

ENERGY SCIENCE REPORT NO. 1

POWER FROM MAGNETISM

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POWER FROM MAGNETISM**Introduction**

This is the first of a series of reports which are intended to serve as a technical briefing helpful in the evaluation of invention rights by expert opinion more familiar with conventional technology.

It is, of course, not to be expected that technical experts, however, skilled in their own research field, have the necessary in-depth training that applies to discoveries extending beyond what is currently taught in academic institutions. The specialists of the world of 'invention' are really those who are professionally skilled in patent matters, whose approach is not that of 'peer review' in a scientific sense but rather one which embraces, without bias, what an inventor claims to have created and then judges on novelty and merit with attention focused on the prospective practical implementation and the technological significance.

The purpose of these ENERGY SCIENCE REPORTS is to bridge the gap between the disclosure of invention, the province of the patent specification, and a few misconceived but established scientific doctrines that might otherwise make it difficult to understand the new science involved. Without such a briefing, technical advisors called upon to comment on the commercial viability of a 'new science' invention, especially one that is at the 'drawing board' stage, could not undertake a meaningful assessment.

No doubt, this report will be read by individuals who are enthusiastic on the 'free energy' front and are searching for new experimental ideas to take that interest forward. Those readers should, however, understand that the intention here is not to communicate project details aimed at the 'free energy' movement generally. The intention, very simply, is to provide the reader with enough technical and scientific educational insight so that he or she can grasp the significance of what is represented in the patent cover that will later be associated with this report. In short, this report is intended as a marketing aid preliminary to presenting invention rights for prospective exploitation by corporate or entrepreneurial interests. It follows therefore that this report should in no way be deemed to confer any implied right of use in connection with what is disclosed, as all possible proprietary rights are reserved, consistent with this report being made available on a non-confidential but restricted circulation basis.

'Free Energy': Defining the Field of Investigation

The words 'free energy' used in the introduction need explanation. This is an expression which has come into use in an international communication network. It simply means a prospective source of clean energy that is in abundant supply and not subject to territorial or climatic limitations, but one that has yet to emerge on the industrial scene.

In a sense one can imagine that engines running on 'free energy' would be classified as 'perpetual motion' machines, but here one needs to clarify terminology and concept. 'Perpetual motion' may be defined as that which, owing to a cosmic influence communicated via the action quantum named after Planck, results in a sustained energy activity in matter which arises from an equilibrium state as between matter and a 'field' medium in space. Thus, there is perpetual motion in us all. The human body comprises atoms in which electrons move ceaselessly with quantized motion. Even if we die and our bodies are cooled to absolute zero of temperature, to a temperature below the 2.7 K of cosmic space, that motion persists, because those electrons never stop moving. The atoms with their electron motion have perpetual life unless transmuted by the $E = Mc^2$ rule into a pure energy form that then dissipates into space. There is, even so, a regenerative process in Nature by which forms of matter can be created and the secret of all this activity lies in the understanding of:

- (a) the nature of gravitation
- (b) the nature of magnetism
- (c) the nature of the photon, and
- (d) the nature of the aether.

The scientific establishment has not, as yet, provided any accepted explanation for any of these physical phenomena. For example, until there is an accepted and valid derivation of the measured quantity 137.0359, the 'over-unity' version of the fine-structure constant, which is the key to the photon action and the energy quantum already mentioned, those 'experts' cannot deny energy transfer from vacuum to matter via the quantum process. Any such denial would only amount to a declaration that obtaining energy from space to serve a useful end is 'contrary to experience', meaning no more than that the fruits of future invention implicit in this pursuit have not yet come to market.

As to gravitation, all that has been offered by those who claim authority on that subject is that it arises from the distortion of space-time, which is another word for 'aether'. Yet, the aether is the

space medium that is alive with energy, and the relativistic philosophy avoids the vision of the aether as an energy source and gives us instead Einstein's four-dimensional space-time as something that is 'distorted' in a way that leaves us completely in the dark on the energy front. $E = Mc^2$ is, by the way, merely a formula derivable from classical pre-Einstein electrodynamics and representing the fact that every individual electric charge comprising a body's mass contributes to the inertial property of that mass by resisting acceleration in just such a way as to preclude loss of its intrinsic electric energy by radiation. In short, every elementary component of the universe resists change of motion in an effort to conserve energy. Einstein did not understand the real nature of gravitation, meaning its essential electrodynamic connection, nor did he ever conquer the mystery of inertia.

The question of primary concern in this Report centres on 'magnetism'. Here, even though you, the reader, might think that scientists understand magnetism, the sad truth is that the phenomenon of magnetic induction which was discovered by Michael Faraday, and which is at the heart of the whole of electrical power engineering, is not understood by the 'experts'.

The simple question of how the energy we feed into a magnetised solenoid is stored by that process has no adequate answer, at least in the standard teaching curriculum of academic establishments. Yet the answer to this question is crucial to the research to be described in this Report.

So, I begin by making a statement about the energy involved in magnetic induction and I challenge any scientist to refute what I say.

When an electric current is supplied to a solenoid the energy stored by induction, which is a mutual action set up between numerous electric charges in motion, is dissipated into the thermal background of the aether itself. However, the action of that current in the solenoid is to deploy the motion of some of the aether electricity that constitutes that thermal vacuum background in such a way that an opposing magnetic reaction is established inside that solenoid. When the current is switched off it is as if this magnetic system is then a transformer with that reacting vacuum field becoming, in effect, a primary winding and the solenoid itself becoming the secondary winding. Energy is then fed back to the solenoid drawing on the thermodynamic state of the aether, which is left in a cooler condition, until, by a process of thermal equilibrium, energy commensurate with that originally dispersed migrates back through the aether to restore the status quo.

The reader should not think of this as a transformer action depending upon alternating current effects. It is an action that applies also with d.c and, of course, with electromagnets and permanent magnets, where the atomic electron activity that polarises the magnet is that of atomic solenoidal current effects.

There is no question that this is a correct description of the phenomenon of induction. We see here an action by which the aether has the ability to transfer its energy to matter. Magnetism provides the means for tapping into the vast sea of energy that fills space. However, the 'temperature' of that aether is not something we can measure by a thermometer, though one can sense it indirectly by its spectral effect on the radiation background.

The experimental work to be described has been founded on the author's insight into the physics of magnetic induction as outlined in his book MODERN AETHER SCIENCE (see particularly pp. 113-124).

If the reader prefers instead to be guided by orthodox textbook teaching, which is different, then a word of caution is appropriate. There are many excellent textbooks and they will tell you about the laws of Faraday and Lenz. Not all will be 'truthful' in the sense that they will tell you that scientists lack knowledge in this field. The book that stands out in my mind as a very readable text is that entitled 'THE NATURE OF PHYSICS' by Peter J. Branczisz (City University of New York); publisher Macmillan Publishing Co, Inc., New York. On page 328 one reads:

"At the present time there is no real understanding of why charges are set in motion by a changing magnetic field. Thus electromagnetic induction must also be regarded as an unexplained law of nature."

The reader will see that a choice has to be made. On the one hand, there are the sterile teachings that accompany acceptance of Einstein's theory. These eradicate belief in the reality of an electrical energy-active medium in space that transports electromagnetic waves. On the other hand, we have the alternative of an aether that accommodates to our energy needs by storing inductive power in its abundant low temperature heat sink.

If the reader seeks an independent way forward on the question of induction that reader could come to terms with the facts expressed, as recently as December 1993, in the Engineering Science and Education Journal issued by the Institution of Electrical Engineers. The cover of this journal shows (a), as the past, the statue of Michael Faraday in the IEE's headquarter building in London, (b), as the present, two students who face an uncertain energy future and (c), as that future, an illustration of a lightning discharge set alongside one showing a battery 'farm' of wind-power generators. The relevant article of reference is one on pp. 273-280 by John Carpenter entitled 'Understanding Electromagnetism'.

Here are some quotes from Carpenter's article:

"A great many electrical engineers, when challenged on such matters, confess to a considerable unease with their grasp of electromagnetic fundamentals."

"One of the most familiar 'consequences' of a magnetic field is the property of inductance...What do we mean by 'inductance'? We define it by the voltage which is caused by a change in current, and 'explain' the voltage in terms of flux linkage, part of which represents the magnetisation (i.e. the electron spins). It is these spins, acting like the electromagnetic equivalent of little flywheels, which interact with the conduction charges in the wire, and increase inductance. That is, they increase the electromagnetic inertia of the conduction electrons. But, we account for the voltage by some rather mystical quantity, denoted **B**, in empty space, and this is nothing whatever to do with electron spins. We represent **B** by lines on a diagram, provided with arrow-heads, and argue that **B** is the 'cause' of inductance. The type of student who always makes a nuisance of himself (or herself) may ask 'what is meant by **B**?' The student can be told to shut up, but the teacher may have been given pause for thought. Electromagnetic theory might be characterised over the last 100 years, as a progressive retreat from the idea of the aether as some form of 'medium' needed to convey the electromagnetic interactions."

Such, indeed, is the sorry plight of education in electrical science, bearing in mind that that 'aether' is the fountain from which flows all the energy that we see in our universe.

Even though Carpenter discusses the question of inductance in such a critical way, he does, in developing his own thesis about the nature of inductance, avoid bringing to bear that full-bodied aether that is essential to resolving the problem. He too gives way by falling into line with that spirit of retreat from the aether concept. The Carpenter interpretation depends upon current 'interactions' as between currents in matter, disregarding current flow in the aether itself. This is at the very heart of the problem. Does induction energy, the magnetic energy we know is stored when current flows in a coil, reside in the inertial motion of the electrons which carry that current or is it 'stored' in the aether in the sense that it is held captive at the seat of the action?

We are all familiar with storing money in a bank. That money we deposit is not kept in a box waiting for us to come back and withdraw the same money. Once deposited that money dissipates into a sea of action that is pooled and spent, just as energy dissipated as heat spreads itself through space. Banks rely on equilibrium which means a return on investment, an inflow balancing an outflow and

compensating for what is spent. We get our money back because the bank has kept a record which 'polarises' the bank's money 'field' in our favour. That record is something left in that bank, that is not the actual money we deposited, but which can be triggered to release money to us from the limited part of the money pool kept by that bank. Inductance is a property by which energy transactions occur in an aether, replicating, in effect, the way in which money transactions occur in a bank. Understanding how the aether 'record' registers an energy transaction is the challenging question and, if we can understand this, with our energy future in mind, we might unlock Nature's energy secret and then be seen to be, as they say, 'laughing all the way to the bank'! Whilst students, therefore, engage in the mysteries of understanding **B** and not then understanding how energy is stored by inductance, the task of harnessing inductance to provide an entry route for tapping energy from that aether is one warranting our attention in this Report.

I must now assume that the reader is ready to accept that magnetic inductance may have some important energy secrets to disclose and now trust that we can move directly to the experimental evidence without the reader feeling that in talking about 'aether' I am leading that person along a blind alley.

'Over-Unity' Power Generation

A brief word is necessary on the theme of 'over-unity'. Readers will have seen this expression used above in connection with the fine-structure constant. This is a fundamental dimensionless physical constant as used by atomic physicists. In that 'over-unity' context it refers to the version of in its reciprocal form $1/\alpha$, a quantity that is slightly greater than 137. In dealing with atomic situations and spectral analysis, the 'below-unity' form for which is 0.007297 is more familiar to physicists.

This digression does have a connection with aether energy, as the reader may see by referring to this author's contribution entitled 'The First Law of Thermodynamics', which has appeared at pp. 340-342 in the November 1993 issue of the U.K. Institute of Physics Journal 'Physics Education' (See Appendix A to this Report).

The expression 'over-unity' has come into general usage by researchers interested in 'free energy'. For a device to be said to operate 'over-unity' its power input (usually electrical) must be exceeded by the power output, whether the latter is electrical or mechanical or thermal.

This reference to 'thermal' should not be confused with the 'heat pump', by thinking that conventional heat pumps operate with 'over-unity' performance. It may be that one joule of electrical energy can transfer 10 joules of room heat from a lower to a higher temperature, but that is not an 11 to 1 'over-unity' performance since the true input then is 11 joules and the output is also 11 joules. The reverse Carnot efficiency factor of merit or 'coefficient of performance' applies to such a process.

By 'over-unity' in this report what is meant is the output of more useful energy than is supplied as useful energy input. In this context, those 11 joules of heat output are not as 'useful' as that 1 joule of electrical input and so the heat pump is not an 'over-unity' device. If, however, we run a device or a machine and it produces an excess of electrical output or an excess of heat at a temperature so elevated in relation to input heat that the Carnot criteria are surpassed, then we have 'over-unity' performance.

Our energy future is secured once we have the technology for this latter kind of operation. These Reports are being written because that technology is now in sight and there are, indeed, several alternative routes to that objective, all warranting our attention.

There are versions of the motor developed by Robert G. Adams of New Zealand, which have already

been demonstrated in 'over-unity' operation, measured strictly in electrical input and electrical output terms. The Nexus magazine published in Australia has pioneered the news on the Adams machine and the Editorial in their January 1994 issue said that in 1993, since the Adams story had appeared:

"Nexus has been contacted by hundreds and hundreds of people from all over the world, and, yes, quite a lot of people have now successfully duplicated the device based on the information we published. In other words, there are now quite a few small-scale free energy machines running successfully out there, in the process of being made into large-scale devices. If you have shares in oil companies - get ready to sell soon!"

The Adams machine will be discussed briefly in a section of this Report and in much greater detail in a later Report in this series. However, at the request of Robert Adams, and in order to deal with a troublesome question that has emerged, I need to comment here on claims of 'over-unity efficiency'. It was said in one early text about the Adams motor that it had a 270% efficiency and 700% was mentioned in a recent magazine report.

The question posed concerns proof of such claims by evidence not relying on calculated interpretation of current and voltage measurements. The crucial and usual question is whether the output from such a machine has been fed back as input so that the machine, once started, runs and delivers output power with no input, at least until some component or connection ruptures or otherwise fails. That would be a 'perpetual motion machine' demonstration.

With such performance it is then absurd to discuss an efficiency measure because the efficiency becomes infinite. Therefore, the expression 'over-unity' has meaning as a classification rather than as a measure and the question is more related to the amount of 'feedback'. It is suggested, therefore, that 'over-unity with 20% feedback' could be one way of saying that 4 units of useful output are generated from one unit of internal feedback. Such a machine or device made available commercially should not be rated by its 'efficiency' but rather by its net power generating capacity, its power rating being its ability to deliver net power continuously.

It is also of relevance here to report that, on present experimental indications, yet to be fully researched, the Adams machines are delivering power which fluctuates with time of day. It is as if whatever is providing that coupling with the aether energy source is dependent upon the orientation of the device in relation to a spin axis characteristic of that aether.

This latter subject is rather special and it too will be covered by a later Report in this series. However, it is noted here that this 'discovery' was, in fact, anticipated by the author, based solely on aether theory, and became the subject of a preliminary patent filing lodged even before the news of the phenomenon was communicated by Robert Adams.

This is an appropriate point at which to interject the statement that, whilst Robert Adams has become the focus of attention, and deservedly so, we owe it to NEXUS magazine for initiating the tidal wave of action that will soon deluge the electrical engineering community. The wave of action will bring with it news of inventions, many of which are already covered by granted patents, but lie unappreciated amongst the dust-gathering information records of our technological age. One very relevant example of this is the U.S. Patent No. 5,227,702 (Inventor: Peter M. Nahirney), dated July 13, 1993, and drawn to my attention by Toby Grotz, the President of the recently formed INSTITUTE FOR NEW ENERGY, the professional society which was created in Colorado in April 1993 when we had, amongst other developments, debated the Nexus article publishing the design details of the Adams motor.

This Report will now deal with experimental results showing how magnetism provides an aether energy access route. In this, our attention turns away from 'free energy' motor developments, as such, and looks at steady-state devices. U.S. Patent No. 4,687,947 (Inventor: Melvin Cobb) is relevant to

the theme developed next and warrants the reader's attention after digesting what is now to be described.

The Power Converter

An established technique used in d.c. power supplies involves using electronic switching to chop an input signal into pulses at an audio frequency and feeding those pulses through a ferrite-cored magnetic inductor coupling to transform the voltage before merging the output pulses into a smooth regulated d.c. output. This process is highly efficient and the power systems are compact in construction and offer high power rating in relation to bulk and weight.

The question now addressed is that of exploiting such technology with a view to incorporating the secret that will allow us to tap aether energy so that we get more electrical power output than is supplied as input.

The point to keep in mind is that the above-described technique will be assumed to be of a form which operates with a 'flyback' coupling in that it uses the inductance to store input energy in a time period separated from that in which the inductance releases energy to the output.

Also, what is to be described experimentally is not based on the use of a ferrite core but rather on a laminated sheet steel core, inasmuch as it is only the principle of operation that needs experimental demonstration for the purpose of this Report and it so happens that a convenient non-ferrite core assembly kit was available. We are not therefore, in this Report, going to get into the details of product design and the related costing of materials and specification of a proposed product.

Readers will appreciate that if we can gain some 'free energy' each time we drive a magnetic core through its magnetization cycle, the faster we can do that, the more energy we gain. The ferrite core permits higher frequency operation and, based on use in existing variable voltage regulated power supplies, there is good reason to expect that what is described below, and which works for laminated steel cores, will be eventually implemented in ferrite-cored systems as a preferred product form.

The following disclosure is also more concerned with the structural form of the magnetic core and its function energy-wise rather than the detailed way in which magnetizing coils are wired into an electronic control circuit. There are many variants and design possibilities for the latter, and such design does not pose unusual problems, but the core design depends upon the secret of that energy-tapping function and that does involve us in some new physics. I also remark that there are many who have wondered about the effectiveness and indeed the purpose of using bifilar-wound coils, with currents in the respective portions of the winding that merely cancel each other electromagnetically. The word 'flyback' used above bears upon this question and I leave the reader to ponder on that as a puzzle that I shall answer in a subsequent report.

To proceed, we need first a brief lesson in simple ferromagnetism as it applies to a magnetic core having an air gap.

Ferromagnetism

Ferromagnetism is Nature's way of giving us something for nothing in energy terms. Build a solenoid which has a non-ferromagnetic core and measure the inductance energy which has to be supplied in a.c. current and a.c. voltage terms and then, with the same voltage, see what magnetizing current is needed if the core is replaced by one that is ferromagnetic, say soft iron. For the same

voltage, that magnetizing current is proportional to power in reactance terms and so to the energy stored at times of maximum current.

With the ferromagnetic core present we need far less current to secure the same voltage. The reason for this is that the ferromagnetic core itself is making up the energy difference by virtue of the 'perpetual motion' of those atomic electrons in the iron that endow the core with its ferromagnetic state.

Now ask how a power transformer works. We have two coils on an iron core. The object is to put energy into one coil and take energy from the other. By using the iron core we find that we can transfer energy between the two coils using a far smaller magnetizing current than would otherwise be needed. That current flowing in a copper coil means a loss owing to the resistivity of the copper and so, to reduce weight and cost, and assure efficient operation with minimal loss, one really must have a ferromagnetic core linking the two coils to assure minimal magnetizing current.

Now, rather than being satisfied that we know how a power transformer works and so have little to learn from that technology, let us ask how that transformer works if the two coils are separated at a distance along the length of a core or are on different sides of a square core, as depicted in Fig. 1.

We find that, somehow, that iron core has the ability to carry energy from A to B. Without the iron core very little of the energy supplied to A would be recoverable from B.

Now, it is a fact connected with the nature of ferromagnetism that, if one could see inside the iron looking at microscopic sections, the iron would everywhere be seen to be fully magnetized to saturation. Inside each crystal there are what are termed 'magnetic domains' in which the magnetism is directed along one of the three mutually orthogonal crystal axes each of which is an 'easy axis of magnetization'. The intrinsic miniature solenoids that represent the magnetic state of such domains each carry the maximum equivalent current associated with the related atomic electron motion and the normal process of magnetizing the iron macroscopically is one of causing these solenoids to reverse direction.

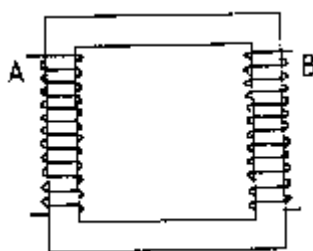


Fig. 1

It needs very little externally applied magnetizing current to promote the reversal of magnetism in a magnetic domain. Essentially such current as is needed is used to overcome the back reaction effects of non-magnetic inclusions in the iron or of the thin boundary wall regions separating domains or any air gaps built into the core as a whole.

These 180° reversals occur with very little work being done and, as the level of overall magnetization builds up owing to overall domain magnetism becoming predominantly in one general direction, so one approaches the stage where the magnetism exploits the possibility of a 90° transition between 'easy axes of magnetization'. This needs a stronger magnetizing influence. Thereafter, from about 70% of saturation onwards, any further increase in polarization has to involve a very demanding action where the domain 'solenoids' are literally forced to turn to come closer into line. However, in this process the externally applied current finds itself assisted by the mutual action of the domain solenoidal effects and this is now a stage where the underlying energy which feeds the

motion of those electrons is contributing very substantial amounts of energy to bring about that increased state of magnetism. Saturation occurs only when all the solenoidal effects intrinsic to the domains are forced into a common direction and each, like a spring under stress, has a will to revert to a position along one of the 'easy axes of magnetization', but is held in place only by that externally applied current.

Now, when this is summed up, we see that, provided the level of magnetization in an iron core with no air gaps is moderate, there is very little external energy needed to control the magnetic flux which is present in the core. Therefore, a primary coil at A can assert its influence in transferring magnetic action to a secondary coil B without too much of its magnetizing force being used to overcome the back reaction of those non-ferromagnetic inclusions and domain boundary walls. It is better if the primary winding and secondary winding are wound around each other, meaning that A is at B or vice versa. However, 'better' in this sense means better from the viewpoint of avoiding the reaction that goes with harnessing the intrinsic power action of the core. In our 'free energy' pursuit that is not the 'better' course, since it means that we have deliberately avoided the source of that 'free energy'. It is only by making the inductive coupling process difficult so that the intrinsic ferromagnetism of the iron core has to work harder in its 'flyback' role that one can tap into its 'free energy' potential.

To proceed further, we now need to ask how an air gap in a core interferes with the ability of a magnetic core to carry the magnetic flux.

Air Gap Reaction Effects

Suppose (Fig. 2) that a magnetic core has a quite large cross-section in relation to its loop length but a very small width of air gap in the vicinity of B, say 0.1% that of the core length. One would think that all this would mean, as a loss of 0.1% of the iron present, is that the magnetic flux set up by a given current excitation in a coil at A would be reduced by 0.1%.

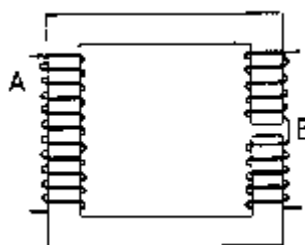


Fig. 2

This is not the case. Indeed, by taking that 0.1% of the iron away, even for iron which is very poor in terms of its magnetic properties, meaning it does not have large crystals and does have impurity inclusions, it can easily be that the magnetic flux is halved in this situation.

It seems obvious, on reflection, that this is not just a question of actions occurring in that iron core. If the magnetism developed by that iron, thanks to a current in coil A, sees nothing to resist it in that air gap, then it should have no difficulty traversing that air gap, especially as it has still 99.9% of its original strength.

Common sense tells one that the air gap is extremely active in its own right, as if an enormous current is flowing in an imaginary vacuum coil at B directed in opposition to the influence of the coil at A. The vacuum devoid of aether cannot, however, be something in which current can be said to flow, especially a d.c. current - or can it?

The way in which to decide this is to replicate that flow of aether current at B by tests involving a

coil placed at B, very close to that air gap, and see what is involved in neutralizing the magnetic reaction effect in the gap.

When this is done, the simple truth is that we discover that there is an asymmetry in the following sense. We establish a state with a given magnet flux traversing that air gap, regarding coil A as primary and see what current is needed in A to set up the flux with no current in identical coil B. Then with coil B as primary acting to set up the same magnetic flux across the air gap in the same direction we find what current is needed for this purpose. It is found that less current is needed in B than was originally needed in A.

Now look at this from the viewpoint of inductance energy storage. To power a coil at A we need more inductance energy input than is needed by one at B to achieve in the air gap the same magnetic condition. What accounts for this discrepancy?

The answer is that for both conditions there is actually a current flow in the aether at the air gap, which current is virtually equal and opposite to that in coil B. Therefore the aether reaction current and the current in coil B complement one another in terms of their role in setting up a store of inductive energy. It needs very little discrepancy between the two currents to stimulate the magnetic polarization in the continuity of the iron core and so, what is represented by this situation is a magnetic flux condition in the air gap with no leakage flux around that gap. Virtually all the energy supplied to coil B is stored in that air gap.

With coil A excitation and no power on coil B, a greater input of energy is demanded by the inductance of the system, because the energy state represented by the air gap proper is supplemented by that of flux leakage, as depicted in Fig. 3.

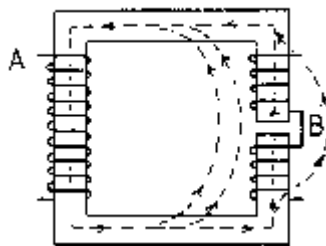


Fig. 3

However, the question at issue here is how the energy gets from coil A to the gap, given that it needs very little action to influence, either create or suppress, the magnetic polarization in the iron. If all the action is by virtue of those 180° or 90° domain transitions any reaction field from the gap region would preclude a change in magnetic flux when coil A is energized.

This poses no problem for the coil B excitation because there is nothing around the iron circuit path to resist a change in magnetic flux, but it is a major problem if the coil A excitation has to work against an air gap in a remote section of the core.

The answer lies in the need to set up an internal magnetic field inside the body of the core between A and B and this means that there has to be at least some domain flux rotation, necessitated by the direct action of the coil A current in urging flux rotation by domains which do not have their host crystals with easy axes of magnetization orientated along the coil axis. Once this scenario develops we are entering the realm of 'free energy' and so it is of interest now to report an experiment which involves an accounting of an energy balance sheet. We shall see that we need to bring into account some energy from that mystery source we have called 'the aether'.

Mystery Energy Source: The Energy Balance Sheet

I invite readers to perform the following simple laboratory experiment, one which I feel should be part of a teaching curriculum for anyone who aspires to understand electromagnetism and its energy implications.

All one needs, in addition to a voltmeter or oscilloscope, an ammeter, and a variable voltage 50 Hz or 60 Hz power supply is a standard inexpensive transformer assembly kit, some cardboard and a little wire. A suitable 100 VA transformer kit is one available, as distributed in U.K., from RS Components U.K. (P.O. Box 99, Corby, Northants NN17 9RS). Stock Ref. No. 207-734. There will be a corresponding source of supply available from the local distributors in many other countries. The transformer has an E-shaped core and a bridging yoke as shown in Fig. 4.

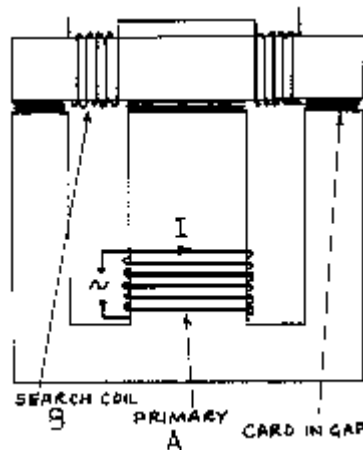


Fig. 4

The experiment involves assembling the kit several times, using a different number of card layers to form an 'air gap' or rather a 'pole gap' of 10 different widths, ranging from 0 to 9 card thicknesses. I used card of 0.25 mm thickness.

The object of the experiment is to compare the reluctance energy or inductance energy stored in the air gap at moments of maximum flux density with the integrated reactive volt-amp measure of energy input to the magnetizing winding over a quarter cycle period.

Standard teaching requires that the input energy represented by that volt-amp-time measure is necessarily greater than the energy stored in that gap. The latter is a measure of the mechanical work potential attributable to the mutual attraction of the magnetic poles, as available if they were allowed to move to close the gap.

The wire is used to wind a search coil or secondary on a part of the transformer core adjacent to the gap where it can provide a measure, given some flux leakage, of the actual magnetic flux traversing the pole gap.

One can, as a physics exercise (see energy balance analysis below), calculate the pole gap energy in terms of the flux density, area and width of the gap. One can also calculate the reactance input energy for the quarter cycle over 1/200 second at 50 Hz or 1/240 second at 60 Hz and compare the two. That is straightforward physics, but the beauty of this experiment is that no such calculations are needed.

For each of the several tests one measures the current supplied to the magnetizing coil, which is the standard primary coil supplied with the kit. The current capacity of the coil is the limiting factor on the flux density so one is obliged with this test apparatus to operate well below the knee of the B-H curve. This current is adjusted by the variable a.c. voltage supply so that the same voltage is induced in the search coil for each test. This means that the gap flux density, and so the force across the gap,

is the same for each test. Therefore we have two variables. One is the input current and the other is the number of card thicknesses defining gap width. We plot a graph of current against gap width (Fig. 5) using the data in Table I.

TABLE I

cards	gap mm.	amps
0	0.25	0.038
1	0.50	0.162
2	0.75	0.221
3	1.00	0.279
4	1.25	0.338
5	1.50	0.382
6	1.75	0.421
7	2.00	0.472
8	2.25	0.516
9	2.50	0.538

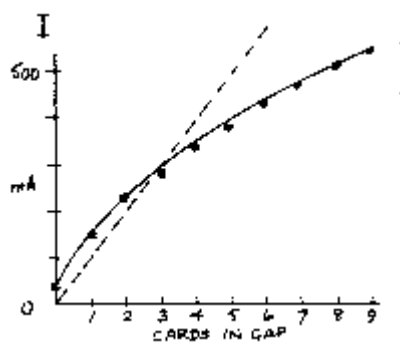


Fig. 5

If we input more energy than is needed to set up the mechanical potential energy of the gap then the plot of current versus that number of card thicknesses will show an upward curve, inasmuch as there will be progressively increasing flux leakage with increasing gap width. However, assuming (a) energy conservation, (b) no loss and (c) no flux leakage, by our standard physics principles, we expect no discrepancy and that means a straight line relationship.

If there is flux leakage, increasing with gap width, but still no energy loss, the inductance energy stored by that leakage will demand more current as input and so the current curve observed will climb away from the ideal linear relationship. That is, unless the 'free energy' source is so overwhelming in its power that it can pull that curve down below the linear norm.

What one finds, in fact, is that, even in spite of leakage effects, the relationship between current and the gap width curves down well below that linear relationship. This means that, with increasing gap width, the reluctance energy in the gap becomes progressively greater, indeed far greater, than the energy supplied as input.

This evidences a clear and direct breach of the law of energy conservation unless we can embrace the concept that the ferromagnetic core has a way of borrowing energy from a source not contemplated by our textbook teachings.

To determine the energy gain and so a measure of the 'free energy' potential, one does need to work

out the reluctance energy input. We can then draw the straight line expressing the theoretical reluctance energy as a function of current versus card thickness in Fig. 5.

I calibrated with 3 card thicknesses and found that a primary voltage 76.9 V gave a search coil induced voltage which had an arbitrary amplitude suited to a chosen grid range on the oscilloscope screen. The above current readings were plotted by using the same test amplitude to set the input voltage for all card thicknesses.

The voltage signal sensed in the series-connected coils B, each of 20 turns, shown in Fig. 4, had a peak value of 1.5 V for this test.

Note that the effect of an air gap is to cause the inductance of the primary winding A to become linear in the sense that the non-linear distortion by signal harmonic components often found when the hysteresis of the iron governs the core response is virtually obscured by the dominant air gap reluctance effect. This means that we can reasonably assume a sinusoidal variation of voltage and current. It is also feasible to ignore the phase shift which occurs owing to resistance in the primary winding, at least for the immediate purpose of proving that there is a very substantial 'free energy' anomaly. This can be justified by keeping track of the proportionality of the relationship between primary and search coil turns ratio in relation to voltage induced and voltage supplied. In any event the ohmic resistance effects can be allowed for in the analysis since primary current is measured and the primary resistance is known (17 ohms). Such considerations do not affect the substance of the analysis presented below.

The inductance energy for a current I is expressed as $LI^2/2$ which, becomes LI^2 if I is the root mean square current value and the inductance energy is that at moments of peak current strength. We therefore shall calculate the energy in the air gap for the flux density B_{\max} corresponding to a sinusoidal a.c. current I . Note that the root mean square value of the voltage V applied to the magnetizing winding is represented by $L\omega I$ so that the inductance energy supplied to the gap at peak current times is VI/ω , where ω is the angular velocity corresponding to the power frequency.

In the reported test the central core area or total cross-section sensed by the combined search coils was 8 sq. cm. but, owing to the flux return, the total pole face is 16 sq. cm. Each 20-turn search coil embraced a 4 sq. cm. cross-section. The magnetizing winding specification was rated at 240 volts and 3.7 winding turns per volt. The magnetic flux density needed to produce the 76.9 V is, therefore, about one third of the normal operational flux density of the transformer. At 50Hz this corresponds to a maximum flux density of 0.4875 tesla or webers per square meter.

However, this is the flux density in the part of the core at the primary winding location. With that three card thickness air gap of some 0.75 mm there is a substantial leakage of flux not reaching the pole faces and so traversing the gaps. We know this because the central core flux density at its maximum amplitude is that giving a 1.5 V signal in 40 turns embracing half the 8 sq. cm. area of that central core. This, at 50 Hz, is 0.2985 tesla.

Bear in mind that this 0.2985 tesla is the flux density that governs the energy stored between the pole faces across a 16 sq. cm. or 0.0016 sq. m. cross-section and it applies over the full current range shown in Fig. 5. Note further that this flux will be non-uniform across the area of the pole faces, which means that the stress energy we calculate as the mechanical potential of that gap will underestimate substantially the true energy potential should we rely on that 0.2985 tesla as being uniform.

Our energy balance sheet must now take as, energy input, the quantity VI/ω and decide how much of this inductance energy input is stored in the leakage flux zone, where the flux traverses long paths through air, to bridge the legs of the E-shaped core, and how much of this inductance energy goes directly into the small-width gap between the pole faces where it can be 'seen' as part of that 0.2985

tesla field.

Our calculation will be based on unit card thickness of 0.25 mm. The card has a permeability μ which is virtually that of the vacuum, namely 4×10^{-7} H/m. B is 0.2985 tesla. The energy density is $B^2/2\mu$ and so the total energy the gap between the pole faces is then 0.0016×0.00025 times this energy density. This works out at 0.01418 J on a per card thickness basis.

If there are N card layers in the test giving the data in Fig. 5 so we have stored inductance energy in the pole gaps given by $(0.01418)N$ joules at instants when the flux density peaks at the level set by the tests. In fact, the energy stored and available for doing mechanical work is much greater than this, because the flux density has to be non-uniform and the root mean square value needed for energy conversion is so much larger than the mean value.

Now, what energy have we supplied? The energy supplied is VI/ω , where I is the primary current and V is that portion of the primary back EMF which can be said to relate to magnetic flux linking the search coil.

The rms primary voltage that corresponds to that 1.5 V maximum is 76.9 V and, for 50 Hz, ω as the angular frequency of the power supply, is 314 rad/s. There is analogy between EMF in a resistive circuit and the effects of primary current in producing magnetomotive force (MMF) in a magnetic circuit. The magnetic flux is analogous to electric current and what we term 'reluctance' substitutes for resistance. By this analogy, our inductance energy input is apportioned to the pole gap region, as if the supply current develops the magnetomotive force which sees a reluctance component that allows a peak flux density of 0.2985 tesla, whereas 76.9 V corresponds to 0.4875 tesla. Therefore, 47.1 V is a measure of V that applies to the primary current in determining reluctance energy fed to the pole gaps.

This energy quantity is $(47.1)I/\omega$ or, for 50 Hz and ω as $2(50)$, $(0.1499)I$ J. This applies to a test with three card thicknesses and the energy then known to exist in the pole gaps is $(0.01418)N$ J, where N is 3. Therefore, the corresponding value of I for a perfectly balanced energy account, is $I = 3(0.01418)/(0.1499)$ A or 284 mA.

Table I shows that the current measured was, in fact, 279 mA.

Accordingly, in choosing the pole gap width of 0.75 mm or three card layers, we have fortuitously demonstrated a calculation that applies at the departure threshold where the energy does, in fact, balance.

The point now of relevance is that, in progressing in the Fig. 5 tests to values of N above 3, the pole gap energy component increases linearly, whereas the input energy reduces in relative terms. With N of 9 the primary input has increased to 100 V and the primary current is 538 mA, but the component supplying the pole gap region is still that 47.1 V. In effect, therefore, the input power feeding the pole gaps has doubled but the energy stored in the gap has trebled.

The downward curve in Fig. 5 tells us that, if we cause the magnetic circuit to require more MMF, so the ferromagnetism of the core becomes subject more and more to domain flux rotation and then it sheds energy and makes it available as a form of inductance energy we can tap mechanically by closing the pole gaps.

We do, therefore, have here, in this experiment, the means for probing the 'free energy' resource afforded by ferromagnetism. This account, under the title 'Mystery Energy Source', was offered for publication to "Physics Education". It ended with the following quoted text:

"I therefore see this experiment as a standard experiment which will be used to show future generations that the ferromagnet is a catalyst which gives us access to a new and plentiful source of energy tapping into the vacuum energy source that determines the Planck action quantum. However, that is too taxing a concept for physics teachers to absorb in view of its startling technological implications, so I will end by simply challenging readers to do this experiment and to try to reconcile what they find with what is currently taught about energy conservation principles.

I add that, for those who lack the pioneering spirit and prefer to rely on the authoritative work of others, it is appropriate to refer to Fig. 113 at p. 173 in the 'Principles of Electromagnetism', 3rd Edition, Oxford, Clarendon Press 1959 by Cambridge Professor E.B. Moullin. Such an experiment is there reported and for a 7mm gap in a rectangular core 4 times larger in linear scale than the one I used, and so corresponding to my 7 card thicknesses, the data presented show that the reluctance gap energy is then twice that supplied as inductance energy. However, Moullin kept the **applied** voltage constant and did not use a separate search coil. Professor Moullin was not averse to the 'aether' concept but, in discussing leakage flux effects, he missed the full significance of his experiment. Only a discerning reader, having reason to suspect the intruding hand of something akin to the Maxwell Demon, would have cause to give special weight to Moullin's statement: "We have seen reasons for supposing the leakage flux does not change very much with gap width".

I only became such a 'discerning reader' after nearly 30 years possession of this book, when I heard of 'crank' claims that certain forms of homemade switched reluctance motor, which, when the magnetization was switched on only for a period before pole closure, could deliver more power output than is absorbed as power input. It was no easy task to turn one's formal education around.

I therefore urge readers to pay attention and repeat the experiment I describe. My earlier communications on 'The Law of Perpetual Motion' and 'The First Law of Thermodynamics' were not based on ignorance or philosophy but were intended to pave the way forward to something of major importance now developing on the alternative energy scene. This 'energy from magnetism' theme, as it evolves into technology, need not take those who teach physics by surprise, especially when so simple an experiment can put one's physics education back on track."

Although my comments on the possibility of 'Perpetual Motion' and energy conservation as needing an aether to avoid breach of 'The First Law of Thermodynamics' were accepted and published in the July and November issues of Physics Education, my 'Letter to the Editor' entitled 'Mystery Energy Source' was rejected by the 'peer review' process.

The reasons given in the referee report may interest the reader:

"Aspden presents his results as evidence of a fundamental flaw in the accepted theories of physical phenomena. These have proved so widely and exactly verifiable that something more than a few simple tests is needed to shake one's faith. It is necessary to show that no reasonable theory will account for the observations, and nothing like enough has been done to justify his ambitious conclusions. One needs careful measurements of current and voltage, observations of phase angles, as well as such simple things as remove the yoke altogether, or at least increase the number of cards

until the limiting behaviour is clear. Until such tests have been made it would be mischievous to publish his letter."

The implication of this is that I must be wrong and that my measurements are subject to question. I am told that I must show that no reasonable theory will account for the observations, even though I quoted the Oxford, Clarendon Press treatise of Professor Moullin and that text shows that the nearest one can come to explanation by accepted theory is not satisfactory. Moullin did extend his tests to removing the yoke!

My answer, therefore, as a physicist, is that I have made my contribution to the world of learning and have not been heeded and so, my task now is to concentrate as an engineer and develop the technology of this 'free energy' opportunity, leaving the physicist to the comfort of an erroneous and stagnant, but 'acceptable' world.

I believe that the 'free energy' experiment I have described above will eventually become a standard experiment which will be used to show future generations that the ferromagnet is a catalyst which gives us access to a new and plentiful source of energy by tapping into the vacuum energy source that determines the Planck action quantum.

Magnetic Leakage Flux and the Adams Motor

It is not intended that this Report should provide any details about the design of the Adams motor, but some comments are necessary.

Firstly, it was said in connection with the transformer experiment already described that, to get ferromagnetism to supply that 'free energy', we had to weaken the coupling between the primary winding and the part of the core in the vicinity of the pole gap.

Secondly, it was said that our experiment was limited in the flux density that could be generated across the pole gap, because the 100 VA transformer kit only allowed primary magnetizing currents that could sustain 0.3 tesla and this meant operation well down on the B-H curve, where the 'free energy' was not forthcoming in great measure.

Both of these factors are crucial to the successful design of an Adams motor. The latter problem is overcome by using permanent magnets to replace the action of the primary winding and the former feature is built into the Adams prototype machines by an open core soft iron stator design, with control windings mounted on the stator pole members near the pole gap.

The motor operates with 'over-unity' performance, showing that the 'mystery energy source' is contributing to the pole gap energy and much of that energy is then used to provide output power by being prevented from reentry to the ferromagnetism of the permanent magnets.

The underlying concept is to operate the motor in a way which transfers intrinsic ferromagnetic power to the gap between the pole faces, where it is stored by inductance and held for 'flyback' return when output coils are switched into circuit after pole closure, but in advance of pole separation.

The pole gap and leakage flux around that gap are key to the Adams motor operation and it is therefore appropriate to comment on that remark by Professor Moullin: "We have seen reasons for supposing the leakage flux does not change very much with gap width".

A small gap in a magnetic circuit can have an enormous effect on reducing the magnetic flux in that circuit. It should, by accepted theory, not produce any significant amount of flux leakage, in the sense that flux escapes from the circuit. Yet, our experiments suggest otherwise, depending upon the core configuration used.

Consider a simple small-width gap in an elongated section of a ferromagnetic core (Fig. 6). The gap adds an enormous capacity for storing inductance energy using a winding on that core and yet the inductance is decreased, not increased. The ferromagnet sets a limit on flux density but the gap allows the core to accept a much greater magnetizing current at that limit of flux density. The $LI^2/2$ energy is related to a flux density proportional to LI and so energy capacity increases linearly with current I , whereas, if L decreases, the energy can increase for the same LI value.



Fig. 6

The energy stored in that gap is represented by a very powerful reacting current flow in the aether in the gap. This current is powered by the aether energy sea. It is a kind of diamagnetic thermodynamic reaction state polarised by the presence of the primary magnetization of the main iron core. This is not a flux leakage phenomenon but one by which the composite magnetic flux, that from the main core and the circulating flux induced locally around the aether current reaction, is effective in appearing as a diversionary agency. The main core flux is partially diverted so as to jump through air external to the main core path whilst the remainder crosses directly between the pole faces.

Now, of course, this reacting aether current flow is what serves in the Adams motor as the means contributing to the weakening of the direct attractive pull between the two core sections, whilst at the same time augmenting the 'flyback' action and serving to deliver energy should the output be taken off electrically rather than mechanically.

The point made here is that Professor Moullin had drawn attention to the curious fact that a small air gap in a ferromagnetic ring core could drastically affect the flux traversing the gap and could cause significant flux leakage around that air gap, but yet by the standard principles of electromagnetism that he knew so well, that should not be. The solution to his problem was unknown to him when he wrote the referenced book in its third edition in 1954, but it was discovered by this author shortly after graduating Ph.D. in that very year for research on ferromagnetic reaction currents, research conducted in Professor Moullin's laboratories. There is what the author terms a 'half-field' reaction effect set up inside metal or in air gaps or in vacuo when magnetic fields are present. This is the way the aether reacts at the equilibrium interface between aether and matter in the energy exchange that we are here discussing.

Physics that does not countenance the 'aether' is physics that has turned its back on the sea of energy in that aether. An electrical engineer of the stature of Professor Moullin had to deal in unsolved mysteries in energy technology because his professorial associates disciplined in physics and mathematics had created a climate of opinion that would not allow aether science to develop.

It was, of course, such frustration that caused this author to write and publish "MODERN AETHER SCIENCE" in 1972. And it is now, following decades of frustration, that technology is ready to take us forward on the track of ferromagnetism to a world which affords access to that energy in the aether.

At this stage, and to underline the importance of the 'half-field' reaction theme, the author could even go further back in years and draw attention to his first printed publication that discloses the way in which the vacuum reacts to store a magnetic field. Chapter 9 of 'THE THEORY OF GRAVITATION' dated 22 November 1959 discusses the gyromagnetic ratio of the aether itself and explains the anomalous factor 2 found in gyromagnetic phenomena. The reaction energy of the magnetic field in vacuo is the thermal kinetic energy stored by the aether.

Some few copies of that printed text are still in the author's possession and are available to those who wish to study the history of these aether developments. This is also mentioned here because, as many readers may know, an initiative launching a 'free energy' company seated in Rapperswil in the vicinity of Zurich in Switzerland in 1993 and offering shares to the public has been based on the aether of a deceased researcher named Oliver Crane. This venture Raum-Quanten-Motoren AG which plans to produce 'free energy' generators in the very near future is associated with the publication of a magazine MAGNETIK which declares itself concerned with electromagnetism and gravitation. In the January 1994 issue there was a 'Focus' (Brennpunkt) editorial entitled: 'Erdmagnetfeld ist Ein Gyromagnetischen Effekt' and mention of Barnett's research and the linking connections with Monstein's experiments and Oliver Crane's 'quantum-space' motor developments. The aether connection between the gyromagnetic ratio and the Earth's magnetic field, and the intermediating quantum-of-action in space were the starting points for this author's theory, as can be seen from the following photocopy of the 'Contents' page of that 1959 'THE THEORY OF GRAVITATION':

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10	48

THE ABOVE IS THE TABLE OF CONTENTS OF H. ASPDEN'S 1959 BOOK, 'THE THEORY OF GRAVITATION' (48pp BOOKLET)

For readers who wish to see a more up-to-date disclosure of the 'half-field' gyromagnetic reaction effect, a mathematical analysis analogous to that Chapter 9 in the 1959 work, showing the way the aether vacuum reaction is translated into a reaction inside a metal, has appeared in a very recent patent specification.

APPENDIX B at the end of this report reproduces the mathematical appendix which was at pp. 25-28 of the author's U.K. Patent Specification No. 2,267,995 published on December 22, 1993. That invention is entitled 'Thermoelectric Heat Transfer Apparatus' and it concerns a development relating to the thermoelectric topic below.

Breakthrough on a Thermoelectric Route to 'Free Energy'

This Report is written following publication of an article launching the author's entry into 'free energy' experimentation. In the work "Three Experiments on Free Energy" the author announced that more details would follow in this first ENERGY SCIENCE REPORT. I must honour this commitment.

Having dealt with the first of those experiments, we will now address the second, even though it departs from dependence on aether technology and there is so much yet to disclose on the developments of solid-state magnetic 'free energy' devices on that aether front. The latter will feature in further ENERGY SCIENCE REPORTS which will begin to issue in the near future.

The author has been involved in developing a new technology by which heat and electrical forms of energy are mutually convertible by solid-state methods operating with extremely high efficiency. It has been realised for some time since the first prototype was demonstrated that there had to be some new physical principles at work in this technology, or at least a very special application of existing physical principles that had come about fortuitously and had not been fully understood.

The 'second' experiment which I will now discuss is one performed expressly with the object of a diagnostic testing of a possible principle concerning the physics of that thermoelectric device. In the event it has revealed a regenerative energy process which, when developed and implemented in one of the forms originally contemplated in the granted patents, promises to be one we can classify as 'free energy' and 'over-unity' operation.

Ferromagnetism provides the catalyst for tapping thermodynamic activity in the vacuum medium and generating useful electrical output from the heat input.

In contrast, where we draw heat from a material source, a magnetic field, which need not be enhanced by ferromagnetism, can serve as the catalyst by which that heat is converted into useful electrical power.

The well-known power generating technology involving this latter action is that of magnetohydrodynamics, where a hot ionised gas flows along a channel (x axis) a magnetic d.c. field acts transversely (y axis) and an electric potential supplying current is set up in the mutually orthogonal direction (z axis). The magnetic field deflects the ions one way or the other in the z axis according to electric charge polarity. The heat, as the kinetic energy of the ion motion, is thereby diverted to produce a voltage which supplies current output.

A solid-state implementation of this occurs in a steel lamination to set up a potential between its opposite surfaces (z axis), provided there is a temperature differential in the plane of the lamination (x axis) and the lamination is magnetized in the other planar direction (y axis). The electrons carry heat and in so doing, being ions in motion in a transverse magnetic field, that intrinsic to the internal ferromagnetic state of the steel, they are deflected to set up that voltage potential between the opposite surfaces of the lamination.

When current of an externally-connected circuit is allowed to flow in the z direction, the lamination cools as the EMF so generated delivers power. The advantage of using the steel lamination or nickel, as in the main prototype experiments, is that the strong intrinsic magnetic polarization of the domains in the metal avoids the need to provide externally-powered magnetizing windings. Thus one witnesses a very efficient technique of refrigeration using a solid-state technology, provided, that is, that one can (a) assure that heat flow in the metal and (b) a transverse current flow that does not provide for a concomitant loss of heat in that transverse direction.

As part of the research effort involved in this thermoelectric project, the author has experimented with a magnetic core comprising bimetallic laminations composed of steel and nickel, meaning steel film plated with a layer of nickel on one surface. The principle of the experiment is to induce magnetization loss in the laminations which produces heat. The heat is conducted away by flow confined within the laminations. A transverse current flow exists near both edges of each lamination, being that of the circulating eddy-currents associated with the induction. That z-axis flow at the edges, plus the y-axis effect of the intrinsic domain magnetism on the x-axis heat flow carried by electrons, combine to offer flow paths through domains which serve to set up a forward EMF augmenting that current flow. In effect, one can hope to set up a negative resistance which allows the device to become regenerative as heat input produces electrical power, which, in turn, unless we can tap into it and take some away, will dissipate as ohmic heating in the central portions of the laminations.

The question addressed by this experiment is whether this scenario can be demonstrated experimentally as a basis for onward development. Note that what is being considered is a process for converting heat into electricity with no Carnot limitation, that is, we are contemplating a heat to electricity conversion that potentially is 100% effective. It would operate as an 'over-unity' device because waste heat at ambient temperature could be converted into useful electricity to result in overall cooling.

The breakthrough resides in the fact that the experiment does show the regenerative action.

Where the thermoelectric EMF plays a role we are not here dealing in energy stored by inductance, but rather with energy loss or energy gain by resistive effects causing heat dissipation or negative resistance effects causing heat energy recovery.

Imagine then an electrical transformer core wound with a primary winding and a secondary winding used only to sense induction and consider the eddy-currents induced in the core laminations. It is as if the laminations themselves form the effective secondary winding. A 50 Hz or 60 Hz a.c. current is fed through a resistor connected in series with the magnetizing winding (Fig. 7). The resistor feeds the X plates of an oscilloscope with a signal proportional to its potential drop, giving an oscilloscope trace measure of H . The secondary winding is connected as shown with the Y plates receiving a signal from a $2\ \mu\text{F}$ capacitor in series with the $100,000\ \Omega$ resistor. This provides a time integral of the time rate of change of the magnetic core flux density B and so the oscilloscope indicates also the B measure.

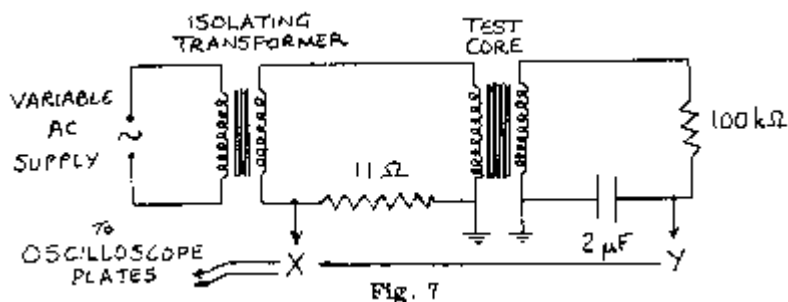


Fig. 7

For normal transformer operation this circuit will provide a normal representation of the B-H hysteresis loop, which develops into an ellipse as the eddy-currents increase (Fig. 8). However, suppose that there is something special about the laminations by which the resistance of the eddy-current path becomes predominantly negative in one section owing to heat being converted into an EMF acting in a forward sense around that eddy-current path.

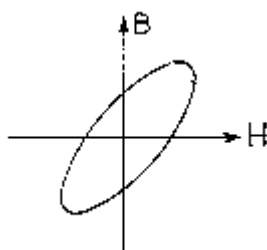


Fig. 8

In this case, provided that action is strong enough, the effective secondary winding provided by that eddy-current path can, conceivably, take over the action and become the primary power input source, energized by input heat. To feed power to the circuit including the resistor used to measure H , the induced EMF would need to derive from a B flux varying in antiphase with H . Accordingly, the B-H

loop would convert to one of the form shown in Fig. 9.

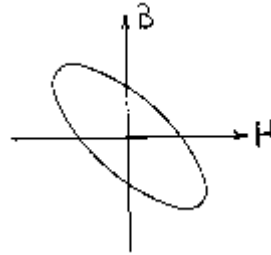


Fig. 9

It follows, therefore, that the regenerative heat-to-electricity conversion potential of the device under test is easily inspected, simply by examining the **B-H** loop as the current in the magnetizing winding is progressively increased.

Now this is exactly what was found to happen in preliminary tests on a transformer assembled with its main limbs comprising steel laminations plated with nickel. This means that there was here sight of a new technology by which bimetallic ferromagnetic laminations can serve to convert heat into electrical power. Before describing what was observed, by adopting the same text as was presented in my article 'Three Experiments on Free Energy', I have to explain that, upon rebuilding the experiment using a more powerful current source aimed at driving the circuit to a higher power level, the staged trigger action of the flip between the Fig. 8 and Fig. 9 B-H loop forms did not occur. Instead, the action was as if there was an enormous activity confined to the Fig. 9 state, characterized by a very wide elliptical form of loop and, on analysis, showing that the power energy action per cycle was extremely high in relation to what could otherwise represent magnetization loss. Note that with the earlier situation and the loop change from Fig. 8 to Fig. 9 as current excitation increased, one knew that there was regeneration.

I now suspect that the test core, which originally exhibited bistable operation, has become conditioned by internal thermal activation, that may have resulted from coupling a capacitor to form a resonant load circuit, so as (this being speculation!) to become locked in its state which precludes Fig. 9 operation.

In my urgency to complete this Report before reworking the apparatus with new laminations, I shall leave this particular issue open for clarification in my next Report on this subject. I am bearing in mind that the power of the B-H loop and phase angle measurements show really enormous magnetization loss per cycle if the device is not acting regeneratively. There are certain other fascinating aspects linking with hitherto unexplained experimental phenomena which will be reported in due course, and which give good reason to interpret the action as regenerative. Special test rigs have now to be built to prove this beyond doubt by extracting that power as output, notwithstanding confinement to the Fig. 8 state, and here we have the leading evidence from the basic experiments on the prototype devices which used films of bimetallic coated polymer. They demonstrated regeneration of electricity from heat convincingly by showing an electric motor running from the thermal effects of ice melting in a room temperature environment. The experiment now under discussion is part of a research programme aimed at improving and simplifying that technology whilst aiming to convert to power delivery accompanied by energy-balancing refrigeration action via a magnetic rather than a capacitive circuit coupling.

The following text comprises paraphrased sections quoted from 'Three Experiments on Free Energy:

"At the mountain retreat where we had a private brainstorming session involving many of the speakers, I mentioned the thermoelectric project in which I was involved and

showed a video demonstrating the quite remarkable speed at which ice can form with very little electric power input and how electricity is regenerated with high efficiency drawing on the energy of melting ice.

That Colorado meeting was a landmark event in the history of new energy developments as it marks the beginning of an escalation which will lead to a bonanza on the energy front.

In the intervening period, since we met in Colorado in April, I attended, in August, the 28th Intersociety Energy Conversion Engineering Conference in Atlanta, Georgia. I presented an update on the thermoelectric project, emphasizing its mode of operation as a very powerful solid-state technique of refrigeration avoiding CFC pollution.

That Atlanta conference lacked the excitement of the Denver event, but it has opened doors that can help in onward progress. From a personal viewpoint I felt at a disadvantage in that I have, for the past five and more years, been following the new energy movement from a theoretical standpoint. The 'jewel in the crown' that inspired me from a patent and business motivation viewpoint was my interest as co-inventor in the thermoelectric technology that my associate Scott Strachan was working on in Scotland. His work has been funded and my hope has been to see that venture become the revenue earner that could take the other energy research forward in a business sense.

However, funded only by my pension income and savings, as we older 'free energy' enthusiasts usually are, I did find myself at the meeting in Atlanta, with no update technical input to report from Scott Strachan, and wondering why I was there with no recent personal hands-on experimental facts at my disposal. Indeed, in talking to Patrick Bailey at that Atlanta meeting, I vowed not to attend another such conference unless I could report on my own experimental work.

So, having exercised my professional skills and established a patent position on several energy inventions that I was unable to demonstrate as working devices built by myself, I set to last month and began my experimental program with a very limited funding resource. I say this because I feel that some of your readers will wish to repeat the experiments I report below and I simply wish to stress that very little outlay is involved.

My object is to demonstrate the scientific basis and technical feasibility of three 'free energy' projects. I direct my comments at those who profess to pass on knowledge to future generations. I am not here going to explain how what is described can be implemented in a practical machine. That will follow later when I progress to that stage. I know what I say has a practical end product because my sole objective is to bridge a knowledge gap to cover the true science lying in that zone between orthodox doctrinaire belief and the working 'free energy' machine.

The target objective for the first of my three basic experiments is:

The curious fact that our thermoelectric refrigeration device is built with an inherent functional symmetry and yet it always cools on its exposed test heat sink surface, it being noted that the electrical operating unit is mounted on the same panel that constitutes the second heat sink surface. The latter gets hot as the former cools, but, unless Scott Strachan builds a version that separates the electrical operating unit from the second heat sink we shall have to await the clear experimental evidence that, in truth, both surfaces are cooling as the device delivers electrical power!

The idea that one can build a power transformer which draws in heat and so cools a

housing in which it is enclosed and at the same time converts that rejected heat into electricity fed along wires leading from that housing is one that seems beyond belief. It defies the second law of thermodynamics, but that should not deter a pioneer who has in his possession the device mentioned above.

The object of the experiment is to test a suspicion that current circulation within a bimetallic lamination can, under certain circumstances, result in cooling for current flow across the thickness of the lamination. The experiment acknowledges that such cooling would produce an EMF and put electrical power into increasing the current flow in the plane of the lamination, unless deflected from the lamination, transverse to its width. This means extra heating and anomalous loss augmenting the eddy-current loss, but such an anomaly is direct evidence of that underlying cooling and electrical generation.

The prototype devices all used thin film bimetallic layers of aluminium and nickel and involved that transverse 'deflection'. The 'circumstances' stated are that the lamination includes a ferromagnetic layer of thickness less than the 100 micron dimension, the size of a magnetic domain formed within the larger crystals of the material.

In the subject experiment, there was no transverse deflection but the other condition was met. Commercially available steel foil (known in the trade as 'shim steel') of 2 thousandths of an inch in thickness was obtained and an electroplating firm was asked to coat one face with nickel using an electroless plating process. The nickel coating was 0.7 thousandths of an inch in thickness. It was found that this could be cut into small rectangles for assembly in a 100 VA transformer core, supplied in kit form (eg. R.S. Components in U.K.). Thin card placed between the laminations was used to insulate them from each other. The arrangement was as shown in Fig. 10, with legs A and B being formed by the bimetallic pieces. Primary and secondary windings, respectively series-connected in pairs, were formed on each of the legs A and B.

The test involved observing on an oscilloscope the changing shape of the B-H magnetization loop as primary current input increased.

To present the B-H loop on an oscilloscope screen the secondary winding was connected across a 100k resistor in series with a 2 μ F capacitor and the Y input to the oscilloscope was taken across the capacitor terminals. The H input was provided by incorporating a series resistor in the primary feed circuit and taking the X input from the potential drop across that resistor.

What I was intending by this experiment was to estimate the eddy-current loss resulting from the bimetallic lamination feature. Having done Ph.D. research studying anomalous eddy-current losses experimentally I was particularly curious as I had never heard of anyone ever before testing a transformer built using bimetallic Fe:Ni laminations. Moreover I knew that I was using laminations that were much thinner, though more conductive, than is customary in transformers.

Added to this, I knew from my Ph.D. research days, during which I measured the loss factors in different elemental sectors of the B-H loop, that there was a particularly high and inexplicable loss in a part of the loop where it was least to be expected.

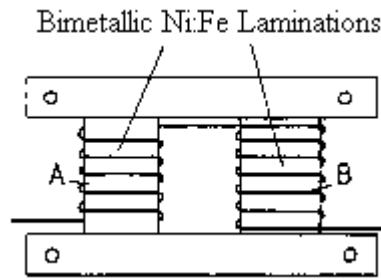


Fig. 10

In the event, what I found was astounding in the light of my experience. I did not have to do any calculations. With such thin laminations magnetized well below saturation at mains power frequency, the B-H picture on the screen at low current was a straight line angled to represent the magnetic permeability. The fact that it was a line meant that there was negligible loss, which is what I expected until a certain threshold was reached.

My reasoning was that the transformer action would introduce heat into the core and that heat would be conducted away. I had planned to arrange for the heat to flow one way so as to set up a temperature difference across the laminations and then my presumption was that a d.c. current would circulate thermo-electrically and affect the form of the loop. Indeed, a d.c. bias would displace the position of the loop on the screen both in the X and Y directions.

Note that a B-H loop with little eddy-current has a rather special shape representing hysteresis effects. An over-dominant eddy-current effect makes the loop elliptical and the width of the loop, in tending to fill more and more of a bounding geometrical parallelogram form, is a measure of the loss portion of the reactive volt-amp input. Remember that magnetic energy is stored as inductance energy and, in oscillating, this energy sheds the loss which is represented by that loop.

Now, what happened was astounding because, upon bringing the current input up to near mid-range, the B-H loop became very wide and quite elliptical. Furthermore, as expected, it shifted laterally by a small but very apparent amount (about 15%). However, the ultimate surprise was that, as the current input increased, the loop began to topple and turn clockwise until, with a greater current, it actually went over so far as to lie in the 'top-left-to-bottom-right' sector of the oscilloscope screen, whereas it began at low current in the conventional 'bottom-left-to-top-right' orientation.

This means that the transformer core having the bimetallic laminations has either become a capacitor, which it is not, or the phase governing the power and magnetomotive force reaction has inverted through 180° . This is an obvious indication that the core wants to act as a generator by which heat sustains a current producing its magnetization and, instead of demanding input current to set up the reaction to the changing magnetic flux, it produces current in a forward direction augmenting that magnetic condition. In the experiment, of course, all that extra current drawn from heat goes into enhancing the eddy-current losses enormously. This is why the loop gets so wide.

So, here was confirmation that there is a process involved in the magnetization of bimetallic laminations that enhances energy transfer productive of anomalous current flow. The source of energy is heat input, but if we dissipate the electricity before taking it off for useful purposes, so we see nothing abnormal in the overall energy action. What we see in this experiment is that toppling B-H loop! There is the clear evidence and

here, at last, from this experiment, emerged the confirmation of my suspicion of the secret as to why our thermoelectric device works in its incredibly powerful refrigeration mode. That device has its own a special way of taking off that electricity before it develops those very high eddy-currents. Here, in fact, was a new development, a discovery which had eluded the author's Ph.D research and which could have enabled the author to build a 'free energy' device decades ago, had this insight been apparent in those early years. But who would have thought that a transformer built from laminations of iron and nickel bonded in layers could tell us anything new about electromagnetism?

It must be said, however, that the 'special' way of taking electrical energy from a stack of bimetallic laminations, as used in the prototype devices, involves building those laminations into a parallel plate capacitor. That is not an easy task and to take it from the demonstration prototype to the commercial world needs the support of a major semiconductor partner. The task is much easier with this new understanding of the physics involved and attention is being given to the possibility of drawing the power off by magnetic induction. It is in this regard that Scott Strachan, the Scotsman who has built the three prototype devices to date, did become preoccupied by a new discovery not yet published by which the thermoelectric action can be controlled with negligible power input, much as a grid in a thermionic valve can control the current between anode and cathode. However, progress on that is extremely slow and, as the need for a new refrigeration technology cannot await Strachan's solitary endeavours, so I am disclosing by this letter my own experimental findings to arouse interest and expedite onward development.

I see the experiment just reported as one that very clearly indicates that heat can be converted into electricity to provide refrigeration technology which, at the same time generates electrical power. The one step essential to the completion of this picture is the verification that if Scott Strachan, or others who now replicate the device, builds a fourth prototype device in which the electrical power circuit is not mounted on the 'hot' heat sink, then that heat sink will also cool.

The above is also my message to those companies now expressing interest in researching this project. This, together with a copy of a specification I can supply to interested parties, points the way forward in a research venture that should provide the best and most effective method of efficient refrigeration and bring, miracle though it might seem, the added bonus of being self-powered electrically."

The Solid-State Energy Probe Experiment

This was the section title under which I introduced the third experiment in my article "Three Experiments on Free Energy". The article was written as an open letter addressed to Don Kelly, Editor of the Space Energy Association's Quarterly Space Energy News, where it was duly published in December 1993. It is also scheduled to be published in Nexus Magazine early in 1994.

It seems appropriate to reproduce first the relevant text from that article:

"The third experiment which tells me that I am on the verge of a breakthrough in penetrating the barrier giving access to 'free energy' in a solid-state device has yielded its own surprises.

Here I built a form of transformer that is intended to serve as an exploratory test rig. I shall, owing to the developing length of this communication, curtail the constructional details and leave something for future reporting.

The test involved setting up a d.c. magnetic bias in the x direction and an a.c. transverse magnetic oscillation in the y direction. Again I used the above-described technique of studying the shape and form of the B-H loop developed by the a.c. flux.

The a.c. excitation was of low magnetic flux density amplitude so that the eddy-current losses should be negligible, as should hysteresis loss. I was operating in the flux rotation zone and above the B-H knee where rotational hysteresis loss diminishes rapidly to zero. I expected the B-H 'loop' to show as a line on my oscilloscope and, indeed, such a line did appear. I had to expand it off the range of the screen by increasing the x deflection sensitivity substantially in order to trace the small capacitive contribution of my circuit for integrating induced EMF to derive the B signal. I could find no trace of a loss. Moreover, the line was not curved; it was very straight, which meant that the incremental permeability effective in the direction transverse to d.c. polarization was virtually constant.

This was as expected from my theoretical reasoning, but there was a surprise in that the transverse permeability was smaller than I expected, by a factor of ten.

Now, if you are wondering what this means, note that my object is to store 'reluctance' energy by that transverse excitation, meaning energy that goes in as inductance energy and is recovered without loss on the down quarter cycle. By making that transverse oscillation stronger and stronger the object is then to deflect the primary polarization so that the intrinsic ferromagnetic power develops flux oscillations in the axis of the primary coil. The aim is to tap energy from that deflected 'reluctance' energy source, most of which is powered by the atomic spins in the ferromagnet, and use that energy on the up quarter cycle.

This process then allows the polarizing bias, which could be that provided by a permanent magnet, to reset as the transverse current diminishes, but the short-fall in the stored 'reluctance' energy given back to the magnetizing coil in that transverse direction has then to be made up by the magnet.

The experiment I report here goes no further than showing that the transverse excitation is a pure, virtually loss-free, inductive process which involved a characteristic magnetic permeability indicating a 30:1 ratio of ferromagnetic power input compared with external power input. That is the starting point which will, I am sure, lead to the fourth experiment in which that energy is diverted and used without affecting the input magnetization circuit. Then the recovery of energy upon demagnetization of that latter circuit will occur, but as it cannot take used energy back from a load, the polarizing magnetic source simply has to do the work and so leave the quantizing vacuum field in a cooler state.

Rather than wait until I am ready to report such further progress, I thought it appropriate to inform you and via you the readers of your Newsletter at this stage."

I now intend in this Report to extend my disclosure on developments from this experiment but, since this particular project promises the best route to tapping aether energy by solid-state apparatus, and there is much research now needed before the patent cover is secure, I will limit what is said.

My object here is to attract sufficient interest from major corporation research laboratories based on a non-confidential disclosure by pointing the project effort in the right direction, whilst withholding enough to give basis for mutually beneficial negotiation adequate to reward my contribution. This may be an untimely step to take, but there is urgency and 'free energy' development must proceed with all speed, in order that the pollution by our existing energy generation methods can be minimized.

If others who read this Report decide to pursue the R&D also, in their independent ventures, that can

but be for the common good, but again it is stressed that this Report should not be taken as granting any rights under what may be proprietary and subject to patent protection. Copyright in this report is also preserved.

As to the principles of the experiment, firstly, the object is to work a ferromagnetic core in such a way that its windings do not cancel the action and so defeat the purpose of allowing the core to contribute some of its intrinsic energy to our output circuit in each successive magnetizing cycle. Secondly, the core has to work hard in this effort and so it must operate at a level of magnetization above the knee of the **B-H** curve or even close to saturation. Thirdly, as much of the core as possible should be involved in this exercise, not just a small portion in a large magnetic circuit. Fourthly, our technique for accessing that energy is to contrive operation so that the input circuit responds as a pure linear inductance whilst the ferromagnetic core acts as a catalyst to feed thermodynamic power to the output circuit electrically.

The drawing in APPENDIX C illustrates a core structure that serves this purpose. The illustration of Fig. 3 should be self explanatory. It is an extract from an early U.K. Patent No. 855,907 dating from April 1956 and of which the author was inventor in his employee capacity with a major U.K. electrical company. However, though there are technical features of that development which the author has called to mind in developing this 'free energy' application, the specific mode of excitation needed to tap that 'free energy' were not disclosed nor, indeed, thought of at the time of that early invention.

A spiral wound steel film coated with insulation has a cylindrical form and is wound around an axially central conductor. A solenoidal winding encompasses the core. Current I in the solenoidal winding produces a magnetic field parallel with the core axis, whereas current I' in the central conductor produces a magnetic field in a circumferential sense. The thin steel film constituting the cylindrical core is everywhere subjected to the cross-field magnetization effects of two fields acting at right angles to each other.

The currents I and I' must, acting together, be sufficient to set up a near saturation condition in the core.

The central conductor winding is d.c. biased and excited with a.c. of smaller amplitude to function as an inductance setting up a circumferential field with energy cycling in and out and subject to very little frequency-dependent loss. There is some I^2R loss in the winding. The intrinsic ferromagnetic energy that corresponds to the near saturation state is represented by a spin state that precesses, in effect, during the cyclic reorientation. In so doing, it induces an EMF in the solenoidal winding and this puts output power into a load connected to that winding during both half cycles of the a.c. oscillations. That output power taps the ferro-magnetic spin energy that the aether supplies by thermodynamic cooling in keeping the ferromagnet its its low minimal energy potential state.

The way in which one should see this is that, looking in any direction of strong magnetization, with the precession moving away from that direction, the **BH** component is reducing without returning all that energy to the aether system. Instead it transfers some to the load circuit. With the precession moving into that direction, the **BH** energy component builds up by input of aether field energy accompanied by thermodynamic aether field cooling and, at the same time, sends some of that energy to the load circuit.

A normal transformer runs solely on the **HB** energy transfers that are conservative in the material system. The 'free energy' future transformers will conserve energy too but will extend the conservation territory to that of the space medium.

The author intends to say no more on this subject until the time comes when a design specification can be disclosed with operational performance data.

On the general issue of 'free energy' from 'aether' reaction in responding to magnetism, there are a few experimental indications now emerging which suggest that the 'free energy' input can be dependent upon orientation of the apparatus in the inertial space frame. Researchers who find performance variations that can change with time of day, as the Earth rotates about its axis, should be alert to this possibility. The underlying scientific reason for such effects and the evidence will be covered by a later Report in this series.

The reader may now find APPENDIX A interesting, as a 'peer-reviewed' November 1993 communication published in the U.K. Institute of Physics journal 'Physics Education'. It has not been presented in its full printed version for copyright reasons. The substantive content of the author's original text only is reproduced and certain sections are presented in bold type, the emphasis being added specially for this Report.

20th February 1994

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APPENDIX A

THE FIRST LAW OF THERMODYNAMICS:

PHYSICS EDUCATION 28, 340-342: 1993

Whilst strongly supporting the view expressed by Moore (Physics Education, **28**, pp. 228-237; 1993) that greater emphasis should be given to non-equilibrium processes in teaching thermodynamics, it is submitted that such teaching gets off to the wrong start by the very prescription of the First Law of Thermodynamics as the governing doctrine.

It is the Principle of Conservation of Energy that should be declared as fundamental. The First Law of Thermodynamics, if retained in the physics curriculum under that name only serves as a 'number one' precedent to the 'number two' law.

A thermal system with no heat flow would be at a uniform temperature. A purely thermal system with heat flow can be in equilibrium with heat flow. Non-equilibrium processes imply actions which are not solely concerned with the flow of heat in a system. In presenting his case, Moore begins by reciting that First Law as having a meaning expressed by:

$$E = Q - W$$

where E is the change in energy, Q is heat flow and W is work done.

Note the words 'change', 'flow' and 'done'. The Principle of Energy Conservation requires that a change of energy between its various states, such as heat, electric potential, gravitational potential or kinetic energy sums to zero and I do not see why a student should have to have to learn this as a law of 'thermodynamics'.

At the outset of his argument, Moore defines 'heat' as 'the interaction that occurs between two systems, or between a system and its surroundings by virtue of a temperature difference'. This is not correct, because 'heat' is a form of energy - a scalar quantity, whereas a temperature difference has direction and so is a vector. 'Heat flow' can be said to have the prescribed definition. This shows how careful one needs to be with words in teaching the fundamentals of the subject.

In his following sentence Moore states: 'A temperature difference can be further defined in terms of lack of thermal equilibrium between two systems ...' Later he says 'A new generation of physics textbooks will probably be needed to cope with the fundamentals involved in the teaching of non-equilibrium thermodynamics at a base level'. However, I suggest that the question at issue is whether we are concerned with the physics of temperature difference or whether we are erring in using 'thermodynamics' to relate to something that is not strictly 'thermal'.

Physics today, and science generally, covers such a vast field and there has to be economy in teaching techniques, whilst conserving fundamentals. We need to understand how energy can redeploy and how order can evolve from chaos, but that is not the subject of thermodynamics. Thermodynamics has only become involved because, historically, it has been used to draw an arbitrary line between the possible and the impossible, but this is a line which is not holding steady. The energy that does cross that line in going from chaos to order is not heat, as such. However, it can create heat after making the transition. One has to distinguish between the physics of heat flow that involves a temperature differential and the physics of energy conversion generally.

In stating the fundamental principles underlying that First Law of Thermodynamics, with examples in mind, one really needs to set the stage for the student who may progress and have to face the following two problems.

Firstly, when a ferromagnetic substance cools down through its Curie temperature it releases heat over and above that associated with its normal specific heat. This extra heat happens to equal the sum of the magnetic energy which is thereby established, meaning the energy needed to set up the same field conditions in an air-cored solenoid as exist in the saturation state of the magnetism created in each ferromagnetic domain, and the additional work done in setting up the mechanical strains associated with that magnetism.

Readers will find, on considering this, that, notwithstanding misguided attempts to bring in magnetism as a negative potential, the First Law of Thermodynamics does not hold. We do not have here a situation where the work done requires a loss of heat. The only system we recognize as present is the substance of the ferromagnet. Unless there really are two systems inside one another, one that supplies energy from a source we cannot see or sense in temperature terms, there is no way of keeping an energy balance according to that First Law of Thermodynamics.

So, turning to the Principle of Conservation of Energy, we need to admit that our 'system' comprises an underlying sub-quantum field medium as a coextensive system having its own reserve of 'zero-point energy'. One presumes that there are in that field medium quantum effects at work in priming those spins in atoms that we say establish the ferromagnetic state.

Secondly, although one finds in books on cosmology that one can ask such questions as 'is the vacuum gravitating?' (see section 11, chapter 1 of Novikov's 'Evolution of the Universe', Cambridge University Press; 1983), one does not see the equally important question 'does the vacuum have a temperature?'.

Yet, when we look into the space enveloping body Earth there is evidence of thermal equilibrium manifested by the 2.7 K radiation. For some reason this 'heat energy' is deemed to be a residue of the Big Bang in the scenario of the expanding universe.

What is rather curious is that cosmologists try to apply the principles of energy balance to the assumed gravitational interaction within the vacuum acting on itself, forgetting that if the vacuum does contain something that can gravitate it must contain electric charges in some neutral composition. The pure vacuum, devoid of matter, must have its own quasi-static equilibrium and probably will not exhibit a temperature. Here, the word 'probably' is used because, in common with so much that is theorized about in cosmology, one really does not know the certain answer, but we need to imagine the likely scenario in our effort to solve the riddles of Nature.

However, assuming that, if matter did not exist, the vacuum would have no temperature, what cosmologists then fail to do is to apply the Principle of Energy Conservation or that First law of Thermodynamics to the straightforward question of how matter, that we know exists, interacts gravitationally **and thermally** with that elusive vacuum medium.

Consider the energy balance equation:

$$\phi m + kT = 0$$

or:

$$\phi m + mv^2/2 = 0$$

where **m** is the mass of a virtual particle deemed by Novikov (in following Zel'dovich) to constitute the vacuum medium, **T** is the temperature of the particle, **k** is Boltzmann's constant, **v** is speed and ϕ is a measure of gravitational potential attributable to matter within gravitational range of the particle of mass **m**.

The equations apply in a physical sense because, by analogy with magnetism in the first problem, gravitational potential is said to be a negative quantity, though really it is a manifestation of an exchange of energy with that hidden field system. Now, much as we think we know all there is to know about gravitation, we really have no adequate reason for believing that gravitation can act over a range exceeding a few hundred light years. Indeed, if gravitation has a limited range of action that could explain why stars form in separate space domains rather than converging into one central core to set up a reversal of the Big Bang scenario. The gravitational coupling across a galaxy can be one that is a chain coupling linking stars that are separated by less than the critical range of action. Note again that the words 'can be' are used deliberately, because students have much to gain by being shown that we are uncertain, which leaves them something to delve into in finding their own way forward in physics!

From a teaching viewpoint, it is then of interest to estimate the gravitational potential at the centre of the sun, based solely on the solar mass. We know ϕ and so can derive **v**, the speed imparted to the mass **m**. When this calculation is performed that speed **v** is found to be much the same as the translational speed of our solar system through the cosmic background. Therefore, if the formation of the sun meant that gravitational energy was shed, then that could have been taken up as kinetic energy by imparting a translational non-thermal motion to mass seated within the sun.

Should one view the relationship as coincidental or does it have significance cosmologically? The teacher cannot offer the certain answer to this question and so that may be a reason for not telling the student. However, physics education should not just be about what teachers know but should also give students an insight into what teachers do not yet know!

Looking at the equation involving **T**, one may apply this to the vacuum medium in the near vicinity of Earth. Here the gravitational potential can also be calculated. The effect of the sun dominates that of Earth by a factor of 14, so we need not be too rigorous about specifying an altitude in making this calculation.

The energy kT is used because it is assumed that there are only two degrees of freedom in the vacuum medium, inasmuch as its action may resemble the properties we associate with antiferromagnetism. However, the exact numerical coefficient is not too important in making the proposition that the 2.7 K cosmic background radiation temperature is local evidence of the Principle of Conservation of Energy or that First Law of Thermodynamics in the vacuum itself. The known gravitational potential attributable to the solar system in the vicinity of Earth, plus that 2.7 K temperature as measured, lead us, from the energy conservation equation, to derive a 'measured' value of m . **The mass of the virtual particles forming the vacuum medium can, therefore be shown to be approximately 0.04 times the mass of the electron*.**

The main thrust of these remarks is that the Principle of Conservation of Energy is a sufficient statement of whatever is intended by the First Law of Thermodynamics and it does have the merit of embracing actions that are not exclusively thermal or temperature-related. However, in its application we need to be open to energy exchanges involving the vacuum medium and we must then come to terms with the problem that so many physicists think it best to avoid, namely delving into the properties of a real vacuum medium. This is forbidden territory because it is outlawed by the theory of relativity.

In summary, whilst students need to know how internal combustion engines and electric kettles conform with the principles of thermodynamics, the laws of thermodynamics must no longer be presented as barriers which preclude exploration of new energy fields. One governing condition suffices, the Principle of Conservation of Energy, and its application to a physical system embracing the total field environment and if we hypothesise laws of thermodynamics by appeal to 'experience' we should keep in mind that students of the future may yet 'experience' something that past textbook authority did not 'experience'.

* It is beyond the scope of this commentary to show in detail how one can confirm this value m by an independent test, save to say that the vacuum has the ability to define the value of the fine structure constant in terms of the ratio of the mass m to the mass m_e of the electron:

$$hc/2\pi e^2 = (108\pi)(4m/m_e)^{1/2}$$

A derivation of the above is presented by the author in *Lettere al Nuovo Cimento*, **40**, 53-57 (1984). See also the derivation as equation (19) on p. 354 of 'Quantum Uncertainties', *Nato ASI Series B: Physics Vol. 162* (Plenum Press) 1986.

Footnote for this Energy Science Report: This value of m , the mass of the aether particle, was shown to be 1/25 of the electron mass at page 24 in the author's 1959 work entitled 'The Theory of Gravitation'.

APPENDIX B

ANALYSIS OF THE A-FIELD REACTION

'A-field' signifies the 'aether' diamagnetic reaction field set up in space by gyromagnetic reaction of aether charge in response to the normal B-field. The experimental evidence from classical physics research on gyromagnetism in ferromagnetic rod specimens presents physicists with an experimental anomaly in that the observed change of

magnetic moment in relation to angular momentum has twice the value expected. The Dirac abstract 'spin' mathematical route to this factor of 2 is wrong and has led science away from the 'free energy' opportunities. The alternative is to accept the simple explanation as a diamagnetic reaction from free conduction charge in the metal. Then one is confronted with the need to extend the argument to the vacuum medium and accept that the aether contains charge in motion that can set up a reacting magnetic field, even under steady d.c. field conditions. This latter proposition has now been verified by experiment reported earlier in this Report. An insight into the formal theory as applied to reaction in metal is presented below, as it recently appeared in the author's U.K. Patent Specification No. 2,267,995.

To determine the strength of the A-field reaction in a metal conductor one needs to note that each conduction electron moves at a high velocity and is subject an electric potential mainly sourced in the positive residual electric charge of the atoms which have shed those conduction electrons. These atoms are locked into the metal crystal structure and so the free electrons move under the constraint of a local electric force $F(r)$ which has a component constraining the electron to move between collisions in general orbital paths of radius r centred on the atoms.

If a magnetic field of strength B is also present this supplements the electric force by a component force Bev , where e is the electromagnetic charge of the electron and v its speed in circular orbit about an axis aligned with the direction of B .

Note that the force $F(r)$ is a restoring force proportional to displacement of the electron from a notional position of rest, assuming it has no motion. The restoring force factor depends on boundary shape but is the same throughout any metal structure having parallel planar boundaries, regardless of the direction of charge displacement. Its value is halved within a cylindrical metal structure provided the displacement is in a plane at right angles to the cylinder axis. Therefore a displacement through a distance r will involve adding potential energy of $F(r)r/2$.

The force equation, assuming that B is zero, is simply:

$$F(r) = mv^2/r \dots\dots\dots (1)$$

If one now sums the effective kinetic energy component attributable to v for all the free electrons in a unit volume of the metal and write that as energy density W , the equation gives:

$$\Sigma F(r)r/2 = \Sigma mv^2/2 = W \dots\dots\dots (2)$$

Now bring in the action of the B field. This adds the force term in Bev to the left hand side of equation (1) and so changes equation (2) in the following way:

$$\Sigma F(r)r/2 + \delta \Sigma F(r)r/2 + B \Sigma evr/2 = W + \delta W \dots\dots\dots (3)$$

Next, note that the terms in F give rise to a potential energy and it is appropriate to bring the energy terms together on the right-hand side of the equation into a single energy density function that depends upon B . Denoting this energy density function as E , equations (2) and (3) combine to give:

$$B \Sigma evr/2 = \delta E \dots\dots\dots(4)$$

The expression involving $evr/2$ is a measure of the reacting magnetic moment of each conduction

electron. It develops a back-field or reaction field which is denoted the 'A-field' and which, if scaled by a factor g, has the value:

$$A = 4\pi g \Sigma e v r / 2 \dots\dots\dots (5)$$

The B-field acting on each conduction electron is, therefore, a combined field effect produced by a primary field which we write as gB and this is offset by the field of strength A. Note that the same scaling factor has been used to modify the B field as is used to modify the reaction field. Reasons for this will be apparent in what follows, but one needs to keep in mind that a unity value must be assigned to g to comply with orthodox teachings on this subject.

One can now write:

$$B = gB - A \dots\dots\dots (6)$$

Combining equations (4), (5) and (6):

$$\delta E = (gB - A)(A) / 4\pi g \dots\dots\dots (7)$$

which is a simple relationship representing an energy quantity which tends to maximize because its negative potential energy component tends to a minimum.

The variable in the equation is the value of the A-field. Differentiating equation (7) with respect to A shows that the energy density attributable to the B-field is a maximum when:

$$gB - 2A = 0 \dots\dots\dots (8)$$

which shows that the strength of the A-field reaction is exactly half of gB and, from equation (6) this means that g is precisely 2. Then, from equation (7) this, in turn, means that:

$$\delta E = B^2 / 8\pi \dots\dots\dots (9)$$

which is the conventional magnetic field energy density formula in the units we are using.

The result of this analysis is that when a primary magnetic field acts on the free conduction electrons in a metal there is, inevitably, a half-field reaction, the A-field, which is opposed to that primary field. Since, in the past, one has been able to work with theory which presumes there is no such reaction, then the B-field which is known to be effective in the metal must owe its action to a magnetizing effect twice as strong as the B-field. The half-field reaction has passed unnoticed in experiments because one has failed to double the primary field action before halving it. Therefore, the moment of electric current attributable to the electron, which is represented by a term such as (evr/2), and which would otherwise be deemed to represent the reaction, must also be incremented by that same g-factor. This explains why the g-factor was introduced in equation (6). It makes sense of an otherwise impossible situation.

Note that the half-field reaction is sensed in gyromagnetic reaction measurements, where observation based on reversing the ordered electron activity which is associated with magnetic polarization causes a proportional reversal of angular momentum. The ratio of the electrical current moment to the angular momentum, as measured, is twice that expected from conventional theory based on the known charge/mass ratio of the electron. This gyromagnetic ratio factor of two is the g-factor deduced above. The experiment confirms the theory presented.

Note also that the interpretation of the gyromagnetic reaction in terms of the 'A-field' is indisputably strong, but it does require the concomitant recognition that there is an A-field vacuum reaction involving the charges which account for Maxwell displacement currents. This A-field reaction in the vacuum or aether is the basis on which inductive energy is stored as a magnetic field. Physicists have for most of the 20th century, at least until recent times, sought to avoid referring to the aether or recognizing it as an active energy medium, and this has been to the detriment of innovative energy

technology.

APPENDIX C

APPENDIX C

855,907 PROVISIONAL SPECIFICATION
 3 SHEETS This drawing is a reproduction of
 the Original on a reduced scale.
 SHEET 1

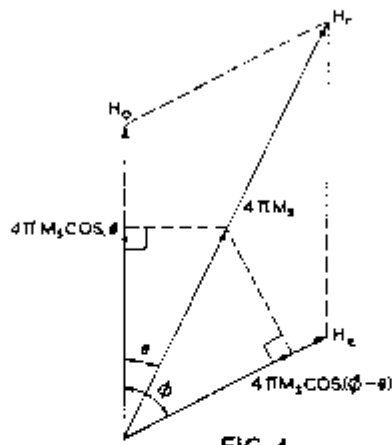


FIG. 1

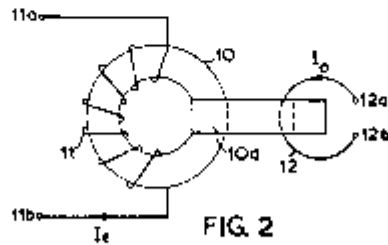


FIG. 2

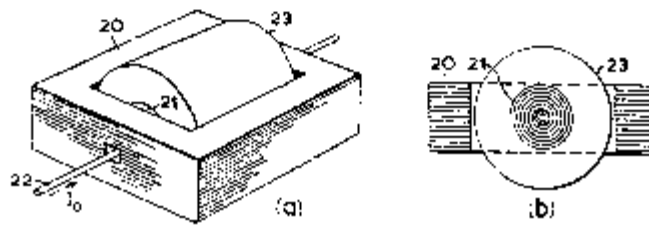


FIG. 3