this existence.

This presupposes I am God; but I am God. There is no separation from God for God and his existence go together. If God were separate from his existence a new interpretation would be possible and offers interesting possibilities.

Something from nothing is only a creative concept, it tells us nothing about the existence of reality. The best the creative thinkers of this world have been able to come up with, and I include myself in that category, is that the cosmic primordial field cannot be deduced since the logical elements of deduction, i.e. words, are in themselves inferred natural elementary symbolisms. Since the basis of which we are arguing is in itself a logical interpretation we are on shifting sands and our thoughts become indeterminate, undefined.

Logic is a self-justifying system, circularities and tautologies are it's only result. Consequently nothing can be proved by logic alone. The Universe we exist in exists because it exists.

The same can be said for the cosmic primordial field. The question is not whether we have to posit or deduce because it is not in the province of logic to be able to arrive at the truth.

Truth can only be determined by experiment. The experiment of existence is something even God cannot try. Because God is the subject of his own experiment. The fact that this conversation is going on at all is because God is not the only concept which fills the Universe. There is the imperfection of God which makes man question his own desires.

17 July 1996

## The Absurdity of Knowledge

I have always been interested in physics. When I went to school in the 60's I was fed the "standard interpretation" of physical phenomena. I came to believe or accept the ideas presented in the University and the interpretations thereof. My mind was blown out after my initial student induced 'pot' experience. I discovered as a direct perception that the flow of time was not Universal.

From this it was but a short time before I began to doubt the axioms and truisms of science. I sensed that if the Universality of time was an incorrect doctrine, all other scientific reasonings dependent on it were also flawed.

Of course one always searches for a "critical experiment" to prove or disprove a scientific thought. For those of us who interest ourselves in altering Reality there has to be a critical experiment which changes everything. Does the photon divide itself before the double slit experiment -- so that one half goes through one slit and the remainder through the other? If in the performance of an experiment we create a contradiction, does Reality come crashing down? Maybe only in our heads since the map is not the territory and we can dream-up anything we want.

For those of us interested in The Pure System, this is a waste of time since it does not address the problem of survival. If we are trapped within a system of logic there is no way out unless we recognize certain things cannot be done, i.e. Free Energy, Anti-Gravity, Space Travel, etc., are implicitly excluded. How do you break the spell, the fixation of humanity on conservation, the dividing up of the limited into the more limited. This book is not for everybody since nobody knows what is true. We must break the cycle of kindness and face reality.

Loosely returning to the plot. Does the Garden of Eden and the Tree of Knowledge represent true experience?

It may not be true but it does represent something, a wild idea about the nature of Reality, anything you want to think up and thump. In searching for a new experiment we wonder as we wander out under the stars. I think there are certain simple statements which can be made, i.e. we have discovered 92 natural elements whose ores precipitate in certain naturally occurring crystallographic groups.

We can say we have discovered three naturally occurring forms of motion, linear motion, rotation, and streptation. And that all presently existing physics books attempting to explain all motion simply as a combination of translation and rotation are wrong. And that might lead us into the insight that the newly recognized form of streptoid motion might have an experimental description altogether different from earlier mechanical descriptions of translation and rotation. Fundamental Laws: mass, inertia, action/reaction, and conservation would alter viz the earlier descriptions of motion generated out of the motion of non-streptating objects.

Any alteration in the conception of conservation will result either in a situation where all machines will become less efficient (theoretically) or will exceed the 100% efficiency level and become self-sustaining.

Once we have examined the theories of Reality we find they are all based on an assumption. The assumption is we can talk about something if we can convert it into something which we can understand. This is the Principle of Equivalence which says you can talk about what you don't know just as long as it is 'equivalent' to what you do know. Equivalence means there is no discernable test to distinguish between. The result of Newton's tests on linear motion do not apply to streptoid

motion. There are certain machines where there are no internal changes to indicate the flow of power through or from the machine.

The Absurdity of Knowledge relates to the fact that Knowledge is an interpretation of reality. What was known to be true at a certain time can be replaced with "new" knowledge resulting in a different interpretation. Peace can become war, and love can become knowledge. The truth is that we do not understand the nature of the world we live in. We can become what we want to become through the nature of our thought. Of course, that could return us to the Garden of Eden, but if we again become fascinated by the allure of the fruit of the Tree of Knowledge we expel ourselves from the peace of God's garden into the excitement of the growth and build-up of various civilizations. Each society is based on an interpretation. And when the limitations of that interpretation express themselves in an eventual de-vitalization of the society so generated, the civilization fails, and after an interregnum is replaced by another.

The point is that civilizations in themselves are based on certain interpretations of ideas. Eventual burn-out is because the map is not the territory. Perhaps this is an argument for a tribal extended family to replace 'organized civilization'. The basic question is: Do we want to return to the Garden of Eden? The basic injunction of Star Trek, "May you enjoy your Reality more than our illusions," still applies.

# ON THE NATURE OF

4 January 1994

## On the Nature of Electricity

*"Blessed be those who believe, yet have not seen." - Jesus*

It may be helpful to conceive electricity from a different viewpoint. The present theory of electricity is founded on archaic ideas carried over into modern expression. Association of the conceptualizations of electricity such as, positive and negative, electrical currents, with the work ethic; defective arguments based on analogies between electrical and mechanical phenomena and the smug "rationalization" of electrical laws with so called conservation laws, have undermined the vitality of electrical science. The hold of the conservation laws is so strong that further inquiries into fundamental electrical science are almost a dead issue.

A new viewpoint on electricity does not necessarily add to our knowledge, but it does form the basis for the rationalization of old information. The fact that the planets do not move in exactly circular orbits around the Sun, or the fact that the Earth is not exactly round does not prevent these ideas from being useful.

If we may be allowed to forgo the interesting speculations which may be developed out of the notions of positive and negative electricity and electrical currents and turn our ideas to the stars we may see that our conceptions of electricity would be more firmly founded if we could see electricity as an aspect of fundamental properties of the Universe as a whole.

The knowledge of science is gathered through observations of Nature. The fundamental polarity is male and female. It has been observed in energetic phenomena that maximum energy has been derived from the merging of the male and female energies.

It is not the purpose of this paper to justify or substantiate the foregoing. The truth is available to those who have eyes to see the truth and for those who have ears to hear the truth.

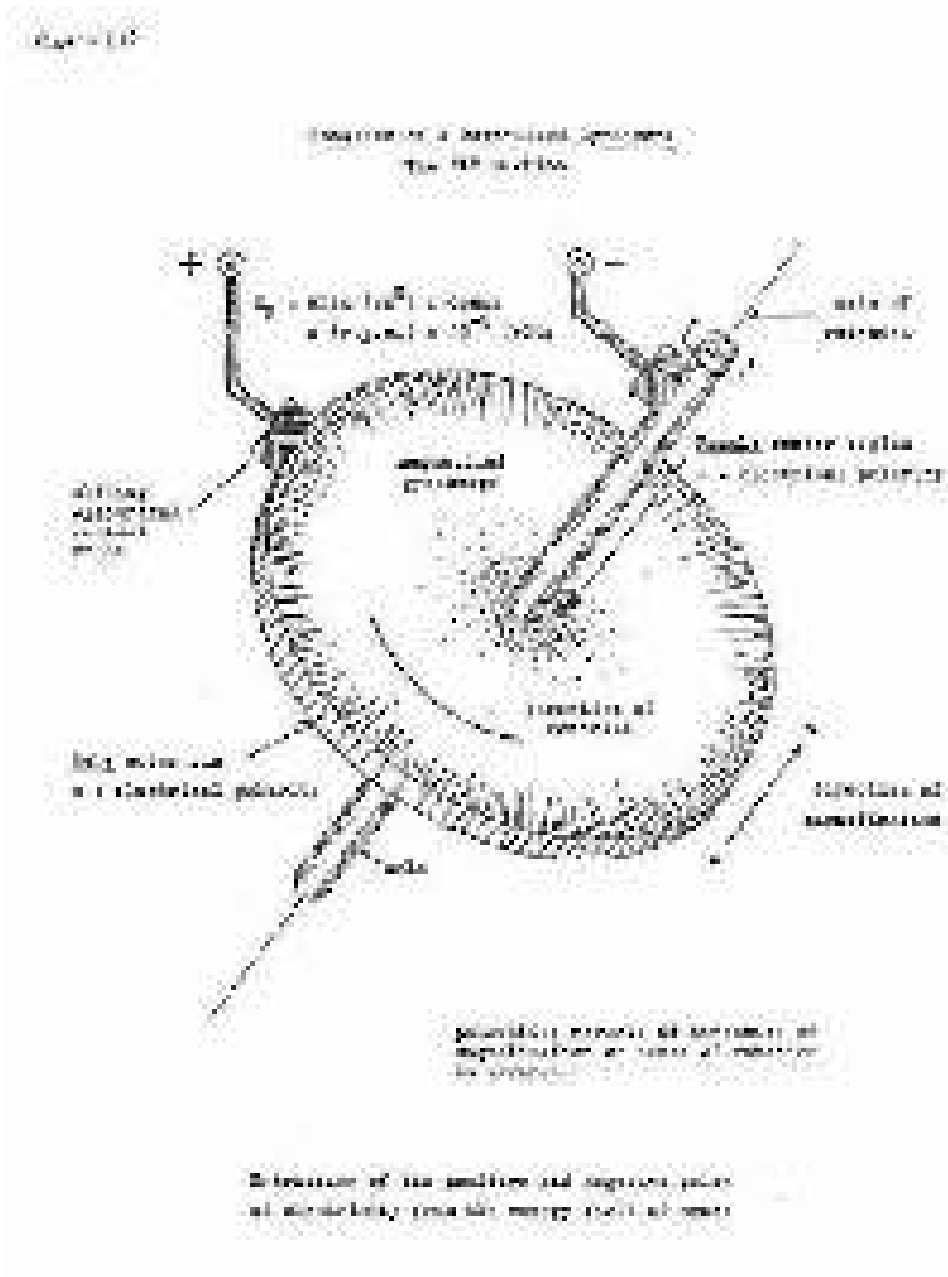
In the history of the development of the discovery of electricity it is interesting that the concepts of positive and negative were never associated with the idea of the fundamental male-female polarization observed in Nature.

Heat, which had always been seen as a phenomena of consumption, is not easily reconciled as being a concomitant of generation (of energy).

Patently preposterous statements about "energy" and the finiteness of its supply and its "convertibility" from one "form" to another are seen to be relevant to the coal fired era of the steam engine and to no other.

The idea of energy can be developed out of a conception of space which contains both male and female properties. The distortion of the homogeneous space represents energy and the self-same distortion elicits in tangible form the male and female spatial polarities.

The male and female polarities of electricity may be developed out of the properties of a magnetized rotating conducting disc. With the disc rotated by an axle the apparatus becomes a rotating magnetized gyroscope, (fig. 1).



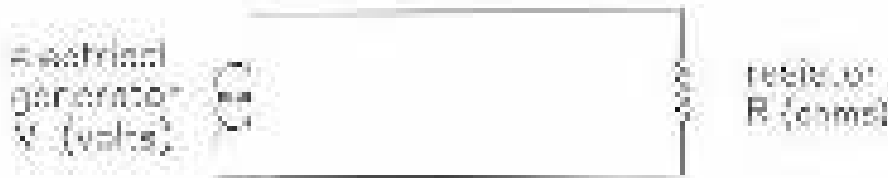
Mechanical rotation of a disc as shown elicits the fundamental mechanical polarities of motion and no motion, with respect of the edge and the center of the rotating disc to each other. The mechanical polarity of motion is designated male and the mechanical polarity of no-motion is designated female.

When the rotating disc is magnetized, one face north and the other south, an electrical potential is found between the center and the edge of the disc. One interpretation of the phenomena would be to say the male-female polarization of the disc superposed on the direction of the flux lines through the disc invokes the positive and negative poles of electricity from the universal spatial energy or primordial field.

The usefulness of an idea is the number of creative ideas it will invoke. The idea of the male-female polarization developed out of spatial distortion of an isotropic primordial field can reinterpret electrical phenomena.

Consider the following situations:

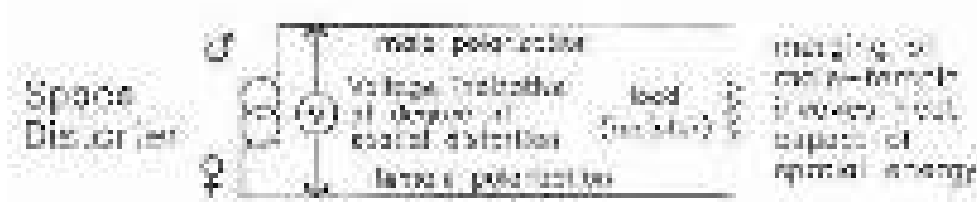
a) An electrical generator connected to a resistor.



The contemporary interpretation is that a generator of V volts connected as shown to a resistor of R ohms will allow a current of  $V/R = I$  amperes to flow and cause a heating effect in the resistor of  $V^2/R = \text{watts}$  to occur.

Applying the male-female paradigm we could also interpret the same situation, to wit:

b)



The idea of electrical current was probably suggested by the physical evidence of a spark when an electrical circuit is interrupted, and also by the thought of conservation. Obviously one had to do work to turn a generator which was propelling a current of quantized electrical charges, electrons, through a load. The heavier the load, i.e. the lower the electrical resistance the more current would be drawn.

The idea that an electrical current was flowing was reinforced by the actions of electricity on electrolytic solutions where the anions and the cations of the electrolyte were observed to flow in opposite directions. Thoughts about fluids of positive and negative electricity were abandoned because no fluid could be conceived which had exactly equal and opposite properties to another fluid.

The principle use for electricity has been in powering electric motors. What could be more practical than putting one in series with electrical power lines and calling the stalled armature torque exerted against a spring balance, the current. This together with the agreed upon polarities and units, would always flow toward the load in one arm (of the circuit) and flow away from the load in the other.

The idea of "efficiency" was developed to evaluate electrical systems in terms of their fulfillment of the conservation paradigm in electrical form.

I would suggest we unload the heavy baggage from the steam engine days when efficiency was judged on how many miles you could get from a ton of coal.

We simply distort space to elicit the basic male-female energetic polarization. Through magnetism we obtain the electrical polarities (+) and (-). The polarizations are conveyed to the

"load" by "conductors", materials wherein the recombination of polarities is minimized. The male-female polarizations thus conveyed to the load recombine within the load to produce heat.

In conclusion, the general idea is to suppose the application of the male-female polarization to a particular situation, we would obtain from:

- 1) A resistor - heat
- 2) A motor - torque
- 3) A capacitor - an electric field
- 4) An inductor - a magnetic field
- 5) An L-C circuit - an electrical oscillation
- 6) An electrolyte - ionic separation
- 7) A lead-acid cell - storage battery
- 8) An L.E.D. - coherent light
- 9) Hydrogenated Pd electrodes in a D2O solution - cold fusion
- 10) Milliken Oil Drop Experiment - the electron\*

\* The implication here is that the (electrical) polarization applied to the Milliken apparatus creates the electron. The electrons thus created cannot be assumed without proof, to be the mechanism for the transference of electrical "charge" through a conducting wire.

N-machines, Space Power Generators, are suitable instruments for separating the spatial polarities because they address the separation of the polarities directly through mechanical distortion of the primordial field.

The possibility of an alternative explanation for electrical phenomena may open the door for further experimental studies, motivated by the suggestion of new phenomena, uncovered, in the exploration of the male-female polarizations as applied to the study of natural phenomena.

28 July 1993

## On the Nature of Electrical Induction

**"It is the conceptualizations which are important."**

-A. S. Eddington, *Fundamental Theory*, 1944

The phenomena of electrical induction which are fundamental to electrical science have long since passed into everyday experience. Recently the nature of this fundamental principle has been re-examined in the light of experiments with electrical machines, which, in their operation violate the conservation laws of charge and energy.

In my early schooling (M.I.T. class of 1958) I was struck by the attention paid to magnetism, magnetic circuits, electrical machinery and magnetic properties of materials. No attention was given to magnetism as a source of understanding of the machines and apparatus which employed it. This attitude was forced on a student because the consensus was: all that needed to be known about magnetism was known because electrical machines obeyed the conservation laws. I.e. one way of generating electricity was as good as another since all machine efficiencies could be "improved" or designed up to the point of a maximum efficiency of 100%.

To point out that electrical efficiency measurements are based on the "mechanical equivalent of heat", 746 watts/horsepower, measured with a calorimeter and paddles by James Watt (inventor of the steam engine) in the late 18th century; a number suspect both in its relevance and accuracy, and sensitivity to experimental vagaries, was heresy.

The concern of this paper is not with all the experiments which have demonstrated anomalous "over unity" energy production, but with the operation of machines which clearly demonstrate violation of energy and charge conservation laws through continuous production of electrical power in excess of the electrical power used to drive and/or energize the machine.

The experimental performance of over-unity machines, the N-machine and Space Power Generators are substantially covered in the literature and are not repeated here. References (1 - 7)

The basic question is: do electrons flow in a conducting circuit impelled by magnetic forces, or, are the electrons created in situ by the magnetic forces, collected by the conducting wire, and then impelled to flow in the appropriate direction by the well known force interaction of electrons and magnetism?

Einstein treated electromagnetic induction as simply a relationship between two members, i.e. the magnet and the wire. He would ask, "what is the point?"

The point is if we stop at Relativity as being the finest appreciation of the experimental situation we would never inquire into the nature of magnetism.

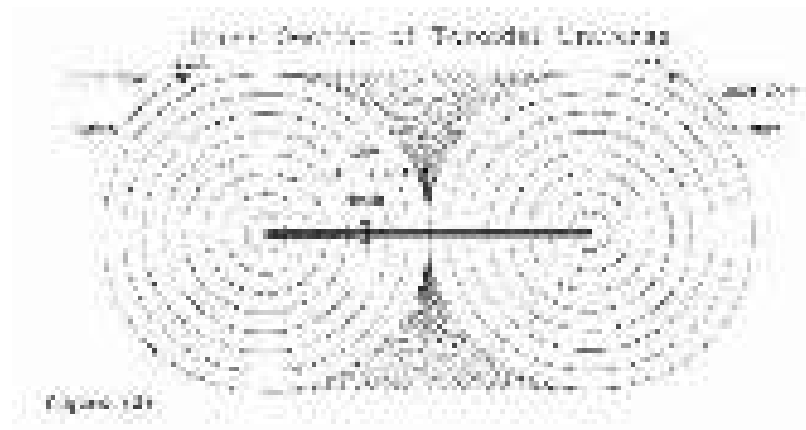
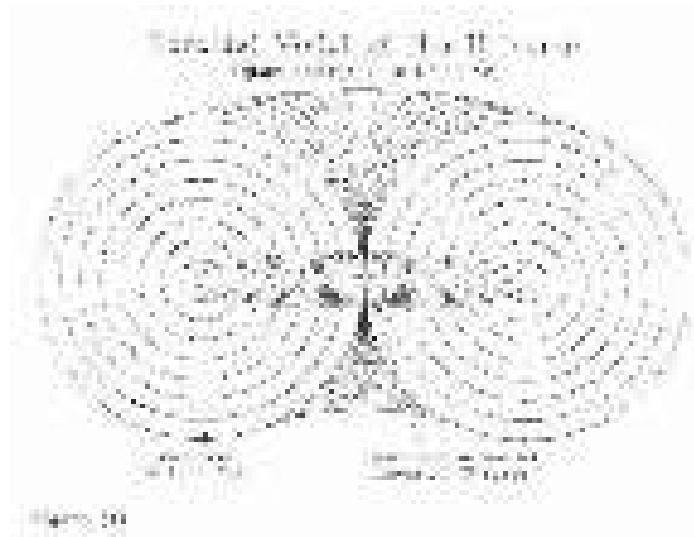
If we consider the original flux cutting experiment of Faraday where a conducting wire is passed through the field existing at the pole of a magnet we observe an electrical potential across the ends of the wire as long as the wire is moving. Reversal of the direction of motion of the wire reverses the polarity of the created electrical potential. If the potential created is applied to an electrical circuit and current flows then a resistance to the applied motion ensues. (Lenz's Law). Here the question is: is Lenz's Law a concomitant or a consequence of the production of electrical energy?

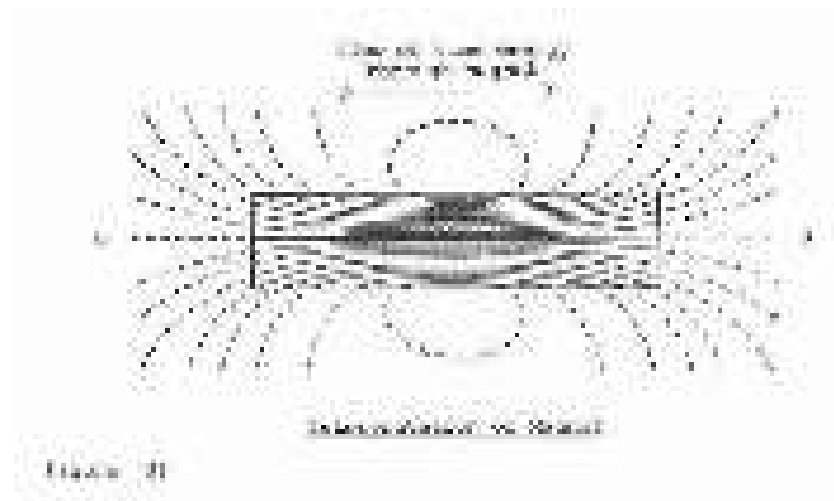
It is not useful to discuss something as fundamental as magnetism at the level of inquiry we wish to pursue without a model of the Universe. Tewari is one of the few researchers who has recognized this. Reference (8).

Magnetism is similar to the gyroscope in that both effects are used in navigational apparatus which depend on an element which retains its orientation either to an external reference, (Earth magnetization), or to itself. What can we say of effects which have directional properties yet seem to orient themselves only to each other or to themselves.

Obviously the magnet and the gyroscope are oriented to a force which does not have a geometric extension into our 3 space. The clear implication is that the magnet and the gyroscope orient themselves to the flow of time energy.

A model of the Universe can be represented by a vortex ring; in which space and time are perpendicular to each other. Figures ( 1 & 2 ). The flow of time energy energizes our Universe. It is this to which the magnet orientates. Figure ( 3 ). The magnet has the property of collimating and concentrating the time energy flow.





Why is all this necessary? It is a consequence of a Universe created from nothing - the void. In a Universe created from nothing, time extension is necessary so the Universe shall not re-collapse in any instant called the NOW. Time extension exists over multiple instants, the sum of which equals the lifetime of particles found in our 3 space. The quantum of time is the Instant. Magnetism has nothing to do with iron and electrical solenoids per se. It is the property of these instruments to orient to and concentrate the time energy flow.

In our practical society it is customary to extract energy from the natural flows, i.e. water and wind. If there was an invisible flow through a magnet or solenoid how could we extract the energy? Suppose we were to construe a copper disc placed in front of a magnetic pole a la Faraday as a form of propeller the pitch of whose blades could be changed by the application of an electrical potential between the center and outer edge. The flow of time energy through the magnet would cause the propeller to rotate like a fan blade in a current of air. The fan can be placed at either end of the magnet, and, providing the pitch of the blades is maintained unchanged in magnitude or direction, it will rotate in the same direction.

If mechanical power is extracted from the shaft or propeller disc then we would find it more difficult to maintain the electrical polarization, i.e. more current would be required. If the rotating Faraday disc apparatus is viewed as a transducer between the electrical power input required to polarize the disc and the resultant mechanical shaft horsepower, then the conservation laws would say the mechanical power out could never exceed the electrical power in. Of course these two quantities are related through the mechanical equivalent of heat experiment with the paddles agitating water in a calorimeter. Acting with the insight of Einstein we would say that experiments which produce identical results, i.e. agitating water with paddles to produce warming versus mechanical input to a machine which produces electricity which is converted to heat by a resistor immersed in water in a calorimeter; are equivalent, thus the figure 746 watts = 1 mechanical horsepower derived from these measurements is a true and reliable number for all the world to see.

We know a priori that no transducer or electrical machine can operate at greater than 100% efficiency so then if we are slightly uncertain about the 746 watts/horsepower figure we can adjust the units to get the exact number right.

"Scientists" feel no guilt with introduction of certain "constants" because they are protected by the conservation laws which are based on common sense which everyone knows is true.

If we return to the analogy of the fan and the magnet we might suppose that rotational drag effects might exist adjacent to the rotor. The action of these drag effects would be to drag the magnet, i.e. cause it to rotate in the same direction as the disc. Clearly then a reduction in mechanical

drag on the rotor could be effectuated by attaching the magnet to the disc and allowing them to rotate together.

Of course if we adhere to the Law of action and equal and opposite reaction then we would never try such an experiment because we would expect the magnet to be acted on by a torque equal and opposite to the shaft horsepower exiting the rotating disc.

It has been known for 100 years that the exciting magnet of a homopolar or Faraday disc motor or generator exhibits no reaction torque to the mechanical forces generated by the polarized disc. Reference ( 9 & 10 ).

Contemporary experiments have also shown the Faraday disc to be a superior motor or generator when the fixed exciting magnet is attached to and rotates with it, thereby removing a constant drag which is superimposed on the mechanical input, or output of the machine. \* ( Ibid. Reference 4 ).

What has all this to do with electrical induction or flux cutting? Simply nothing.

A mistake was made in science 150 years ago through what Einstein identified as the Principle of Equivalence and energy conservation laws based on physical conceptions of the 18th century. It was the attempt of science to square the behavior of the one-piece Faraday disc machine with the performance of two piece induction machines where magnetic flux lines were perpendicular to the axis of rotation.

It simply turns out that the efficiency of a two-piece Faraday disc machine is close enough to that of an equivalent two piece induction machine, about 1%, so that generic differences between the two families of machines are concealed in the indeterminacy of the exact number for the mechanical equivalency of heat. Reference ( 11 ). If the magnet is loosed and free to rotate with the disc, i.e. the one-piece Faraday homopolar generator, then the true distinction in families of machines is revealed. The one-piece Faraday machine is superior to the two piece induction machines both as generator or motor.

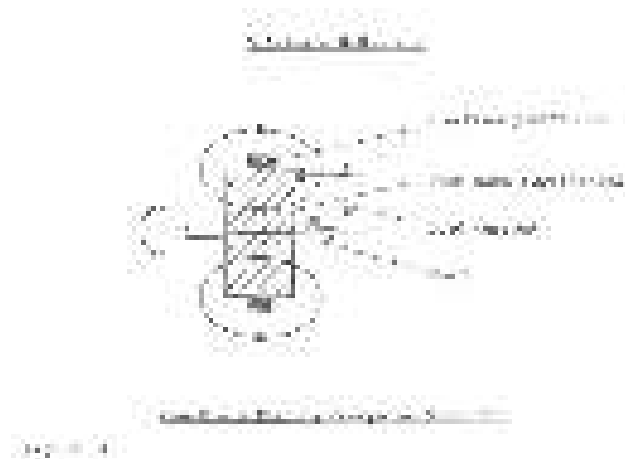
Without trying to tangle the reader in the circularities and tautologies of modern scientific reasoning, acceptance of a family of motors and generators without stators to receive reaction torques contradicts Newton's third Law. We can avoid consideration of this problem by not using these sorts of machines.

Men are more persistent in their pursuit of inquiry. If a superior machine is found men will endeavor to explain it. If a machine produces in excess of 746 watts per input horsepower what is our interpretation of this "excess" energy production.

The Universe is alive and this is beyond our powers of conception. We can say, based on our experience, a certain intellectual model can be constructed. This is like saying the world is round or that the planets rotate in circles around the sun. Neither statement is exactly true, but they rationalize information in our minds and lead to new knowledge.

We are familiar with the process of transmission and reception of electrical energy by means of resonant structures known as antennas.

An antenna for the reception of Universal Energy would be a model of the Universe itself. The suggested structure is the one-piece Faraday disc, homopolar generator. Figure ( 4 ).



The magnetic flux lines become the time lines of the space energy flow and the rotating disc is the 3 space Universe existing in the instant of the present.

As for the family of two piece induction machines, these are seen by this author to operate on the principle of transformer induction, including d.c. machines which are nothing but transformers with rotating secondaries and mechanical commutators for rectification.

A superior motor would produce more output power, torque x speed of rotation, per increment of input electrical excitation. The output power would exceed 1 horsepower for 746 watts of electrical input.

A superior generator would produce more than 746 watts electrical output per horsepower input.

A two-piece induction machine operating essentially as a rotating transformer would never be able to exceed 100% electrical efficiency because electrical transformers in themselves are not known to be able to create energy. (There may be special circumstances where this is not true, but these peculiar effects characterized by a negative are not normally encountered in conventional electrical machines)

The mirror image symmetry characteristic of the input and output ports of a transformer is carried over to the equivalence of two-piece induction machines operated as motors or generators. This motor-generator symmetry is not characteristic of the one-piece Faraday homopolar machine.

As a generator the one-piece homopolar machine evinces reduced drag in comparison with the two-piece induction machine for the production of equal amounts of electrical power. This is because the perceived mechanism of operation is to precipitate electrical charge from the time-energy flow by a centrifugally engendered force field. Reference ( 12 ).

As a motor the one-piece homopolar machine produces the same amount of torque as an equivalent two-piece induction machine for measurements made with a blocked rotor. Reference ( 13 ). The reduction of magnetically induced drag by attachment of the magnet to the rotor is not evinced by static measurements.

The torque attainable from a motor acts in relation to the Earth reference frame. For a two-piece induction machine, the stator, the receptor of the reaction torque from the rotor, is physically attached to the Earth reference frame. In contrast the one-piece homopolar machine has no fixed Earth reference. With the rotor blocked there is a physical connection to the fixed Earth reference frame and the relationship between motor torque vs. current input follows conventional expectations.

With the magnet of the one-piece machine loosed to rotate with attached Faraday disc the mechanical connection to a fixed Earth reference frame is broken. With this connection broken the

ability of this motor to do useful work is compromised by the necessity of transferring torque from a rotating reference frame to a fixed one. As the one-piece machine rotates at increasingly higher speeds the torque connection between the rotating frame and the fixed Earth frame becomes more tenuous until the torque output of the machine is balanced by mechanical losses. Further increases in motor current result in increasingly disproportional torque to the point where no further current increase can produce an increase in motor speed.

It is for this reason the one-piece homopolar Faraday machine is a far better generator than it can be as a motor. Better is in comparison with the two-piece induction machines.

What we have uncovered is a second family of electrical machines. If a genealogy of electrical machines is projected we would see the two-piece induction machines, with symmetrical motor-generator properties and limited by the properties of transformers to the 100% efficiency level in contrast to the one-piece Faraday homopolar machines. The one-piece machines transduce multiples of the 100% efficiency factor of the transformer machines in the generator mode but are not completely useful as motors because of self limitations of torque and speed output. The reduced drag obtained by physical connection of the magnet to rotate with the disc in the motor mode is not unambiguously useful since the torque output of the machine is only with respect to the rotating reference frame of the machine. The rotating reference frame is only tenuously coupled to the fixed Earth frame thus torque output can only arise through the dragging action of these two frames against each other.

Returning to the consideration of electrical induction we conclude that the Faraday conceptualization of flux line cutting is spurious and not worthy of further consideration.

Faraday's ideas about transformer induction are correct and form the basis of two-piece induction machines presently in commercial usage.

The conceptualizations of spatial energy and spatial time distortion \* ( Appendix 1 ) were not available in the time of Faraday, consequently the idea of flux line cutting was invented. The persistent dispute over whether flux lines rotate with the axially rotated magnet or not is a consequence of this incorrect hypothesis. The idea that electric charge latent in space can be precipitated into a moving conductor opens a door to accessing the Universal Energy flow which is implicit in a model of a Universe with time extension which is created from nothing.

The only general principle this author is aware of is God. Symmetry, equivalence, relativity and conservation are not sufficiently general enough on which to base physical conceptions. The paradoxes, contradictions, and general incompleteness of contemporary physical theory speaks to this.

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**N.B-** A. D. Trombly, Director of Research and Development, Zero Point Technologies Inc., P. O. Box 1031, Evergreen, Colorado, 80439, U. S. A.
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### Simple Experimental Test for the Inertial Field of a Rotating Real Mechanical Object

Introduction: For the last five years, this investigator and others<sup>1</sup>, have studied the mechanical properties of rotating objects for the purpose of application of certain heretofore undiscovered properties of rotation to new forms of propulsion machinery and machines with anti-gravitational effect. The course of this investigator has not been to try to perfect new propulsion machinery, per se, but however to thoroughly investigate the phenomena of rotation.

The result of a great deal of experimentation (see appendix), has resulted in a picture which relates the performance of certain non-conventional machinery: Dean, Laithwaite, Wolfe, DePalma, to a variable inertia property which can be engendered through motion of a rotating object.

In terms of the acceptance of a new body of information relating to the properties of rotating objects and variable inertia, a simple experiment has to be devised which clearly demonstrates the new phenomena. In the performance of experiments with large rotating flywheels, there are great experimental difficulties which result from experimenting on the large rotating flywheels themselves. Through a series of corroborating experiments it has been established the anisotropic inertial properties of a rotating object are conferred on the space around the object. That is to say the space around a rotating object will have conferred upon it an inertial anisotropy. Let us ascribe this to the setting up of an od (odd) field through rotation of a real physical object. The purpose of the experiment to be described is the determination of one of the properties of an od field. The anisotropic inertia property.

The Experiment: A good way to detect a field whose effect is a spatial inertial anisotropy is to use a time measurement based on an inertial property of space and compare it to a remote reference. With reference to figure ( 1 ) we have a situation where the timekeeping rate of an Accutron tuning fork regulated wrist watch is compared to that of an ordinary electric clock with a synchronous sweep second hand.



The Accutron timepiece is specified to be accurate to one minute a month. Examination of the relative time drift of the Accutron - electric clock combination shows a cumulative drift of .25 second Accutron ahead for 4 hours of steady state operation. This is within the specification of the watch.

With the flywheel spinning at 7600 r.p.m. and run steadily for 1000 seconds (17 minutes), the Accutron loses .9 second relative to the electric clock.

Much experimentation has shown that the effect is greatest with the position of the tuning fork as shown. Magnetic effects from leakage fields from the gyro drive motors are almost entirely absent; any remaining leakage is removed by co-netic magnetic shielding. The Accutron is also in a "non-magnetic" envelope.

The purpose of the experiment is a simple demonstration of one of the effects of the od field of a rotating object. The demonstration may easily be repeated using any one of a variety of rotating objects, motor flywheels, old gyrocompasses, etc. The rotating mass of the flywheels used in

these experiments is 29 1/2 pounds. The rotational speed of 7600 r.p.m. is easily accessible. The effect is roughly proportional to the radius and mass of the rotating object and to the square of the rotational speed.

Finer measurements can be made using an external electrically powered tuning fork oscillator and an electronic frequency counter. In this case the inertial anisotropy of the od field of a rotating object can be much more quickly and precisely measured. Field strength lines can be plotted along contours of constant frequency shift for the two orientation conditions of fork vibration direction parallel to, and perpendicular to, the axis of rotation of the test object.

Conclusions and Observations: The proper conclusions and evaluations of the above experiment will affect present conceptions of Cosmology. Before this can happen, simple tests must be performed to show the existence of a new phenomenon. It is hoped the apparatus for the performance of these tests is widely enough available to lead to quick verification.

1) Eric Laithwaite, John S. Wolfe, Edward Delters, Bruce dePalma

**Appendix:** Axial moment of inertia measurements of constrained gyroscopes, pendulum experiments demonstrating anisotropic inertia of a rotating body. (available from Bruce dePalma)

\* Tewari has investigated the co-rotating Faraday homopolar motor. He calls it the Space Power Motor or SPM. The increased torque available when rotating is mitigated by a "slippage" which increases with rotational speed. Over a certain speed range the product of the two effects can result in a superior machine.

\* Appendix 1 - "Simple Experimental Test for the Inertial Field of a Rotating Real Mechanical Object"

Published as: "The Tuning Fork Experiment" in: "Is God Supernatural"  
R. L. Dione, Bantam Book Pbl. Co., 1976

27 February 1997

## On The Nature Of The Primordial Field

### To err is to be human

The description of the Primordial Field is imaginary but that is precisely why it is correct. The best instrument for the exploration of this question is the human mind.

The representation of reality within our conscious persona is constructed out of the myriad chemical reactions to the sensory stimuli of "external reality". On this basis the sensory image is living and we could speculate the external reality was non-living unless we knew the self-evident proposition that all reality was alive.

Nothing could exist unless the organizing force were more powerful than destructive & dissipative effects. Consequentially we can view the organizing force as transcendent and that destruction and dissipation are facets of the constructive energy.

The most profound manifestation of the creative force in material form are the thoughts and ideas. Thoughts and ideas are modifiers in the direction and application of Force. We arrive at the idea that the primordial field is a field of pure Force.

The detection of an isotropic field consists of distorting it and noting the force isotropys.

On the highest level of abstraction Force is Intelligence; consequently the primordial field is intelligent. Within the limits imposed by the capability of my human mind reality exists as it is. Its architecture is beyond the scope of my discovery.

Nevertheless that architecture forms a basis for the positing and asking of questions. A dialogue of questions and answers, the field of a design for Physics. As long as we remain rational, 'it' remains rational.

The primordial field has all known properties. We understand its force nature through experiments with charged capacitors, magnets, and gravity. In every case, a distortion of the primordial field results in an unbalanced force.

Apparently the primordial field has certain mechanical characterizations which allow for the propagation of 'waves'. Mechanical characteristics mandate the possibilities of discrete 'particles'. Both characteristics exist simultaneously. The measuring instrument asks the question, the Universe provides the answer.

Consequently, in the Universe of the primordial field the Nature or origin of the field is unknown being beyond the conception of the minds which are examining it.

The human mind or body is a materialization of an implied tendency in the body of space. Consequently man can never know his source because only in the downstream of time is the material manifestation formed.

Can the material manifestation form more subtle connections than itself? Can you have more subtle thoughts than you can think? The plenum of existence is formed within the limitations of the human mind.

The existence of the primordial field can be proved by the manifestation of unbalanced forces through distortion of its normally isotropic condition, i.e. by electricity, magnetism or gravity.

That the primordial field has certain mechanical characteristics can be shown by the apparent propagation of waves and the existence of discrete particles.

Mathematics is a facet of the Nature of the intelligent primordial field. The mathematics we presently use is derived from the counting of integers. This is OK when counting marbles or money.

What is the Nature of the integer? Is an integer exactly the result of a number or are properties of counting being ignored like the higher order precessional modes of rotation, i.e. nutation, ..., ..., etc.

Every experiment which is done qualifies and quantifies the primordial field in some aspect.

If you want chaos you get chaos. For those of us who govern our thoughts with logic we get logic. Actually logic and chaos are the extreme of what we know as thought.

For those of us who consider ourselves sophisticated we amuse ourselves with a pastime called Science. This the application of logic (the self-defining reasoning process in Nature), to Nature. This self-examination in itself has the limitation of the manifest in attempting to describe the un-manifest.

A final thought. The primordial field is responsible for the inertia of material objects. Without rotation the manifested inertial mass is isotropic, as is the primordial field. With rotation anisotropy is established firstly in the existence of directions for the inertia experiment, i.e. axial motion or motion in the plane of rotation. Apparently there is a connection, (through time), between the manifest material object and the primordial field. Consequently, rotation of a material object introduces spatial anisotropy of inertial mass measurements into the spatial region surrounding the rotating object.

It is suggestive that magnetism, a phenomena of spatial anisotropy, could be introduced into a normally non-magnetic material, i.e. brass, through the influence of a field of spatial inertia anisotropy. Certain recent experiments of Monstein have borne this out.

Although as a field it is no more primary than electricity, magnetism, or gravity, the spatial inertial anisotropy created by a rotating object is called the OD field.

**SECRETS**

## The Secret of the Force Machine

In the analysis of Free Energy machines it is shown that spatial distortion created to elicit electrical power extraction or anti-gravitational effects, results in the appearance of physical forces in the apparatus. The physical forces which appear represent the tangible counterpoise of the spatial distortion.

### Anti-gravitational Effects

When a real mechanical object, a flywheel, is rotated, forces appear, the centripetal forces of rotation within the material of the flywheel. These forces are the counterpoise to the spatial distortion created by the centripetal acceleration applied to the mass elements of the rotating wheel. Although these forces are not available for explicit measurement, their presence is evidenced when the wheel is rotated at a high enough speed such that the forces exceed the tensile strength of the flywheel material and an explosion results. The interesting phenomenon is that no work is required to maintain these forces at arbitrarily high values.

The gravitational field of the Earth is a spatial distortion occasioned by the presence of mass. The weight of an object is measured by a scale under a condition of constraint, i.e. no motion, and represents the degree of spatial distortion at the point of measurement.

Objects in free fall are not acted on by Newtonian forces, consequently their rate of "fall" is subordinated to rate of influx of the gravitational flow. A hydro-electric power station extracts energy from the gravitational energy flow.

Gravitational energy is a flow not a force which distinguishes it from Newtonian forces arising from the acceleration of masses. Reasoning by analogy with electrical Free Energy machines within which forces are manifested proportionally as a counterpoise to the degree of spatial distortion required to elicit a certain level of output electrical power, we can hypothesize that to paddle upstream in the gravitational flow a mechanical Free Energy machine would also manifest within itself such a force counterpoise.

Thus to generalize we can say that in the class of machines known as Free Energy machines the mode of such apparatus, either in the mechanical or electrical form, is such that the principle of operation is expressible as an equivalence between the explicitly manifested mechanical force counterpoise and the power output of the machine whether it be mechanical, electrical, or other.

The gravitational flow represents mechanical power, because power can only be extracted from a flow of power. If the mechanical power output of a machine exceeds the gravitational power flow in the region of its operation then a force will be developed in the direction opposite to the gravitational flow and an anti-gravitational effect will be demonstrated.

Actually what is connoted as gravitational power flow and mechanical power output derived from Free Energy anti-gravitational apparatus is Time-Energy. This subject is discussed in other of my writings, reference (1).

The archetypal gravitational engine or Free Energy machine is a combination of two counter-rotating gyroscopes with axles parallel and rotors co-planar. The original Force Machine was constructed in 1971, figure (1). The total weight of the apparatus was 276 lbs. The "active" mass at the rim of the flywheels was 10 lbs. The assembly was suspended from a spring scale and the gyroscopes driven counter-rotating at 7600 r.p.m. Under these conditions the support cylinder was

driven at 4 r.p.s. to precess the gyros. A consistent set of experiments repeatably showed 4 - 6 lbs. of weight loss. Although thousands of pounds of force were developed, expressed as tension and compression in the walls of the support cylinder, none of this could appear as torque in the precessional axis due to the geometry of the machine. Precession more rapid than 4 r.p.s. caused fracture of the tool steel gyro support axles. It is easy to see how the machine design could be improved by mounting both gyros on the same axle and supporting the developed precessional forces by one rotor bearing directly on the other. Other mechanical improvements would greatly increase the achievable anti-gravitational effect. Figure (2).

The important observation is that in a Free Energy anti-gravitational Force Machine, essentially no input mechanical power to the precessional axis is required in the manifestation of arbitrarily large forces in the walls of the gyro support cylinder. From the point of view of physics we can say there is an equivalence between the force explicitly developed in the walls of the machine and the mechanical, time-energy, power produced. Thus in this machine we have in operation a Force - Energy equivalence paradigm of great power. In contrast, the consumptive physics now in vogue can only offer a Work - Energy paradigm expressed in machines which are said to "convert" raw materials into energy.

## **Electrical Force Machines**

### **The N-machine**

In the construction of an electrical machine analogous to the mechanical Force Machine use is made of the phenomenon of the Faraday disc. It is known that in electrical machines consisting of a conducting disc rotated proximate and co-axial to the magnetic pole of an axially suspended magnet, figure (3), no reaction torques are transmitted from the driven or driving disc to the magnet supplying the exciting field. Attachment of the conducting disc to the magnet itself and co-rotation of disc and magnet elicit an electrical potential between the center and outer edge of the conducting disc. Electrical power at a high degree of efficiency exceeding the electro-mechanical equivalent of work may be drawn from this apparatus, (N-machine).

When the N-machine was originally disclosed to the public, ref. (2), (3), careful testing revealed output electrical power exceeding equivalent input mechanical power by 5 - 7.7:1. Theoretical considerations derived from experiments with the mechanical Force Machine would lead one to expect that power could be extracted from such a machine almost free, i.e. electrical power could be extracted without any drag being reflected on the source of driving energy. Many other experimenters attempted to "improve" on the original design. In most cases however while overall efficiency was greater than unity it rarely exceeded 2:1. What was forgotten was the withdrawal of electrical energy in itself created a spatial distortion which interfered with the action of the machine by creating drag.

The high efficiency of the "Sunburst" prototype was due to partial compensation of field distortion created by current withdrawal. With reference to figure (4), the magnetic field created in the rotating current collecting disc was partially cancelled by current flow in the opposite direction in a fixed conducting plate, situated as close to the rotating disc as the thickness of the brush assembly would allow. Indicated schematically in the drawing. An improved machine would position a fixed compensation plate as close to the rotating disc as physically possible. Thus current withdrawal would cause the minimum distortion of the exciting magnetic field. In this case almost totally free power would be obtained.

The double machine of figure (5) shows an almost ideal configuration where compensation for the spatial distortion of current withdrawal as well as doubling of voltage output is accomplished

by contra-rotating magnetized rotors supported on a single shaft. There is a striking similarity between this construction of an N machine space power generator and the suggested twin counter-rotating gyroscopes mounted on a single shaft as an anti-gravitational mechanical space power generator. It is suggested that a mechanical space power generator is converted into an electrical space power generator simply by magnetization of the gyroscopic rotators.

In terms of the Force - Energy paradigm the constrained repulsive force generated between the contra-rotating magnets upon the withdrawal of current represents a measure of the electrical power output of the machine. In the anti-gravitational space power machine the torques created in the precession of the counter-rotating gyroscopes, absorbed one upon the other are representative of the anti-gravitational effect.

### **Force - Energy**

On the basis of the geometry of both the electrical and mechanical force machines there should be no drag or resistance to precession of the counter-rotating gyroscopes or contra-rotation of the magnetic rotors. Force - Energy equivalence relates to the relationship of internally generated constrained forces and space power output. What we would call efficiency would relate to the work input to these machines, i.e. torque x angular velocity compared with the space power output.

Space power is developed out of distortion of the normally isotropic space, the amount of distortion being represented by the reflected internally constrained forces explicitly developed in these machines. As yet there is no measure of space power expressed mechanically as an anti-gravitational effect. Electrically developed space power can be measured in watts. Consequently the efficiency of an electrical space power generator can be expressed as electrical watts output divided by the electrical equivalent of mechanical power required to rotate the magnets.

On the basis of present understandings of electrical and mechanical forces, the geometries of both the mechanical and electrical space power machines allow of none of the internally constrained forces developed to appear in the drive axis. Consequently space power should be developed as totally free mechanical or electrical energy.

Measurements on practical machines however do show drag to be present. Because one torque is neutralized by an equal and opposite mechanical torque or a force of electrical repulsion is constrained by an equal and opposite mechanical force does not mean that the space in which the neutralization occurs is returned to its original state of isotropicity. I have given a great deal of consideration to this situation.

### **Defect of Forces**

In the conservative physics of the work-energy paradigm the thermodynamic law of Equipartition of energy gives some insight of the energy coupling of orthogonal modes of mechanically interpreted systems. In the physics of energies elicited through spatial distortion of the cosmic primordial field a useful idea is the concept of Defect of Forces which can help us understand the properties of situations whose neutrality is achieved by the balancing of equal and opposing similarly derived forces.

The idea is that when a force is manifested as a counterpoise to an experimentally created spatial distortion, i.e. the forces existing in the body of a rotating flywheel, mutually constrained precessional torques or the balancing of electromagnetic distortions by the superposition of equal and opposite vector fields; the manifested force is not perfect.

A perfect force by definition possesses only magnitude and direction. A real force manifested as a counterpoise to a condition of spatial distortion has a magnitude, a direction, and

something else. The something else would be a property of imperfection common to the universal manifestation of what we know as Reality. The philosophical treatment of the innate imperfection of Reality is beyond the scope of this paper. Suffice it to say, in a physical sense, the defect of forces is a real entity and is the property held in common by all manifested forces, and represents a possible mode of coupling between them. For example an explanation for the phenomena of inertia can be developed out of the coupling of atomic and nuclear forces to the balance of the mass in the Universe through the mechanism of defect of forces.

The defect of forces exists, yet is unquantifiable except in terms of itself and has no known properties in terms of things that exist. Its existence is non-existence yet it is held in common with all things that exist. I posit that defect is connected and is responsible for the phenomenon of inertia.

In terms of this paper I posit the drag which appears in the drive axis of orthogonal machines is a coupling of the force counterpoise of the created spatial distortion into the drive axis through the mechanism of connectivity of defect.

### **Summary**

Force - Energy equivalence is a simple expression that in what I call orthogonal machines a force is manifested proportional to the degree of created spatial distortion. The primordial cosmic field is pure energy, consequently distorting it to obtain a polarization from which power is drawn can make available an arbitrarily large quantity of energy. The energy available is limited more by the mechanism of extraction than the cosmic field.

The idea of efficiency applies to the particular configuration of mechanically realizable extraction apparatus. Force - Energy is a way of characterization of the degree of spatial distortion achievable with mechanical apparatus. Defect of forces is a concept to explain why free energy machines are not infinitely efficient. It is also proposed as a mechanism to explain the phenomena of inertia.

The machines we construct are almost infinitely puny in comparison to the energy released from the cosmic field observed in the super-nova. The ideas of spatial distortion, Force - Energy equivalence, and defect of forces may open our eyes somewhat to the latent and omnipresent power and majesty of the universe.

### **Addendum**

It is constructive to consider the interpretation of familiar phenomena from the viewpoint of Free Energy. Distortion of the cosmic energy field by the presence of mass evokes the gravitational flow of time energy. The measure of the created spatial distortion is the force counterpoise known as weight.

Distortion of the primordial field by a rotating flywheel or gyroscope evokes the od field of inertial anisotropy. In this case the force counterpoise is not explicitly available but nonetheless exists centripetally expressed within the body of the rotating object.

In the interpretation of stellar phenomena the gravitational flow into matter could result in the liberation of heat. Denser matter would increase in temperature. The liberation of energy in stars could result simply because of their mass. As stars became more dense because of gravitational accretion of mass more energy would be liberated. Under gravitational pressure matter itself might have various stages of collapse.

The first stage of collapse could precipitate from the cosmic field energy sufficient to cause a Nova. A second state of collapse could precipitate a Super-Nova. A normal stable star would

operate in a density range where matter would retain its identity in terms of the series of known elemental configurations. The collapsed matter stages of the nova or super-nova can only be hypothesized and probably would not be available for study under terrestrial conditions.

The important observation is that the explosion of a star is analogous to the explosion of a flywheel when rotated at sufficient speed such that its internal cohesion is neutralized by a superabundance of time energy precipitated from the cosmic field. In this case the invocation is rotation. For stars the invocation is mass density and the perceived effect is the gravitational flow. What the rotating flywheel and the star have in common is that an explosion can occur when the internal energy exceeds the forces of material cohesion. A long and useful life results when the density of energy invoked from the cosmic field is less than that required for the disruption of the elemental materials from which they are constructed.

### **References:**

- 1) DePalma, "On the Nature of Electrical Induction", 28 July 1993, Nova Astronautica, vol. 14, number 59, 1994; Magnets, vol. 7, number 8, August 1993; New Energy News, vol. 1, number 6, October 1993.
- 2) DePalma, N-machine D.C. Generator, 24 March 1978, drawing available from B. E. DePalma, Private Bag 11, Papakura, South Auckland, New Zealand.
- 3) Kincheloe, Homopolar "Free Energy" Generator Test, presented at 1986 meeting of the Society for Scientific Exploration, San Francisco, CA, U.S.A., 21 June 1986, revised 1 February 1987. Contains references to earlier DePalma papers re N-machine.

### **Diagrams 1 - 5:**

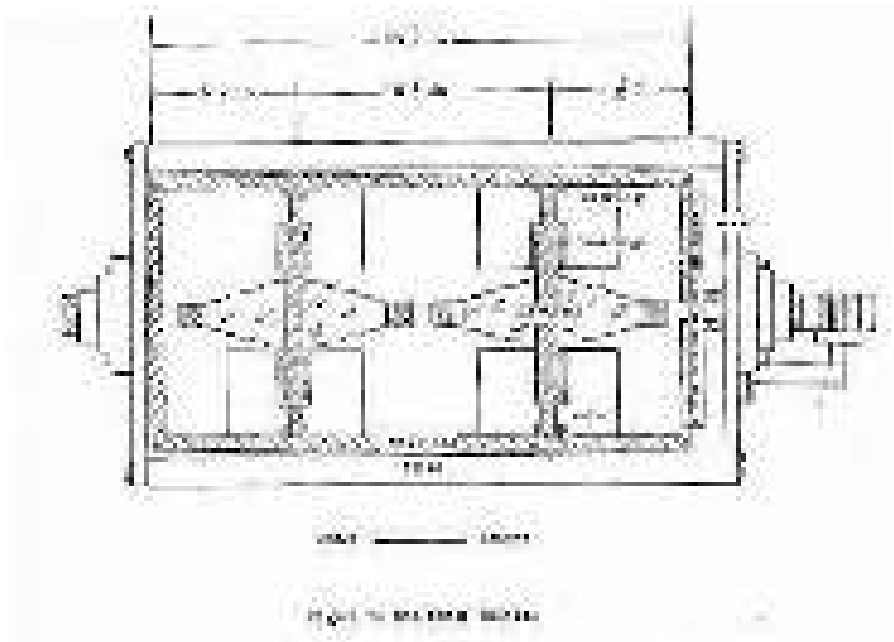


FIGURE 2

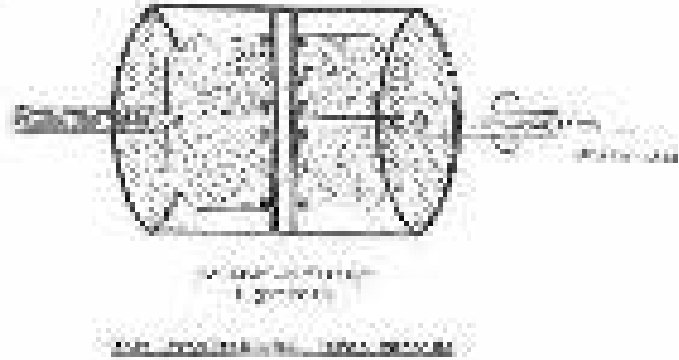


FIGURE 3

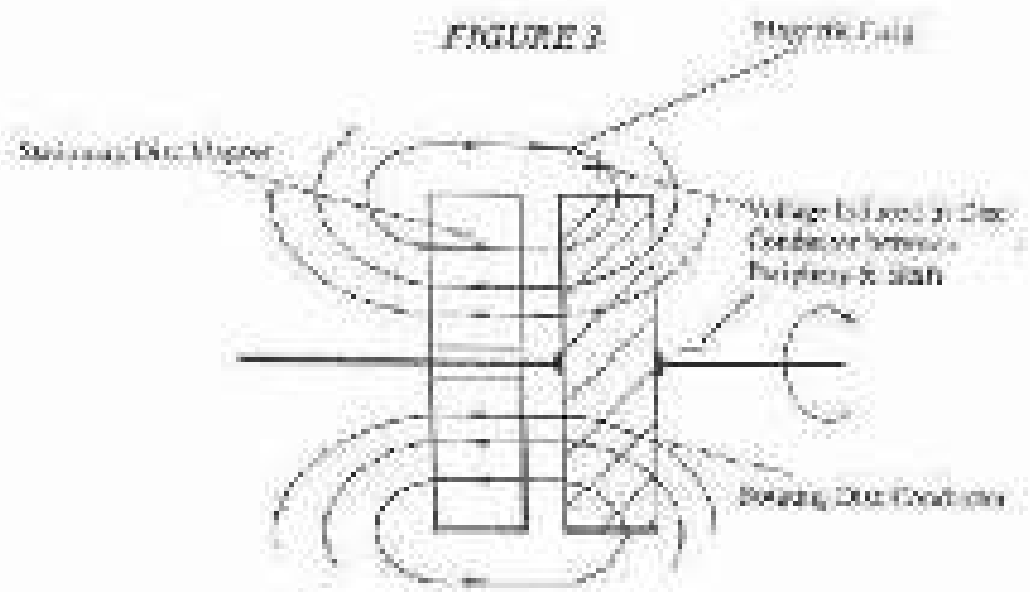


Figure 14

Technical Drawing (Figure 14)

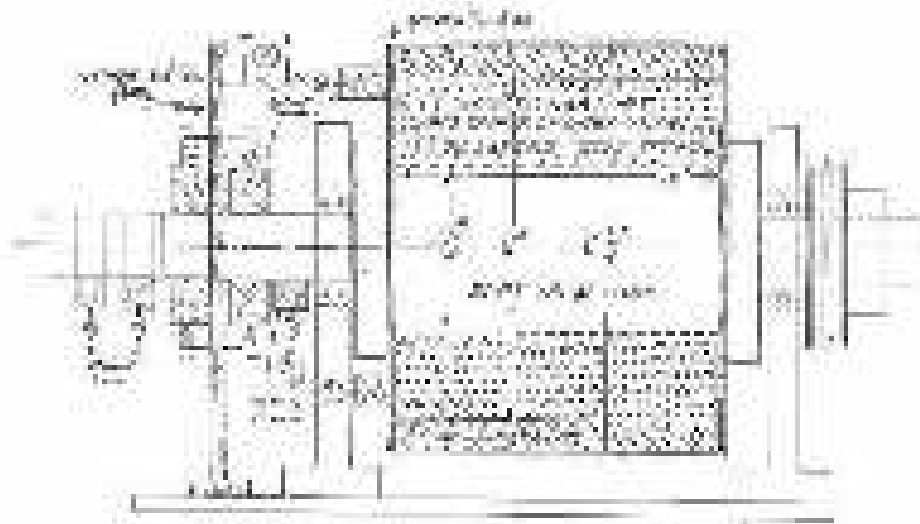
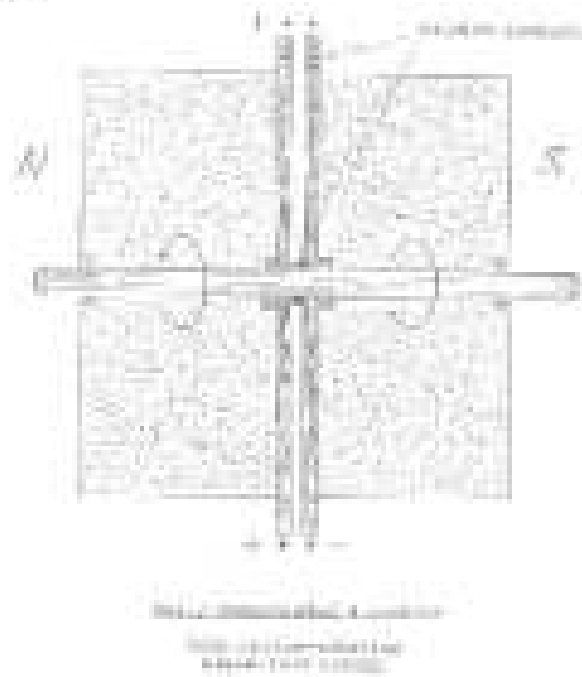


Figure 15



1 February 1995

## **The Secret of the Faraday Disc**

**A collection of essays**

### **The Secret of the Faraday Disc**

"Primary causes are unknown to us; but are subject to simple and constant laws, which may be discovered by observation, the study of them being the object of natural philosophy." - Fourier

The Faraday disc is a magnetized wheel. A wheel is an intrinsically self-defining object. It becomes itself only when rotating. The properties of the wheel are determined by the experiments which involve it. The statement: "wheels within wheels" is the philosophical interpretation. Through the Faraday Disc we can connect the forces of magnetism and electricity to the inertial properties of space and time.

An interesting problem is the inertial frame sense of the Earth moving through space. The Laws of Inertia govern the material objects resting on the surface of the earth. But what of the space surrounding the Earth. Would it be the electric, magnetic, or gravitational field which stabilized the inertial frame or can we posit an inertial field of matter. It is clear that the properties of phenomena occurring within matter are conveyed to the space surrounding without matter.

Because of the confusion and ambiguity created by Einstein's "Principle of Equivalence", inertia and gravitational forces have been linked. The search for a purely inertial field has been proscribed.

If a field exists around matter which conveys the inertial condition of that matter to the surrounding space then the general principle would be: a transport mechanism exists which serves to communicate the internal condition of matter to the surrounding space. Let us call the inertial condition conveyed to surrounding space by matter the od field.

The od field of matter can be manipulated through rotation, creating the anisotropic inertial effects observed in rotating gyroscopes. Forced precession of the rotating gyroscope creates such a strong interaction with the local inertial, od, field that the precessing gyro can be said to "lock in space" with respect to the local inertial frame. The motion of a mass point in the rotor of a precessing gyroscope is unique and is known as streptoid, (Gk. twisting), and is not a combination of rotation and translation which are supposed to describe all mechanical motions.

Trinics, the calculus of three dimensional motion is in its infancy. The inventor of this calculus is John Sohn Wolfe, now deceased, and his book is: Neo-Principia Mathematica, as yet unpublished.

It is now recognized there are three classes of motion, i.e. translation, rotation, and streptation. Streptation includes precession, nutation, and higher orders of three dimensional motion. In order to extend the science of mechanics the following experiments are suggested:

- 1)  $F = MA$  is not obeyed by an object in streptation. What are the laws of force for such an object?
- 2) Momentum is not conserved in an elastic collision of an object undergoing streptation with a non-moving control. What are the laws of elastic collisions of streptating objects?
- 3) What are the laws of inertia for a streptating object. Would the idea of variable inertia including positive and negative values be appropriate?

4) The idea of an od field that could alter the mechanical and inertial properties of material objects is not part of the knowledge of contemporary mechanics. Should it be, or should the ideas of mechanics end at the surface of all mechanical objects?

The limits of scientific conception which emerged in the 19th century can be expressed in the "action at a distance" and wave propagation hypotheses requiring some sort of spatial medium or aether. Twentieth century particle physics and the hypothesis of the neutrino opened the way to a conceptualization of space filled with a sea of particles. A space filled with a sea of particles interpenetrating matter and possessing a relaxation time such that the internal condition of matter was impressed on them and was thus conveyed to the surrounding space could be the mechanism for a transport process wherein the internal condition of matter; electric, magnetic, gravitational, heat, charge, radioactivity, inertial et al. was conveyed to the surrounding space.

I call the particle whose condition is an impression or memory of its passage through matter, a psion. Thus the basic condition of empty space is a psion field. Radiation laws of emissivity vs. temperature and intensity drop off with distance, i.e.  $1/r$ ,  $1/r^2$ , and  $1/r^3$  dependencies are related to the relaxation time of the impression created on the particles by their passage through matter. One could assume these particles, psions, travel at the speed of light. The term psion is meant to imply an atom of consciousness which retains an impression of the internal condition of matter through which it has passed.

### The Faraday Disc

The Faraday Disc [reference 1] is generally thought to be a two piece machine consisting of a conducting disc rotating proximate to the north or south pole of an axially suspended fixed magnet. It can be said that this invention was in part suggested by the earlier work of Arago and Barlow. The truly unique invention made December 26, 1831 consisted of the discovery that the magnet and disc could be cemented together, rotated jointly, and the same voltage could be obtained by sliding contacts touching the centre and edge of the conducting disc as was obtained when the magnet was fixed and the disc rotated alone.

Ideas of flux line cutting and induced voltages were brought forward to explain the mechanism of voltage generation in the rotating disc but when these were applied to the two situations of disc rotating independently or together with the magnet, they lead to contradictory interpretations.

The true discovery of Faraday was that relative motion was not necessary for the generation of electricity. If rare earth or superconducting magnets had been available in the days of Faraday and Maxwell the one-piece homopolar machine might have become an article of commerce.

Comparisons of the energy efficiency of this construction with two-piece Faraday or induction machines would have been made. The future we now live in would have been energized by the one-piece machine and the mechanical equivalent of heat would no longer square with the electrical equivalent of heat. What this would mean in terms of contemporary theories can only be guessed at.

Because the Faraday discovery, now known as the N-machine Space Power Generator is not perfect, it will never be possible to reduce the drag of such a machine to zero in the production of an arbitrarily large quantity of electrical power. The reason drag is intrinsic is because the same space whose polarization elicits electrical power also contains the inertial frame reference for the machine.

Experiments [ref. 2] performed by the author have directly demonstrated the dragging of a purely mechanical rotating reference frame against a fixed one.

The force relationship existing between magnetized objects directly illustrates the interaction of separate inertial frames linked magnetically. It is possible to infer N-machine drag will be reduced in outer space remote from the inertial influence of the sun and planets.

In the Faraday disc experiment the instrumentality of evocation of the magnetic field partakes in the inertial frame-sense. Yet the magnet does not partake in any reaction torque. The output torque of the disc is referenced to the local inertial frame. Thus the magnet only connects the generated torque to the local inertial frame.

This suggests that if the magnet were to rotate with the disc the torque output of the machine would be with respect to the rotating inertial frame of the magnet, although there would still be no net torque reaction of the disc against the attached rotating magnet.

In the Faraday disc, the torque is relative to the reference frame of the instrumentality which is the evocateur of the magnetic field.

Unlike the repulsion of the hysteresis or eddy current drag machines, the generator drag of a Faraday disc must be an intrinsic drag manifestation of the precipitation of electricity. Consequently allowing the magnet to rotate with the disc will increase the electrical power output by not letting the drag appear twice. Once with respect of the electrical power generation drag - akin to the locking in space of the precessing inertial gyroscope and twice by the coupling of such drag to the inertial plane of the Earth via the instrumentality of the magnet. If the magnet rotates then the inertial reference is no longer to the Earth but to the rotating reference frame of the magnet.

In the Faraday disc, part of the drag arises from the intrinsic drag of electron collection relative to the local frame, what I call non-reactive drag. The balance of the drag derives from direct, action-reaction, drag of the rotating polarized member against the Earth reference frame coupled through the instrumentality of the magnet.

In the two piece machines, (either induction or Homopolar), the reactive drag coupling is accentuated by the proximity of the mass of the stator. This cannot be changed in the induction machines but the one-piece Homopolar geometry avoids excessive stator drag by eliminating the stator. What remains is the reactive rotor coupling to local space without the presence of ferrous matter, to which the rotor magnetic field could couple, and the intrinsic electron collection drag referenced to the local space reference frame.

The principle of equivalence exhorts the equivalency of gravitational and inertial forces, but gravitation is not a relative force, i.e. it exists independently of relative motion. Although the voltages derived from homo-polar and induction machines may be equal, the drags resulting from the processes are unequal.

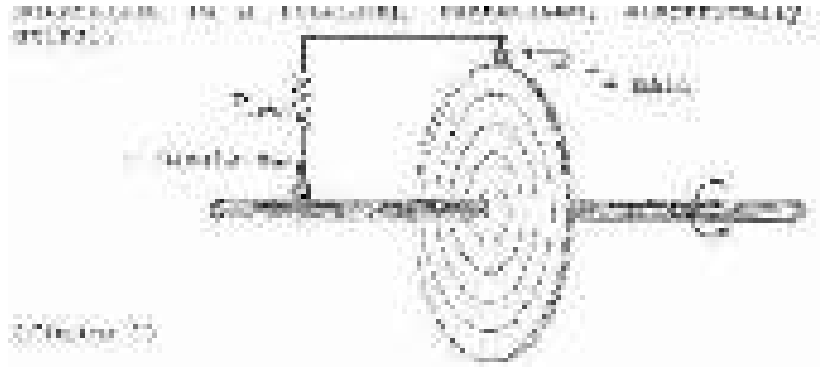
Copper is an insulator for the recombination of male-female energies. i.e. internal resistance = zero, with perfect insulation. I had always been taught that although the voltage in a magnetically linked circuit was  $B\ell v$  the current which could be drawn was limited by the series resistance of the circuit. Since the voltage developed across the terminals of moving wire arises from space why should the current being drawn be limited by the internal resistance of the wire connecting the terminals?

The situation resolves itself when we regard what is developed across the terminals of the moving magnetically linked wire as a male-female polarization and that recombination of the developed potentials is resisted by the insulating action of the copper or silver "conductor".

The reason copper and silver are good conductors is because they resist the recombination of the male-female polarizations and can conduct these polarizations to the point where they are merged to recombine in some socially useful manner.

The electrical metals are useful because they can be used to convey the electrical potentialities from point to point while at the same time they insulate them from recombination, the state of neutralization ultimately resulting in heat.

The simplest machine for the mechanical extraction of electrical potentials is a rotating, magnetized, electrically conducting spiral.



For simplicity the voltage pickoff points are indicated as brushes. In practice both contacts are liquid metal in a symmetrical circumferential arrangement where the current flow is wholly radial into and out of the machine. Since it has not been noted that electrical solenoids or coils commence to rotate when energized, it is clear that application of voltage to the sliding contacts will not cause the machine to commence rotation.

On the other hand if the conducting spiral is caused to rotate at high speed and an electrical load is connected between the terminals of the rotating spiral a voltage is quickly developed. This effect can be initiated by a small "inducer" coil or permanent magnet brought in proximity to the rotating spiral. The flux from this magnet initiates the current buildup in the rotating spiral. For short term experiments currents of 25-50 Kilo-amperes can be developed in a load of sufficiently low resistance.

What is important about this experiment is its non-reciprocity, i.e. the rotating spiral can produce voltage and power when energized but a spiral conductor is not known to rotate when a current is caused to flow in it.

What force or influence governs the local reference frame? When the precessing gyroscope locks in space because of its streptoid (twisting) motion does it lock into the space through which the Earth is moving at 5 miles/second, or does it lock into the local (Earth) frame, but why?

The magnetic field produced by current flow through the spiral is a distortion of the local space. Thus we can say the magnetic field links the rotating frame of the spiral with local space.

The characteristic of a rotating inertial frame (generated by a rotating real mechanical object) is an inertial anisotropy such that for axial measurements the inertia increases but for radial motions the inertial mass decreases. This distortion of inertial isotropy existing in the space around a rotating object is called an od field. Although the magnetic field links the local inertial frame the space of the local frame is distorted and modified by the inertially anisotropic od field created by the rotation of a real mechanical object. The result of this is to reduce the dragging action of an electrically polarized rotating spiral for motions in the plane of rotation. Since the plane of the spiral is the rotational plane it can be expected that there would be a reduction in drag of such a machine in comparison with an induction machine producing the same amount of power. A fact borne out by experiment.

It is clear from this that the space of the local inertial frame can be distorted magnetically and odically. The inertial anisotropy of the od field reduces the reaction forces generated by the extraction of electrical current from the rotating conducting spiral. If inertial dragging can be eliminated in this way, then the remaining drag must be due to the creation of the condition of precipitation of the male-female polarities and their resistance to depolarizing effects, i.e. electrical loading.

In such machines it is easy to compensate magnetic field distortion through current withdrawal by a proximate fixed compensation disc wherein the output current is caused to flow in the opposite direction. Thus polarization created in the rotating spiral can be made independent of the flow of current since no magnetic field disturbance is noted in the compensated machine with the withdrawal of current. Under these conditions can it be said that polarization (male-female) alone can invoke the flow of electrical current and that the magnetic field itself results from male-female recombination within conductors?

What is precipitated is quantized electrical charge with the evolution of heat - substances give off heat when they crystallize, and the recombination of the polarities with the evolution of heat.

Whether it be the generation of the polarities or the merging of the polarities, heat is evolved in both processes. In the cosmic cycle of generation, preservation and destruction, heat is evolved in generation and destruction and equilibrium is saved in preservation.

The heat of evolution of electrons is reflected in the spatial drag of the primitive rotating spiral N machine. The balance of the drag is contributed from the linkage of inertial frames through magnetism, i.e. a polarized conducting disc is linked to the local space frame through the spatial distortion of magnetism which can be accentuated by the near presence of ferrous (paramagnetic) objects, magnetically permeable structures - stators -, for magnetic flux path closing.

Mass is coupled to the local inertial frame through the mechanism of inertia. Magnetic linkages to ferromagnetic stators contribute additional drag.

The contributions from the different sources can be itemized thus:

- 1) heat of electronic creation of polarities.  
(heat of evolution of electrons)
- 2) intrinsic spatial drag of a magnetized rotating polarized conducting disc.
- 3) increase of intrinsic spatial drag through magnetic interaction with a proximate ferromagnetic object, i.e. a stator\*.

\* The stator presents a modification of the space in which the rotor must operate. Under this condition the intrinsic drag would be greater in comparison with free space.

In general, the primitive machine is the rotating magnetized spiral. This is an antenna which reduces the spatial magnetized energy to a form utilizable by mankind, i.e. the positive and negative polarities of electricity. As with all antennas, field distortions introduced by the close proximity of ferro-magnetized objects, stators, upset the symmetry of energy withdrawal and interfere with the operation of the antenna.

Higher orders of symmetry are employed in the cylinder machines. The rotating magnetized spiral is in relation to the cosmical time energy as the dipole antenna is to electromagnetism. Rotation and magnetism are combined in a material object constructed from an element wherein the recombination of the permitted polarities is minimal. That is the N machine. We are definable by our thoughts and our thoughts have reached the limit of resolution.

The heats of electronic precipitation and recombination cannot be said to be equal since the difference between the two rates must account for the presence of electrons in the Universe, while at the same time the Universe is neither getting hotter or colder. Thus in most cases one could safely say the heats of generation and recombination are equal. Ohm's Law can be said to apply, but one cannot rule out the possibility of a special condition, i.e. superconductivity, where different Laws apply. For an N machine with a superconducting rotor is the heat of electronic generation 0 or is a superconductor a special state of matter with a zero heat of electronic generation and recombination. If there is a connection between heat of electronic liberation and N machine drag then a superconducting rotor should be tested in comparison with a similar machine constructed of "normal", i.e. non-superconducting materials.

### **The Secret of the Faraday Disc**

All science consists of the elaboration of principles whose manipulation attempts to describe the continuous palate of Nature. So when I speak of the Faraday Disc I can look upon it as a powerful magical spell or I think I can understand it in terms of the causality of logic. Does understanding something remove the mystery?

The gyroscope is a totally mysterious object. Attempts to understand it mathematically have failed to explain anomalous inertial and gravitational behavior. Do we understand electricity? On deep examination electrical laws can be shown to be inconsistent with Newton's Laws. We have a working relationship with magnets and wires in electrical machines, is more necessary?

It seems to me that thinking in the abstract, and the formation of theories is helpful because the existence of these theories can posit new experiments. In Reality anything can be done, but of all the things which can be done, which are the significant experiments? And why are they significant? The implicit circularity of logic closes it and brings us back to significance in terms of the principles on which our theories are based. So do we know anything except the defined concepts of relationships between elementary experiments?

We accept a self-organizing principle in Nature which defines itself. In terms of written memorabilia logic defines itself as a self-organizing principle in Nature. If we leave the world of the printed page we enter the realm of music and subtler vibrations not susceptible to logic. Is that where our science ends? The tree becomes once more the tree and the forest the forest. We do not get the world we think we want, we get the world that is going to happen.

### **References:**

1) Faraday, Michael, Experimental Researches in Electricity. 3 vols. London: Richard and John Edward Taylor, 1839-1855.

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# FREE ENERGY

## Free Energy

The Political, Social, and Economic Implications of  
The N Machine / Space Power Generator

*It is said: "The whole Universe and created world is a thought in the mind of God."  
- The Gospel of Sri Ramakrishna*

If that be the case, wouldn't He want it to be the finest show in town?

As a long time worker in the field of Free Energy physics, and the inventor of the N machine which extracts energy from the Free Energy field of Space, sooner or later I would have to face the political nature of progress. It is not simply enough to violate the established laws of physics with a new experiment. (1)

We are facing at the close of the 20th century a situation unique in the history of the world. In the past the inventor had to serve the requirements of a vital and expanding society. The telegraph, the telephone, long distance communication, the railroad and automobile covered the globe and finally satellite communications making a truly global and planetary society. With the coming of the global society the planetary Earth became a floating island in space with only resource wars on the horizon as a foreshadowing of things to come.

Limitation of resources as opposed to development of uncharted territory poses a new challenge to the inventor. In the case of Free Energy, it is not a case of being able to accomplish something which had not been done before but being able to accomplish the same things which had been done before without consumption of gas, coal or oil or the pollution of natural resources by exhaust fumes or combustion by-products.

Take the case of the electric car. An automobile which could exceed the presently accepted performance while not consuming or burning oil or gas - which could be switched on before a journey and off after reaching your destination. The power unit for such a machine would extract its energy directly from space without noise or pollution.

With the growth of society limited by the finite planetary surface area the Space Power Generator offers the only hope for avoidance of resource wars. In fact, planetary renewal can be affected with the availability of unlimited non-consumptive and non-polluting Space Power. It must be recognized that advancement in society always means less manual labor and that finally we must accept the condition of un-employment as the fulfillment of the nature of progress itself. A new source of energy in our society, a new prime mover, can make possible a new kind of independence. A kind of independence for the common man where he can take pride that he has fulfilled his role in free society and now he can make his own life in the certainty of a new source of prime energy which can make him independent of the feeling that he must take orders from someone else in order to feel he has a job.

That total un-employment is the ultimate goal of capitalistic society. When all the natural forces of Nature have been harnessed man is released from the state of slavery. At this point politics becomes a form of state or option from which he can launch his platform to the stars.

If energy and transportation costs were zero, society would center around quality of life, small communities would form in which all basic life support requirements would be met locally. Money would still be required to purchase manufactured high-tech items and money could be earned through sale of community grown or manufactured goods.

A political administration would be elected to provide global planetary coordination for projects outside the scale of simple community organization. This does not imply the necessity of a global one-world government; a loose federation of autonomous states and countries would be sufficient.

In our present 1993 society Mammon has been elevated to the position of a god, i.e. nothing can be accomplished without money. The challenge is to replace promises on paper with real quality of life.

When Isaac Newton formulated his "Principia Mathematica" in the late 1600's he violated his own admonition "Hypotheses non Fingo", "I make no hypotheses" in his third law of motion: "For every action there is an equal and opposite reaction." This statement implies there is an "equal" and "opposite" reaction to every action. The statements "equal" and "opposite" are in themselves an hypothesis, since every experiment in physics would have to be tested, including experiments not yet to be done, in the future, to substantiate the truth of such a statement. Newton's first two laws, the law of inertia, and the law of mass, are laws of experimental observation which define inertia and mass and do not in themselves include a foreshadowing of the results of those experiments, to wit equal and opposite. Einstein, whose theories are based on the definitions of Newton's 1st and 2nd laws and the conservation laws which grow out of the hypothesis of the third law, are in themselves a conjecture resting on the hypothesis of equality of action and reaction.

Free Energy transduced through the reactionless self-running electric engine will replace all other forms of internal combustion machines. Society will reformulate itself around the new reactionless prime mover. Man and his activities will hitch themselves to the very wheelwork of the Universe, the forces which cause the planets to rotate and move in circular orbits around the Sun.

#### REFERENCES

(1) Magnetism as a Distortion of a Pre-Existent Primordial Energy Field and the Possibility of Extraction of Electrical Energy Directly from Space, Bruce de Palma; the proceedings of the 26th Intersociety Energy Conversion Engineering Conference (IECEC), August 4-9, 1992, Boston, Massachusetts; sponsored by The Institute of Electrical and Electronic Engineers (IEEE).

14 March 1995

## The Problem of Free Energy

Some inventions are good inventions, others are bad inventions. We all know what the good inventions are, the bad ones are guns, atomic bombs, poison gases, germ warfare, etc.

A good invention is intrinsically good, waxed paper, buttons, phonograph records, tape cassettes, and so on. A free energy machine falls into this category, it produces energy without consuming it, creates no pollution, and liberates Mankind from centralized control of his freedom. It could eventually liberate him from money. Because I am the inventor of the N-machine/Space Power Generator my greatest experience lies with this, a machine powerful enough to light cities, propel automobiles, and project Mankind into the exploration of space. There are other free energy machines, but these are only lesser manifestations of the same principle, the extraction of electrical energy directly from space. Although the technical details of these inventions are very interesting, they are covered elsewhere in the literature. The point of this essay is why haven't these devices and inventions come into the public domain.

The reason for this has more to do with the contemporary culture rather than with the inventors or the inventions themselves. To illustrate this I offer historical evidence, from the beginning with the concept, to its eventual realization in a practical machine.

The first person one has to convince of the availability of energy in a free unalloyed form directly from Nature, is yourself. Having received training from the best of schools, M.I.T. and Harvard, I started out fully indoctrinated with the ideas of conservation of energy, the laws of Newton, and the equations of Maxwell. In this there is no free energy. I had to become convinced, by direct experimental evidence, of an energetic principle in Nature, a principle that could be tapped if understood, and utilizable in some form of machine whose total output was mechanical or electrical energy, without consumption or burning of fuel of any sort. Needless to say, this goal can be achieved by distortion of space itself, but this is another story. In order to obtain milk from the cow, you do have to squeeze and pull on the udder.

I have a very strong background in successful high-tech R&D. Once I had demonstrated the reality of direct extraction of electrical energy in a small model N-machine, I thought commercial development would be obvious and easy. That was 17 years ago.

We live in a technological world. We tend to think all problems in the world can be solved through science and technology. If this were the case, we would have free energy now, and the world would be at peace.

The details of my experiences with the N-machines I have built and demonstrated have been published elsewhere. Through it all I have had to learn by direct experience certain realities of the world we live in and the consequences of introducing a possibly world changing invention to Mankind.

Einstein showed us power was in the existence of all things, and nowhere is that more true than in the works and activities of the elite groups who attempt to control society. The nature of these groups and their power has come to light in the studies of the Tri-lateral Commission, the CFR, the World Bank, and Dope Inc. Power and energy, the generation and control thereof, is the number one business in the world, more powerful than guns and drugs, food and property. One of my first discoveries, after having graduated from University, was that science and scientists in

general were controlled in their activities by managers and political influences originating from individuals with no intrinsic knowledge of science. The feeling was that if there was a job to be done, a specification could be generated, money could be offered and technical people would step forward. If there were first rate scientists who felt the job was immoral or impossible, then there were legions of second and third raters who would step forward and take the money. This ensured the control of science and scientists could be maintained by money. In this world nothing was impossible and all things could be done. As soon as a scientist would step forward and challenge the rationality, viability, or morality of a given program, he could be stopped through excommunication.

In the old days, prior to the second world war, scientists would have to raise money for their researches from wealthy private individuals, Trusts or Foundations. Thus we have the Hale reflecting telescope, the Lawrence Livermore Laboratories, and the Fels Planetarium. With the discovery of the splitting of the atom and the possibility of military power based on the atomic bomb, the tenor of science changed. Funding came from the government and projects were developed along lines consistent with the concept of a New World Order. Not only the character of research but the sequence of introduction of new technology was controlled in the interests of the maximization of profit and the maintenance of a strong, credible military deterrent.

Into this best of all possible worlds three factors entered to disturb the implementation of the Plan. First there was a limitation of material resources obtained from fossil planetary deposits. Second, the means of enforcement of a New World Order based on atomic power became flawed because people realized that the carrying out of the threat of its use would destroy the planet. Thirdly, in a world of total centralized control of resources, the population eventually became jaded and unfulfilled. Man does not live by bread alone, and a world without a dream has no spiritual dimension. Consequently there was total control, but nothing to believe in. Thus the desire to work and fulfill the orders of the masters withered away. To say we live in a safer, cleaner, more satisfying world now than we did fifty years ago, before the dawn of the atomic era, is a manifestation of the Orwellian nightmare.

In all of this we have not yet spoken of free energy. That is because free energy is not part of this world. Free energy comes from a place where limitation is not the paradigm of Mankind, and ownership and control are ideas which have been forgotten long ago. In the sense that free energy is available now, the contemporary establishment is confronted with something it does not want to understand, because in its understanding all other realities are shattered.

I have often thought that this situation is mythological in the following way. In history we find kings and rulers allied with wizards and sorcerers, in the happy and successful kingdoms of the past. The wizard [a.k.a. scientist] Merlin, educated the young King Arthur. Aristotle was the teacher of Alexander who conquered the world. It was never so that the king would attempt to control or usurp the power of the sorcerer any more than the sorcerer was interested in ruling the kingdom. In modern times, with the power of money, bankers and businessmen rule the roost with their handmaidens of wealthy property owners and families. Nowhere in this is the power of the sorcerer recognized. In such a world the power of non-doing is unappreciated.

In this world of contemporary times, all the agencies, CIA, FBI, KGB, NSA, Electric Power Research Institute, DARPA, Brookings Institution, Henry Kissinger, Edward Teller, et al., all are aware of DePalma and his ideas. Because these individuals and institutions are employed by the ruling elite to forecast the future and satisfy present needs and demands, it is clear that free energy is a threat to the world order constructed by business and the mindset of those who want to own the world. Free energy represents Man's aspirations and dreams of freedom and equality, uniform division of resources and the ability to choose one's own future. The fact that free energy is suppressed speaks to the greed and self-interest of a ruling elite which, even in the face of an emergency of global starvation, resource depletion and environmental pollution, will not give one

inch if it means loss of control. This is an attitude of paranoid delusion and fantasy which can only arise from the alienation of a class of elitists who, through their money, are completely insulated from the reality of the day to day fight for existence of the common man.

Many things have been said to me in the long years I have spent in the development of the science and technology of free energy. One of them has been, "After the crash." Another has been, "If there was one chance in a hundred of this working, then we should go for it because there is no alternative." I would hate to think that society would have to destroy itself before this new form of energy were introduced. In terms of the world of the bankers, property holders, money men, elitists and others of their ilk, their world is over, with or without free energy. I have always felt that we live in a compassionate world of Nature, in which the choice of life or death is always available, both to individuals and societies. As long as we the people allow our collective future to be controlled and manipulated, we have no choice. Given the possibility of a new source of energy, the world can be turned and we can re-create Nature once again on this planet. I am not advocating my machine or any other machine in particular to be "the solution". What is needed is a change of attitude. We have to go beyond the understandings and strategies of our feudal and warlike past. Our theories of Nature must take into account the transcendence of all things that exist, and the possibility of an energetic principle latent in Nature. With this we may survive.

I have given a great deal of thought to the presentation of experimental results of my machines, new reports, new theoretical interpretations, more hardware, nuts and bolts appreciations. It does no good to write reports about things people cannot understand or do not want to understand. What is needed is to unload the accumulated baggage of our unenlightened past, and open our minds to new ideas. If such is the case, I am more than happy to discuss my machines and theories with anyone and everyone.

18 July 1995

## That is Science

It is well known that geometrical optics is a mathematical technique for the design of lenses. Using this theoretical construct diffraction limited optical systems may be fabricated. The important point is that diffraction limited optical systems are limited by the properties of light. The general inference is that the theoretical construct is correct because what can be designed and fabricated is limited by the natural properties of that which is operated upon by the system. In this case a further refinement in the theoretical construct would not lead to an increase in the resolution of a diffraction limited system.

The question to be asked is: would further refinement in theoretical expressions of electromagnetic forces lead to any improvement in electro-magnetic devices? The other area of concern is in conceptualizations. Is it proper to attribute to the (model of) the electron the results of disparate experiments, i.e. charge, mass, radius, magnetic moment, "spin". Is an electric current the movement of discrete "charges".

The Weltanschauung of the theoretical physicist is that there is some overall unifying concept. The use of models, i.e. the 'electron', is a reflection of this idea. I hesitate to cite the Einsteinian view of 'equivalence', not only because it is totally wrong but philosophically incorrect. Nevertheless the blind and misguided application of this idea by the Relativists goes on even when confuted by experimental facts.

The real reason why philosophical surds like central order, universal formal principles and equivalence persist is because the ambiguities they create offer endless lebensraum for the creation of pseudo-physical theoretical dreams by the epigones. None of this, ipso facto, can offer mankind any help in the rationalization of the physical world.

It is not the fault of electro-magnetism that ten different theories exist for the 'explanation' of electromagnetic forces.

Proper experimental science consists of the design and execution of simple experiments in which the result is the unambiguous revelation of a simple truth. The prismatic dispersion of white light into a spectrum of colors, the attraction or repulsion of parallel current carrying wires. The generator action of a rotating magnetized conductor, the numerology of the periodic table of elements and the rationalization of organic chemistry by the benzene ring or double-helix are such simple truths.

Some physicists call themselves experimentalists because they take data from experiments. Others call themselves theoretical scientists because they dream the dreams of the paranoid and schizophrenic.

What is useful for mankind is the simple observation of an experimental result which in itself creates a new world from the old.

The world is round, not flat. The planets revolve around the Sun, not around the Earth. The benzene ring rationalizes organic chemistry. Gravity is a flow not a force. Space consists of pure energy, the distortion of which engenders the created world.

All of these observations are the result of the examination of many experiments, the collation of enormous data. If it is said that to read the results of one year's accumulation of experimental data takes 12 years, then the reader has not learned to reject the absurd, to cull out the ineptly taken experimental data, to exercise discrimination between the real and the unreal.

The complete scientist is a balanced person. He has the discernment and discrimination to perceive the underlying truths of nature, hidden beneath the multiplicity of experimental appearances. He has enough sense not to extend his theoretical expectations beyond the resolution of his experiments. Nor to delude himself into thinking the manipulations of mathematics can offer him more insight than the conceptualizations on which they are based.

What is required in Science is not the training of more clones or epigones. What is required is the balancing of the individual, the harmonization of thinking. The development of insight, and observational instincts to discriminate between the real and the unreal. That is Science.

16 July 1993

## Where Electrical Science Went Wrong

*"It is characteristic of fundamental discoveries, of great achievements of the intellect, that they retain an undiminished power upon the imagination of the thinker. The memorable experiment of Faraday with a disc rotating between two poles of a magnet, which has borne such magnificent fruit, has long passed into every-day experience; yet there are certain features about this embryo of the present dynamos and motors which even today appear to us striking, and are worthy of the most careful study."*

- Nicola Tesla, 1891, New York City, New York

*Law of Equipartition of Energy: In a given thermodynamic system, the total energy will subdivide itself equally amongst the characteristic modes of the system.*

After Michael Faraday performed the initial experiments resulting in the discovery of the one-piece homopolar generator of December 26, 1831, figure (1), he devoted considerable effort to reconcile the appearance of generated electrical potential in the apparatus with his conceptualization of the cutting of flux linkages by a moving conductor.

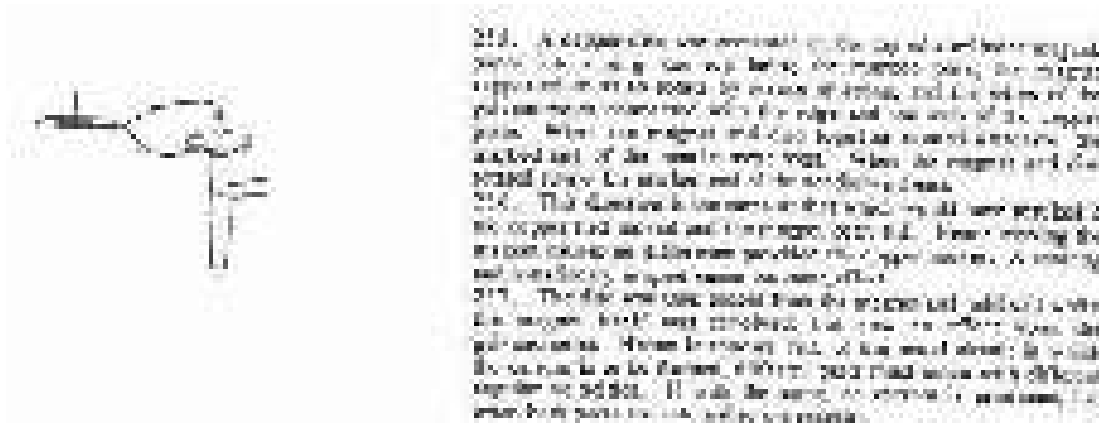


Figure 1  
Last of a rotating magnet for electrical generation  
in December 1831.

Although Faraday never adduced an experiment to prove the cutting of flux linkages in the axially rotating magnet experiment, he was troubled to his last days about his interpretation of his experiment. It took until 1978 when DePalma, reference (1), did the critical experiment to determine if the form of electrical induction was the same as the flux cutting originally proposed by Faraday. The problem has been re-stated by other workers who would attempt to determine whether flux lines rotate with, or are spatially independent of the axially rotating magnet. To date, no experiment has been found either to confirm or disprove the axially rotating flux line hypothesis, reference (2).

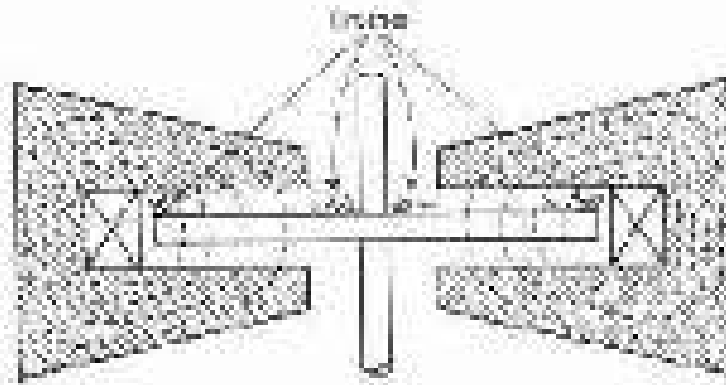


Figure 2  
Cross section through a disc machine in the plane of the shaft.

The laudable efforts of Clerk-Maxwell to express in mathematical form the results of the electrical experimentation of Faraday reflect the uncertainty which he had over the interpretation of the 1831 experiment. The result was that Maxwell did not consider the problem at all, or felt he had nothing more to offer.

For those scientists who consider mathematical expressions of physical laws as the only possible descriptions of physical reality, having no mathematical description is tantamount to no physical reality.

Electrical science, which is considered to be completely known, has been ultimately reduced to a completely self-consistent set of equations which are suitably stored in computer memories and are used to design motors, generators, transformers and other sorts of familiar electrical hardware.

The first place electrical science went wrong is when electrical phenomena which were not subject to unambiguous mathematical interpretation were simply omitted from electrical curricula.

The second place electrical science went wrong is concisely illustrated in a sequence of evolution of electrical machinery abstracted from "Exciting Electrical Machines", by E. R. Laithwaite, D.Sc., Ph.D., C. Eng., F.I.E.E., F.I.E.E.E. Professor of Heavy Electrical Engineering, Imperial Technical College, London, England. Reference (3).

"The various steps shown in figure [3 (a)-(d)] do not represent an historical sequence. They represent an attempt to break down the topological difference between Faraday's disc and an early type of commercial machine into simple basic steps. Figure [ 2 ] shows a cross section through the disc machine. In theory the two brushes marked (+) would be part of a continuous annular brush at the centre; likewise the (-) brush extends all around the periphery. This arrangement is represented diagrammatically in figure 3(a). The first step consists of elongating the disc axially so that it forms a cylinder. The magnetic circuit is then re-arranged so that the flux enters the rotor through one end of the cylinder and emerges through the periphery, as shown in figure 3(b). If the rotor were of solid copper, the magnetic circuit through it would be poor. The rotor is therefore modified to consist of a hollow cylinder filled with iron, as shown in cross-section in figure 3(c). For ease of mounting the rotor, i.e. with a bearing at each end, the iron core is made integral with the conducting cylinder and the two rotate as one unit.

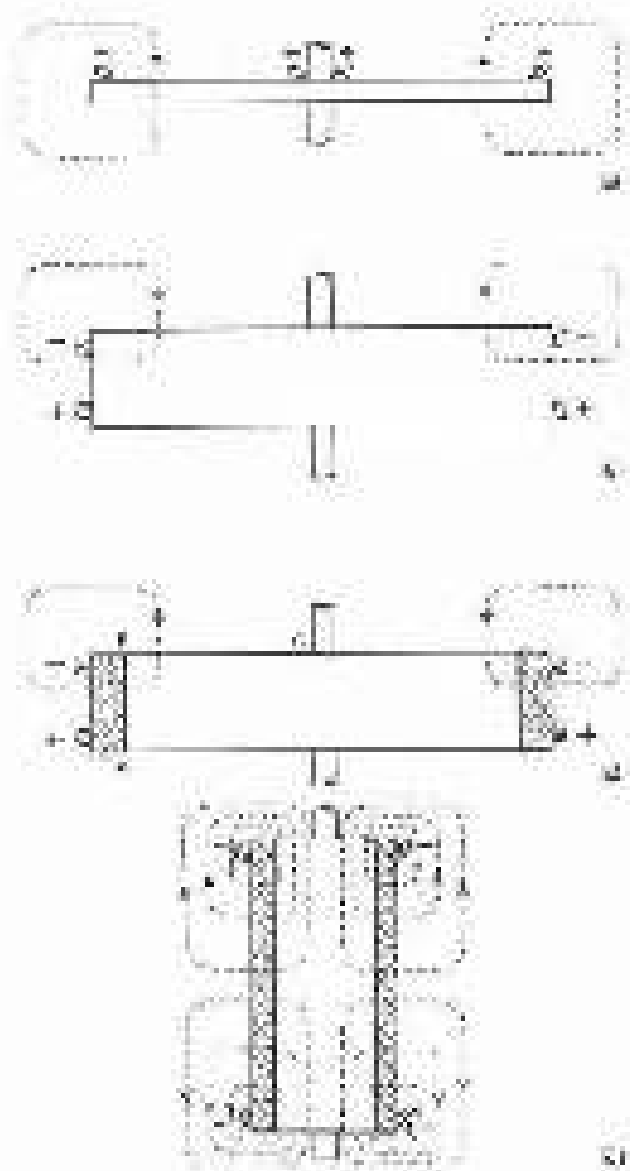


Figure 3 (a)-(e) Basic topological design of a rotor with brushes at both ends.

"The dimensions of the rotor are next changed to take advantage of the fact that the useful e.m.f. is generated along AB (figure 3(c)) rather than BC, i.e. between the brushes. The diameter is reduced and the length increased. The axial direction, however, now represents a bottleneck in the magnetic circuit, even though the machine can be flux fed from both ends, as shown in figure 3(d). The solution to this situation is to send the flux right through the rotor, as shown in figure 3(e)."

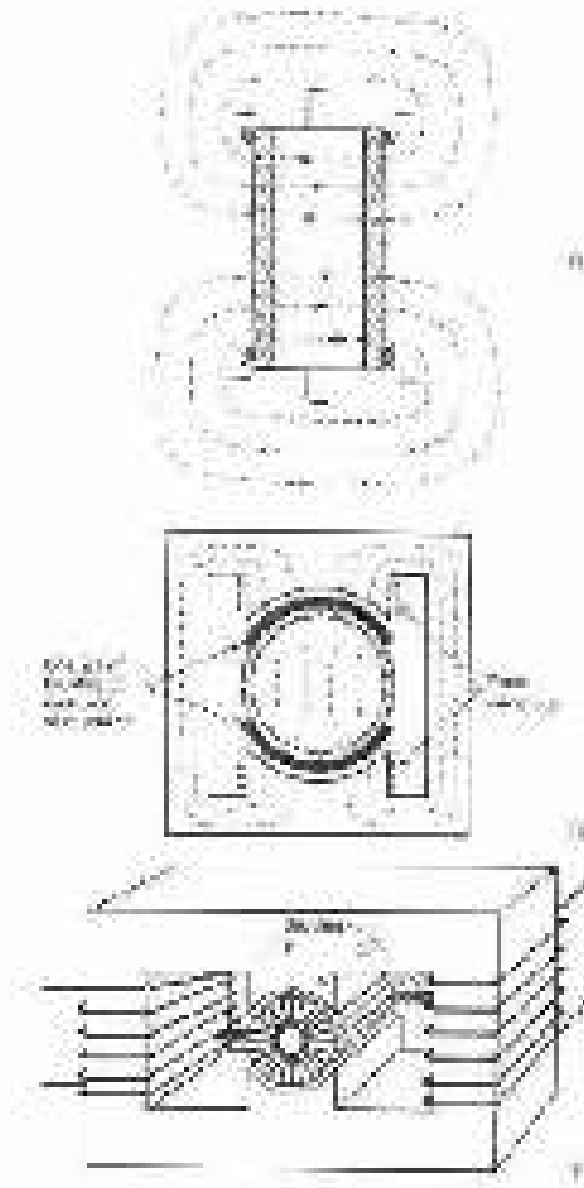


FIGURE 3. (a)-(c)

In a manner so casual so as to escape attention Laithwaite alters the magnetic field direction from flux lines parallel to the axis of rotation to flux lines perpendicular to the rotational axis. This fundamental change and the unstated ambiguity: do flux lines rotated in the manner shown, figure 3(e) ipso facto demand a two-piece machine, figure 3(f)? If the two piece, i.e. rotor-stator construction is implicit for electrical machines where the flux lines through the rotor are perpendicular to the axis of rotation, then what has this to do with the archetypal one-piece Faraday

homopolar machine which does not require a stator. Is the evolution suggested by Laithwaite an evolution or the description of two fundamentally different families of electrical machines?

We continue with Laithwaite: "Notice that this means that two sets of brushes are now needed, since the polarity of the e.m.f. around one arc of 180 degrees is opposite that around the other. The plane of the magnetic circuit can now, with advantage, be turned through a right angle so that a cross-section of the machine is as shown in figure 3(f). This is the point where the rotor conductor is split into individual wires which can be connected in series. To do this it appears to be necessary to use a hollow iron core and to connect each wire at end X (figure 3(g)) to the next, at end Y, by means of a wire passing up the centre of the core."

In his dissertation Dr. Laithwaite has made a number of assumptions, which, in the light of contemporary knowledge, can be questioned. I am not singling out Dr. Laithwaite as being defective in his reasoning, but his position of authority is representative of the presently accepted level of knowledge of electrical science.

The first assumption:

That there is a relationship between the Faraday disc and the two piece induction machine of commerce.

The second assumption:

That there is no difference in behavior of electrical machines if the source of flux moves with the rotor or not.

The third assumption:

That there is no difference in the behavior of electrical machines if the flux lines are either parallel or perpendicular to the axis of rotation of the machine.

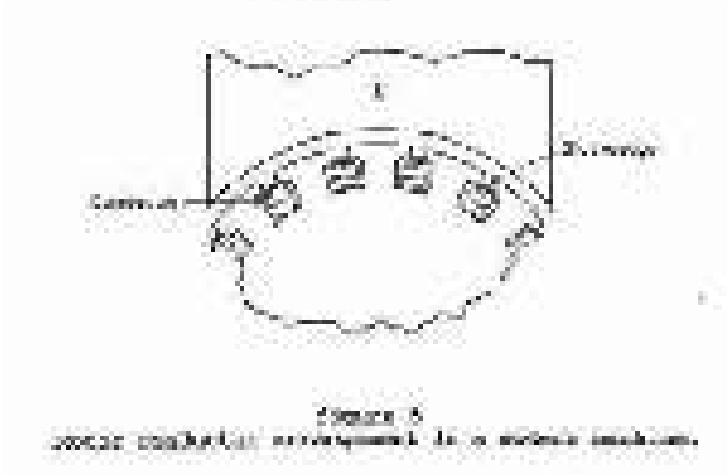
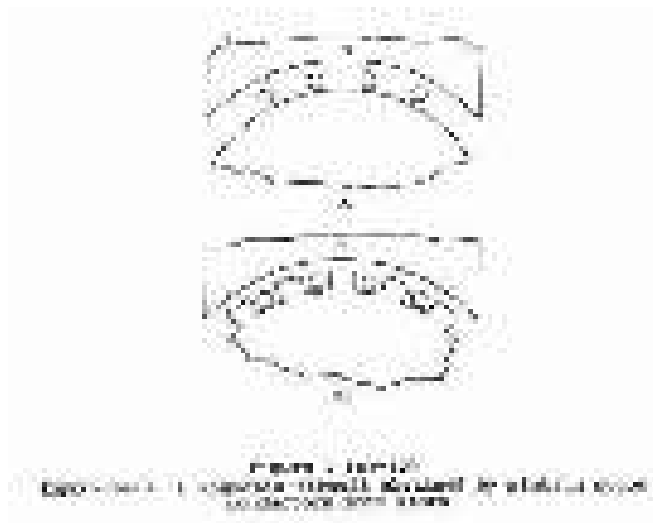
The fourth assumption:

Flux cutting is the only mechanism for the generation of electricity from magnetism.

It is left to the reader to intellectually explore the implications of the first three assumptions on the evolution suggested in figures 3(a)-(g).

That the fourth assumption is suspect is ably illustrated by a second extract from Laithwaite.

"Figure [4(a)] shows that surface conductors demand a gap in the magnetic circuit which must increase with increase in thickness of conductors, which in turn is demanded by an increased current loading, whereas a conductor system in slots as in figure 4(b) can combine thick conductors and small air gap in one arrangement. Quite apart from magnetic considerations, conductors on the surface are liable to become displaced around the periphery, aided by the speed of rotation which tends to stretch and loosen the conductors. If the conductors are constrained in a slot, and held in by a non-metallic slot wedge as shown in figure [5], the speed of the machine, and therefore its output, can be increased without suffering these effects of rotation.



"The big question, however, is whether the machine will still function at all. After all, the magnetic flux will now take the line of least reluctance and cross the gap only opposite the rotor 'teeth'. The flux now cutting the conductors is now perhaps only 10% of that which cuts the conductors of a surface-wound motor. Will the output voltage therefore be only 10% also, as apparently dictated by the flux cutting rule? For a long time no one would try the slotted rotor, because they did not believe in the 'magic' of electromagnetism. They believed they knew all the answers. Worst of all, they did not realize that only circuits mattered and that so long as a machine broke and re-made linkages between magnetic and electric circuits the answer would be the same whether the conductors were buried or not."

It is not all of us who conceal our ignorance by appeal to the belief in the "magic" of electromagnetism. The fact that the modern two piece wound rotor machine works at all speaks to the operation of electrical laws outside the computer controlled algorithms now representative of electrical science.

The fifth assumption:

The fifth assumption is that all the laws of electrical science must be consistent with the energy conservation laws. Is this why the "magic" of electromagnetism is necessary?

To quote Laithwaite once more: "It is to be hoped that we are all not suffering from similar inhibitions when we design our modern machines."

Reference (1): Magnetism as a Distortion of a Pre-Existent Primordial Energy Field and the Possibility of Extraction of Electrical Energy Directly from Space, Bruce DePalma; proceedings of the 26th annual Intersociety Energy Conversion Engineering Conference (IECEC), Boston, Massachusetts, August 4-9, 1991.

Reference (2): "Spinning Magnetic Fields", Djuric; Journal of Applied Physics, vol. 46, no. 2, February 1975, pp. 679-688.

Reference (3): Exciting Electrical Machines, E. R. Laithwaite, pp. 13-17; Pergamon Press Ltd., Oxford, England, 1974.

## The Generation of a Unidirectional Force

**Summary:** The theoretical prediction and experimental elucidation of the variable ratio of inertial to gravitational mass of a constrained gyroscope under forced precession opens up a new field of Inertial Mechanics. The controllability of inertial mass makes possible the generation of thrust by mechanical motion alone. A new device, the Linear Force Machine, is described which operates on a heretofore unrecognized interaction between rotation, magnetism, and inertia, to generate a unidirectional force as a solid state interaction. The application of a controlled and directed mass field flow to the containment of a controlled thermonuclear power reaction is discussed.

### The Generation of a Unidirectional Force

**Introduction:** The mechanical generation of a unidirectional force, is shown to be a consequence of the variable inertia property of matter.

**The Linear Force Machine:** A series of experiments<sup>1</sup>, has elucidated a variability in the ratio of inertial to gravitational mass of real objects. The key to the unsuspected variability of inertia of real material object lies in heretofore unrecognized properties of rotation. The possibility of inertial control makes practical the generation of a unidirectional force through purely mechanical interactions.

There are many ways to control inertia of objects, but all of them are based on the primary interaction of rotation and inertia. The simplest manifestation of the phenomena is the rotation of a spherical material object. Depending on the speed of rotation, the inertial mass of the object will vary as the square of its rotational velocity. The ratio of inertial to gravitational mass may be found by pendulum experiments. This ratio is defined as the OD number, this quantity having found to be dependent on the angular velocity of rotation of the test object, its composition and geometry, and the value of linear acceleration which is applied to the rotating object to test for inertial mass. All things considered then:

$$N_{od} = \frac{\text{inertial mass}}{\text{gravitational mass}}$$

For the simple spherical metallic object, the spinning ball, the od number may reach factors of five or so as the rotational speed is increased to the point where the object will explode, i.e. 50,000 rpm for a 1 inch steel ball bearing. For practical controllability of inertia, larger inertial variations must be created and be subject to control other than the rotational acceleration of a test object to 50,000 rpm and then back to zero again as part of a cycle.

A much more powerful interaction takes place through the precession of a constrained spinning gyroscope. The ratio, inertial/gravitational mass, of a constrained spinning gyroscope can easily reach a factor of several hundred, depending on the velocity of precession and the rotational speed.  $N_{od}$  is, (at least) a function of the square of the precessional velocity. That is:

$$N_{od}(\text{precession}) = K\omega^2 + 1$$

Where  $\omega$  = gyro angular velocity

and  $\dot{\omega}$  = angular velocity of gyro precession

$K$  is a geometrical and physical constant.

A suitable mechanism for the demonstration of the unidirectional force is a mechanical arrangement based on the force machine. A force machine, c.f. figure (1), is a combination of two mechanically identical gyroscopes, rotating coplanar and with parallel axes, in opposite directions at equal angular velocities. Such a device allows us to study the properties of rotation without interference from gyroscopic torques.

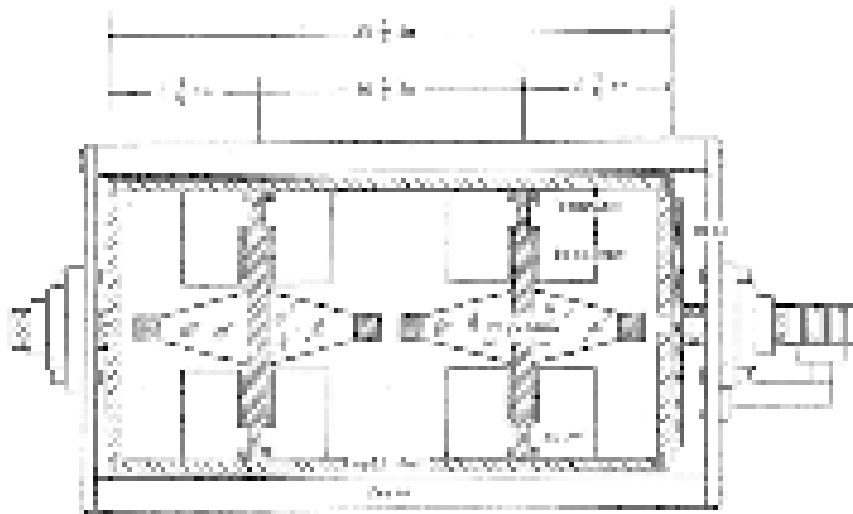


Figure 1. Force Machine

Figure 2. Force Machine

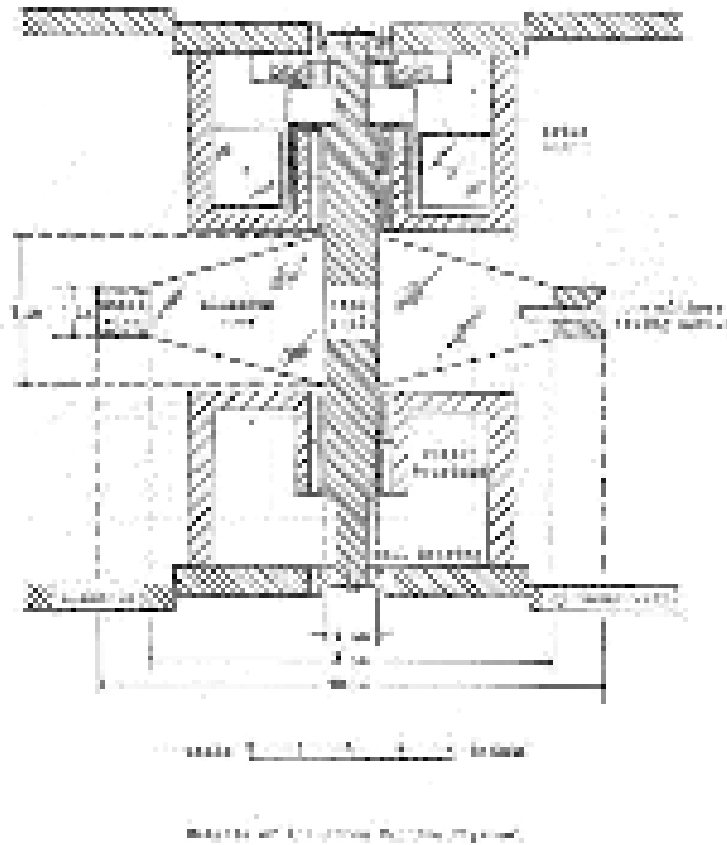


Figure (1a)

Since inertia is isotropic, it is clear that inertial changes engendered from procession are reflected in linear inertial changes as well. A sequence of operation is indicated. Consider the energized (gyros turning) force machine. The machine is pushed away from the experimenter in the low inertia (no procession) condition. When the machine is pulled back, however, the gyros are precessed at some angular velocity. The condition of procession multiplies the inertia of the rotating gyroscopes by a factor of several hundred times. This is reflected linearly and presents a strong resistance to the force exerted by the experimenter attempting to return the machine to its original, (near) position.

A combination of linear and torsional oscillations, (the latter at  $1/2$  the angular frequency of the former), will produce a unidirectional reaction force in the direction of linear oscillation of the energized force machine

A phase diagram showing the relationship of the linear velocity to torsional oscillation and the direction of net momentum flow, appears in figure (2). A combination of mechanical linkages to accomplish this effect in a rapid cyclic manner is shown in figure (3). The resultant momentum flow is a product of  $N_{od}$  (precessional)  $f(t)$  and  $v(t)$  (linear motion), and represents the unidirectional reaction force.

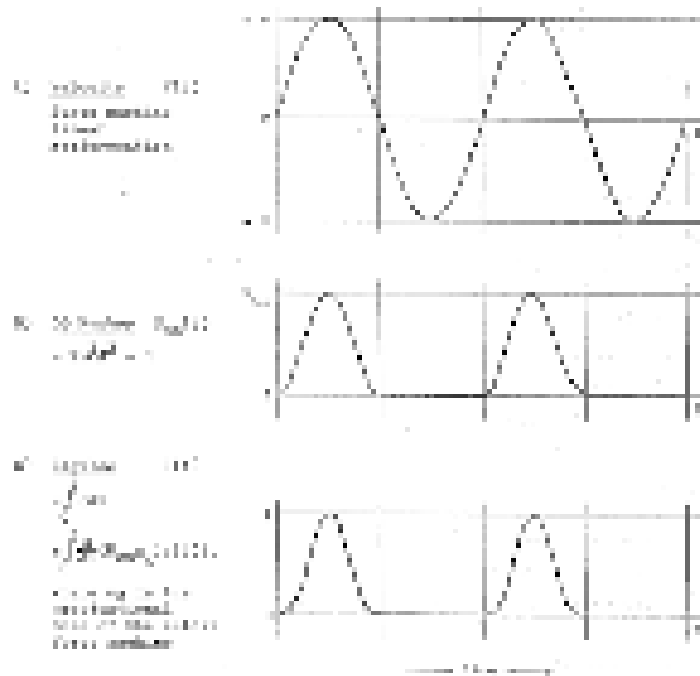


Figure 10. Force variation.

When the relative level of the piston is increased or decreased continuously, various conditions of unidirectional force are obtained.

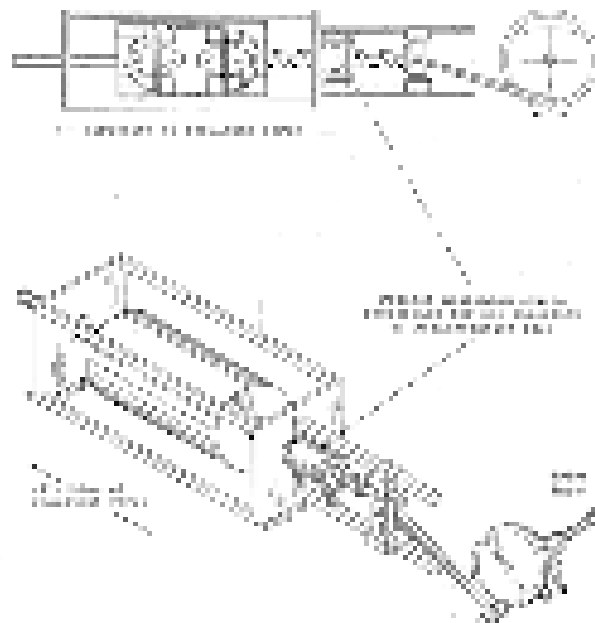


Figure 11. Linear force machine.

The machine of figure (3) has been constructed in our laboratory and delivers unidirectional reaction force in the pulsating manner expected. The device is called a Linear Force Machine.

**Inertial Mechanics:** The field of inertial mechanics refers to that class of mechanical experiments wherein inertia becomes a variable. Although the mechanical force machine demonstrates the usefulness of the variable inertia concept in the generation of a unidirectional force; there are several reasons why such a machine stands in relation to its ultimate form in the same wise as the early rotating mechanical radio frequency generators stand in relation to the modern high power vacuum tube or transistor radio frequency power oscillators. In the first place the delivery of force or momentum impulses is in a pulsating manner. It would be highly desirable to have the delivery of force or momentum in a steady manner. Secondly, the necessity of maintaining the condition of energization of the force machine requires a steady high speed rotation of constrained gyroscopes. As well as the necessity for the supplying of the rotational excitation via electric motors or mechanical gearing, the necessity for sturdy bearings to support the gyros under intermittent reciprocating precessional torque reactions. The fact that these are problems of a conventional sort, which can be easily solved through accessible bearing technology, does not mitigate against the search for a more desirable rotational-inertial interaction.

In the linear force machine thus far described, the form of the motion imparted to the force machine, is called "three dimensional". The form of motion where driven precession is coupled with linear oscillation is called "streptation", a derivative of the Greek word for twisting.

What is desired is a mode whereby streptoid motion can be achieved without mechanical linkages and reciprocation. Such a machine would achieve the generation of unidirectional force without pulsation.

**Inertial Drive:** The ideal inertial drive would achieve a smooth flow of momentum in a desired direction with the resultant reaction force of steady and constant magnitude. The method of accomplishing this result is through a heretofore unrecognized magnetic interaction. With reference to figure (4) we observe a rod of medium hard magnetic material suspended within the gap of a permanent magnet. The length to diameter ratio of the magnetic core determines the dimensions of the magnetic gap. From the front to rear of the machine the magnetic gap is twisted 180 degrees. The magnetic core is suspended on bearings designed to withstand whatever thrusts are generated by the machine.

Within the gap of the permanent magnet the magnetic induction is maintained such that the

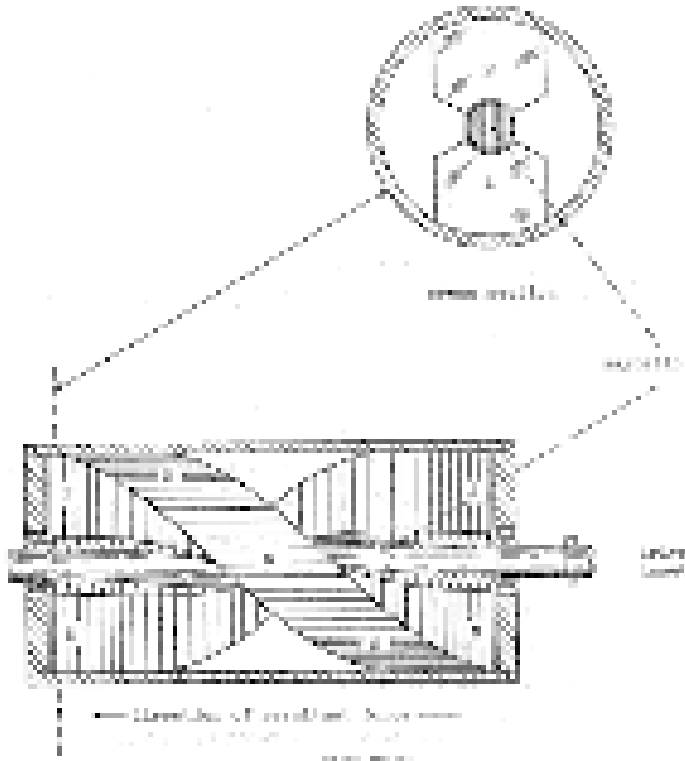


Figure 4. Magnetic Drive Mechanism (Simplified)

magnetic core is saturated under all conditions of operation of the machine. Under such conditions the external magnetic field maintains alignment of the magnetic dipoles within the material such that no projections of internally generated torque vectors, produced by rotation of the magnetic core within the gap, can appear in the drive axis. This is the familiar disappearance of hysteresis torques under saturation conditions, and represents the condition of constraint of a rotating gyroscope.

Motion of a magnetic material in a magnetic field sufficient to cause saturation elicits the identical inertial properties that have been found in rotating real mechanical objects. What is necessary is to obtain the streptoid three dimensional motion in order to elicit the unidirectional force. This is simply accomplished by twisting the magnetic gap so that in

rotation the magnetic dipoles within the core material are both twisted and translated. The combination of twisting and unidirectional translation is simply accomplished by rotating the magnetic core.

In like manner to the precession torques of rotating gyroscopes, the hardness of the magnetic core material will determine the strength of the interaction. The ultimate force handling capacity of the machine will be limited by the demagnetization of the rotating core through inability of the external field to maintain constraint over the magnetic dipole interaction.

The machine of figure (4) becomes a fundamental drive unit, capable of generating a thrust against "space" itself, and thus may replace all earlier methods of generating unidirectional motion, i.e. gears wheels transmission units for road travel, and propellers and jets for airborne vehicles.

**The Mass Field Effect:** The ability to enhance the inertia of a rotating object controllably makes for the possibility of controlling the flow of inertia. The mass field or OD field represents the possibility of storing energy in the inertial property of space. That this has been shown as a field which exists is the result of our prior experiments. Now the possibility of a directional flow of that inertia, the mass field, exists as a concomitant of the operation of the linear force machine. A directed mass field flow can have useful mechanical applications.

**The Hydrogen Fusion Reaction:** Although it is cloaked in many mysterious terms relating to the properties of nuclear plasmas, the fusion of hydrogen to helium is nothing more than another

form of burning or combustion which can only take place under conditions found in the interior of stars. Creation of such a condition here on Earth entails the creation of a region of space, a "bottle", wherein the proper temperature and conditions for such a reaction are maintained. At a temperature of  $10^9$  degrees K, the necessary conditions can be maintained only through a field of force.

Prior attempts to contain the reaction through electric and magnetic interactions with the charged plasma have failed through the inability to generate sufficient forces for containment. Although at present, it is just an experimental possibility, it is suggestive to consider a containment region maintained through the mass field flow of a suitable number of linear force machines arranged geometrically with their force vectors convergent to delimit the reaction region.

**Mass Field Flow:** When an OD or mass field is created, its first order effect is to enhance the inertia of material objects immersed within the active region. Momentum can also be transmitted through a mass field, and this is responsible for the conundrum of a "mass field flow".

In general we associate a flow with the movement of material. The flow of momentum associated with the mass field of a linear force machine, is, a directed flow of inertia which acts to produce a linear force on mass particles immersed within the field. The resulting flow which takes place, is described by the motion of test mass particles. Thus, although the mass field does not itself flow, test particles immersed within it are acted or by forces which cause motions similar to those of the fluid flow in liquid and gasses.

On the basis of this analogy we can see how a region of containment can be created by the geometrically symmetrical and radially inward convergence of directed mass field flow. In many respects the magnetic core of a linear force machine resembles an antenna whose directivity is a function of the length to diameter ratio of the rotating member. If this relationship holds true, it is suggestive to consider the degree of focusability of these beams and the attractive and repulsive forces which may be set up in a properly directed array. The potentialities of these arrangements need to be explored in every possible detail in view of the possible vital payoff in terms of the controlled fusion reaction. Other possibilities of controlled and directed mass field flow are left to the imagination of the observer.

**Conclusion:** The linear force machine, as a mechanical prime mover, replaces gear trains, propellers and jets, as a device for the generation of thrust with one moving part, and the polarity of thrust determined by the sense of input shaft rotation, this machine becomes a fundamental tool of our civilization. In degree of sophistication, this machine represents the level of scientific inquiry of our society. The forces which use and make ready this device for the benefit of society, will have at their disposal a tool of unprecedented force and power. The use of this machine to enable the controlled thermonuclear fusion reaction will inaugurate a new dawn of civilized society on this planet, and will inaugurate the entrance of Man into interplanetary space and ultimately the stars.

(1) references to the force machine experiments:

- a) Antigravity 9 January 1973
- b) The Force Machine Experiment 9 January 1973
- c) The OD Effect - A New Physical Phenomena 9 June 1973
- d) The OD Effect - Radio Frequency Shift Expt. 17 June 1973
- e) The Effect of Gravity on Rotating Objects 18 March 1974

Acknowledgement is given to **Mr. John S. Wolf**, (formerly of) 741 Torrington Place, Dayton, Ohio 45406, for the independent development of the theory of the relationship of inertial to gravitational mass of a precessing gyroscope, and to whom the terms "mass field effect" and "streptation", are credited. Mr. Wolf is one of the pioneer investigators in this new field of inertial mechanics.

## **Power Output of A.C. Induction Machines**

### *The Method of DePalma*

The alternating current induction motor was invented by Nicola Tesla in 1888. From its inception its ease of manufacture and its power dominated the field of electromechanical energy conversion. Considering its universal use and application the power available from a given motor frame construction was increased from 7.5 Hp in 1900 to 100 + Hp by 1965. With contemporary manufacturing and application the performance characteristics of a given machine can be specified to an accuracy of 1% or better.

IEEE standard test procedure for polyphase develops six main parameters which characterize the performance of a given induction motor. They are:

- 1) Efficiency**
- 2) Power factor**
- 3) Torque**
- 4) R.P.M.**
- 5) Watts**
- 6) Amperes**

These parameters are plotted vs. motor output in horsepower and are available from the motor manufacturer. There are additional parameters for the characterization of polyphase motor performance but these are subsidiary and not germane to the substance of this report.

Slip of a.c. motors: The parameter of importance in this discussion is the a.c. motor slip frequency which is the difference between the unloaded motor speed, governed by the frequency in c.p.s. of the mains supply, and the speed at which the motor rotates under load. The torque of a polyphase motor varies almost directly as the magnitude of the rotor slip r.p.m.

Over the range of power in which a motor of a given capacity may be used efficiently, i.e. an efficiency greater than 88%, manufacturer's data is available completely specifying the relationship of rotor slip to mechanical power output. Thus the power output of a motor may be specified completely on the basis of the slip frequency providing the motor is operating at the standard excitation of 50 c.p.s., 30, 415 v.a.c. and the excitation waveform is sinusoidal.

Mechanical power output of a large a.c. motor may be accurately measured with a tachometer used in conjunction with a set of curves of slip vs. power output supplied by the motor manufacturer. This method obviates the standard method of motor power measurement requiring an in-line torque sensor interposed between motor and load. In a sense the motor itself becomes the in-line torque sensor with slip speed as the indicator.

This method of motor power indication becomes more interesting when the mode of motor excitation is the synthetic sinusoidal waveforms characteristic of the present generation of variable speed drives and motor controllers.

Non-sinusoidal motor excitation may be characterized by an alteration in the power balance within an a.c. machine. The presence of harmonics of the fundamental 50 c.p.s. mains supply as well as artefacts of the internal switching strategies of the motor speed controller result in a redirection of power flow through the machine such that rotor and stator heating increase at the expense of motor torque and power output.

In practical terms this means that for the same loading, rotor slip in a polyphase a.c. motor can be greatly increased in comparison to the same motor operated at the same voltages and frequency from a sinusoidal supply. The loss in efficiency of electromechanical conversion in the motor under these conditions is reflected in a redirection of energy flow such that power normally converted to torque x r.p.m. is diverted to the heating of the rotor and stator.

Consequently the power conversion efficiency of an electric motor is reduced when operated on non-sinusoidal excitation.

A correction factor may be derived from the relationship between the slip vs. load for a specific non-sinusoidal excitation waveform by measurement of the motor slip at constant load for sinusoidal and non-sinusoidal excitation.

Since the torque output of an a.c. induction machine depends on the magnitude of the slip frequency if we were to find twice as much slip from the same power input with non-sinusoidal excitation in comparison to the sine wave, we could surmise the torque producing properties of this waveform had been compromised to the extent of 50% with the balance of the real power input to the machine being dissipated in a non-torque producing manner, i.e. heat in the rotor and stator.

We might expect from the manufacturer's specifications an electromechanical energy conversion efficiency of 90+% on sine waves, however, the measurements of this author on motor speed controllers under 10 Hp using direct torque measurements of motor output power show overall efficiencies of 40-60%, even though individually the controller may be .97 and the motor efficiency .96.

It is easy for a motor controller manufacturer to specify .97 efficiency into a resistive load. A motor manufacturer specifies using sinusoidal waveforms.

Because of the way motors under 10 Hp are generally employed it would be hard for the user to uncover the nature and magnitude of interactive system losses, and for the small amounts of power being consumed and dissipated the motivation for these studies would be very low. A different rationale might apply to electromechanical systems where energy management and efficiency were significant parameters.

The Method of DePalma for characterization of polyphase a.c. electromechanical energy converters consists of the measurement of rotor slip frequencies with sinusoidal and non-sinusoidal motor excitation and at constant motor loading.

The ratio of these frequencies taken under the conditions of: 1) constant motor power input, 2) standardized voltage and frequency of excitation, e.g. 50 c.p.s., 415 v.a.c., 30, 3) constant motor loading gives the correction factor to the motor mechanical power output for operation with quasi-sinusoidal waveforms. The necessity for such a correction factor arises because of an alteration of the power flows within the motor excited with non-sinusoidal waveforms.

In motor sizes under 10 Hp, increased rotor slip and heating, and additional heating of the stator may not be noticed because no comparisons are made and the benefits of variable speed control outweigh the (possible) considerable reduction of efficiency.

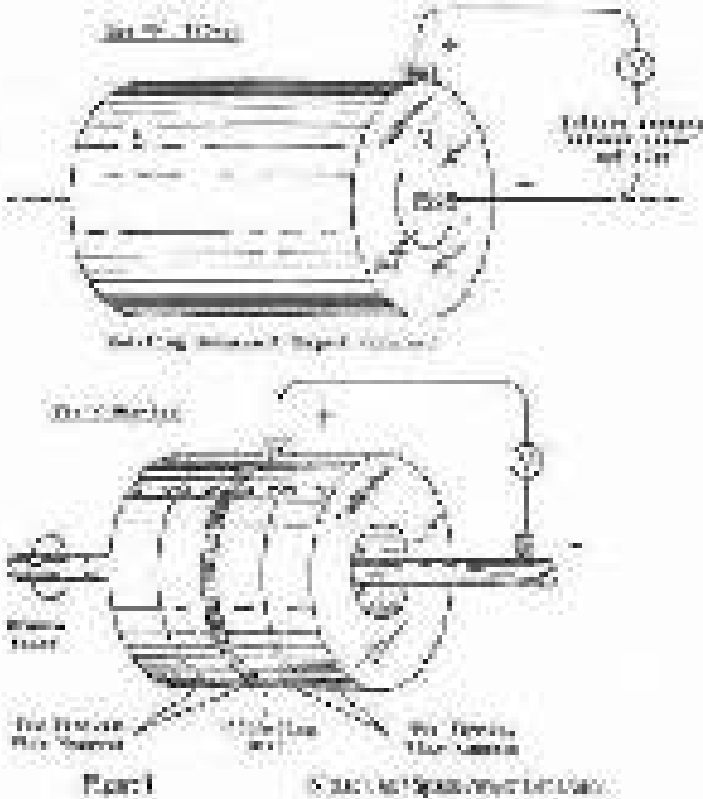
# DEEP THOUGHT

# Magnetism As A Distortion Of A Pre-Existent Primordial energy Field and the Possibility Of Extraction of Electrical Energy Directly From Space.

**ABSTRACT**

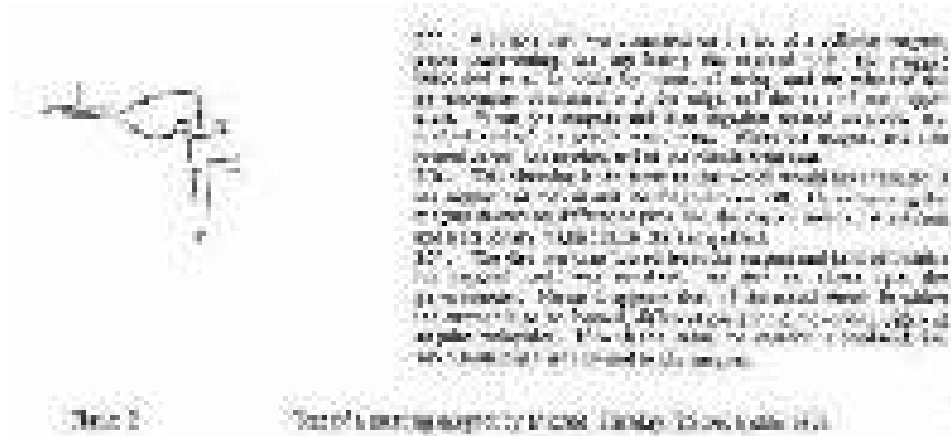
*The key to understanding and explaining the baffling situation of anomalous excess electrical energy generation in free energy machines, lies in a re-interpretation of magnetism as not being a property of the magnet, but of space itself. The spatial distortion induced into the homogeneous Primordial Energy Field by the anisotropy of the magnet is what we call magnetism. It is the thesis of this paper that the distortion of the PEF occasioned by the magnet is the operative principle in the class of machinery known as induction machines. The PEF is also distorted as a consequence of the spatial reaction to the centripetal force field existing within the rotating magnetized conductor.*

Based upon an effect first discovered by Michael Faraday in 1831, the N machine/Space Power Generator (figure 1) is an electrical machine which has the possibility of producing electrical energy with significantly less mechanical power input than the presently employed induction machines.



In the autumn of 1831 when Michael Faraday performed the initial experiments which resulted in the discovery of the first dynamo, he also described a phenomenon which has yet to be understood in terms of conventional electrical theory. In paragraphs 255, 256, and 257 of his diary [fig. 2, ref. 1], dated December 26, 1831, is described the experiment of cementing a copper disc on

top of a cylinder magnet, paper intervening, and supporting the magnet by means of a string so as to rotate axially, with the wires of a galvanometer connected to the edge and axis of the copper plate. When this combination was caused to rotate an electrical potential was found to be created. The polarity and the magnitude of the potential was found to be the same as would occur if the copper plate had moved and the magnet remained still. Faraday spent his latter years pondering the relationship between the situation of magnet and disc rotating together vis-à-vis the situation of fixed magnet and disc rotating independently. He explained the situation by positing the assumption that the magnetic field of a magnet remained stationary in space whilst the metal of the magnet revolved axially. Thus a relative motion would exist between the moving metal of the magnet and the posited stationary flux lines giving rise to the expected potential which results from the motion of a wire through a magnetic field.



Through the years many attempts have been made to observe whether magnetic field lines rotate with the motion of a magnet which is rotated about an axis connecting its poles. To date, no conclusive proof has been found that the lines of force rotate with the magnet or not. [2, 3] One experimenter Djuric [4] goes so far as to say: "That no experiment with the generalized homopolar generator or its classical form can resolve the puzzle, which one of the two logically possible hypotheses is correct, the moving force line hypothesis or the nonmoving force line hypothesis."

In 1978, after having studied the anomalous inertial and gravitational phenomena of the precessing gyroscope through numerous experiments carried out in the prior seven years, it occurred to me that anomalous electrical phenomena might occur if the gyroscope was magnetized, the magnetic lines of force being parallel to the axis of rotation. Following in the footsteps of Faraday I reasoned the metal of the magnetized gyroscope moving through its own magnetic field, when rotated would produce an electrical potential between the axle and the outer edge of the rotating magnetized flywheel. The voltage thus created would be described by the well known laws of electrical induction relating to the relative motion of a conducting wire and a magnetic field.

As is well known, Lenz's Law applies to the forces which are generated between a current carrying wire moving in the vicinity of a magnetic pole wherein the current through the wire is the resultant of the electrical potential generated by the motion of said wire being applied to an external load. In the case of the rotating cylindrical magnetized conductor, however, it is not clear how Lenz's Law could be applied. In static measurements current can be passed through a cylindrical magnet between the outer circumference and the central axle passing through its poles. The torque developed will be the same as one would get by suspending a copper disc over one of the magnetic poles and holding the magnet fixed [5, 6]. The question is: since the rotating gyroscope possesses

anomalous inertial and gravitational properties, would the back torque of the rotating magnetized gyroscope be the same with a given amount of current passing through it as would be if the rotation were blocked and a fixed torque measurement made.

Despite the simplicity of the one piece rotating magnetized conductor, N machine/SPG, compared to the two piece rotating induction machine or Faraday disc, in the time since its discovery in 1831, no one had performed a test to see if the same generator principles were at work as one found in a conventional induction machine. In 1978 in Santa Barbara, California, a large electromagnetically excited N machine/SPG was constructed, the "Sunburst" machine. This machine was independently tested by Dr. Robert Kincheloe, Professor Emeritus of Electrical Engineering at Stanford University [7]. The abstract of this report quotes:

"Known for over 150 years, the Faraday homopolar generator has been claimed to provide a basis for so-called "free energy" generation, in that under certain conditions the extraction of electrical output energy is not reflected as a corresponding mechanical load to the driving source. During 1985 I was invited to test such a machine. While it did not perform as claimed, repeatable data showed anomalous results that did not seem to conform to traditional theory. In particular, under certain assumptions about internally generated output voltage, the increase in input power when power was extracted from the generator over that measured due to frictional losses with the generator unexcited seemed to be either about 13% or 20% of the maximum computed generated power, depending on interpretation."

After a thoroughgoing critique and examination of his data Kincheloe concludes:

"DePalma may have been right in that there is indeed a situation here whereby energy is being obtained from a previously unknown and unexplained source.

This is a conclusion that most scientists and engineers would reject out of hand as being a violation of accepted laws of physics, and if true has incredible implications."

The "Sunburst" machine was an experiment to determine if the rotating magnet N-machine/SPG operating as an electrical generator would produce less back torque than a conventional induction machine generating the same current. A practical SPG would employ permanent or super-conducting magnets eliminating the burden of excitation of an open flux path electromagnet. Replacement of sliding carbon-graphite or copper-graphite brushes with liquid metal contacts reduces mechanical friction losses by 80%. Brush voltage drop is negligible in liquid metal sliding contacts. Both of these techniques are employed in the machines currently produced [8, 9]. Applied to the "Sunburst" design the techniques of liquid metal current collectors and permanent magnets for the field excitation could result in a machine with an output[input power ratio of 5:1.

A parallel program of SPG r&d has been taking place in India since 1978. P. Tewari of the Indian Atomic Power Board had developed a generalized theory of matter and energy which showed that energy could be developed from the vacuum by positing a structure for the electron. Having received the experimental results of the "Sunburst" machine he instituted an r&d program to develop practical versions of the SPG for general use. Tewari has constructed N machine"SPG apparatus which produces excess output power over that required to rotate the generator when all losses have been subtracted from the output generated power [10,11, 12, 13].

The phenomenon of direct extraction of electrical energy from space has a simple explanation based on a re interpretation of magnetism. Heretofore it has been believed that the magnetic field comes from the magnet. The phenomenon of the magnetic field can also be explained by positing a Primordial Energy Field, which, in the first order is uniform and homogeneous. The highly anisotropic condition of the material of the magnet, if it be the permanent variety, or the condition created by the passage of electric current through a solenoid, causes a distortion of the isotropic spatial field which we know as magnetism. Passing a conducting wire through the spatial distortion adjacent to the pole of a magnet elicits the electric potential across the

ends of the wire. Field magnets in electric generators do not run down nor does more electrical excitation need be applied no matter how much energy is being drawn from the machine. This is because the generated electrical energy is being drawn from the spatial distortion created by the field magnets.

The N machine represents a configuration where two forms of spatial distortion are used to elicit electrical energy from the homogeneous and isotropic spatial field. In the first instance there is the spatial distortion created by the anisotropy of the magnet, and superposed on this is the spatial reaction to the centripetal force field produced by axial rotation of the magnet. It is a fortuitous circumstance that energy can be drawn from the superposition of the two distortions without the drag associated with invocation of Lenz's Law necessary in the two piece induction machines.

Many fundamental questions in electromagnetism are re opened by the implications of the experiment with the rotating magnetized conductor. For those interested in delving more deeply into these questions I would recommend the reading of the following references [14, 15, 16, 17, 18].

## **CONCLUSION**

The drag and energy penalty of the conventional two piece induction electrical generator arises from the incomplete understanding of magnetism and the nature of the magnetic field. If we accept the notion that all electricity generation arises from distortions of a Primordial Energy Field then we could look to methods of creating the appropriate distortion and concomitant energy generation without invoking Lenz's Law. Based on this interpretation the rotating magnetized conductor N machine/SPG is a method of eliciting the spatial energy without the drag associated with the two piece machines. The further conclusion is that mechanical energy is not "converted" to electrical energy in an electrical generator. The idea of "conversion" is simply an unproven assumption. Different electrical machines produce energy with different efficiencies. In these days of depletion of natural resources there would be no reason to employ the induction generator of 150 years ago when electricity could be generated much more efficiently by the simpler one-piece N machine/SPG.

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4 November 1974

## Fundamental Discoveries of the New Physics and Mathematics and their Relationship to the UFO Flying Saucer Observations and Encounters.

**Introduction:** For the last four years this investigator has been engaged in the theoretical and experimental development of a new conception of physical Reality. The basis of the conception resides in the variability of inertia which may be engendered through the rotation of real physical objects. These experiments are summarized in the body of this report. At the point where the possibility of a practical antigravity machine had been practically realized an attempt was made to correlate the physical characteristics of this - force machine - with the observed phenomena in common with the UFO flying saucer encounters and sightings. A positive correlation was made with the characteristics of our force machine and the artifacts of the antigravity-propulsion principle of the UFOs. A thorough examination of the available data has led me to conclude the UFO phenomena are real and represent a true incursion of a parasitic extraterrestrial race onto this planet. This paper serves as a warning and a call to action in the repulsion and annihilation of these invaders.

### New Physical Information:

What is important is my experiments place me at the carbon filament electric light bulb stage whereas our enemy possesses the modern electro-luminescent panel solid state variety.

We are all familiar with the great experiment of Galileo in 1590 when he showed that objects of different weights fell at the same rate when he dropped them from the top of the Leaning Tower of Pisa. This experiment has been formulated as a principle by later thinkers. The Einstein principle of equivalence is the contemporary expression of the idea that the acceleration of gravity is the same for all objects, and, for this a construction is possible which represents gravity as a property of a geometrical interpretation of space. This is the current "standard interpretation." Of course if a situation were found wherein the rate of gravitationally induced acceleration could be varied, constructions and theories based on the original Galilean experiment would be rendered void. As well, control of the rate of fall of objects is the entré into the construction of a practical mechanical antigravity machine which could be ultimately developed.....

The basic experiment is the discovery that a rotating object behaves differently under the influence of gravity than a non-rotating one. The basic experiments are:

- 1) Rotating objects falling in a gravitational field are accelerated at a rate greater than "G", the commonly accepted rate for non-rotating objects falling in a vacuum.
- 2) Pendula utilizing bob weights which are rotating, swing nonsinusoidally with periods increased over those of pendula with non-rotating bobs.
- 3) A precessing gyroscope has an anomalous inertial mass, greater than its gravitational mass.
- 4) An anomalous field phenomenon has been discovered, the OD field, which confers inertia on objects immersed within it. This field is generated by the constrained forced precession of a rotating gyroscope.

These simple experiments which can be verified by any experimenter with simple equipment, form the basis of a new interpretation of physical Reality. As well as being the most fundamental physical discoveries since the experiments of Galileo, to mathematics must be added a new

fundamental proposition, such that the phenomena be described. This proposition may be stated: No numerical quantity, representative of a physical measurement, may be infinitely subdivided. For example, a contemporary mathematician would claim that the center of a rotating disc was not rotating. This is false to fact. At the other end of the spectrum this paradox is represented by the topological fixed point theorem of Euler and the aleph null and aleph one transfinite denumerable non-denumerable paradoxes of Georg Cantor.

The limitation of the Newtonian laws of motion to the special case of non-rotating objects, (and other limitations as to the rate of change of acceleration), places our present level of physical understanding on the threshold of the resolution of these paradoxes and the generalization of our conception of motion. The spinning ball experiment which shows a greater rate of fall than a non-spinning object is the stone of David which slays the Goliath of the ideational constipation which clouds the best minds of our race. It is not germane to the purpose of this paper to engage in further exposition of these ideas. Spontaneous interest must be sparked by the individual verification of these ideas by the motivated investigator. For the present it is sufficient to say that a much greater theoretical and experimental context now exists into which these primary results fit.

With the variability of inertia established, and the interaction of a rotating object with the gravitational field, several kinds of antigravity machines may be constructed. Without going into constructional details here, the machines take two forms. The first kind involves the generation of an OD field of sufficient strength to neutralize the gravitational attraction of the mass of the machine itself and associated masses. The second form of the machine - the linear force machine - is a direct conversion of rotational energy input to a unidirectional force output through the principle of variable inertia. Details of this machinery are available from this source.

The generation of a force (OD) field of sufficient strength to propel a space vehicle results in a local interaction with the electromagnetic field which may be characterized as an increase in the inertia or slowing down of electrical processes, *viz.*, for instance the magnetic field collapse which is necessary for the generation of the spark ignition voltage in a gasoline engine is slowed down to the point where insufficient voltage is generated for ignition and the engine stops. An alteration in the resonance of electrical circuits to lower frequency and a cross modulation of frequencies of different signals existing within the same circuit. A similar mechanism causing the anomalous red shift of optical signals is observed in the Quasar stellar phenomena. That such a mechanism exists in a stellar phenomena together with the observed UFO behavior strongly indicates the generation of an OD field is possible through a solid state interaction. A proposal has been developed along these lines on the basis of an interaction between rotation, magnetism, and inertia. It must be emphasized that when inertia is no longer considered a constant, variations in inertia as the result of certain physical processes can be searched out and applied to the solution of a number of important physical problems.

As well the effect of a field which confers inertia on objects immersed within it can be applied to a number of situations, not all of which have to be mechanical, i.e. chemical reactions are affected by such a field. Reactions which do not take place under "normal" conditions may be catalyzed. Other reactions may be inhibited. There is a strong effect on the operation of the human nervous system of such a field. It may be used to inhibit behavior.

**An Analysis of the UFO Situation:** Clearly the observed UFO behavior both with regard to the mechanism of propulsion and the inhibitions which have been directed against humans and internal combustion engined machinery and radio apparatus suggest strongly that here is an extraterrestrial group which uses the OD field as the basis of their energy generation, propulsion, and communication. The use of directed od fields together with intense stroboscopic illumination to dazzle and confuse native populations appears to be the standard operating procedure for the

"outsider" operations on this planet. I would like to point out that for myself, as a physical investigator, I was unable to reward the plethora of sightings and encounter information with appropriate credibility until I was able to generate the propulsion field within my own laboratory and gauge some of its characteristics. At this point it became possible to separate hard data information from concealment and subterfuge deliberately generated to confuse and obfuscate the human population. I might add that their effort is immeasurably aided by our inability to decide whether they are here at all. An inability which is nurtured by the egos of those individuals who continually demand more "proof" in the face of an overwhelming amount of evidence which is being gathered by concerned individuals of much less "sophistication" than the "experts" who are to be "convinced". A list of such "experts" is appended to this report. They should be avoided or bypassed by anyone who would seriously get behind the world-wide action activity which is necessary to rid our planet of these parasites.

On the basis of the known UFO information and the results of my laboratory experiments, I have been lead to the following hypothesis: It seems to me that to consider space unpopulated by any others than the inhabitants of this planet is a modern form of geocentrism. Quite the contrary I believe space to be inhabited by the members of many races who probably live in a loose confederacy. We should not be deluded by those thinkers who are tied to an Einsteinian space time manifold who believe space travel is impossible. My work has shown that present conceptions of space and time are now to be revised in the light of the refutation of the theories of Einstein. If we conceive space to be populated then we can also conceive that the races which have attained space travel would view with benevolent eyes the activities of younger races whose youth and vitality was about to carry them over into the discovery of the variability of inertia and the perfection of a means of propulsion by pushing against space itself. If I were observing from outside, so to speak, I would see it was necessary to relinquish certain limitations of thought, i.e. the "velocity of light", the invariance of inertia, before a more properly general attitude could be developed such that new machinery could be designed and built. In this state of potentiality I would see that to interfere with the development of this race would be to damage the natural mental growth process leading to the entrance of man into space as an equal, or on an equal developmental footing to the races which were already there. There already may be in existence a police force for the protection of undeveloped planets from the ravages and incursions of exploiters and predators, especially where intelligent races were involved. I am sure that when the United States enters space it would constitute itself as the protector of the weak as the fundamental consequence of the democratic system of government. At least it is clear that if less altruistic motives were involved, contacts would not be made in a clandestine and surreptitious manner.

The evidence suggests the Earth has already been invaded by a small group of parasitic outsiders. Such a group would probably live its whole existence in spaceships preying upon undeveloped and primitive worlds for the procurement of natural products which could not be generated in a space environment. It seems to me that no race which had a home planet would operate surreptitiously on another world.

Even though these outsiders possess (at present) superior technical knowledge, their small numbers do not permit them to dominate this world. If such an attempt were to be made, all the technological resources of the planet would be mobilized against them and such an operation would certainly be apprehended by other more mature members of the interstellar community. It serves the interests of these parasites to contemptuously remove from our society whatever it is that interests them. It seems to me that the removal or mining of physical resources or goods would be immediately noticed. The one quantity whose disappearance would not be noticed is people. This datum fits in nicely with the disappearances in the Bermuda Triangle and the complete control the outsiders have had over those individuals who have been simply "examined" and then released.

Perhaps certain desired characteristics were lacking in the individuals who were apprehended and then released. A parasitic race living in a space environment would be continually irradiated with hard radiation from outer space. The most chilling hypothesis is that this humanoid species is praying upon us for certain blood fractions necessary for life in a high radiation environment. Reproduction would also be affected. What attempts might be made in conjunction with this species can only be guessed at. The facts are that the released individuals can have memories of their experience recovered through deep hypnotic treatments. Certainly it is within the capabilities of human medical technology to perform operations such that the subjects concerned have no memories of the procedure. The fact that the erasure is incomplete in cases of the recorded UFO human encounters bespeaks of the contempt of a group which holds itself to be superior to its host. The fact that no whole-scale invasion has taken place, with overt contact made, speaks to me of a fundamental Achilles heel to the operations of "outsiders" on our planet.

The fact that Earth is our home planet, and that large scale depredations would be observed by other intelligent forces, places the human race in a fundamentally superior position no matter how far advanced the technology of this interloper group is. The capitalization of this position for the defense of our planet and the repulsion of the UFO outsiders depends upon our ability to 1) intercept the UFO communications, 2) construct weaponry effective against UFO vehicles, and, 3) construct vehicles propelled by variable inertia machinery, force machines, capable of coming to realistic grips with their machinery. A vehicle propelled via an OD field is capable of accelerations which would be destructive to the crew except for the fact that immersion in an OD field imparts an inertial connectivity such that the vehicle and its contents are propelled as a whole. The crew of such a machine would not experience the sensation of acceleration associated with machines in which only the structure of the vehicle is accelerated, i.e. jet aircraft or rocket propulsion. As well, electrical machinery will not function properly in the environment of intense OD fields so that our (primitive) mastery of such technology may serve us in ways that are not readily apparent until more experiments are performed.

A race of parasites operating just two jumps ahead of the law is not one in which research and scientific development are primary concerns, if at all. We can expect these interlopers are here for one purpose only, and that is to satisfy a compelling need for a natural product which they themselves are incapable of satisfying. The clandestine and contemptuous lack of respect for a species toward which their depredations are directed only speaks of an immorality which is supported only out of lack of a normal healthy substrate for living. Further analyses are possible, but at this juncture more detailed behavioral inferences would detract from the apprehension and rationalization of the data already presented.

**Plans for the Future:** The simple experiment of dropping the spinning ball and ascertaining the reality of a fundamental experiment in the interaction of rotation, inertia, and gravity, will provide the focus for the development of a new basis for society. Man's entrance into space will be sparked by the mastery of the principle of variable inertia. The experiments suggested here may be easily verified by the concerned experimenter with elementary equipment. Experimental write-ups of the work which has been done at this laboratory are available by writing to this author. All assistance will be furnished to those who will duplicate the basic experiments and convey the results to those agencies who have the power of action. In the years I and my students have been prosecuting this work we have compiled a list of those individuals and their respective institutions who have consistently rejected my experimental findings. No better service to the common enemy could be done than by these men who refuse to acknowledge new discoveries in the chauvinistic determination to protect their respective positions and uphold their reputations and those of their supporters.

**Friends and Enemies:** Dear friends, those of you who have been involved in the gathering of evidence to support "new phenomena" have time and time again come up against "expert opinion" which trenchantly resists the notion that there is anything new, much less a deadly threat. At all costs we must avoid a panic. Those of you who have attended scientific Universities are familiar with the way in which scientific material is presented by the "experts." We tend to laugh at the students who are the "grinds", who memorize the material by rote and regurgitate it for the exams. What lends a more sinister note is that these "grinds" are usually the ones who linger through graduate degrees and post doctoral fellowships and finally sit on that much sought after chair. Having attained the priceless gift of tenure they sit until called to act on that panel which is convened to examine "the evidence." Most of these people have never done an experiment in their lives. When faced with facts or information which cannot be fitted into an interpretation of the dogma on which they base their careers we hear the familiar: -- "I do not understand it at all", "totally unconvincing", "none of our reviewers has been able to see any merit in your papers". These quotations are taken from the utterances of Dr. S. A. Goudsmit, Editor-in-Chief of the **Physical Review**. More on this later.

In the development of the ideas which are the greatest physical discoveries of the 20th century and which represent the breakthrough into the new physics and mathematics which will extricate us from the present crises of power and energy, I have had to learn by direct experience who are the people who are to be avoided if new scientific progress is to be made. Of course through all this there are many friends too. I speak here of my students and friends who have been supporting me from the time I left my associations at **Harvard** and **MIT** to pursue these researches. My advice to those who wish to follow the path to new knowledge is that if an individual cannot apprehend the new information immediately, it is fruitless to think he will be able to think it over and later decide what you have to say is correct. Truth has a ring to it which is unmistakable to those in search of it. Early in the game I discovered it was a mistake to wait for a reply from those to whom I sent the results of my experiments. To force the issue I and my students made visits to some of the "great minds" to confront them with the evidence in their offices.

At this point I would like to point out that the discovery of variable inertia has been preceded by some work in which the investigators knew they were on to something new but were unable to consummate their work because they were unable to assemble a thorough enough understanding of the phenomena to come to the conclusion of so basic a phenomena as the variability of inertia, the refutation of Einstein, and the complete overthrow of the dogma which presently paralyzes the thinking of our scientific establishment. I speak here of the pioneering work of Norman L. Dean of Washington, D.C. who demonstrated and patented a prototype machine for the conversion of rotary motion into unidirectional motion. **U.S. Patent 2,886,976** filed July 13, 1956. John W. Campbell of then **Astounding Science Fiction** magazine inspected the prototype and wrote an article: "The Space Drive Problem", which appeared in **ASF** for June 1960. Campbell inspected and documented the operation of the machine which then was able to generate a unidirectional force of about 18 lbs. from the output of a 1/4 Hp. electric drill motor. Dean's machine was never able to "lift off" because, although he did not realize it at the time, his machine required an inertia load which was lost as soon as the machine lost contact with the ground. The best he could achieve was zero weight. The demonstration of the Dean machine to many of the constituted governmental agencies and scientific "authorities" elicited no support and much ridicule. Experts were called in to "mathematically prove" the machine could not possibly work.

Interest in "non-linearities" in Newton's Laws of Motion sparked investigations by Dr. William O. Davis which appeared as another article in **ASF** May 1962, "The Fourth Law of Motion." Davis was trying to understand what he called "rate" effects in the application of accelerative forces to real material objects. He was the first to call attention to the fact that it mattered how fast acceleration was applied to a real physical object. At high rates of "surge" ( $dA/dt$ ) forces were generated which were destructive to the object under test and which seemed to be much greater than those predicted by the simple application of  $F = MA$ . He tried to develop alternative modifications of this basic expression to explain the forces he was measuring but since his development was not supported by more basic understanding of matter and motion it was not pursued further.

During this period Mr. John S. Wolfe of Dayton, Ohio was mathematically examining Dean's machine to see whether it could be explained on the basis of a mathematical system he had invented which included the additional postulate of the non-infinite divisibility of mathematical representations of real physical quantities. His work correlated with the results of Dean's prototype machine and he became so excited about the possibilities he and his son took out an extensive ad in the **Dayton Daily News** of June 1, 1960 to try to publicize the implications of their studies and their implications

**Additional Laws of Motion** was run again in the **Dayton Daily News** in spring 1974 when it was brought to my attention by a connection I had in Detroit to whom Wolfe had sent a proposal for the development of new propulsive machinery. Wolfe and I have been associated since that time. His mathematical development is too abstruse to be presented here but it represents the substrate into which the principle of variable inertia can be mathematically described. I call your attention to all this because the main difficulty in the acceptance of the idea of variable inertia is the fact that this physical entity cannot be described by present mathematical systems without the inclusion of the additional postulate of non-infinite divisibility of mathematical representations of physical entities. This very basic idea can be illustrated by the concept of the weight of an object, say so many pounds for the weight of a particular object. If the number which represents the weight of an object is subject to division we have to include the fact that when we divide a real physical object into smaller and smaller portions we eventually reach a point of the last atom wherein further division destroys the identity of the material. A mathematical representation of a real physical quantity must include the property of non-infinite divisibility in order to properly represent the real physical property of the object or entity under consideration.

The simplest ideas generally require the most lengthy exposition. I must defer further discussion of these ideas to more specific papers which are available from these Authors. My point is now a framework exists for a more general description of physical phenomena than now represented by the obsolete representations of Newton and Einstein.

It is clear that to ask a scientist to rearrange and reformulate everything he has ever learned in the context of new physical and mathematical information is a task so exciting it is beyond the possibilities of all except the youth and those ready to accept new information. It is said that the youth are hated by those for whom there is no future and no more clear illustration of this is the reaction of those "authorities" who feel so secure in their positions that they have gone on record in their reaction to the idea of rotationally engendered variable inertia. To conclude what has grown to be a rather lengthy essay I append some of their comments:

**Dr. Philip Morrison, MIT.** "I do no experiments."

**Dr. Edward Purcell, Harvard.**

"We know all we need to know about rotation from the properties of rotating atoms, some of which are rotating at  $10^{14}$  rpm."

**Dr. Robert Dicke, Princeton.** "I have something to lose."

**Dr. John Wheeler, Princeton.** "I have given your papers a cursory inspection."

**Mr. George M. Rideout, Gravity Research Foundation.**

Four papers submitted, no response.

**Mr. Edward Phillips, Physical Science Editor, "Nature",** two papers submitted

"...we cannot publish it in Nature."

**Mr. Ben Bova, Editor, Analog Science Fact and Fiction.**

"I have sent your material to two trusted friends of mine, physicists who are deeply enough into science fiction so that their brains haven't petrified. Both of them show some interest in your ideas, but both express disappointment that your ideas are not worked out carefully enough for them to check them in detail."

Speaking of petrified brains we now come to Dr. Samuel Goudsmit, Editor-in-Chief of the **Physical Review** and **Physical Review Letters**. He is the ultimate Authority (at least in secular matters). I have submitted six papers to him over a period of three years. His penultimate reply summarizes the previous five rejection letters, I quote: "I am no expert and have to depend on reviewers regarding the acceptance of papers. So far they have rejected yours as being totally unconvincing. I doubt that you have convinced Dr. Dicke. He merely stated that your experiments have never been performed before, but not that you have done them correctly. Perhaps you should try to publish your work in some other physics journal, submitting it again to the Physical Review will be useless."

Sincerely yours,  
ss/ S. A. Goudsmit  
Editor-in-Chief

Dr. Goudsmit, a former associate of Einstein, was one of the members of the Robertson Panel which in 1953 concluded: "... the evidence presented on Unidentified Flying Objects shows no indication that these phenomena constitute a direct physical threat to national security." The report of the panel went on to suggest a program of public "education" to help people identify natural phenomena thought to be UFOs. The recommended program would be "designed to reassure the public of the total lack of evidence on inimical forces behind the phenomena."

I have suggested to these gentlemen that they formulate their retirement plans. Evidently it takes a giant to remove a worm.

2 February 1995

**A review of: "The Homopolar Handbook", by Thomas Valone**

Integrity Institute, 1377 K Street NW, suite 204, Washington D.C. 20005; 1994

Recently a copy of Valone's Homopolar Handbook was sent to me for review. Because Valone's book represents so well what is wrong with America and why America has become a third rate scientific power, it is worthy of comment.

Comments about a first rate, world class, scientific invention often reveal much more about the critics than they do about the invention. In the argot of contemporary language Thomas Valone could be summed up as a science groupie wherein the admonition, "a little knowledge is a dangerous thing" finds realization. We are ingratiated into his presence by his easy familiarity with Bruce, Adam, Tim, and George. His presence in the formative days of the free energy revolution is chronicled.

With the insight and perspicacity of an experienced name dropper, junior college instructor, and scientific dilettante he presents a carefully selected panoply of 19th and early 20th century scientific writings concerning unipolar induction. Although he does admit there are ambiguous and unexplained phenomena of electricity production and torque reaction in the homopolar machine, "his" experiments suggest the efficiency of energy generation in the N-machine/S.P.G. can never exceed 100%.

Without understanding and familiarity with unipolar induction many of his readers would be impressed with his and his professors ignorance of the basic phenomena of electromagnetism. But the greatest error of all is his presumption that if he cannot reproduce the experiments of DePalma, Trombly and Tewari then the experiments are at fault. With this he joins the ranks of those who "proved" man cannot exceed 15 m.p.h., heavier than air machines cannot fly, electricity cannot be transmitted down wires, and free energy is impossible.

The costing programs of Trombly and Mitchell are carefully recorded connoting Valone's true fascination with money. The monstrous contraption of Parker Kinetic Designs, a child of the greed induced collaboration of Richard Marshall and William Weldon, presided over by Herb Woodson, formerly of the D.C. White-Woodson "Energy Laboratory" of M.I.T., appears on the cover of his tract.

Because the phenomena of unipolar induction are so fundamental to electrical science and the benefits of a change in the paradigm of electrical power generation are so incredible, one can view the reaction to the N-machine/S.P.G. and its technology as an indictment of America and American science rather than as an affront to the workers who are bringing this technology into existence.

Valone derives his supercilious kicks from deriding Adam Trombly, who, because he has been gagged by the DoD and had his experimental setup confiscated, cannot defend himself.

The management of America, the lawyers and politicians, have finally resorted to confiscation of patents in the name of national security. You will note the "Fara-Drum" is part of a weapons system to propel projectiles at velocities greater than achievable with chemically powered cannons. No thought is given to energy applications of a life supporting nature designed to reduce the cost of electricity for the general public.

No first rate, world class scientist would have anything to do with a system of secrecy and intimidation funded at the trough of U.S. government supported "scientific" research. The Fara-Drum will go the way of the Super-Collider while the mountain of public debt grows ever higher.


If I felt that the introduction of a new form of energy extraction into the world were simply a matter of convincing or the winning of scientific arguments then I might be inclined to refute point by point. Suffice it to say that Valone omits in his report two seminal papers: The Kincheloe Report, "Homopolar 'Free Energy' Generator Test", presented at the 1986 meeting of the Society for Scientific Exploration, San Francisco; and DePalma's: "On the Possibility of Extraction of Electrical Energy Directly from Space", *Speculations in Science and Technology*, Vol. 13, No. 4, page 283, 1990. Professor Kincheloe's report is possibly the most carefully analyzed report on an N-machine presently in general circulation. It concludes N-machine drag is 13% - 20% of what would be measured on a conventional induction generator delivering the same amount of power.

The rationale of Valone and his ilk is that they are providing a service to humanity by ferreting out the "truth". What results is the duplicitous serving of a crypto-technical state whose intentions are a new world order where the ends justify the means. The debt ridden state of America trembles at the thought of technical innovation in energy generation. Eighty to ninety percent of the cost of energy is required to service the debt of the utilities incurred in the era of atomic energy and to maintain the salaries of the executives and meter readers, not to speak of the maintenance of long distance power lines. A more local energy system based on direct extraction of energy from space, without burning or consumption of fuel would delight the populace. Capital would desert the present monstrous complex of environmentally destructive atomic and coal fired boilers and turbines. The Fara-Drum monstrosity speaks to the arid world of a technically controlled society ruled by the gun of conservation, read corruption.

In a world which has passed beyond the gentlemanly dialogues and colloquia of the 19th and early 20th century is it not clear to be seen in the rising waters, earthquakes, fires, and plagues upon mankind, God's answer to the acolytes and servitors of greed and ego.

# INVENTIONS

# International Patent Application - A Homopolar Generator

**PCT** 


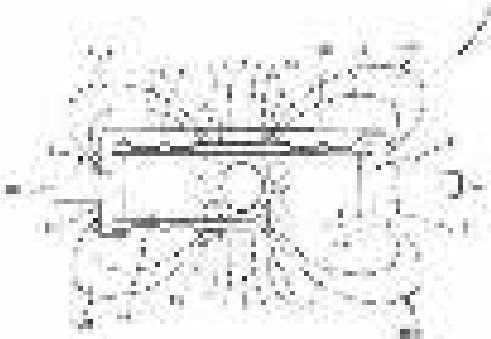
INTERNATIONAL PATENT APPLICATION UNDER THE TREATY ESTABLISHED BY THE CONVENTION ON THE GRANTING OF PATENTS RELATIVE TO THE EUROPEAN PATENT CONVENTION

<p>1. International Filing Classification <b>H02K 11/00, H02K 13/00</b></p> <p>2. International Publication Number <b>WO/96/02219</b></p> <p>3. International Publication Date <b>1996.02.02</b></p> <p>4. Applicant <b>General Electric Company</b></p> <p>5. Inventor <b>John J. H. ...</b></p>	<p>6. Title <b>...</b></p> <p>7. Abstract <b>...</b></p>
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8. Description  
**...**

9. Claims  
**...**

10. Drawings  
**...**



11. Bibliography  
**...**

## **BACKGROUND**

[5] The present invention relates to an electric generator. The generator described herein is referred to as a quadrupole generator because of the four distinct magnetic poles involved in the machine.

## **PRIOR ART**

[10] In 1831 Michael Faraday performed the initial experiments which resulted in the discovery of the dynamo. In one of his experiments a copper disc was secured to a cylindrical magnet with paper intervening the two. The poles of the magnet were aligned along the axis of the copper disc. Wires of a galvanometer brushed the centre and circumference of the copper [15] disc respectively. It was discovered that upon rotation of the copper disc and magnet, an electrical potential was created between the terminals of the galvanometer. This simple construction is known as a homopolar generator. Importantly, this experiment revealed that a potential difference was created across the copper disc when it was rotated through a magnetic field, irrespective of whether the magnet was rotated with the copper disc or [20] remained stationary.

Another early generator was the two piece design by Faraday where a conducting disc is revolved adjacent to the poles of fixed magnets.

[25] Homopolar generators produce low voltages at high currents. In the later 1800's these unipolar generators were used in metal reduction and plating applications where high currents are required. In the early 1900's however, the development of commutated DC and AC generators which could develop higher voltages at lower operating speeds led to the decline in use of homopolar generators, except for specialized applications.

[30] Another prior art generator involves the combination of two one piece homopolar generators similar to that designed by Michael Faraday in 1831 and mounted in common on a central supporting conducting shaft. This generator was constructed with magnet poles aligned in opposition so that they were voltage additive between two current collector rings encircling [5] the centers of the tandem rotating magnets. The current generated by this generator flows radially inward in a conducting disc located centrally within and co-axially disposed within one magnet through the connecting axle and then radially outward in a disc co-axially disposed within the second magnet. The mechanism of voltage generation in this generator was similar to that in the previously described one piece Faraday homopolar generator [10] wherein the magnetic flux lines within the magnets are perpendicular to the conducting disc co-rotating with and centrally disposed within each permanent magnet assembly.

One disadvantage of this generator is that the current output is limited by the diameter of the supporting axle. If the axle is larger, it is necessary to have larger holes in the magnets [15] through which reverse flux may pass. The necessity for the hole through the magnets and the reverse flux problem reduces magnet strength and voltage.

The copper discs of this generator were subdivided into two spirals to produce a self magnetizing effect with current withdrawal which counteracted partially the high internal [20] resistance of the long current path through the two copper spirals and the axle. The 50mm diameter shaft limited current output to four kilo amperes. Above this current level excessive heating would occur.

Another disadvantage of this prior art generator is that the dumb-bell shaped rotor lacks [25] rigidity compared with the rotor of the present invention to be described below. This affects ease of balancing the rotor.

## DESCRIPTION OF INVENTION

According to the present invention there is provided a single piece homopolar generator which has one moving part, the rotor and in which the desired electrical potential is produced [5] without the mutual interaction of a second member (stator). This generator includes an electrically conductive member such as a cylindrical tube having two magnets therein which) when the generator is in operation, rotate with the tube. The cylindrical version of this generator, known as a Quadrapole, is not an immediately apparent development of the original Faraday 'one-piece' axially rotated magnet experiment since the vector directions of [10] the (radial) magnetic flux lines and axially flowing electrical current are interchanged in their respective directions in comparison to the previously described Faraday Disc experiment.

The one-piece, rotor only version of what is presently known as a cylindrical homopolar generator has not hitherto previously been known. [15]

Throughout the specification the term 'homopolar' can be taken to mean the repulsion of like magnetic fields, i.e. N-N or S-S which can alter the direction of magnetic flux lines and produce a radial pattern in the central zone of the rotor.

[20] Within the last ten years certain materials such as rare earth, Neodymium-Iron-Boron ( $\text{Nd}_2\text{Fe}_{14}\text{B}$ ), and Samarium-Cobalt (SaCo) permanent magnets, and Niobium-Tin or Niobium-Titanium superconductive magnet wire have become available. With these materials it becomes practical to fabricate magnetic structures impossible to realize with iron and copper wire. The configuration of the present invention exploits the advantages that modern magnetic materials provide[25].

It is an object of the present invention to provide an improved generator or to at least provide the public with a useful choice.

[30] In one broad form of the invention there is provided an electric generator comprising: a single piece homopolar generator for use alone or in combination with like or known generators comprising: current collectors co-operating with a rotor body wherein the rotor body comprises; at least one electrically conductive member, [5] a central zone between end zones, at least  $\sim$  two axially aligned magnets, arranged so that like poles of the magnets oppose to produce flux lines which pass through and exit the central zone of said rotor body in a direction radial to the axis of rotation; wherein the magnets in polar opposition rotate with the conductive member or members and[10] wherein the north/south polar alignment of each magnet is axial; and electrical contacts proximate each end zone and an electrical path or paths proximate the radial extremities of the rotor and between each contact formed by said electrically conductive member or members.

[15] Preferably there is one electrically conductive member comprising a cylindrical tube and the magnets are permanent magnets which are permanently fixed with respect to the tube. The poles of the magnets are preferably orientated co-axially with the axis of the tube and the tube is preferably rotated at high speed.

[20] Alternatively, the performance characteristics of the generator may be achieved by use of alternative structural arrangements which receive and retain the magnets and other rotor components. For example, it would be possible to use an array of radially disposed conductors such as rods providing electrical paths connecting electrical contacts on the rotor Alternatively, the generator may comprise concentric cylinders or a nest of cylindrical tubes [25] whose axes are parallel.

According to another embodiment there is provided an electric generator as hereinbefore described including an electrically conductive compensation tube provided about said central zone and spaced apart there from, an end of said compensation tube being electrically connected to the

contact adjacent thereto, the other end of said compensation tube being electrically connected to a generator output terminal.

The advantages of the homopolar generator according to the present invention include the [5] following: a solid magnet across the full internal diameter of the tube providing higher and uniform magnetic field and the elimination of current flow through the magnet and an increased current carrying capacity now only limited by the size of the current collectors. [10] In another broad form the present invention comprises; a rotor for use with a generator as hereinbefore described, the rotor comprising; a rotor body comprising; at least one electrically conductive member, a central zone between end zones, [15] at least two axially aligned magnets arranged so that like poles of the magnets oppose to produce flux lines which when the rotor is in use pass through and exit the central zone of said rotor body in a direction radial to the axis of rotation; wherein the magnets in polar opposition rotate with the conductive member or members and wherein the north/south polar in alignment of each magnet is axial; and [20] electrical contacts proximate each end zone and an electrical path or paths proximate the radial extremities of the rotor between each contact formed by said electrically conductive member or members.

In an alternative form, the invention comprises; [25] a current collector for use with a generator as hereinbefore described, the current collector comprising; a two part body one of which parts is detachably attached to the other part, wherein when the two parts are attached, a central bore is formed which receives a rotor, means located at least partially within said bore for creating a seal between the rotor and the [30] outside of the bore, wherein said means forms a circumferential recess within the bore in which an electrically conductive material is located and which is in electrical contact with electrical contacts on a rotor in the generator, wherein, the space between the base of the recess and the electrical contacts of rotor is filled with liquid metal or eutectics providing an electrical path between the rotor and the current collector.

[5] Preferably the electrical contacts are machined into the rotor and comprise a circumferential ring on each end zone, providing an electrical connection between the surface of the cylindrical tube and the conductive liquid metal or eutectics.

[10] In a finer form according to the system aspect the present invention comprises: a system for generating electricity using a single piece homopolar generator; the system comprising; the single piece generator, having one moving part, the rotor, and in which the desired electrical potential is produced without mutual interaction of a stator, [15] a power source to drive the generator, a field of energy influence within which the generator is situated and with which the generator interacts, wherein the interaction between the generator and the field influences the output of the generator by supplementing energy input to the generator from said power source.

[20] A rotor may be constructed of multiple concentric conducting cylinders. In the zone of zero or low magnetic flux pertaining to the region encircling the centers of rare-earth magnets or super-conducting solenoids, multiple sliding liquid metal contacts may be established thus enabling a series connection of the portions of the concentric conducting cylinders in the [25] voltage generating region between the opposing poles of the rotating magnets contained within the nested cylinders. Voltage addition by connecting a series of concentric conducting cylinders in a one-piece cylindrical homopolar generator has not previously been known.

Because of the existence of a region of zero radial magnetic field in a zone encircling the [30] center of a cylindrical permanent magnet, i.e. the neutral zone, current extraction from the rotating member is taken at this point. Current extraction by means of a liquid metal sliding contact in this zone eliminates any electro-magnetic forces which might act to disturb the liquid metal contact during current extraction. A zone of zero magnetic flux also eliminates electrical currents circulating

transversely through the conductive body of a current collector [5] because of in homogeneities in voltage across the width of the liquid metal sliding contact.

With the Quadrapole, the magnets are arranged NSSN or SNNS and the fact that the magnetic flux lines emerge radially from the center of the conducting cylinder is because of the mutual repulsion of opposing directions of like (homopolar) force.

[10] In the conventional two-piece cylindrical homopolar machine, magnetic flux lines are caused to emerge radially from the central voltage generation segment of the cylindrical rotating member by fixed iron pole pieces which encircle the rotating cylinder and form part of a stator structure which closes the magnetic flux paths in fixed external loops back to each axle [15] of the machine. The two piece closed path construction makes no use of the mutually repulsive effect of homopolar magnetic fields because in the closed path construction the magnetic field internal to the cylinder is directed to flow radially outward by low magnetic reluctance external pole pieces.

[20] Without the provision of external pole pieces and a closed magnetic flux path, the attainable magnetic field strength within such a machine would be so low as to render the machine not suitable for commercial application. Rare earth high strength permanent magnets make it possible to obtain high strength and useful radially directed magnetic flux lines without closed magnetic flux paths. The radially directed flux arises from mutual repulsion of homopolar [25] flux fields.

The key requirements of the cylindrical one-piece homopolar generator as herein described are that all parts of the rotor including the magnets must rotate together and there is no closure of the magnetic flux paths by fixed ferromagnetic yokes, - stators.

[30] If the permanent rare-earth magnets are replaced with super-conducting electrical solenoidal coils, the coils must rotate with the cylinder. The magnetic fields produced when they are cooled and energized must be poled NSSN or SNNS and the spacing of the coils adjusted to produce radial flux lines perpendicular to the central voltage producing segment, (of the [5] rotating conductive cylinder enclosing and supporting the magnet solenoids). The mutual repulsion of homopolar flux fields is employed to create radially diverging flux lines in the central zone

The present invention in all its forms will now be described in more detail according to a [10] preferred but non-limiting embodiment and with reference to the accompanying illustrations wherein:

Figure 1: shows a long sectional view through a generator rotor according to a preferred embodiment;

Figure 2: [15] shows an exploded view of the generator incorporating the rotor of figure 1 according to a preferred embodiment of the invention;

Figure 3: shows an isometric exploded view of one current collector for use with the generator;

Figure 4: shows an assembled view of the current collector of figure 3,

Figure 5: [20] shows the rotor of figure 1 seated in part of current collectors and showing the relationship of the rotor to the electrical contacts and seals.

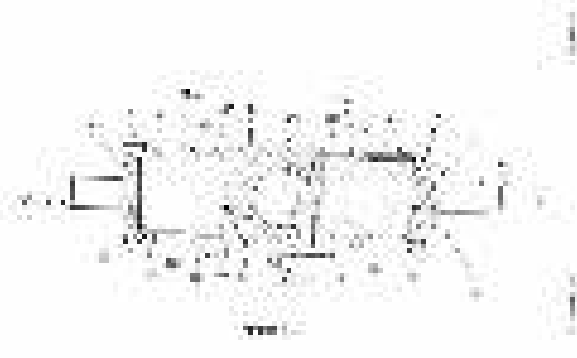
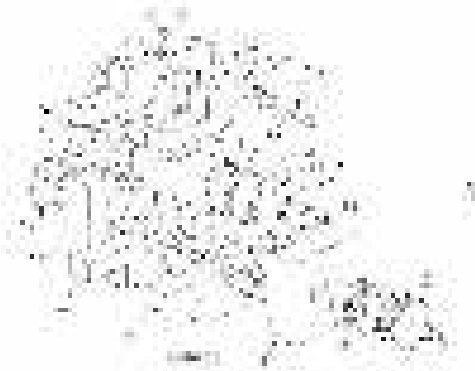
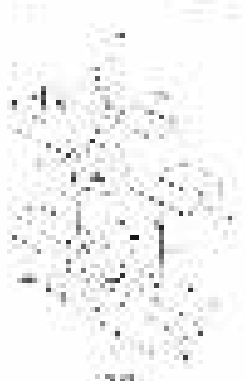

Figure 6: shows a long section through the generator rotor of figure ~ with lines of magnetic flux indicated,

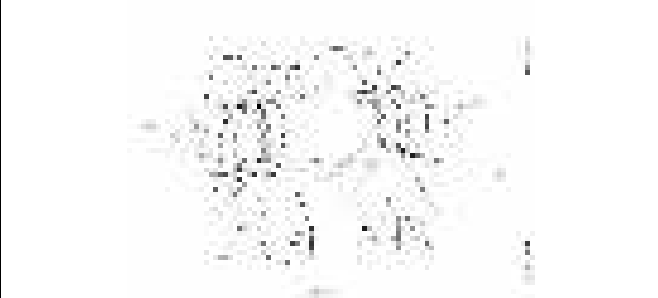
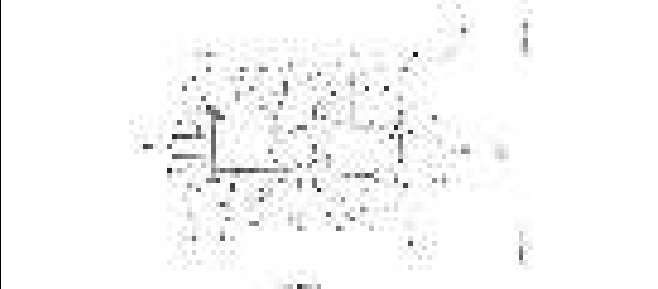
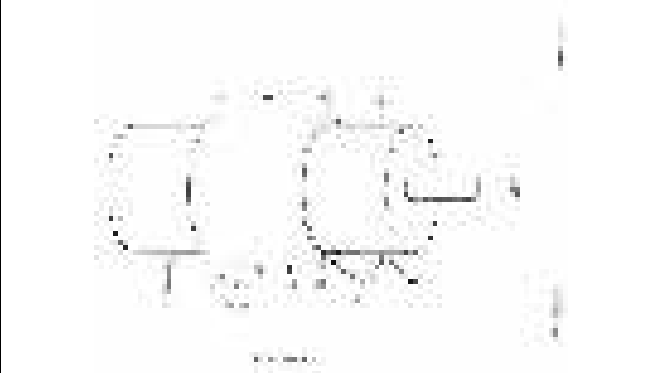
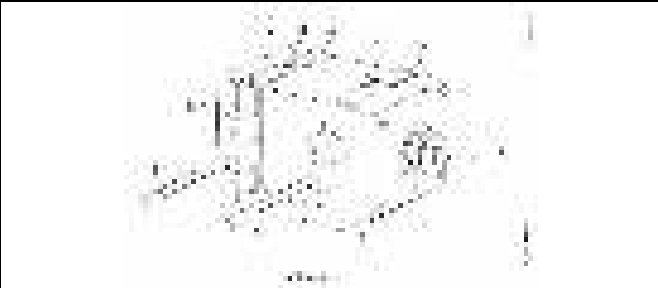
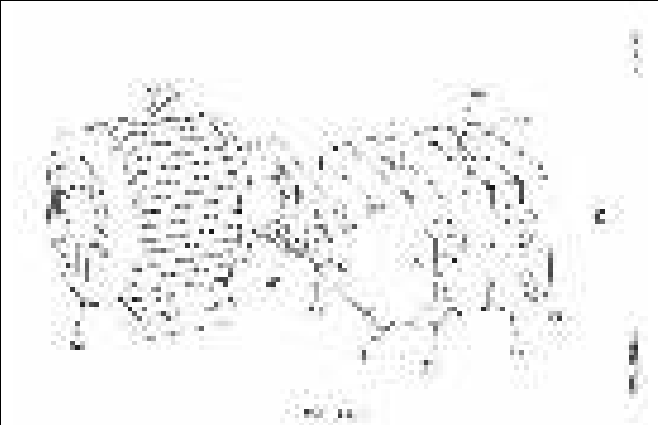
Figure 7: shows an embodiment of the rotor according to a preferred embodiment of [25] the present invention including magnetic compensation,

Figure 8. shows an isometric view of the completed generator with output terminals according to a preferred embodiment of the invention, and

Figure 9: shows the generator of figure 8 from a rear view driven via a drive belt by a drive motor.

**Picture Figure Summary**  
**(Large versions of these pictures are at end of this patent application)**

	<p style="text-align: center;">Figure 1</p> <p style="text-align: center;">Shows a long sectional view through a generator rotor according to a preferred embodiment</p>
	<p style="text-align: center;">Figure 2</p> <p style="text-align: center;">Shows an exploded view of the generator incorporating the rotor of figure 1 according to a preferred embodiment of the invention</p>
	<p style="text-align: center;">Figure 3</p> <p style="text-align: center;">Shows an isometric exploded view of one current collector for use with the generator</p>
	<p style="text-align: center;">Figure 4</p> <p style="text-align: center;">Shows an assembled view of the current collector of figure 3</p>

	<p style="text-align: center;">Figure 5</p> <p>Shows the rotor of figure 1 seated in part of current collectors and showing the relationship of the rotor to the electrical contacts and seals</p>
	<p style="text-align: center;">Figure 6</p> <p>Shows a long section through the generator rotor of figure ~ with lines of magnetic flux indicated</p>
	<p style="text-align: center;">Figure 7</p> <p>Shows an embodiment of the rotor according to a preferred embodiment of [25] the present invention including magnetic compensation</p>
	<p style="text-align: center;">Figure 8</p> <p>Shows an isometric view of the completed generator with output terminals according to a preferred embodiment of the invention</p>
	<p style="text-align: center;">Figure 9</p> <p>Shows the generator of figure 8 from a rear view driven via a drive belt by a drive motor</p>

**Referring now to figure 1** there is shown a sectional view of a rotor 2 for use with a generator I (see figure 2) according to a preferred embodiment of the invention. Rotor 2 comprises an electrically conductive cylindrical tube 3 which may include end plates 4 and 5. End plates 4 and 5 each preferably comprise an aluminum disc. Fixed to the ends of [5] cylindrical tube 3 and covering plates 4 and 5 respectively are non magnetic stainless steel end caps 6 and 7. End caps 6 and 7 terminate in shaft ends Ba and Sb respectively. End caps 6 and 7 are preferably affixed to the cylindrical tube 3 by means of screw threads 6a and 7a located on end caps 6 and 7 respectively. Alternatively, end caps 6 and 7 may be fixed via an internal thread (not shown) on inner surface 3a of cylindrical housing 3 or fixed with a glue [10] or friction fitted. The electrically conductive tube 3 of rotor 2 may comprise as an alternative hollow members such as but not limited to a sphere or cube. Shaft ends Ba and Sb may be integral with or are detachably connected to end caps 6 and 7 and are co-axial with cylindrical tube 3. Rotor shaft ends Ba and Sb are, when in situ, surrounded by bearing assemblies 9a and 9b (see figure 2) respectively allowing free rotation of the cylindrical tube [15] 3 upon rotation of rotor shaft B. Once bearings 9a and 9b (see figure 2) are fitted to the rotor shaft ends Ba and Sb, the bearings are contained within stationary supports 10 and 11 (see figure 2). Cylindrical tube 3 rotates freely about its axis when driven via shaft ends Sa or Sb. Fixed to cylindrical tube 3 are permanent magnets ~2 and 13 which rotate with the cylindrical tube 3 when the generator operates.

[20] The magnets are oriented so that their like poles oppose (in this case the north poles) resulting in magnetic flux lines being directed radially outwardly from central zone 14 of cylindrical tube 3. Throughout the specification the term 'central zone' can be taken to mean that region in the centre of the rotor wherein the output voltage is generated when the rotor [25] is rotated. A cavity 15 is formed between two shaped cast iron pole pieces 20 and 21 between magnets 12 and ~3.

As well as having a central zone 14, cylindrical tube 3 includes end zones 18 and 19 wherein the central zone 14 is disposed between the end zones.

[30] **Referring to figure 2** there is shown an exploded view of the generator of figure I including the rotor 2 of figure 1, current collectors 22 and 23 and their interrelationship with the cylindrical tube 3.

[5] Figure 2 also shows connected to electrically conductive cylindrical tube 3 end caps 6 and 7 terminating in rotor shaft ends Sa and Sb respectively.

Current collectors 22 and 23 both of which are identical are located at contacts 32 and 33 in end zones 18 and 19 respectively of cylindrical tube 3. Each collector is located along [10] cylindrical tube 3 in a neutral region of each end zone in a flux field where the concentration of flux is low. As current collectors 22 and 23 are identical, only current collector 22 will be described in detail and with reference to figure 3 below to avoid duplication.

As the rotor of the generator I is rotated, a voltage potential develops between contacts 32 [15] and 33. Power output is drawn from the generator via the two current collectors 22 and 23. The mercury provides the electrical contact between the cylindrical tube 3 and current collectors 22 and 23 which are in electrical contact with output terminals 24 and 25 (see figure 8). It has been found that using the pole configuration shown in figure 1 that 3 to 4 times the voltage output of a standard homopolar generator may be obtained using magnets [20] having the same field strength.

**Referring now to figure 3** there is shown an exploded isometric view of a typical current collector. Figure 3 shows an enlargement of the current collector 22 of figure 2 comprising two parts 27 and 28 which preferably are symmetrical about their plane of separation and [25] which together form a contact body housing 26 (see figure 4). Body parts 27 and 28 are preferably manufactured

from a high conductivity material eg. copper. To form current collector 22 each of parts 27 and 28 which include semi circular bores 29a and 29b respectively receive substantially semi circular and preferably plastic sealing elements 30a, 30b, 30c and 30d which when in situ and mated together form circular recess 31 (see figure 4). [30] In use, recess 31 receives liquid mercury which provides the electrical contact with contact 32 on cylindrical tube 3. Contact 32 rotates in circular recess 31. Body parts 27 and 28 are mated together by means of bolts or locking screws 34 and 35.

**Figure 4 shows** the current collector 22 of figure 3 assembled. When body parts 27 and 28 [5] are mated together a seal is created by plastic seal 30 formed by sealing elements 30a, 30b, 30c and 30d thereby preventing the escape of liquid mercury during operation of the generator. It will be appreciated that plastic seal 30 can be an integral member as an alternative to formation by separate elements. There is a small clearance between sealing elements 30a, 30b, 30c, 30d and the rotor 2. Screw threads are machined on the sealing [10] lands 58, 59, 60, 61 (see figure 1) of the cylindrical tube 3, so that any leakage of mercury is returned when the rotor is rotating to recess 31 - the electrical contact zone.

As an alternative to use of liquid metal contacts, electrical brushes which are widely used in electrical machinery may be used. However, the generator, according to the present [15] invention produces low voltage at very high currents which is generally unsuitable for solid sliding contacts. The preferred contacts are conducting liquid metals such as mercury or eutectics such as sodium-potassium or gallium-indium. The use of liquid metal electrical contacts gives the advantage of lower electrical resistance, lower mechanical friction and low wear.

[20] Electrical contacts 32 and 33 are machined into the cylindrical tube 3. Preferably a number of annular ridges 32a and 33a may be formed on contacts 32 and 33 respectively. Contacts 32 and 33 are when surrounded by current collectors 22 and 23 separated by a very small clearance between the conductive surface of recess 31 (in the case of contact housing body 26)[25]. There is a corresponding arrangement in contact assembly 23. Preferably that clearance for each contact is 0.5mm or less.

Each of current collectors 22 and 23 include capillary lines. As the capillary line arrangements for current collectors 22 and 23 are the same, the following description will [30] relate to the capillary line for current collector 22 shown assembled in figure 4. Referring to figure 3 it can be seen that body part 28 of current collector 22 includes mercury reservoir 44 which feeds into capillary line 42 with flow of liquid metal into recess 31 being controlled by means of valve 46. In use, rotor 2 is rotated and then liquid metal is introduced from reservoir 44 via the capillary line 42 to the space between the circumferential contact 32 [5](see figure 1) and recess 31 of current collector 22 (see figure 3).

Centrifugal forces and viscous drag cause liquid metal to be taken up on the contacts 32 and 33 of cylindrical tube 3 to form a circumferential ring of liquid metal bead encircling those contacts. Thus, for current collector 22 mercury is in contact with the surfaces within recess [10] 31 of contact body housing 26. Similarly for contact assembly 23. Because the liquid metal bead is held in place by a combination of centrifugal and viscous forces the clearance between contact 32 and recess 31 can be quite large (for instance; 2mm). Once the cylindrical tube is rotating and the liquid metal has been introduced, the apparatus will operate equally well either horizontally or vertically. For satisfactory operation the liquid [15] metal should wet the inner surfaces of recess 31. In the case of mercury, to achieve proper amalgamation it is preferred that a process is employed to remove oxide from the surface of the body parts 27 and 28 prior to introduction of the mercury.

**Referring to figure 5** there is shown the rotor 2 of figure 1 seated in part of current collectors [20] 22 and 23. It can be seen that contacts 32 and 33 locate in recesses 31 and 37

respectively. Recess 31 is formed by plastic seal elements 30a, 30b and recess 37 is formed by seal elements 38a and 38b. Seal elements 30a, 30b, 38a and 38b engage respectively sealing lands SB, 59, 60 and 61 which have helical threads which urge any mercury that escapes recesses 31 and 37 back into those recesses when the rotor rotates.

[25] **Referring now to figure 6** there is shown a long section view of the rotor 2 of figure 1 showing the disposition of the flux lines relative to the cylindrical tube 3. Cylindrical tube 3 is shown including permanent magnets 12 and 13. Magnets 12 and 13 are preferably permanent magnets and may either be conventional magnets, rare earth metal magnets or [30] super conducting magnets. The magnets 12 and 13 may each be formed from a plurality of magnetic elements or other magnetic material. As cylindrical tube 3 is preferably formed of a high strength, high electrical conductivity copper alloy the cylindrical tube can be rotated at very high speeds. The polar opposition configuration of magnets 12 and 13 produce flux lines which pass through and exit the central zone of cylindrical tube 3 in a direction that is perpendicular to the axis of the cylindrical tube 3 in central zone 14. From figure 6 it can be seen that there is a concentration of radial flux in central region 14 as depicted by flux lines 39. Flux lines 40a, b, c and d are concentrated in end zones 18 and 19 as shown.

Rotation of the conductive cylindrical tube 3 with the magnetic flux generates a potential difference between contacts 32 and 33 (refer figure 1). The electric potential between terminals 32 and 33 is given by the relationship

$$E = 10^{-8} \cdot v \cdot B_n \cdot dl$$

where:

E is the potential difference between the contacts 32 and 33 in volts,

$B_n$  is the flux density (in Gauss) normal to the surface of cylindrical tube 3, i.e. acting radially to the axis of rotation of the rotor.

l is the distance in cm between contacts 32 and 33; and

v is the tangential velocity of the surface of cylindrical tube 3 in cm/second.

Accordingly, l will effectively be the length of cylindrical tube 3 adjacent poles 16 and 17.

As the potential difference is proportional to the tangential velocity of the cylinder it is preferable that the cylindrical tube 3 be built as large as possible to achieve optimal output voltage, and be rotated as fast as possible, for example, up to 100,000 rpm or beyond if physical limits permit.

Due to the high currents generated by the generator, super conducting materials are particularly suitable to be incorporated in or used with cylindrical tube 3.

A generator of the type hereinbefore described can produce very high output currents (multiples of kilo amperes) at low voltages. The withdrawal of high electrical currents from the generator results in a magnetic field consisting of circular flux lines enclosing the central zone 14 of the cylindrical tube 3. A method of canceling or at least minimizing these effects [5] will now be described with reference to figure 7 of the drawings.

**Referring to figure 7** there is shown a schematic representation of a generator similar to that depicted in figure 1 including magnetic compensation means. In the embodiment shown a conductive compensation tube 48 is positioned about and spaced apart from, the central zone [10] 14 of cylindrical tube 3. One end 49 of compensation tube 48 is electrically connected to contact 50 by conductor 51. The opposite end 52 of compensation tube 48 is connected to outward terminal 53 of the generator by conductive connection 54. Compensation tube 48 remains stationary while cylindrical body 3 rotates relative thereto. Compensation tube 48 produces compensatory circular magnetic flux which cancels the field generated by [15] withdrawal of current. This works in the

same manner as a coaxial cable; whereby equal currents flow in opposite directions thus the magnetic fields thereby produced cancel each other. The cancellation of the magnetic fields due to the high currents in the generator is important, since the field distortion (armature reaction) produced by these currents when uncompensated can limit the power output of the machine by altering the perpendicularity of [20] the flux lines to the rotating cylindrical tube 3.

**Referring now to figure 8** there is shown an isometric view of a fully assembled generator including output terminals 24 and 25 in communication with current collectors 22 and 23 with spacing block 56 there between. Outside current collectors 22 and 23 are bearing [25] supports 10 and 11 which receive bearings 9a and 9b (see figure 2). Outside bearing support 11 is drive wheel 57.

**Figure 9 shows** the assembled generator of figure 8 with an electric motor 62 connected thereto via drive belt 63 which engages drive wheel 57.

[30] It is thus seen that the present invention provides a generator having improved performance over known homopolar generators. Particularly, in this invention the arrangement of the magnets in polar opposition provides increased flux concentrations, increasing the output voltage of the generator for the same strength of magnet employed. The magnetic [5] compensation method of the invention allows the generator to operate at high power outputs without substantial effect on the perpendicularity of the flux lines. Finally, contacts using liquid metal reduce the electrical and frictional losses of the generator.

Where in the foregoing description reference has been made to integers or components [10] having known equivalents then such equivalents are herein incorporated as if individually set forth.

For example, it is to be appreciated that cylindrical tube 3 need not be cylindrical, although a cylindrical tube is preferred.

[15] The magnets which are the source of flux must rotate integrally with the cylindrical tube 3 in polar opposition with flux lines parallel to the axis of rotation even though the output voltage is generated by a 90° curvature of these lines intersecting the rotating conductive cylindrical tube 3. No fixed external pole pieces or magnets can be used for the purpose of magnetic [20] field enhancements.

As an example of the performance of the generator using known magnets, it could be expected that a voltage output of 1.5 V.D.C. could be achieved at a rotational speed of 12,000 rpm. A power output of 10KW maybe obtained from the machine by the withdrawal [25] of 6,670 amperes of electrical current. At this current under 400 watts will be dissipated in the rotor as heat. A realistic determination of allowable current flow based on rotor heating would be 12,000 amperes, with 6,000 amperes taken from each side of the machine. Generator drive can be achieved by use of any applicable electrical, mechanical, internal combustion, water or wind power.

[30] Although this invention has been described by *way* of example it is to be appreciated that improvements and/or modifications may be made thereto without departing from the scope or spirit of the invention, such as but not limited to: use of low friction bearings, for example air bearings; [5] operating the device in a vacuum sealed environment to reduce windage drag; modifications to the magnetic field to enhance the performance, utility and regulation of the generator.

The claims defining the invention are as follows:

1. A single piece homopolar generator for use alone or in combination with a like or known generators comprising; current collectors co-operating with a rotor body wherein the rotor body comprises; at least one electrically conductive member, a central zone between end zones, at least

two axially aligned magnets, arranged so that like poles of the magnets oppose to produce flux lines which pass through and exit the central zone of said rotor body in a direction radial to the axis of rotation; wherein the magnets in polar opposition rotate with the conductive member or members and wherein the north/south polar alignment of each magnet is axial; and electrical contacts proximate each end zone and an electrical path or paths proximate the radial extremities of the rotor between each contact formed by said electrically conductive member or members.

2. A generator according to claim 1 wherein said electrically conductive member or members comprise(s) a cylindrical tube(s) and wherein the magnets in each said tube(s) are spaced apart and are disposed in axial alignment with the axis(es) of the tube(s).

3. A generator according to claim 2 wherein the rotor comprises one cylindrical tube and the generator includes current collectors which connect electrically with the cylindrical tube by sliding brush or liquid metal contacts or both, wherein the current collectors are each located along the tube in a neutral region of each end zone in a flux field where the concentration of flux lines is low.

4. A generator according to claim 3 wherein each current collector includes an element which provides a seal to prevent egress of liquid metal from a current collecting zone between the tube and each current collector.

5. A generator according to claim 4 wherein the magnets are either superconductive solenoid repelling magnets or rare earth magnets such as  $\text{Nd}_2\text{Fe}_{14}\text{B}$  or  $\text{SmCo}$ .

6. A generator according to claim 5 wherein the speed of the generator is within a range up to 100,000 rpm.

7. A generator according to claim 6 wherein the tube is supported by shafts extending from each end and which bear on fixed bearing supports.

8. A generator according to claim 7 wherein the cylindrical tube is formed from superconducting materials.

9. A generator according to claim 7 wherein the cylindrical tube is manufactured from Beryllium-Copper alloy.

10. A generator according to claim 8 or 9 wherein the brushes are carbon or copper graphite.

11. A generator according to claim 8 or 9 wherein the liquid metal is either mercury, sodium-potassium eutectic or gallium-indium eutectic as the conductive material.

12. A generator according to any of the foregoing claims wherein multiple generators are connected in series.

13. A generator according to claim 12 wherein the generator is adapted with cooling means whereby a cooling liquid or gas is passed through the rotor and/or current collectors of the machine during operation.

14. A rotor for use with a generator as hereinbefore described, the rotor comprising; a rotor body comprising; at least one electrically conductive member, a central zone between end zones, at least two axially aligned magnets, arranged so that like poles of the magnets oppose to produce flux lines which when the rotor is in use pass through and exit the central zone of said rotor body in a direction radial to the axis of rotation, wherein the magnets in polar opposition rotate with the conductive member or members and wherein the north/south polar alignment of each magnet is axial; and electrical contacts proximate each end zone and an electrical path or paths proximate the radial extremities of the rotor between each contact formed by said electrically conductive member or members.

15. A rotor according to claim 14 wherein said electrically conductive member or members comprise(s) cylindrical tube(s) and wherein the magnets in each said tube(s) are spaced apart and are disposed in axial alignment with the axis(es) of the tube(s).

16. A rotor according to claim 15 wherein the rotor comprises one cylindrical tube.

17. A rotor according to claim 16 wherein the contacts are circumferential about the cylindrical tube.

18. A rotor according to claim 17 wherein the electrical contacts include annular ridges.

19. A rotor according to claim 18 wherein the central zone includes two shaped cast iron pole pieces forming a cavity there between.

20. A current collector for use with a generator as hereinbefore described, the current collector comprising, a two part body one of which parts is detachably attached to the other part, wherein when the two parts are attached a central bore is formed which receives a rotor, means for fitting at least partially within said bore to create a seal between the rotor and the outside of the bore wherein said means allows the formation of a circumferential recess within the bore in which an electrically conductive material is located and which is in electrical contact with electrical contacts on the rotor.

21. A current collector according to claim 20 wherein the two parts are symmetrical about their line of separation.

22. A current collector according to claim 21 wherein said sealing means comprises a plastic insert having four elements two of which engage one part of the current collector and two of which engage the other part.

23. A current collector according to claim 22 wherein the electrically conductive material is mercury or liquid metal eutectics.

24. A current collector according to claim 23 wherein one part of the current collector includes a passage in communication with the recess in the bore and which receives an outlet of a mercury or liquid metal eutectic reservoir, the reservoir including a valve which regulates the flow of said mercury or liquid metal eutectic from said reservoir via said passage into said recess.

25. A compensation tube disposed concentrically about the cylindrical tube of the rotor as hereinbefore described and which produces compensatory circular magnetic flux.

26. A compensation tube according to claim 25 wherein the compensation tube is connected to a first contact on the rotor and the other is connected to an output terminal of a generator as hereinbefore described.

27. A system for generating electricity using a single piece homopolar generator; the system comprising; the single piece generator, having one moving part, the rotor, and in which the desired electrical potential is produced without mutual interaction of a stator, a power source to drive the generator, a field of energy influence within which the generator is situated and with which the generator interacts, wherein the interaction between the generator and the field influences the output of the generator by supplementing energy input to the generator from said power source.

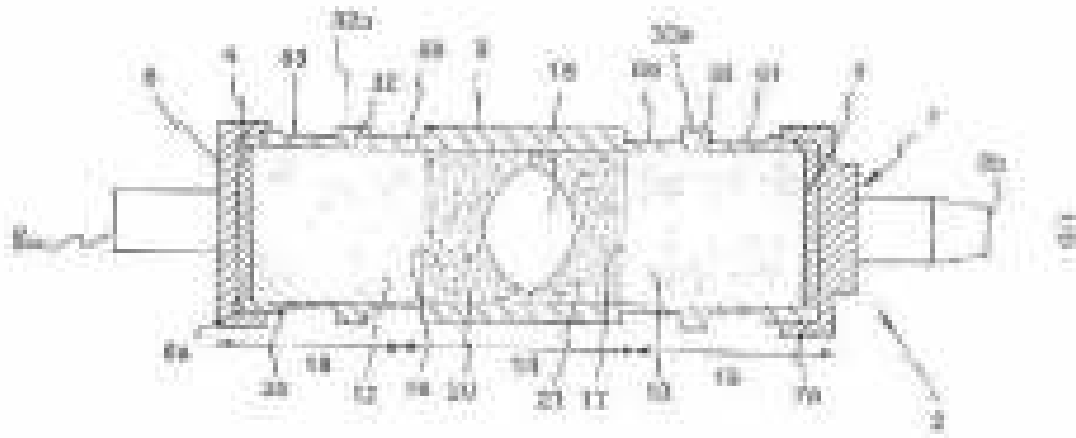


FIGURE 1

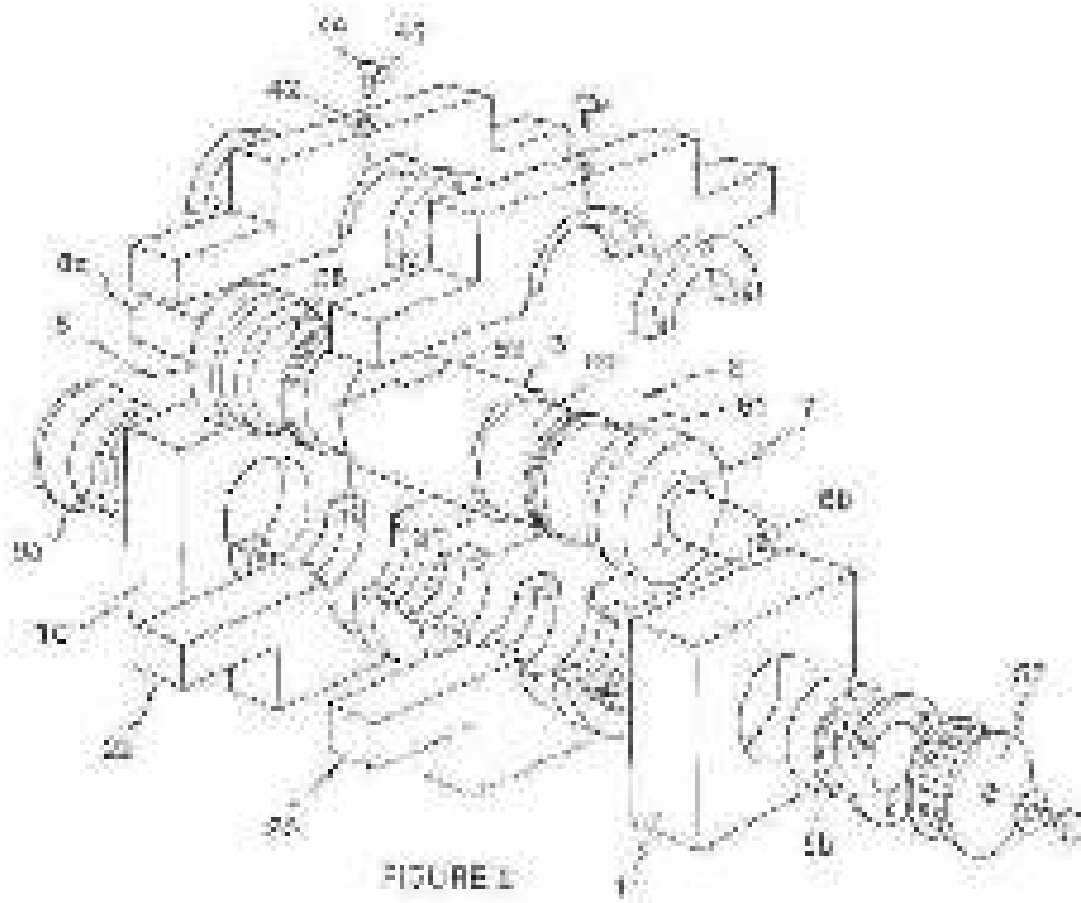


FIGURE 1

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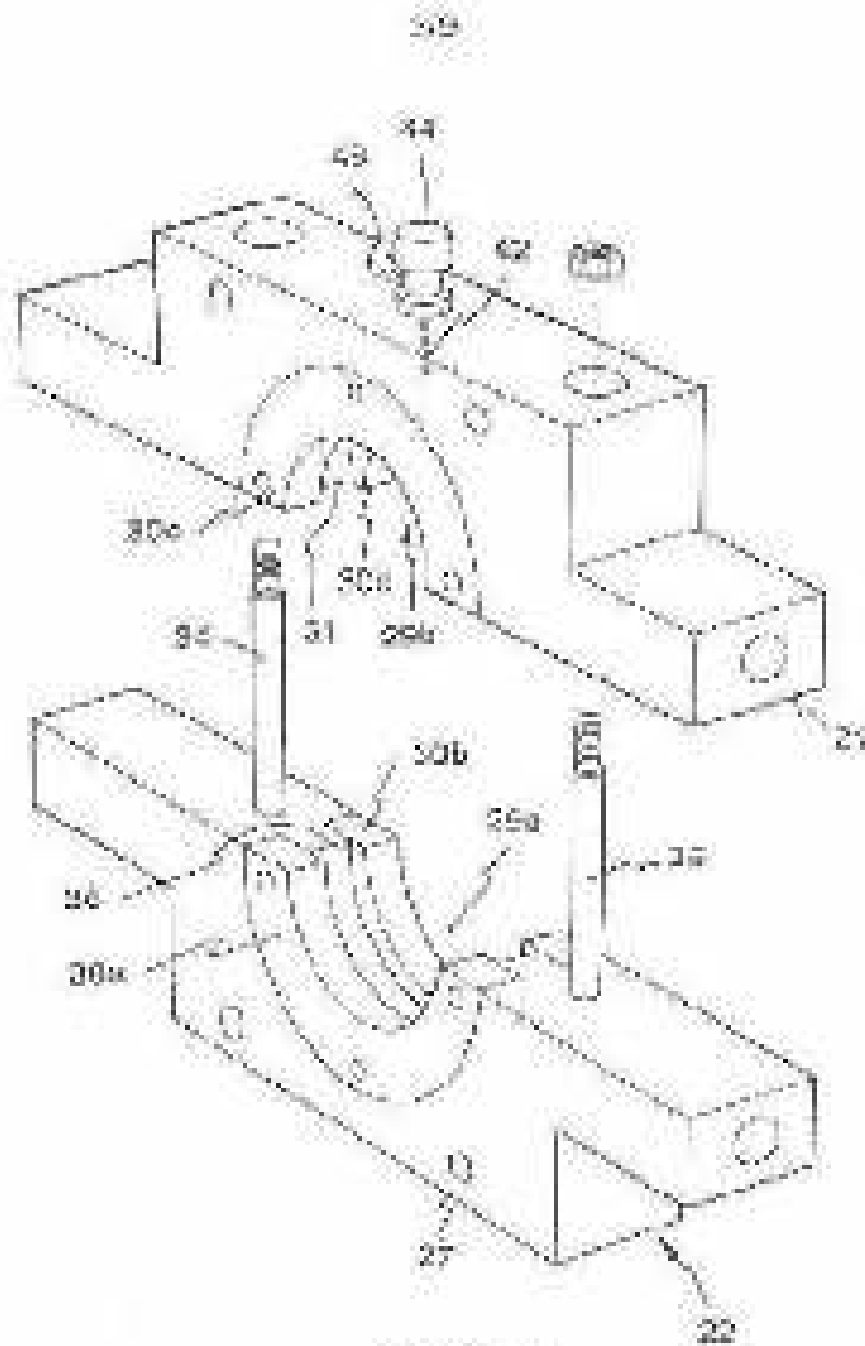


FIGURE 8

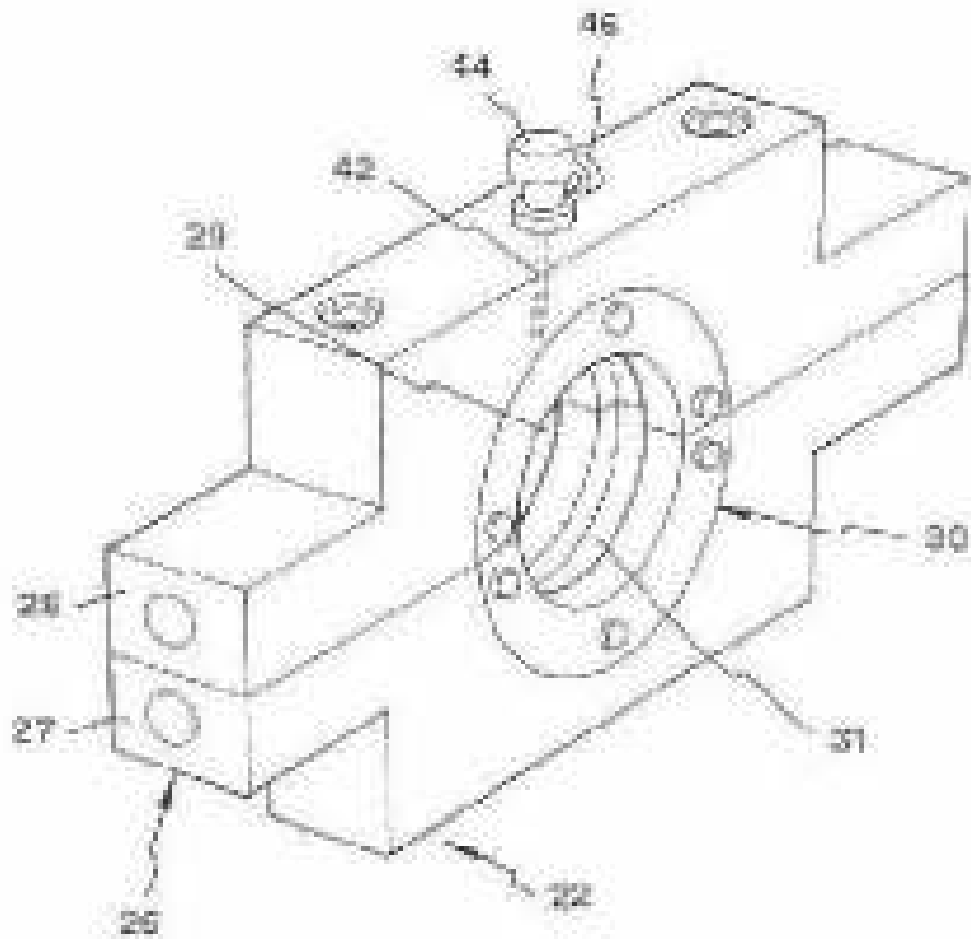


FIGURE 2

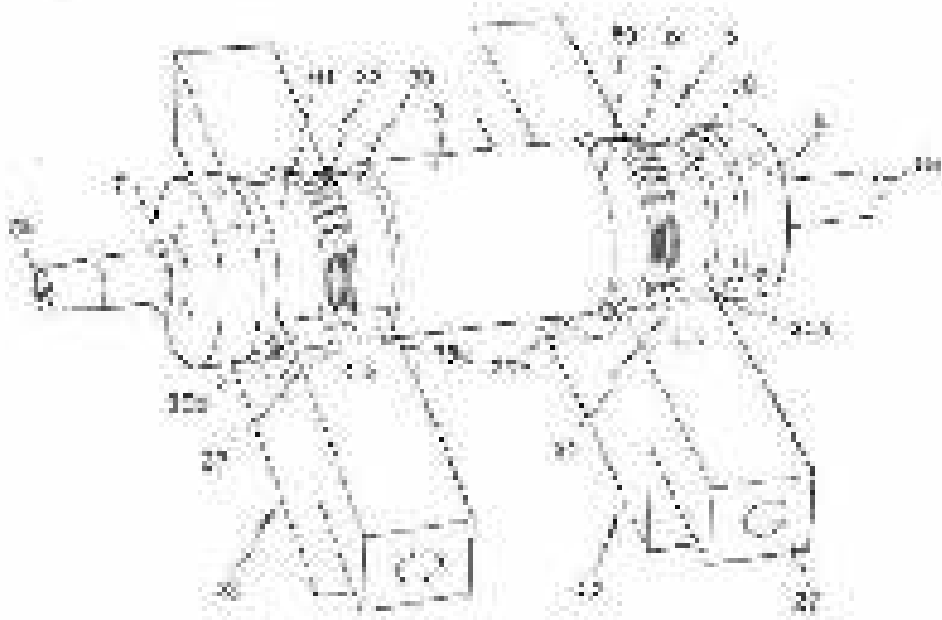


FIG. 12C

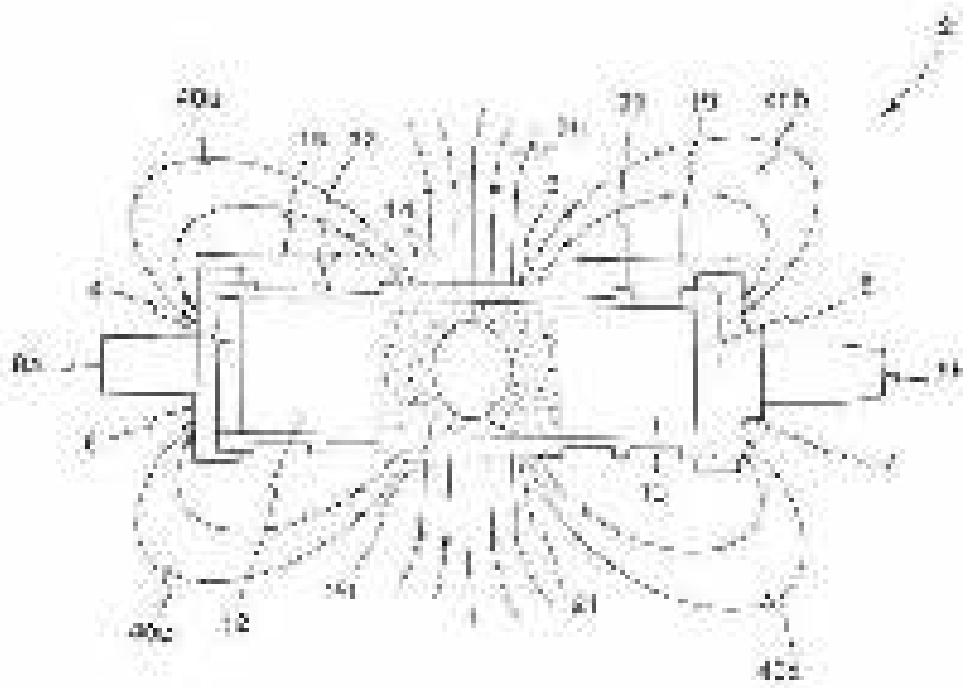


FIG. 12D

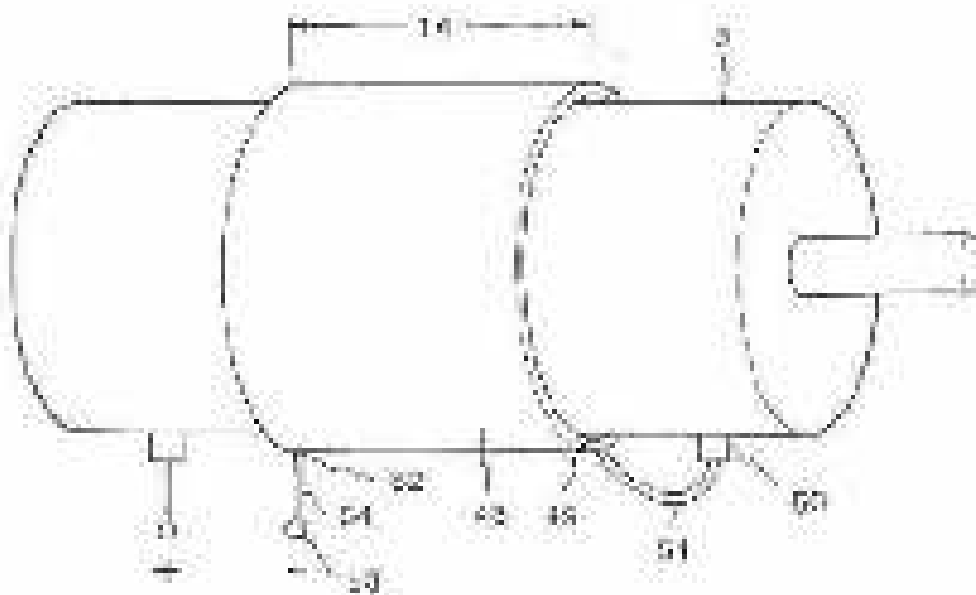


FIGURE 7

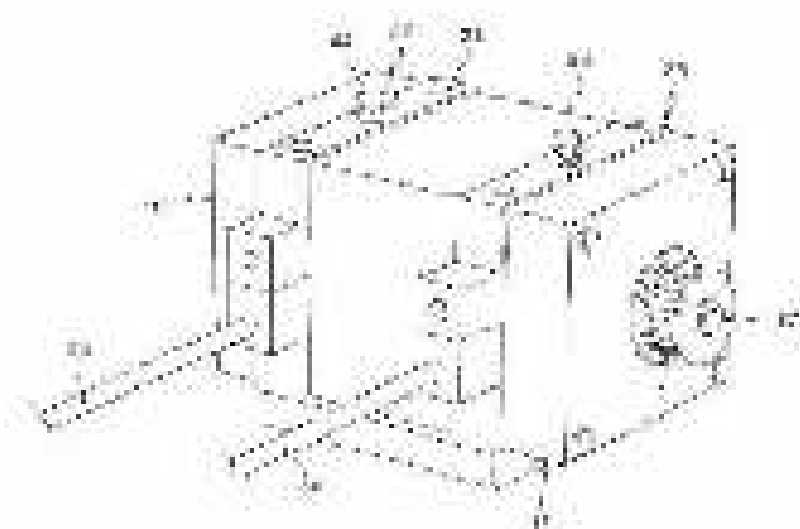


FIGURE 8

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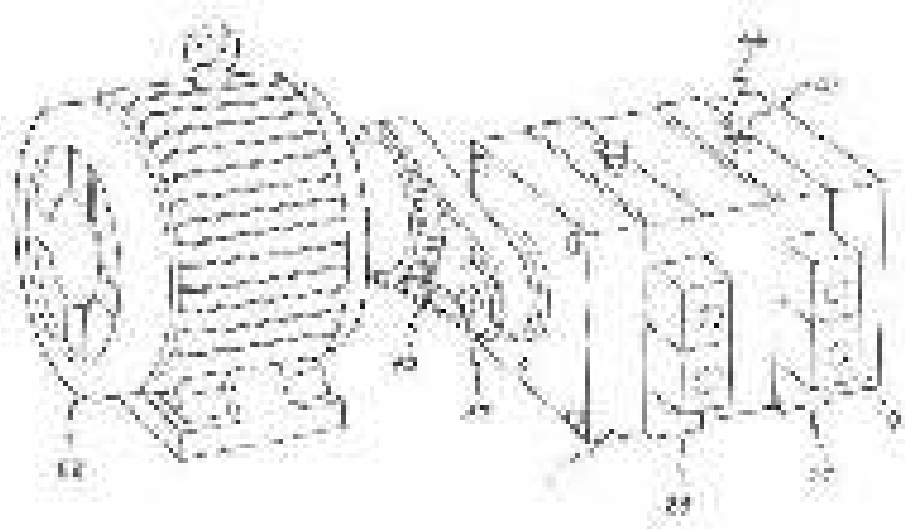


Fig. 10



Exercise	Description of the exercise (with a reference to the corresponding part of the theory)	Author(s)
1	Exercise 1.1.1. The RYR is a...	...
2	Exercise 1.1.2. The RYR is a...	...

EXERCISES ON THE THEORY OF...

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EXERCISES ON THE THEORY OF...

This document is provided as a guide only and is not intended to be used as a substitute for professional judgment. The information herein is not intended to be used for any purpose other than the purpose of information.

Case Name	Case Description	Case Status	Case Type	Case Category	Case Sub-Category	Case Sub-Sub-Category
1	Case 1	10	Case 1	Case 1	Case 1	Case 1
2	Case 2	10	Case 2	Case 2	Case 2	Case 2
3	Case 3	10	Case 3	Case 3	Case 3	Case 3
CPA-10001						

19 January 1997

## **Analog Audio Power Amplifier Design**

### **The Method of DePalma**

*"Art which does not have the appearance of art is true art."*

- Old Roman saying

#### **1) Introduction**

This author's experience with analog audio circuit design extends over a period of 50 years -- the era of the vacuum tube, long playing records, FM radio, tape recording, and transistors. It also includes the digital era where computers became involved with audio. Since the subject of this paper is analog audio, digital audio signal processing is not discussed.

#### **2) Historical Background**

In his youth, the author was fortunate in growing up and being educated in a geographical region, east coast U.S.A., Philadelphia, New York, Boston, M.I.T. - Harvard; during a time extending from the 1940's to the late 70's. In 1954, I met David Hafler and Irving Fried, who lived near my family home in Philadelphia. Through their association and friendship I met a number of the east coast audio figures of the time. At that time David Hafler and Herb Keros were manufacturing ACROSOUND transformers for the Williamson amplifier. Later on, Hafler went on to form Dyna Company, manufacturing audio output transformers, amplifier and pre-amplifier kits, Dynakits.

As Chief Engineer in the early vacuum tube days with Dynaco, I met and spoke with other audio designers, i.e. Stuart Hegeman, Ben Drisko, Frank McIntosh, and Henry Kloss. Out of these meetings a philosophy of design was emerging which encompassed the whole audio reproduction process. As time went on I became acquainted with Emory Cook, Rudy Bozak, Paul Weathers, Edgar Vilchur, Arthur Janszen, and Donald Chave (LOWTHER, U.K.).

Although my primary interest developed in the basic physical sciences, my interest in music and sound reproduction has persisted to this day. Over a period of decades, experience and introspection have resulted in the evolution of certain precepts which comprise the Method of DePalma in analog audio circuit design. The philosophy and working out of these ideas are exemplified in the three power amplifier designs presented here.

#### **3) Philosophy**

Analog circuit design I would characterize as an Art. Digital circuit design I would characterize as a geometry. Art is said to be in the eye of the beholder, consequently it is not altogether a logic process which governs the choice of a circuit topology. The object of our desire is a pleasing and satisfying musical experience comparable on some basis with the original performance. Over the history of evolution of the artificial -- and now electro-mechanical reproduction of sound, certain notions more commonly associated with the music being reproduced injected themselves into the specification of electrical parameters.

The ideas of stability, linearity, harmony, balance, and power express themselves in electronic circuitry. Imagery developed; it could be conceived the analog audio power amplifier expressed itself out of the properties of the reproduced music. Out of the amplifier configurations and possibilities assembleable through the known (fixed) laws of electricity and the properties of the known active amplifier devices, of these which are the musically acceptable topologies?

It is postulated here that the musically acceptable topologies must necessarily satisfy all the electrical laws as well as the musical ones. Conformity with musical laws converts an experiment in electromechanically induced transduction into a musical experience.

#### **4) Tubes and Transistors**

Amplifiers designed using active devices, i.e. tubes and transistors, are similar in conception to modern multi-element high-speed photographic lenses. In lens design, materials with definitely non-linear properties, chromatic and spherical aberrations, are balanced off against each other to result in a magnification (gain) without chromatic aberration (flat frequency response). High signal to noise and reduced intermodulation, (modern low reflection lens coatings). The exceptional quality of modern optics speaks to the achievement of this balancing. In fact the resolution of a modern (diffraction limited) lens is regulated by the properties of the light passing through it. This principle carries over into electronics where gain and linearity can be achieved by balancing the inherent curvatures of active devices. A push-pull class A transformer coupled circuit demonstrates this. There is probably no inherent musical superiority of tubes vs. transistors. All known gain - transconductance devices have separate and individual characteristics. The design problem is to interface the active elements with the circuit topology in the most harmonious manner.

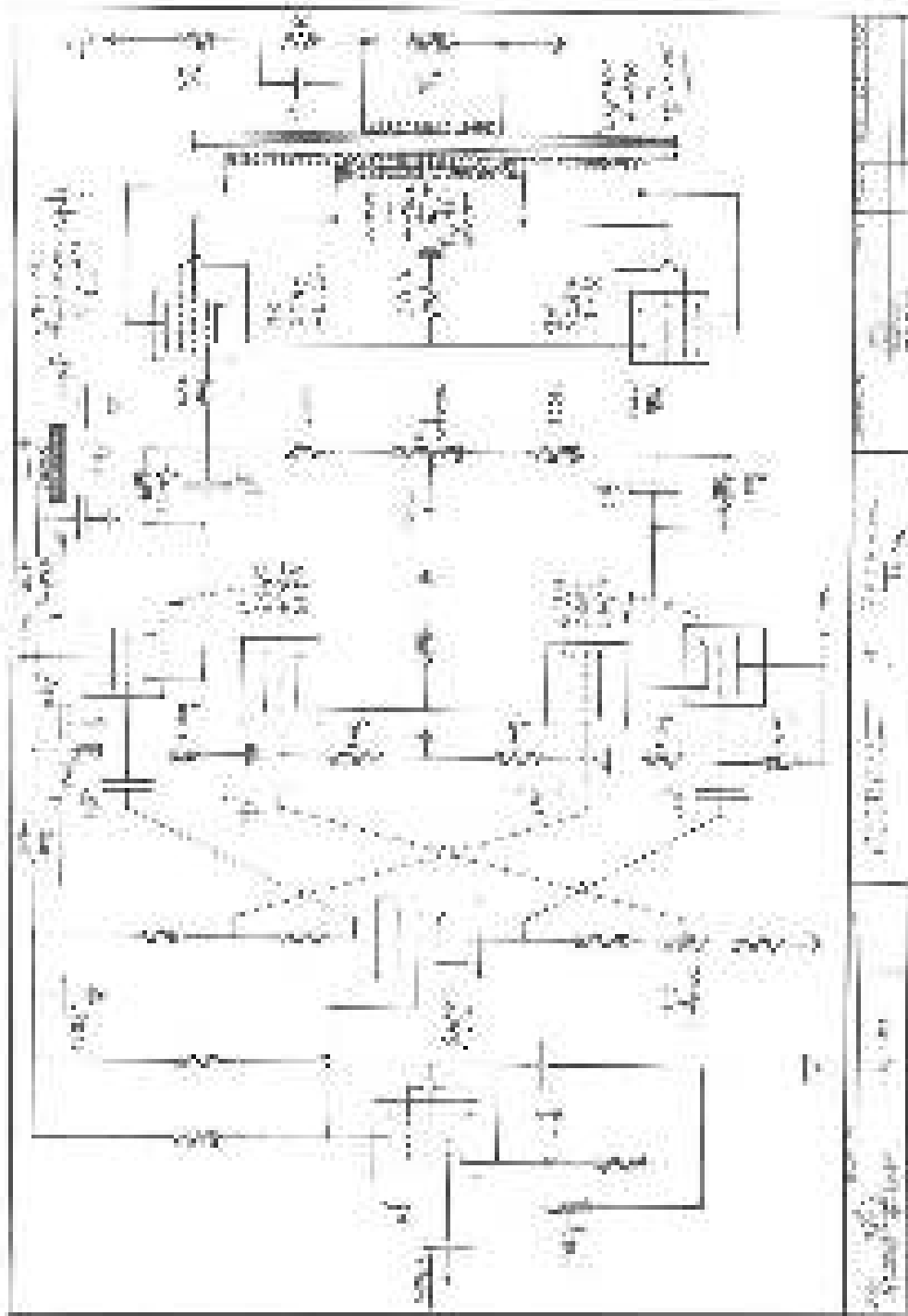
Ninety years of development of vacuum tube circuitry during the analog era have probably resulted in better Hi-Fi than 50 years of transistor circuitry developed during a time when analog techniques are on the decline and digital technology is on the ascendancy.

#### **5) The First Circuit**

The first circuit is the oldest, making use of a.c. coupling, vacuum tube active elements, transformer coupled push-pull Ultra linear output. Having stewed in the ferment of 50's golden age audio, it is a combination of tried and true with a distillation of the ideas of D.T.N. Williamson and Norman Crowhurst.

The driver circuitry is the input pentode direct coupled to a triode split load phase inverter. The pentode section, (6AN8), operates at a low plate voltage making for satisfactory direct coupling to the phase inverter grid. Low frequency gain and phase shift is controlled by the size of the screen bypass capacitor.

It is well known that even though signal current is common to both the cathode and plate load resistor of the split load phase inverter, because of the differing incremental impedances at the cathode and plate the circuit can become unbalanced at high audio frequencies. A circuit has been devised, figure (1), to provide low impedance drive to the output tubes as well as correct the high-frequency unbalance of the phase inverter. In this circuit the voltage output is controlled through the upper (cathode follower) grids and the current in the load by the drive to the lower tubes' grids.



With the combination as shown using a 6AN8 inverter driver and two 6SN7s, 6CG7s, or 6FQ7s, the frequency response is identical for both sides, minus 3db @ 35kc.

Driver output impedance is 600 ohms. The fraction of the plate or cathode load resistor of the inverter stage tapped off to drive the lower tubes' grids is determined by experiment. The drive to one of the lower tube's grids is adjusted for a.c. balance or lowest distortion.

Coupling to the output tubes' grids is via a "step network" which gives zero phase shift at d.c. This is important for stability. Output is push-pull Ultra linear with a tertiary winding for differing plate and screen voltages. Negative fixed grid bias voltage is supplied to the output tubes by a separate d.c. power supply.

The output cathodes are tied to ground through a 10 ohm wire-wound common cathode resistor. The size of this resistor regulates output stage distortion at high levels. Distortion at high levels is reduced at the expense of a small increase in low level I.M. The 10 ohm value represents a compromise.

It is essential for Hi-Fi use that the voltages applied to the circuit build up gradually. Voltage surges can cause flashovers in the output tubes which could damage delicate loudspeakers.

## **The Power Supply**

The all vacuum tube first circuit requires a rather elaborate power supply. At full output, 250-300 watts, it must be able to maintain the output tube plates at 800 volts and the screens at 400 v.d.c. The low level stages and the driver circuit are isolated via L-C filtering from the output tube plate circuit.

With single ended stages in the input driving a class AB output stage unwanted feedback through the power supply sicklies over the audio image.

It goes without saying that d.c. delivered to all amplifier stages must be pure d.c. without ripple. Under certain conditions the effects of power supply ripple under load may be ameliorated by complementary (transistor) circuitry. On the other hand there is no substitute for pure d.c.

For circuit one the power transformer provides 800 v.a.c. center tapped to a full wave bridge rectifier composed of four 6AU4 damper diodes. Under light load, quiescent conditions for the amplifier, this circuit gives one-thousand volts for the plates of the output EL34s. The transformer center tap gives 1/2 voltage, i.e. 500 volts d.c. for the screens.

Individual filtering of the plate and screen busses is by two stages each of pi section 15 henry chokes with 10 microfarad paper filtering capacitors, except for the input capacitor which is 5 microfarads. The 500 volt buss is further filtered by two more pi sections using 20 henry chokes and 10 microfarad paper capacitors. This line feeds the driver section of the circuit. The B+ for the input 6AN8 triode-pentode is further isolated with another pi section using a 20 henry choke and a 10 microfarad filter capacitor.

Output tube negative grid bias is supplied from a separate half wave silicon diode rectifier working into a single pi section filter using a 20 henry choke and 100 microfarad low-voltage electrolytics.

The 6AU4 damper diodes have good enough heater cathode insulation so that they may be operated from a common 6.3 v.a.c. winding. The slow warm-up of the heavy duty filaments applies the high voltage to the circuit with a smoothly rising voltage build-up. A separate 6.3 v.a.c. winding supplies the filaments of the power amp.

Use of high-voltage paper filter capacitors gives essentially unlimited lifespan as compared to electrolytics which are good for about 20 years when operated within ratings. Use of paper capacitors will ensure a constant, low power supply internal impedance over the audio range.

The power supply should provide two functions. Firstly to supply steady d.c. to all stages, and secondly to isolate the stages in such a way that unwanted feedback loops are not set up between them. This is especially important with single ended low level stages. Because of complementarity, transistor stages can be balanced to eliminate common mode (power supply) fluctuations from the output. Tubes come in one sex only so that the balancing operation is much more difficult, leading to the use of differential circuitry which has its own complications.

It is hard to make general statements about power supplies for audio amplifiers. Even with perfect balance, intermodulation can result if a gain parameter is sensitive to current. The pentode-like characteristics of solid-state devices make them less sensitive to power supply voltage fluctuations than triode vacuum tubes.

Suffice it to say that power supply configuration and topology is just as important as amplifier design. If there is complementarity in vacuum tube circuit design it is expressed in the relationship of the active circuit to its power supply. It is in this that the musical as well as the electrical laws are satisfied.

### **Negative Feedback**

In the circuit described 20db of negative feedback is taken from the output transformer secondary 8 ohm tap to the cathode of the input pentode. The circuit is set up by adjustment of the feedback resistor bypass capacitor to produce a critically damped 20kc square wave into an 8 ohm non-inductive load. The feedback network is a step circuit to prevent excessive high-frequency feedback in a range where internal amplifier and transformer phase shifts could produce oscillation, especially with capacitor (electrostatic loudspeaker) loading.

With all other low-frequency time constants as indicated a low-frequency 2 c.p.s. d.c. function generator is used for the adjustment of the screen bypass of the input pentode. Perfect reproduction of the low-frequency square wave is what is desired. In this circuit with 20db of overall negative feedback this capacitor should be adjusted to reproduce the 2 c.p.s. square wave at the output without slope or tilt. Too large a screen bypass capacitor will produce overshoot, indicating an undesirable peak in low-frequency response. These tests must be done at a low signal level into an 8 ohm load to avoid saturation of the core of the output transformer.

In some respects circuit one is derived from the earlier (1948) Williamson amplifier design. The Williamson amplifier could exhibit a constant low-frequency oscillation resulting in a "breathing" action of woofer cones moving in and out, triggered by wow or rumble in the reproduction of long-play vinyl discs.

The Williamson amplifier was stabilized by the use of "step" network coupling of the driver plates to the output tube grids. This modification corrected the low-frequency phase response and was originated by Norman Crowhurst.

Circuit one incorporates step circuit coupling to the output tube grids as well as the low-frequency phase and gain adjustment afforded by variation of the screen bypass capacitor of the input pentode.

In a vacuum tube amplifier there is essentially zero time delay between the signal grid drive and a current response at the plate. This not the case with transistors where the flow of charge carriers through solid semi-conductors is much slower than electrons moving through a vacuum.

The limitation in the use of negative feedback to reduce distortion occurs because of phase shifts in the circuit elements adding up to 180 degrees at subsonic and ultrasonic frequencies and thus turning negative feedback into positive feedback. This is especially true when an output transformer is one of the circuit elements. Experience has shown that 20db of feedback is optimum in a circuit where it takes 30 - 35db to make the circuit oscillate. Negative feedback is very useful in distortion reduction if not overdone.

DePalma likes to design his circuits so that there is only one voltage gain stage, i.e. the input pentode. The subsequent stages are unity gain cathode followers.

## Discussion

Listening tests by this author have determined that different power output tube types have different sounds. Different brands of the same tube also sound different. The two generic tube types are the beam tetrode and the pentode exemplified by the KT-66 and the EL-34/6CA7. The KT-66 has a sweet, smooth sound, and the EL-34 a sound which has been characterized as dry. I do not prefer the sound of the 6L6, 6550 or KT-88. I think the EL-34 pentode originally manufactured by Philips and later by U.K. Mullard, and German Telefunken, is the best audio tube ever made. For what it's worth, I listen to a stereo system with one channel EL-34s and the other KT-66s.

Vacuum tubes have long reliable life spans when operated within ratings, and especially at high voltages and low currents. The fastest way to shorten power tube life is to over-dissipate the tubes.

There was a time in the history of audio power amplifier design when output tubes were run at excessively high currents to achieve low I.M. distortion. This led to short tube life necessitating replacement every six months or so of continuous listening to maintain specs.

A trend developed of operating plates and screens at the same voltage. At the same time, amplifier manufacturers tried to maximize output power, necessary because of the extremely low acoustical efficiency of acoustic-suspension, AR, KLH, and electrostatic type loudspeakers. Operation of plates and screens at the same voltages, obtained from Ultra linear tapings on the audio output transformer primary, leads to a dangerously unstable situation as plates and screens are taken up to the 500 volt level. Excessive electron current can cause the screen wires to become incandescent, increasing tube current to destruction. The screens of EL-34s should be in the "shade" of the control grid wires. Later versions of EL-34s manufactured in the 80's and 90's may not be as carefully assembled as the original Philips construction.

The best way to get high power and low distortion is to operate EL-34s at high voltage. The EL-34 can give 100 watts/pair with 800 volts on the plates and 400 on the screens. This necessitates a tertiary screen winding on the output transformer. The best transformer for this purpose is the Dynaco A-440, or one of its clones. At the 800-400 plate - screen voltage ratio this transformer can give 300 watts output between 30 cycles and 15kc, 200 watts 20-20kc.

In the amplifier design described no load voltages on the output tube plates and screens are 1000, 500 respectively. Over the 40 years of experience I have had with this design no special problems have developed with the exception that these voltages should be applied with a controlled build-up which is obtainable from the vacuum tube damper diode rectifiers which are employed. Tubes also flash occasionally from loose internal particles. A few sharp raps generally loosens them.

DePalma and Hafler discovered the distortion reducing properties of a small common cathode resistor in class AB circuits when they were looking for an easy way for the customer to set the output stage bias. A 12 ohm resistor equated to a 1.56 v.d.c. drop which was equal to the voltage of a 1.5 volt dry, zinc-carbon cell. It also turned out that this resistor reduced high level I.M. by 2/3, down to .25 percent, while low level, one-watt I.M. was only perceptibly increased.

Use of a 10-12 ohm common cathode resistor in class AB push-pull audio power output stages allows a reduction in quiescent static current to achieve the same distortion at maximum output. Any reduction in tube current will increase tube life. A small common cathode resistor together with high-voltage, 800-400, operation of the EL-34 can result in a tube life in excess of 20 years.

The important parameter in vacuum tube life is bulb temperature. Output tube temperatures high enough to burn fingers when touching the bulb evaporate getters on the inside of the envelope. These tubes eventually become gassy and lose emission. Anyone serious about vacuum tube

amplifier design must either contemplate manufacturing his own tubes or developing circuits which maximize the performance and life of the existing remaining stocks.

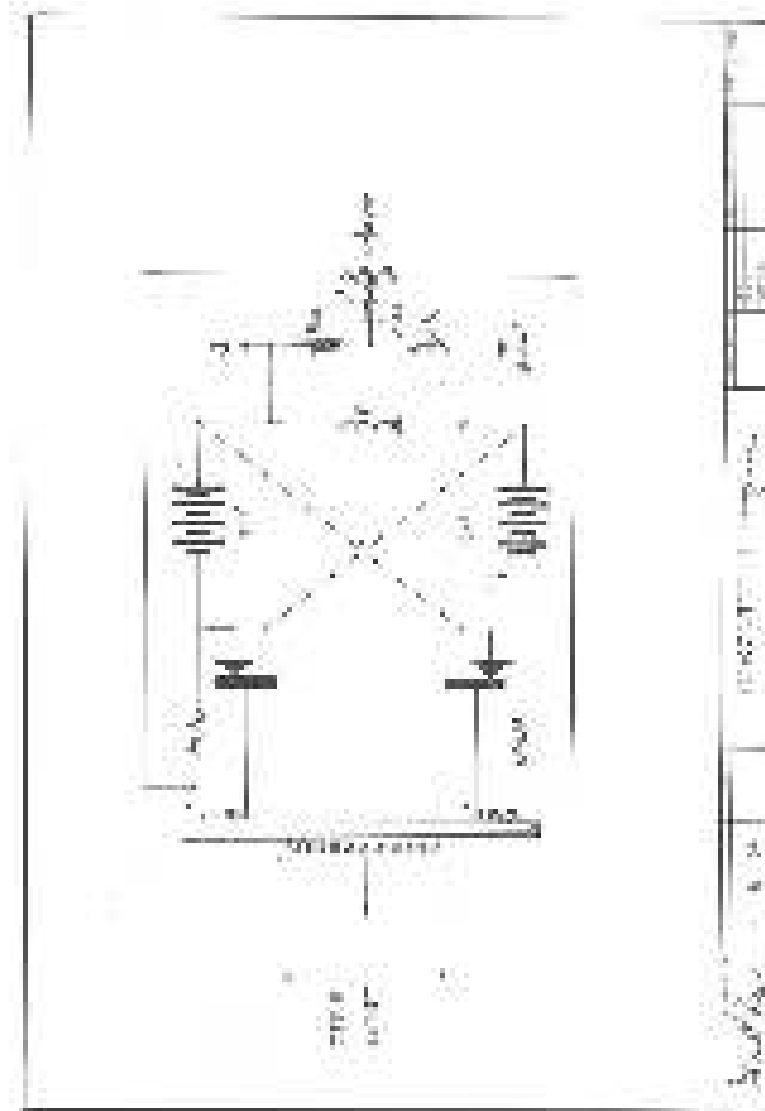
In the early days of Hi-Fi the earth had not reached its limit of planetary resources. Economic considerations had not yet reached a limit where price and "performance" were intra-convertible or even relevant. The important fact was to achieve musical performance for one's Hi-Fi system. The contemporary aphorism is not whether it is musical but good value for the money. As we drift into our uncertain future we have lost touch with music.

## **6) The Second Circuit**

The second circuit was developed as a hybrid tube-transistor audio power amplifier. In the original design a DynaKit 6AN8 voltage amplifier phase splitter drove a 6360 single envelope twin tetrode, Ultra linear connected. The output transformer was a Dynaco A-410 modified with normally paralleled 16 ohm secondaries separated. These windings drove one or more pairs of same sex transistors in the manner shown, figure (2).

A single power transformer with two capacitively isolated 40 volt windings and a 250 volt winding for the two tube phase inverter driver was used. The 6360 power stage need only put out a few watts to drive the transistors to saturation. In the circuit constructed a bypassed common cathode resistor provided bias.

The second circuit can also be driven by a transistorized voltage-amp-phase-inverter-driver. The salient features of this output circuit are that identical same sex transistors can be used and because of the floating nature of the transformer coupled drive, either end of the output load resistor may be grounded. Negative feedback to the input stage cathode (6AN8) is taken from the ungrounded end. Either same sex bipolars or FETs can be used in this circuit.



### Philosophy

Vacuum tubes come in only one gender. Transistors can be N type or P type. An N type transistor can be synthesized from a P type and vice-versa, by what is known as a quasi-complementary circuit. Quasi-complementary circuits using combinations of N and P type transistors work well but direct fabrication of fairly well matched N and P type complementary power transistor pairs has put these circuits on the back burner.

Of course a purist designing class B transistorized audio power circuitry would never consider using complementary pairs, being that the matching is not perfect. On the other hand this necessitates the use of an audio driver transformer, the imperfections of which limit the amount of overall usable negative feedback.

The reason I consider the transformer coupled driver circuit acceptable is that exact matching of the output power transistors is possible. This in itself minimizes even order harmonic distortion. Small low-power, 10 watts or less, driver transformers have excellent frequency response extending to 100kc for the A-410. Capacitive effects between windings and their attendant resonances in a small transformer are well outside the audio range.

Larger and bigger audio output transformers normally used in the range 100 - 500 watts have definite high-frequency resonance and leakage problems which limit the overall amount of negative feedback which can be used. For example, the 250 watt output of the first circuit can be obtained at about .5% I.M. using 20db of negative feedback. Oscillation would occur at 32db feedback. In the second circuit 100 watts could be obtained from a pair of diffused-base bipolars @ .25% I.M. In this design 25db of feedback could be used with oscillation occurring at 35db.

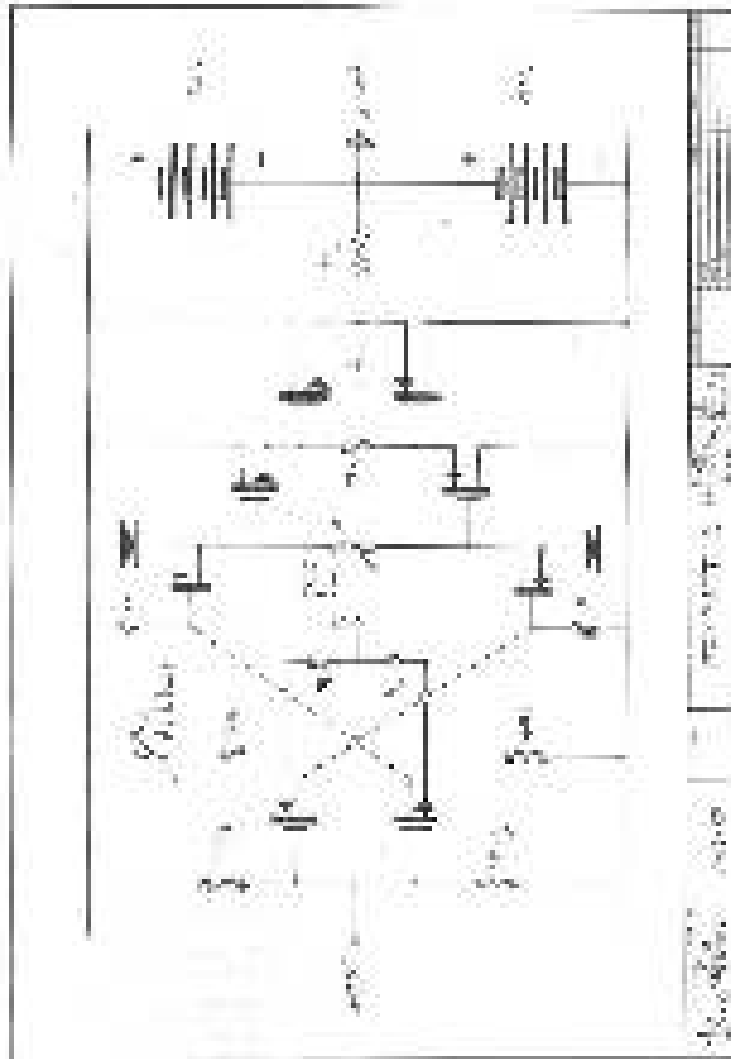
Because of stored base charge and propagation delay effects, negative feedback is not as effective in distortion reduction for transistorized power amplifiers as for tube-transformer designs. In the same vein, excessive negative feedback may create non-harmonious distortion in transistor circuits. Consequently whatever the design, the principle should be to obtain the lowest distortion before feedback is applied. Negative feedback as a cure for distortion when properly applied can have non-harmonious and destructive (oscillatory) side effects if overused.

I like the second circuit because it can employ same sex matched and balanced transistor pairs to achieve any desired output power. Even though a small low-power driver transformer is required, the problems it solves more than compensate for the few ills a well designed and constructed audio transformer produces.

As is well known, the vanishingly small distortions which can be obtained in fully transistorized audio power amps are not necessarily reflected in their audio listening quality.

### **7) The Third Circuit**

The third circuit was developed to fully utilize complementary symmetry matched P and N type field-effect transistors. Using these devices, a fully d.c. coupled audio power amp was designed. In recent years audio quality has been adversely affected by the use of plastic dielectric coupling capacitors. There are well known memory and electric hysteresis effects in plastic dielectrics. If coupling capacitors are used in audio circuits they should be paper or metalized paper dielectric. Of course, d.c. coupling removes all capacitors as shown in the third circuit, figure (3).



In this circuit the musical as well as electrical laws are followed. Complementary symmetry, FETs and bipolar transistors are all utilized in a completely balanced, symmetric, d.c. coupled configuration. The experienced designer will see that in this circuit complementary symmetry bipolars can be substituted for all the FETs.

In order to achieve d.c. coupling the first stage of this circuit has a voltage gain of less than unity. Bipolars or FETs may be used here. The second stage is the voltage gain stage. Complementary bipolars should be used here to insure maximum voltage, rail to rail, drive. The second stage is interesting because it is a combination of two driven current sources using each other as load resistor.

The diodes in the emitter circuit are used in a dual mode. Using complementary bipolars as recommended, these diodes provide temperature compensation in conjunction with the 1K base to ground resistors. The other function is to ensure the lowest base input resistance in the voltage amplifier stages. The current supplied to the gain stages by the input transistor pair divides between the base to ground resistor and the input resistance of the gain stage, i.e. the lower the base input resistance the more driver current flows into the gain stage transistors.

If the base input resistance were zero, all the driver current would flow into the bases and the gain of the two-stage combination would be highest. Substitution of complementary FETs in the gain stage changes the input situation since FETs are voltage actuated.

In the gain stage each transistor acts as the load resistor for the other. Very high gain and linearity is possible. Using bipolars, the drive output of this stage is almost peak to peak, rail to rail, less the saturation voltages and emitter diode voltage drops. The gain of this stage using bipolars is 1000-1500. Since the second stage operates as a current source a variable series resistor in the common collector circuit can be used to regulate the output stage quiescent current. As can be appreciated from the circuit schematic, any supply voltage variations either from mains fluctuations or long term thermal temperature co-efficient effects in the active devices appear only as a common mode effect and do not shift the d.c. balance point of the circuit.

Circuit three requires a power supply with exactly equal and opposite output voltages balanced against ground. This ensures, all other things being equal, that no d.c. offset will appear across the output load resistor for zero voltage input to the amplifier. A proper circuit uses a four diode full-wave bridge rectifier fed from a center-tapped power transformer secondary winding. The center-tap becomes a 1/2 voltage point which is grounded. Two 1000 microfarad electrolytics connected in series are used for filtering. The center point of the seriesed capacitors is also grounded, providing adequate filtering of the plus and minus 40 v.d.c. outputs.

The d.c. balance control is an internal set-up adjustment which becomes ineffective when the overall d.c. negative feedback loop is closed. Complete elimination of any remaining offset voltage is effected by a minute trimming of the resistance of one of the 1 megohm input resistors. (Use of a high-power direct-coupled amplifier for high-fidelity audio requires a low frequency cut-off to prevent damage to loudspeakers.)

Selection of the emitter resistors of the input stage determines the quiescent current of the gain stage. Interestingly, the gain stage may be operated class A or B.

The emitter-follower following the gain stage can be either bipolars or FETs. An important parameter here is the input capacity of these devices which can cause a high-frequency roll-off. This roll-off can be used as high-frequency phase compensation. When using FETs, their extended frequency response can lead to R.F. oscillations. This can be controlled by series "stopper" resistors of up to a few hundred ohms in the gate circuits.

With FETs in the input stage and bipolars in the gain stage, negative and positive temperature coefficients work against each other. If quiescent output stage current is temperature sensitive in the sense that d.c. compensation of the input stages does not offer complete control, then a series diode string between the output driver transistor bases (or gates) can replace the resistor control shown between the driver transistor emitters.

The third circuit can drive several pairs of paralleled output transistors. A complementary symmetry FET emitter-follower drives the output transistors. The emitter-follower driver fed from the driven current source gain stage provides low distortion symmetrical rail to rail drive to the output stage. Here again complementary bipolars can be substituted for the FETs.

The output stage can be either bipolar or FET. An alternative method of regulating quiescent current is a series diode string in the emitter circuits of the driver stage. This might be more important with a bipolar output stage since temperature compensation with negative co-efficient diodes is possible. The built-in negative temperature co-efficient of current in FETs renders this unnecessary. As a strictly purist comment, I do not like to use diodes in a signal path. They may be forward biased and in conduction, but they still have a non-linear current-voltage relationship as compared to a resistor.

## Negative Feedback

Negative feedback in the third circuit is from the hot end of the load resistor (loudspeaker) to the input emitters. To obtain best square wave response and transient stability this resistor may be bypassed by a small capacitor. If the feedback resistor is connected between the two points marked fb and bypassed with a small capacitor, the identical emitter resistors in the input stage can be adjusted to be some fraction of the main feedback resistor. Thus a "step" network is created which limits feedback at high frequencies and improves stability. Experiments with this circuit showed that oscillation ensued with 55db of feedback.

The designer should produce a circuit which has inherently low distortion before feedback is applied. Odd harmonic distortion can be balanced out by symmetry. Even harmonic distortion is reduced by choice of inherently linear circuitry, i.e. emitter-follower output and output driver circuits, and a linear driven current source symmetrical high-gain stage.

With the above combination distortion does not continue to decrease above 30db of feedback. Just under clipping and at full output into 8 ohms, I.M. distortion of the third circuit is unmeasurable or in the noise level of the instrument. Power response is flat from d.c. to 100kc where the output is rolled off deliberately through internal compensation. One-half volt d.c. input drives the amplifier to full output. At 30db of negative feedback no compensating capacitor was required across the feedback resistor to produce a perfect 20kc square wave.

## Philosophy

The third circuit was designed to take advantage of the most advanced semi-conductor technology available today (1990's). I have felt that transistor audio power amplifiers could equal or out-perform the best vacuum tube designs. Analog audio thrived in the days of vacuum tubes, but design has turned away from analog to digital and the serious evolution of analog transistor power amplification has never taken place.

Transistors have made it possible to eliminate the audio power output transformer from audio amplifiers. Complementary transistors make new design options possible. The pentode-like high incremental impedance of transistor collector circuits reduces filtering requirements of power supplies. Total d.c. coupling is possible in complementary circuits thereby eliminating all coupling capacitors.

## Performance

I like the sound of all three circuits, but the third circuit represents all I know about electrical and musical laws. The sound is sweet, smooth, effortless and transparent. 100 watts of audio can be gotten from 8 transistors and 6 diodes. The history of the development of electronic audio rests on the control of the flow of current, firstly via the vacuum tube grid, then by carrier injection into a back biased semi-conductor junction, finally control of transconductance via an electric field projected into a semi-conductor. Other means of current control may be possible and some might be practicable.

Returning to the golden rules of audio, the simplest design with the fewest stages is preferable and if balance, complementarity, linearity and power are the musical factors I would prefer circuit 3.

### A final thought

The reproduction of music electro-mechanically does not lend itself to the manipulations of the digital computer and the exigencies of apparently "perfect" analog to digital and digital to analog conversion.

Offshoots of contemporary inattention to perfection are the operational and differential amplifier circuit chips. Analog design has been relegated to the ministrations of specialists who design large scale integrated circuit chips. Amplifiers are not designed but specified. Differential amplifiers are installed as input circuits where negative feedback is not applied to the same active device as the signal. This tactic, often hailed as a great freedom in the design of amps with "balanced" negative feedback, builds in irreducible distortion from a stage of amplification not includable in the negative feedback loop.

The degree of perfection and subtlety of design required for Hi-Fi analog audio mandates discrete design of audio circuits and the avoidance of prepackaged integrated circuits with their attendant "commercial" mass-produced sound.

Negative feedback must be applied in a single loop from the output load terminal to an input device. The signal and feedback must interact in the same active device. Those who care to study the subject of feedback further should read: Valley and Wallman, Vacuum Tube Amplifiers, M.I.T. Rad-Lab Series. Further wisdom on the subject of negative feedback can be gotten from the works of Norman Crowhurst.

This paper has been written for professionals in the field of active analog audio circuit design. It is not intended as a "how-to" construction article. Writing a design paper is different than a scientific article. Design is the selection of an appropriately chosen set of concepts to motivate and actualize a particular function, i.e. electro-mechanical analog audio sound reproduction.

What has been sketched out in this paper are the sets of concepts and choices DePalma would, and has, made in his pursuit of an audio image expressed electronically. Other sets of choices are available and can be woven into a rationally acceptable audio image. The choice is in the eye of the beholder and in the ear of the listener.

# PHYSICS WITHOUT DEPALMA

27 July 1997

## Physics Without DePalma

Science without philosophy is as empty as philosophy without science.

The best instrument for the exploration of this question is the human mind.

When we are born into this world we come with nothing including no a-priori knowledge.

What we can know of this world is built up from the experience of experiments. Seducing is easy, making love to your friends is hard. Up close and personal.

Philosophy comes in at this point. Logic, cause and effect.

If we enter this world (collectively) knowing nothing, can we ever know anything?

The way out of this dilemma is to know we are creating it all for ourselves and this brings us back to the human mind.

We know nothing because we can know nothing. Life consists to us of experience, filtered through our prejudices, -- what we *can* know of experience.

The distillation of experiences is the experiment.

The formulas and recipes for successful experiments can be recorded and passed down through the ages. These are the spells and invocations of earlier times.

In the successful formula or experiment or recipe the cake which is baked is the desired result of the desirer, the experimenter, the baker, the cook who bakes the desired cake, the formulator of the experiment.

So there we have another principle at work. You get what you want, the power of prayer, the meditation which gives the answer. The transformative power of free energy that converts the wish of the desirer into the desired result.

All this is a theory, a wish made up in the human mind to satisfy a need for identity. What or who we are does not matter, our place in the game expires with terminal guilt.

You have to have something to start something, something secondary to reality but not part of the lie. Your awareness of self precedes eternity and its perception. So the theory is that we exist and feel pain as the primary perception.

And beyond that we have time to exist in, and feel our pain.

In earlier papers I have described a model of the Universe which, through the time-energy of its creation, exists in a state of aliveness. There is something paradoxical about the state of existence. We exist, we are born alive, but in the nature of our creation we are single and alone and search for completion or peace.

Other versions of ourselves are present, we speak to ourselves through images, mirrors, reflections. Co-operative man, the hive brain, from whence it comes and where it goes no one knows.

Yes we know there is energy within existence, without energy there is no existence.

Time is happening all the time. It is the energy which drives events. The clocks we use do not measure time, it is time energy which causes phenomena to happen at certain rates.

Look at all the things we do to arrive at the above. We have to exist, we have to observe, we have to invent and make clocks. We have to abstract the nature of time from the measurements of clocks.

Time for something to exist in as opposed to how fast its happening.

Do we know anything more? Do we know anything at all. We have found something by observation. Through deduction we have abstracted and generalized. We formulate a notion, a

conception, a model. Is any of this true or real? Of course not. It's all in our mind, which returns ourselves to the primal state of knowing nothing.

The mind of man is trapped in its own reality. The puzzle is always over, the game is „always“ finished. So ends the reign of logic. It is an \_\_\_\_\_ indescribable world. And it isn't just one world, its anything you can think it up to be, and all at the same time.

I didn't make it this way, I found myself here. Awakening on the sandy beach of time, which pretty pebble shall I pick up.

# APPENDIX

# Gyro Drop Experiment

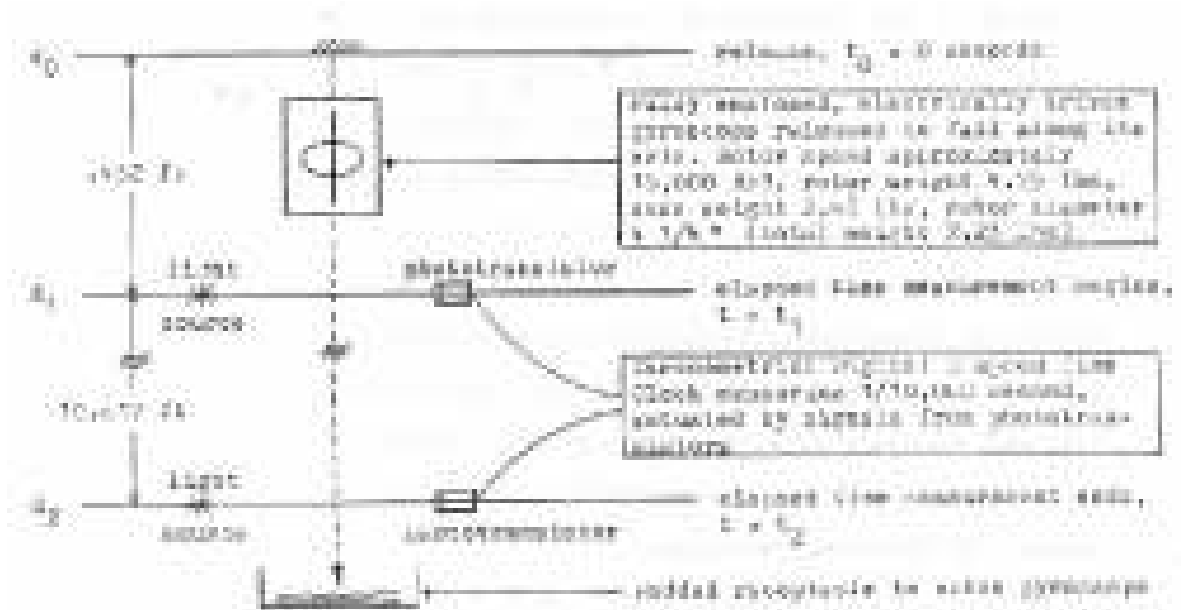
Performed by **Kenneth Gerber, M.D., Richard F. Merritt**  
 Analysis by **Edward Delters**

In this experiment a fully enclosed, electrically driven gyroscope is released to fall freely under the influence of gravity. The elapsed time taken to fall a measured distance of 10.617 feet was measured, with the rotor stopped and also with the rotor spinning at approximately 15,000 RPM.

Data was gathered on a Chronometrics Digital Elapsed Dime Clock measuring 1/10,000 second, actuated by two phototransistor sensors placed in the paths of two light beams which were consecutively interrupted by the edge of the casing of the falling gyroscope.

The gyroscope, of total weight 7.23 lbs (rotor weight 4.75 lbs, case weight 2.48 lbs) was released to fall along its axis. Electrical leads supplying power to the 4 1/4" diameter rotor were disconnected just prior to release.

## EXPERIMENTAL SET-UP



## SUMMARY OF EXPERIMENTAL RESULTS

	Stop-Rotor (180°)	Spin-Rotor (150°)
$t_1$	0.0000	0.0000
$t_2$	0.0000	0.0000
$t_3$	0.0000	0.0000
$t_4$	0.0000	0.0000
$t_5$	0.0000	0.0000
$t_6$	0.0000	0.0000
$t_7$	0.0000	0.0000
$t_8$	0.0000	0.0000
$t_9$	0.0000	0.0000
$t_{10}$	0.0000	0.0000
$t_{11}$	0.0000	0.0000
$t_{12}$	0.0000	0.0000
$t_{13}$	0.0000	0.0000
$t_{14}$	0.0000	0.0000
$t_{15}$	0.0000	0.0000
$t_{16}$	0.0000	0.0000
$t_{17}$	0.0000	0.0000
$t_{18}$	0.0000	0.0000
$t_{19}$	0.0000	0.0000
$t_{20}$	0.0000	0.0000
$t_{21}$	0.0000	0.0000
$t_{22}$	0.0000	0.0000
$t_{23}$	0.0000	0.0000
$t_{24}$	0.0000	0.0000
$t_{25}$	0.0000	0.0000
$t_{26}$	0.0000	0.0000
$t_{27}$	0.0000	0.0000
$t_{28}$	0.0000	0.0000
$t_{29}$	0.0000	0.0000
$t_{30}$	0.0000	0.0000
$t_{31}$	0.0000	0.0000
$t_{32}$	0.0000	0.0000
$t_{33}$	0.0000	0.0000
$t_{34}$	0.0000	0.0000
$t_{35}$	0.0000	0.0000
$t_{36}$	0.0000	0.0000
$t_{37}$	0.0000	0.0000
$t_{38}$	0.0000	0.0000
$t_{39}$	0.0000	0.0000
$t_{40}$	0.0000	0.0000
$t_{41}$	0.0000	0.0000
$t_{42}$	0.0000	0.0000
$t_{43}$	0.0000	0.0000
$t_{44}$	0.0000	0.0000
$t_{45}$	0.0000	0.0000
$t_{46}$	0.0000	0.0000
$t_{47}$	0.0000	0.0000
$t_{48}$	0.0000	0.0000
$t_{49}$	0.0000	0.0000
$t_{50}$	0.0000	0.0000
$t_{51}$	0.0000	0.0000
$t_{52}$	0.0000	0.0000
$t_{53}$	0.0000	0.0000
$t_{54}$	0.0000	0.0000
$t_{55}$	0.0000	0.0000
$t_{56}$	0.0000	0.0000
$t_{57}$	0.0000	0.0000
$t_{58}$	0.0000	0.0000
$t_{59}$	0.0000	0.0000
$t_{60}$	0.0000	0.0000
$t_{61}$	0.0000	0.0000
$t_{62}$	0.0000	0.0000
$t_{63}$	0.0000	0.0000
$t_{64}$	0.0000	0.0000
$t_{65}$	0.0000	0.0000
$t_{66}$	0.0000	0.0000
$t_{67}$	0.0000	0.0000
$t_{68}$	0.0000	0.0000
$t_{69}$	0.0000	0.0000
$t_{70}$	0.0000	0.0000
$t_{71}$	0.0000	0.0000
$t_{72}$	0.0000	0.0000
$t_{73}$	0.0000	0.0000
$t_{74}$	0.0000	0.0000
$t_{75}$	0.0000	0.0000
$t_{76}$	0.0000	0.0000
$t_{77}$	0.0000	0.0000
$t_{78}$	0.0000	0.0000
$t_{79}$	0.0000	0.0000
$t_{80}$	0.0000	0.0000
$t_{81}$	0.0000	0.0000
$t_{82}$	0.0000	0.0000
$t_{83}$	0.0000	0.0000
$t_{84}$	0.0000	0.0000
$t_{85}$	0.0000	0.0000
$t_{86}$	0.0000	0.0000
$t_{87}$	0.0000	0.0000
$t_{88}$	0.0000	0.0000
$t_{89}$	0.0000	0.0000
$t_{90}$	0.0000	0.0000
$t_{91}$	0.0000	0.0000
$t_{92}$	0.0000	0.0000
$t_{93}$	0.0000	0.0000
$t_{94}$	0.0000	0.0000
$t_{95}$	0.0000	0.0000
$t_{96}$	0.0000	0.0000
$t_{97}$	0.0000	0.0000
$t_{98}$	0.0000	0.0000
$t_{99}$	0.0000	0.0000
$t_{100}$	0.0000	0.0000

\*Note: Value for gravitational acceleration at sea level, 39<sup>0</sup> Latitude (Washington, D.C.) based on the formula of the U. S. Coast and Geodetic Survey. The data for the non-rotating gyroscope is normalized to this value, and the data for the rotating gyroscope is compared to it.

FICTITIOUS FORCE INCREMENT

A hypothetical, fictitious force increment which would have to be applied to the non-rotating gyroscope to impart the increased acceleration noticed in its rotating mode, was calculated for comparison purposes.

Force increment:  $\Delta F = (F_R - F_{NR}) = .024 \text{ lbs.} = .38 \text{ oz.}$

DATA

Non-Rotating		Rotating	
Time (seconds)	Distance (feet)	Time (seconds)	Distance (feet)
0	0.000	0	0.000
1	0.000	1	0.000
2	0.000	2	0.000
3	0.000	3	0.000
4	0.000	4	0.000
5	0.000	5	0.000
6	0.000	6	0.000
7	0.000	7	0.000
8	0.000	8	0.000
9	0.000	9	0.000
10	0.000	10	0.000
11	0.000	11	0.000
12	0.000	12	0.000
13	0.000	13	0.000
14	0.000	14	0.000
15	0.000	15	0.000

Mean & Standard Deviation:  
 Non-Rotating:  $\bar{x} = 0.000$ ,  $s = 0.000$   
 Rotating:  $\bar{x} = 0.000$ ,  $s = 0.000$

STATISTICAL ANALYSIS

Value for Student's "t" Test:  
 $t = 2.3980$   
 $p = .0275355685$  (18 degrees of freedom)

On the basis of the Standard Deviations of the data from this experiment, one can say with a 97% level of confidence that a fully encased, spinning gyroscope drops faster than the identical gyroscope non-spinning, when released to fall along its axis.

APPENDIX

The following are calculations performed on the measured data to arrive at the values given in the Summary of Experimental Results (above).

a) Calculation to find velocity  $v_1$  at beginning of elapsed time measurement for the Non-Rotating gyroscope, using the equation

$d = v_1 t + 1/2 at^2$ , with

$d = (d_2 - d_1) = 10.617 \text{ feet (measured)}; t = (t_2 - t_1) = 0.66203 \text{ seconds (ms'd)}$

$a = 32.1549$  ft/sec (normalized value);  $v_i =$  unknown, velocity  $v_i$  at time  $t_i$ .  
 Substituting values:  $v_i = 5.393$  feet/second

b) Calculation to find the distance between release position and beginning of elapsed time measurement segment for the Non-Rotating gyroscope.

$$v_f^2 = v_i^2 + 2ad, \text{ with}$$

$v_f = 5.593$  ft/sec (from (a) above);  $v_i = 0$  ft/sec (initial velocity);

$a = 32.1549$  ft/sec (normalized value);  $d = (d_1 - d_0) =$  unknown.

Solving the equation:  $d = (d_1 - d_0) = 0.4522$  feet

c) Calculation to find time already spent falling when the elapsed time measurement begins for the Non-Rotating condition of the gyroscope

$$v_f = v_i + at, \text{ with}$$

$v_f = v_i$  at  $t_1 = 5.393$  ft/sec (from (a) above);  $v_i = 0$  ft/sec;

$a = 32.1549$  ft/sec<sup>2</sup> (normalized value);  $t = (t_1 - t_0) =$  unknown.

Solving the equation:  $t = (t_1 - t_0) = 0.1677$  seconds

d) Calculation to find total time taken to fall total distance for the Non-Rotating condition of the gyroscope.

$$t_{\text{total NR}} = (t_2 - t_1)_{\text{NR}} + (t_1 - t_0)_{\text{NR}} = 0.66203 + 0.1677 = 0.82973 \text{ seconds}$$

$$d_{\text{total NR}} = (d_2 - d_1)_{\text{NR}} + (d_1 - d_0)_{\text{NR}} = 10.617 + 0.4522 = 11.0692 \text{ feet}$$

e) Calculation to find time already spent falling by the Rotating gyroscope when elapsed time measurement begins. This assumes the acceleration of the Rotating gyroscope is constant. It is found by comparing the ratio or the initial time interval to measured elapsed time interval for the Non-Rotating gyroscope, to that of the Rotating gyroscope.

$$\frac{(t_1 - t_0)_{\text{NR}}}{(t_2 - t_1)_{\text{NR}}} = \frac{(t_1 - t_0)_{\text{R}}}{(t_2 - t_1)_{\text{R}}}, \text{ with}$$

$(t_1 - t_0)_{\text{NR}} = 0.1677$  sec. (calculated);  $(t_2 - t_1)_{\text{NR}} = 0.66203$  sec. (measured);

$(t_1 - t_0)_{\text{R}} =$  unknown;  $(t_2 - t_1)_{\text{R}} = 0.66097$  sec. (measured).

Solving the equation:  $(t_1 - t_0)_{\text{R}} = 0.1674$  seconds

f) Calculation to find acceleration ( $a_R$ ) of the Rotating gyroscope using total time and total distance values, using the equation

$$d = v_i t + 1/2at^2, \text{ with}$$

$d = 11.069$  ft (from (d) above);  $v_i = 0$  ft/sec;  $a = a_R =$  unknown;

$t = t_{\text{total R}} = (t_2 - t_1)_{\text{R}} + (t_1 - t_0)_{\text{R}} = 0.66097 + 0.1674 = 0.82857$  seconds.

Solving the equation:  $a = a_R = 32.2619$  feet/second<sup>2</sup>.

g) Change in Acceleration:

$$\Delta a = a_R - a_{\text{NR}} = 32.2619 \text{ ft/sec}^2 - 32.1549 \text{ ft/sec}^2 = 0.1070 \text{ ft/sec}^2$$

$$\text{Percentage change in acceleration: } \Delta a / a_{\text{NR}} = 0.00333 = 0.333 \%$$

h) Fictitious Force Increment: Calculation to find a hypothetical, fictitious force increment which would have to be applied to the Non-Rotating gyroscope to cause the increased acceleration observed for the Rotating gyroscope. The mass (m) of the gyroscope is assumed not to have changed, for the purposes of this calculation. Using the equation:  $F = ma$  a ratio is set up:

$$\frac{F_{NR}}{F_R} = \frac{m_{NR} a_{NR}}{m_R a_R}, \quad \text{with}$$

$F_{NR} = 7.23$  lbs. (measured gyro and case weight);  $F_R =$  unknown;  
 $a_{NR} = 32.1549$  ft/sec<sup>2</sup> (normalized value);  $a_R = 32.2619$  ft/sec<sup>2</sup> (from (f) above). Solving the equation:  $F = 7.254$  lbs.

The fictitious force increment is:  $\Delta F = F_R - F_{NR} = 7.254 - 7.23 = 0.024$  lbs.;  
 or converted to ounces:  $0.024$  lbs. x  $16$  oz/lb =  $0.38$  ounces.

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