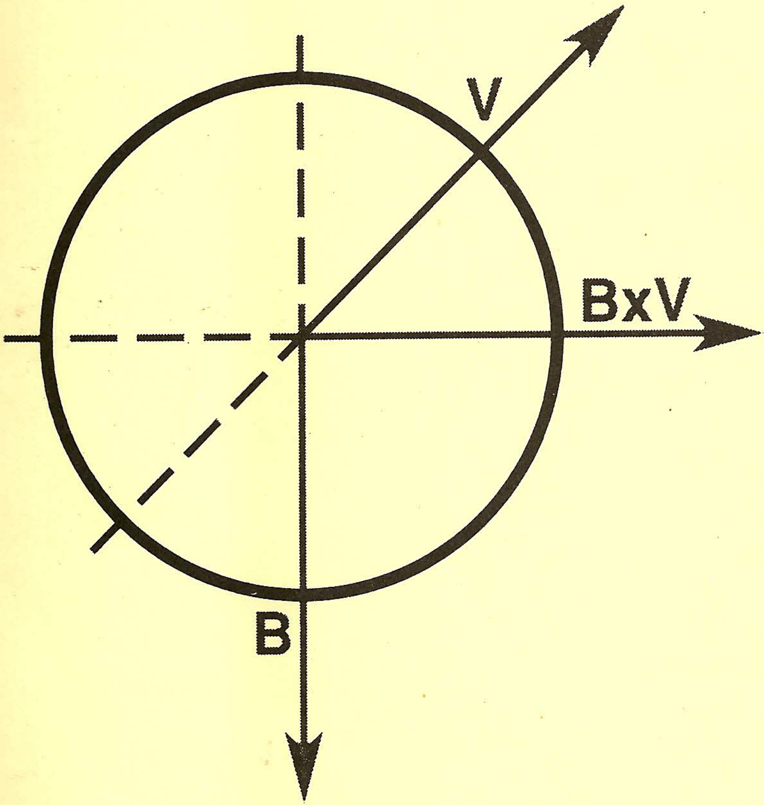

THE ALL-ELECTRIC MOTIONAL ELECTRIC FIELD GENERATOR AND ITS POTENTIAL

by Frances G. Gibson

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This is the written version of a talk given at the Second International Symposium on Non-Conventional Energy Technology in Atlanta, Georgia, February 10, 1983. It is based entirely on the theory and experimental work of Dr. William J. Hooper, BA, MA, PHD. in Physics from the University of California, Berkley, and formerly Professor Emeritus at Principia College, Elsah, IL.

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PREFACE

From 1968 to 1971, my husband, Warren W. Gibson, financed the research of Dr. William J. Hooper. I worked with Dr. Hooper as secretary and laboratory assistant. He explained his theory and the intent of each experiment to me as the work progressed. I was personally present when every experiment was performed during this time.

After Dr. Hooper passed on in 1971, I tried to perform an experiment with a vacuum tube generator which he had designed. On my first attempt I burned out the tube, and with that I lost confidence in my ability to do the research on my own.

I satisfied my desire to continue the work with the publication and sale of his manuscript, and with the hope that it would spark an interest in someone who would want to carry on the research. There has been much interest expressed in his theory and research, but to my knowledge there is no one presently continuing the work.

Many people who have read Dr. Hooper's manuscript have asked for more experimental data. This paper includes that information.

Frances G. Gibson

THE ALL-ELECTRIC MOTIONAL ELECTRIC FIELD GENERATOR AND ITS POTENTIAL

The history of scientific progress shows that new discoveries often are not made until some old assumptions are challenged and found to be wrong. Dr. William J. Hooper challenged the assumption of electromagnetic theory that there was only one electric field in nature, the electrostatic, and that led to more challenges of current theory.

In his manuscript, New Horizons in Electric, Magnetic, and Gravitational Field Theory, Dr. Hooper defines three electric fields with distinct characteristics: the electrostatic, which is very familiar; the transformer electric field, which is produced by a changing magnetic field intensity; and the motionally induced electric field, which is the product of relative motion between a conductor and a magnetic field. A table on page 15 of his book shows the major differences in the properties of these fields.

When all his experiments indicated that the motionally induced electric field was incapable of being shielded by ordinary electrostatic or magnetic shielding materials, he pondered the possibility that this field was akin to gravity, which has characteristics similar to an electric field except for its inablility to be shielded. This paper will not deal with his extensive shielding experiments which are thoroughly described in his manuscript and were done before my time.

Let's review again the nature of this motionally induced electric field. When magnetic flux is moved perpendicularly across a conductor, we say that an e.m.f. is electromagnetically induced within the conductor. This phenomenon has been little thought of as involving the production of a spacially distributed electric field. It arises from the operation called flux-cutting, wherein the electric field is motionally induced within the space occupied by the moving magnetic flux, and is present therein, whether a conductor is present in this space or not.

Correctly defined, we can say that when magnetic flux of vector intensity $\overline{B}$ is moved across a region of space with vector velocity $\overline{V}$, an electromagnetically induced electric field of vector intensity $\overline{B} \times \overline{V}$ makes its appearance in this space at right angles to both $\overline{B}$ and $\overline{V}$. Therefore,

$$\overline{E} = \overline{B} \times \overline{V} \text{ ....Equation 1.}$$

It is this field that Dr. Hooper felt might be related to gravity. I will hereafter refer to this field as the motional E field.

After contemplating the structure of the atom, Dr. Hooper concluded that if the charged particles in the atom, especially the electrons and protons, acted like miniature magnets, their motion would create in the space surrounding the atom this motional E field. The field created by the motion of both the positive and negative charges would cancel to some degree, but because the velocity of the negative electron in orbit is greater than the velocity of the positive proton in the nucleus, the induced field of the electron would predominate. He determined that the field due to the orbital motion of these charges would vary inversely as the square of the distance, the same as gravity. He also determined that the field produced by the translational motion of these charges would vary inversely as the cube of the distance. These observations may totally unite electromagnetic and gravitational field theory and account for the strong and weak forces in the atom.

If his theory was correct, Dr. Hooper envisioned the ability to tap the gravitational field of any planetary body for electric energy, free from polutants, with a properly designed ultra high frequency receiving circuit, incorporating an antenna, a transistor valve, and oscillating tank circuits. When he learned of the work of T Henry Moray, he was convinced that Moray had tapped the earth's gravitational field, and he expected Moray to complete this work for mankind, so he decided to concentrate his research on proving his theory.

When he passed on in 1971, Dr. Hooper was sure he had done this, as he had been issued patents on two generators, a mechanical one, Patent no. 3,656,013, and an all-electric one, Patent no. 3,610,971. Dr. Hooper spent many years building devices to rotate magnets at high speeds to test his theory, but always found that the magnetic field of the magnets, and the vibration and noise of the motors interfered with his attempts to measure the field with either a capacitor connected to an electrometer or a gravity meter.

In 1968, soon after I began working with Dr. Hooper, he conceived and built a device which would eliminate all previous problems because there would be no measurable magnetic flux and no motors. He called it the All-Electric Motional Electric Field Generator. Its design was based completely on his theory of gravity, and how he believed gravity was produced in the atoms of matter. If his theory was correct, he expected his device to produce a motional E field outside the generator by the movement of the magnetic field associated with the conduction electrons making up the current flowing in the copper wire of the generator.

Figure 1. shows the design of the generator. It consists of one length of #11, formvar insulated copper wire, 924 meters long, bent 180^{o} at nine inch intervals and packed side-by-side with the two ends emerging together from the top. These nine inch linear conductors, 4020 in all, were then sealed together with epoxy in the shape of a right circular cylinder. When energized by direct current, half of the conductors, 2010, would be carrying current and magnetic flux vertically downward, and the same number would be carrying them vertically upward. Thus, the generator is non-inductive, having no measurable magnetic field around it. But Dr. Hooper hoped to find something else around it, the motional E field, similar to gravity, in that, it could not be shielded.

Electromagnetic induction with no measurable magnetic field is not new. It is well-known that in the space out-

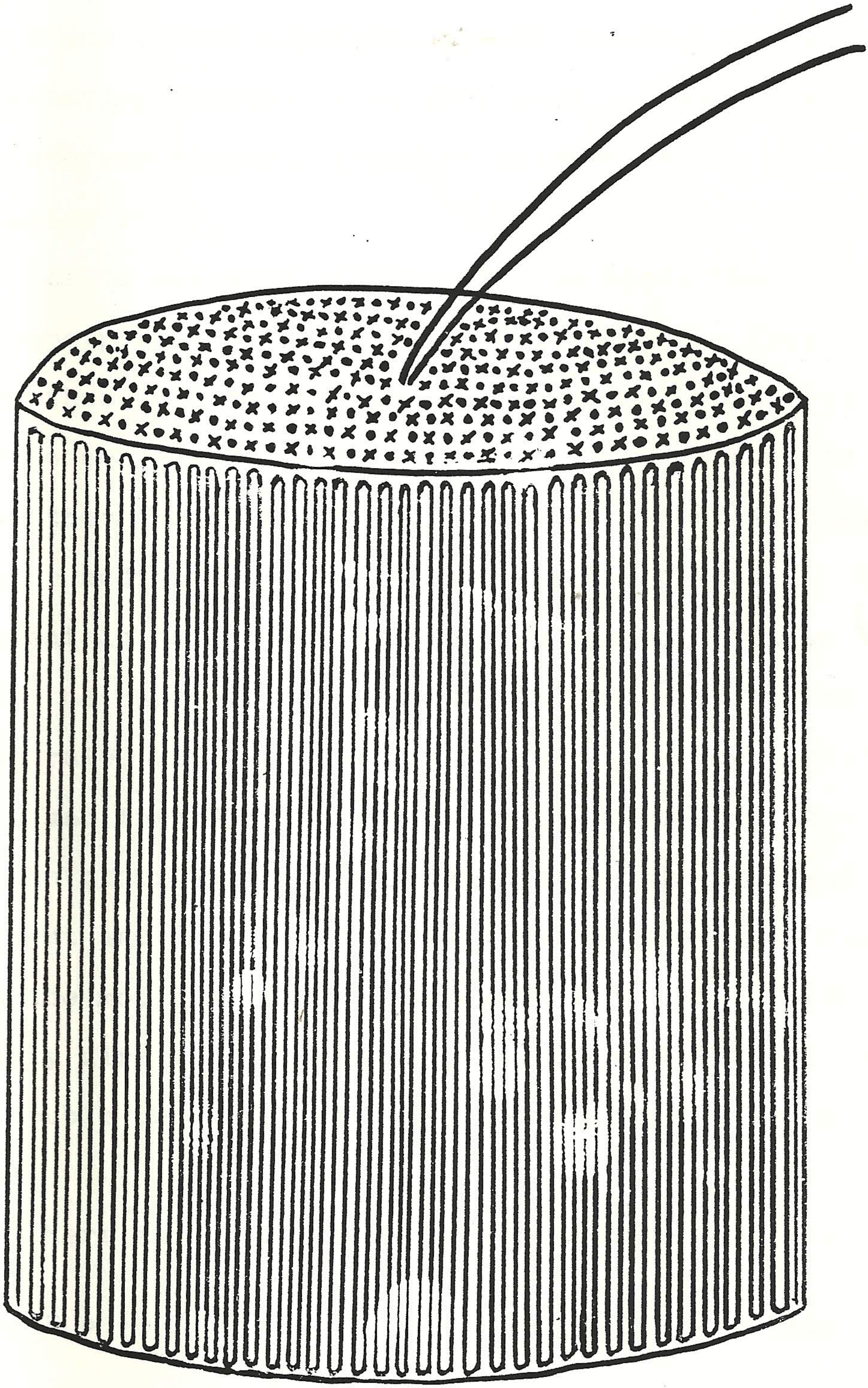

Figure 1.

The All-Electric Motional Electric Field Generator side a properly wound toroidal coil, there is no magnetic field due to the superposition of fields, and yet, when alternating current is surging back and forth in it, a transformer electric field is present in the space surrounding it.

Let's see what happens when we apply the principle of superposition of fields to this device. This principle says that in order to find the resultant intensity of superimposed fields, each field should be treated as though the other were absent; the resultant is obtained by the vector addition of each field considered singly. When the current in half the wires in this generator is moving up, both the current and the magnetic field follow the right hand rule, and the motional E field would be vertical to both and inwardly directed. At the same time, the current in the other half of the wires is moving down, and both the current and the magnetic field follow the right hand rule and the motional E field is again vertical to both and inwardly directed. Therefore, the resultant field intensity is double the intensity attributable to one set of conductors.

Here is how it is expressed mathematically:

$$E = (\overline{B} \times \overline{V}) + (-\overline{B} \times -\overline{V}) = 2(\overline{B} \times \overline{V}) \text{......Equation 2}$$

where E is the electric field intensity, $\overline{B}$ is the magnetic field that is moving with the electron drift velocity, $\overline{V}$. The first $\overline{B} \times \overline{V}$ in the equation represents the flow of the magnetic field when the electrons are moving in one direction in the wire, and the second term ($-\overline{B} \times -\overline{V}$) represents the flow of the magnetic field when the electrons are moving in the other direction. $\overline{E}$ is the sum of both $\overline{B} \times \overline{V}$'s.

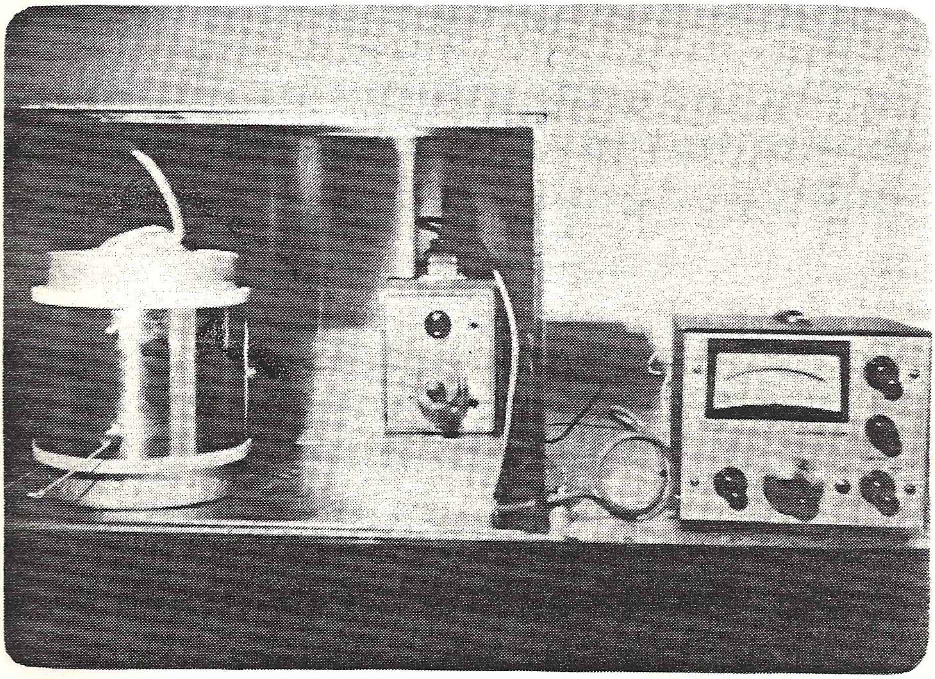

Figure 2

Figure 2 pictures how we measured the presence of this motional E field. A highly insulated, stainless steel capacitor was placed around the center of the generator. The inner capacitor plate was connected to the heavy coat of conductive silver, shielding the rest of the generator and then grounded. The outer capacitor plate was connected to the input head of a Keithley 640 Vibrating Capacitor Electrometer. This particular electrometer with its high shunt resistances and its vibrating capacitor seemed ideal for this purpose. The generator with its capacitor and the head of the electrometer were then placed inside a stainless steel cabinet. All the connecting wires between the electrometer head inside the box and the galvanometer outside the box were electrostatically shielded, as well as the leads to the generator from the power supply. Everything was grounded through a terminal on the electrometer. Now, we were ready to energize the generator with up to thirty amps of current from our power supply and measure the motional E field on the outside.

The predicted value of the measurement was in the low microvolt region. Dr. Hooper, through working in college physics laboratories for over forty years, was well aware of the many problems associated with taking measurements in the microvolt region, and we had to test for and guard against them all. Our greatest problems came because we were unaware of the tendency for an electrostatic field to be generated equally and oppositely to this motional E field, and how frequently this phenomenon occurs. One time when we used one thick capacitor plate and one thin one, we discovered that the motional E field set up an electrostatic distribution within the thick capacitor plate, and reversed the charge on the outer plate. When capacitor plates of equal thickness were used the motional E field measurement was always positive.

Another problem we had involved the unbalance of our power supplies. We used two power sources: our own specially built one, designed to rectify 220 AC voltage to low ripple

DC voltage, providing a maximum of 275 DC volts and 30 amps, and occasionally, 12 volt car batteries connected in series to compare results. At one point we discovered that when the current from the power source entered from one direction, the measurement of the motional E field was less than when it entered from the other direction. Here, in Dr. Hooper's own words, is how he accounted for this problem, "The question arose as to why there would be a difference in readings because of an unbalance in the power source, as the inner capacitor plate is grounded, and the law is that there would be no electrostatic charge on the outside of a grounded enclosure. The interesting thing is that the only answer seems to lie in the fact that there is a motional E field present. If there is an unbalance on the inside of the container due to an unbalance in input voltage, the normal thing would be for charge to flow through the ground wire to balance the charge on the inside of the container. However, if the motional E field was acting in the ground wire in one way, it would oppose the flow of electrons toward the shield and, therefore, would allow an electrostatic charge to remain on the inner capacitor plate and affect the readings." We had to realize the significance of the fact that this field permeates everything.

Dr. Hooper's explanation seemed to be confirmed by close observation of the needle on the electrometer in an experiment done immediately following this discovery. In that experiment, 100V was applied to the generator; 26 amps was the resulting current. When the direction of the current was one way, it is recorded that the electrometer needle, first, went negative to 11µv and, then, positive to 17µv. When the current was reversed, the electrometer needle only went positive to 28µv. The difference between the two final readings was 11µv, the same as the negative deflection. When the input voltage was balanced between positive and ground and between negative and ground, the measurements of the motional E field were the same when the current was flowing in either direction.

The above figures are not comparable to the measurements that will be referred to later because different size capacitor plates were on the generator. The measurements I will be using were taken before this discovery, but we did not redo them because we saw that the unbalance was always a negative factor, causing our readings to be less, never more. Dr. Hooper did not feel that it changed the conclusions reached, even though the exactness of the measurements might be questioned.

Between February 4 and July 19, 1969, when the generator was in the condition shown in Figure 2, we varied temperature, resistance, types of current, and types of power supplies. Measurements were taken by hand at 5 amp intervals, up to 30 amps. We did not have the sophisticated equipment that is available in many laboratories today. Voltage was often not taken because it was felt that

Voltage	Amperage	PD μv	Parabola at 30 amps
February 4			
35	10	7	6.7
52	15	15	15.0
73	20	25	26.7
91	25	40	41.7
110	30	60	60.0
February 11			
	10	10	10.0
	15	25	22.5
	20	41	40.0
	25	60	62.5
	30	90	90.0
July 19			
	10	15	13.9
	15	30	31.2
	20	55	55.6
	25	85	86.8
	30	125	125.0
	25	85	
	20	50	
	15	27	
	10	10	
	15	26	
	20	55	
	25	87	
	30	140	
	25	90	

Figure 3

Measurements taken when generator was at room temperature.

if we took our measurements only when the generator was cool, the voltage would remain the same, and we wanted to move up the scale quickly before the generator could heat up. Also, Dr. Hooper felt that the amperage was the most important factor because theory predicted that the field intensity would be directly proportional to the square of the amperage, because it is proportional to the virtual value of the magnetic field, which is proportional to the current, and to the electron drift velocity, which theory says is proportional to the current.

Figure 3 provides some typical measurements of the potential difference measured across the capacitor plates by the electrometer at room temperature. The PD reading in the third column will be the significant figure to watch from here on. That is what we considered to be the measurement of the intensity of the motional E field produced by this generator. This measurement was never just a swing of the electrometer needle and then back. These measurements were steady on the electrometer as long as the amperage reading was held the same, showing that the field was being produced continuously. Now, I don't mean to say that on such a sensitive electrometer the needle was completely stable, but when the amperage was turned up, the needle went up also and the instability was always in the area of the measurement; when we turned the amperage up more, the needle continued up the scale. If we had jerks of the needle in one direction or the other, we knew we had something spurious affecting our readings, and we worked until we found out what it was, or until it was no longer there.

The PD readings on the electrometer were always very close to a parabola, as Dr. Hooper predicted. However, the magnitude varied from day to day. We determined that there were at least two possible causes of this. One, there was some evidence that 8 to 10 degrees variation in room temperature caused variations in the readings--the higher the temperature, the higher the readings. The reason for this may become clearer later. Two, the unbalance of the power supply, already discussed. You will note that the fourth column of figures on this chart shows what the predicted values of PD would be for the other amperages, based on the experimental figure at 30 amps. The predicted parabola was always close to the actual readings.

On July 19, we went up and down the scale several times because it had been suggested that our readings might be due to thermoelectric effects between the two capacitor plates. This proved they were not. If our readings had been due to heat, they would not go up and down the scale with the current. These readings also show that the readings were not due to an e.m.f. induced by changing flux. You will note, however, that after a few times up and down the scale, the generator did begin to warm up, and the readings on the electrometer began to increase. We had noted this many times and had assumed that it was due to thermoelectric effects and, immediately, stopped experimenting until the generator cooled down. However, on June 4, we decided to see just what the effect of heating was on the measurements.

For comparison purposes, the first set of measurements in Figure 4 were taken when the generator was at room tem-

Voltage	Amperage	PD μv	Parabola at 30 amps
	10	11	12.8
Cold	15	27	28.8
Generator	20	50	51.0
	25	80	79.9
	30	115	115.0
	10	13	25.0
Hot	15	40	56.3
Generator	20	75	100.0
	25	123	156.3
	30	220	220.0
	25	130	

Figure 4

perature. The second measurements were taken the same day when the generator was hot to the touch. When the generator was hot, the PD at all levels increased, and you will see the curve is no longer a parabola. However, the difference was not totally due to thermoelectric effects, because there was a substantial jump back at 25 amps. Several measurements were taken with the hot generator that day with almost identical results. We were sorry that the voltage measurements were not taken because they could have given us an idea of how hot the generator was.

Because heat resistance in the generator seemed to increase the PD measurements, it was decided to try other forms of resistance in the circuit with the generator. The first set of numbers in Figure 5 was obtained when we put a carbon pile rheostat in the line. The normal resistance of our generator was 3.7Ω. The rheostat increased the resistance in the circuit to 5.3Ω. We dis-

Voltage	Amperage	PD µv	Parabola at 30 amps
Rheostat 5.3Ω			
53	10	11	22.2
80	15	30	50.0
107	20	70	88.9
133	25	80-100	138.9
160	30	200	200.0
Rheostat 7.5Ω			
225	30	360	
Photofloods 12.3Ω			
160	13	100	
Rheostat 12.3Ω			
160	13	100	
Nothing added 3.7Ω			
48	13	15	

Figure 5

covered that these first measurements were very similar to the ones where heat was the added resistance, in Figure 4. We then increased the resistance to 7.5Ω, and, as you can see, there was another substantial increase in the PD readings at 30 amps. Then, we added photofloods of 1500 watts to the circuit, increasing its resistance to 12.3Ω. In order not to burn them up, we only put 13 amps in the line, but, if you will compare that 13 amps with the 15 amps above, you will find a substantial increase. For more comparison, we then returned to the rheostat and adjusted it to 12.3Ω and at 13 amps we got exactly the same PD reading. Then, when all resistance was removed, the reading was substantially less.

These experiments showed that our PD measurements, believed to be the measurement of the motional E field, increased with the addition of resistance in the circuit, and that the form of that resistance, whether heat, carbon pile rheostat, or photofloods, didn't make any difference.

Since Dr. Hooper anticipated that the best way to intensify this field would be through the use of superconductivity, he wanted to see the effect that cooling would have on our generator. On February 28, we packed the generator, capacitors and all, with dry ice for five hours. Then, we took the first set of measurements, shown in Figure 6. Unfortunately, there is no record of voltage which would have indicated how cold the generator had gotten. At first, the results were very puzzling to us; certainly not what Dr. Hooper had expected. The curve was not at all parabolic. When you look at the PD at 30 amps, it is not much different than at room temperature.

We soon discovered, however, that the results almost exactly fit the curve having a formula of $PD = KI^4$, where K is the proportional constant and I is the current, whereas the formula for a parabola is $PD = KI^2$. Then we became excited, for it could mean that a radical change had taken place in the drift velocity of the electrons in the copper wire, somewhere between room temperature and dry ice temperatures. If this was so, it could help explain the phenomenon of superconductivity. Whether it was a gradual change

Voltage	Amperage	PD μv	Parabola at 30 amps
Dry Ice, 5 hours			
	10	1.5	1.2
	15	6	5.9
	20	17	18.8
	25	45	45.8
	30	95	95.0
Dry Ice, 17 hours			
20	10	1.5	.5
32	15	2.5	2.3
43	20	6	7.3
55	25	14.5	17.8
68	30	37	37.0
21	10	--	.6
33	15	2	2.8
45	20.5	6	8.9
57	25	18	21.7
70	30	45	45.0
	11	1	1.3
	16	5	6.0
	20	14.5	14.7
	25	40	36.0
	31	85	85.0

Figure 6

or whether there was a critical temperature, we could not determine from these experiments.

That night we packed the generator in dry ice overnight, 17 hours. The readings that were taken the next day all fit the formula, $PD = KI^4$. Fortunately, the first two sets of readings included voltage measurements from which we determined that the resistance had dropped from 3.7Ω to 2.3Ω, over one third. You will note that sometimes we missed the proper 5 amp interval; it was because we were taking the measurements rapidly before the gener-

Voltage	Resistance	Amperage	PD μv
		10	-4.5
		15	25
		20	70
		25	115
		30	150
With added resistance			
120	4 Ω	30	200
61	4 Ω	15	55
120	18 Ω	6.7	160
275	18 Ω	15	220

Figure 7

AC voltage in the generator at room temperature.

ator could heat up. I am sure that is also why we skipped the voltage measurements on that last run, and afterwards we were sorry we had.

Have you ever tried to visualize what happens to the electrons in a wire when AC voltage is applied? We decided to try to find out. On several occasions we put AC voltage into our generator from the 220 line coming into our laboratory and through our power supply. Figure 7 is typical of the results. You will note that the PD readings were no longer a parabola, but almost a straight line, having its beginning at less than zero. The bottom figures are the result of adding resistance to the circuit with AC current. Here again, you will note that the PD increases with the addition of resistance to the circuit.

At one point we began to ask ourselves, if this is the measure of the motional E field, what is happening in those wires. Fortunately, there are formulas available to give us a clue. First of all, we determined that there was no reason to believe that the intensity of the virtual magnetic field around the generator changed with temperature when the current was the same, so therefore it must be the drift velocity of the electrons that was changing.

To get a close approximation of v_d, the drift velocity of the electrons, we used the equation:

$$PD = \overline{B} \times \overline{V} \cdot l \qquad \text{Equation 3}$$

where PD is the measurement of the field's intensity across the capacitor plates, l is the distance between the plates, $\overline{B}$ is the virtual magnetic field intensity, and $\overline{V}$ is the measurement of the drift of $\overline{B}$, which is identical to the electron drift velocity, v_d. From the formula,

$$I = Aenv_d \qquad \text{Equation 4}$$

where I is the current, A is the cross-sectional area of the wire, e is the charge on the electron, and n is the number of conduction electrons, we see that if v_d changes, n, the number of conduction electrons, must also change, for in this particular generator A and e are constants. Therefore, if the drift velocity changes with temperature, so must the number of conduction electrons. If one goes up, the other goes down.

Using equation 3, and using the calculus to integrate the line integral of the electric field intensity, PD, between the capacitor plates, a more exact figure for v_d can be obtained. Doing it this way, using the PD reading at 10 amps from one of the early experiments, Dr. Hooper determined the drift velocity to be 1.78 cm/sec. Using the classical derivation of the drift velocity, with Avogadro's number, and then decreasing it by 100 as indicated by the Fermi-Dirac statistics, he arrived at almost the same figure as the experimental, 1.762 cm/sec.

These experiments show that the number of conduction electrons remains fairly constant at room temperatures and that the drift velocity increases linearly with the current. When resistance in the form of heat, carbon pile rheostat, or photo floods was added to the circuit, the number of conduction electrons decreased from that of room temperature and normal resistance while the drift velocity increased. At dry ice temperature and at low current, there were almost ten times as many conduction electrons moving, but moving very slowly, like cars on a crowded highway. As the amperage increased, the number of conduction electrons decreased rapidly, causing a greatly accelerated increase in the electron drift velocity. When AC current was put in the generator, it appeared that 3 to 4 times as many electrons were moving at low amperage as move under DC current at room temperature, but as with dry ice, when more electrons were moving, they were moving very slowly. By the time the amperage increased to 20 amps the number of electrons had decreased to almost the same number as with DC current at room temperature. From 20 to 30 amps the number of electrons remained fairly constant. The electron drift velocity increased rapidly at low amperages and continued to increase but at a decreasing rate at higher amperages.

These observations regarding electron drift velocity and number of conduction electrons would appear to be more consistent with the current theory regarding gases, semi-conductors, and semi-metals, than with the current theory for metals. If these findings are true, they would seem to indicate that the conductivity of a metal is related to the number of electrons in motion and their velocity, both of which change with temperature and resistance.

In his book, <u>Electromagnetism and Relativity</u>, published in 1957, E. G. Cullwick predicted, based on experimental evidence, that the magnetic field of the electron could move with the electron drift velocity. He also said, "Measurements of the normal Hall effect in metals are often assumed to confirm the conventional view that all the available conduction electrons participate continuously in a conduction current." He then shows that this need not be so. Our experiments also indicate that this might not be so.

The question is usually asked about how this motional E field fits into the relativity theories. Dr. Hooper has a section in his manuscript where he says that he feels there is no conflict with the Special Theory of Relativity, only with how it is currently being interpreted by some relativists. It does appear to conflict with the General Theory of Relativity.

In the beginning I said that Dr. Hooper began by challenging the assumption of electromagnetic theory that there is only one electric field, the electrostatic, and that this led him to make more challenges of field theory. In formulating his theory of gravity, he had to challenge the current belief that the magnetic field, known to be present when an electron is in motion, does not move with the electron. However, if his theory is correct, we have a solid basis for a unified field theory, based on the motional E fields created when the charges in the atom are in motion. When he built a generator to test his theory, the results challenged the belief in current theory that the electron drift velocity in metals does not change with temperature, an aspect of current theory which makes metals different from all other substances gases, semi-conductors, and semi-metals.

Dr. Hooper not only visualized that if his theory were correct that we could tap the gravitational field for energy, "atomic" energy in its most usable form; he also saw the possibilities, if this motional E field could be intensified enough, of gravity free areas on earth, artificial gravity in space, space vehicles, and even off the road vehicles on earth. He felt that this field could be used for communication through previously impenetrable barriers, and to separate ions, such as in the desalination of water and the control of thermonuclear plasma.

Now, lets go back to Equation 1, $\overline{E} = \overline{B} \times \overline{V}$, where $\overline{E}$ represented the intensity of the field we were producing.

That intensity represents the strength of the field. It must be substantially increased before the field can be made useful. The V in the equation represents the electron drift velocity in the material making up the generator. An increase in the drift velocity would increase the field's intensity. This research indicates that it can be done at both higher and lower temperatures, and with increased resistance in the circuit. Hence, it provides a direction for more research.

To begin, most would want to duplicate the experiments here outlined. All the original equipment is still available. That might lead to building generators like this from a variety of materials, which would give a great deal of information about the conductivity of solids, heretofore unknown, which could indicate a pattern of activity for electrons in various materials, making possible predictions about what happens to electron drift velocity at both higher and lower temperatures, amperages, and with varying amounts of resistance. There would probably be some materials that would be best used at high temperatures, others that would be best at low temperatures, and still others that might do well at room temperature.

The possibilities are great that this experimentation begun in 1969 will transform the world.