THE USE OF KIRLIAN PHOTOGRAPHY IN FOOD QUALITY ASSESSMENT

by

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ABSTRACT

The variables that could affect the Kirlian image were investigated. By use of a standardized technique which eliminated variables, it was found that external forces, in the form of physical stresses, can affect Kirlian photographs of organic materials but not inorganic. The "lost leaf" effect was experienced with no success. All three food types (ie, leaves, worms and salami slices) showed a dying off effect. A transfer of energy occured when two leaves were placed in close proximity. The worms, inversely, showed a repulsion effect when placed side by side. No such effects occured for the salami slices.

ACKNOWLEDGEMENT

The author would like to express his gratitude to Francois Dodier, an electronics technician, who helped a great deal with the construction of the apparatus. Without him the experiment would not have been possible

The author is also grateful to Dr. R. Kok of the Departement of Agricultural Engineering, for his encouragement and open mind in the field of science.

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INTRODUCTION

In 1958, a Russian scientist named Semeyon Kirlian reported in his work "In the World of Wonderful Discharges" a method of obtaining a photographic image using high-voltage charges. With this technique, he said, it would be possible to find the state of health or sickness of an organic material very precisely.

Today much attention is being paid to food quality assessment. Government policies and public pressures have increased the regulations in agriculture and food industry. Difficulties are encountered, specially in terms of accuracy of the results, when trying to find the quality of the product.

Starting from these principes it was decided to investigate food quality by means of Kirlian photography, as it is called. For doing so, a Kirlian device suppling high-voltage had to be built using electronic schematic from the literature. On the other hand, no work using Kirlian photography with food has been found in this literature. Since there was no point of comparaison, personal judgement in choosing experiments was used throughout this project.

I - LITERATURE REVIEW

1) DEFINITION

Kirlian photography, which is also known as electrophotography, high voltage photography, radiation field photography, and corona discharge photography, is a method of obtaining a photographic image of high energy interactions between a subject and an applied electric field.

The image captured on the film reflects the dynamic relationship between the externally generated electric field and the energy emited from the subject. No externally applied light source is used for this technique; the light emitted as photons from the electrical interaction causes the image on the film. Figure 1 shows how a high positive charge is created on an electrode, which is then covered with a piece of photographic film. The film base acts as a spacer and dielectric.

When the subject matter, which is well earthed, is placed onto the film, an electrical interaction occurs which causes photon emission to affect the film. In the case of a piece of food (ie slice of salami), a corona, or aura as it called, streamers and other details not found in conventional photographs are formed around the subject, an example of which is shown in Figure 2.

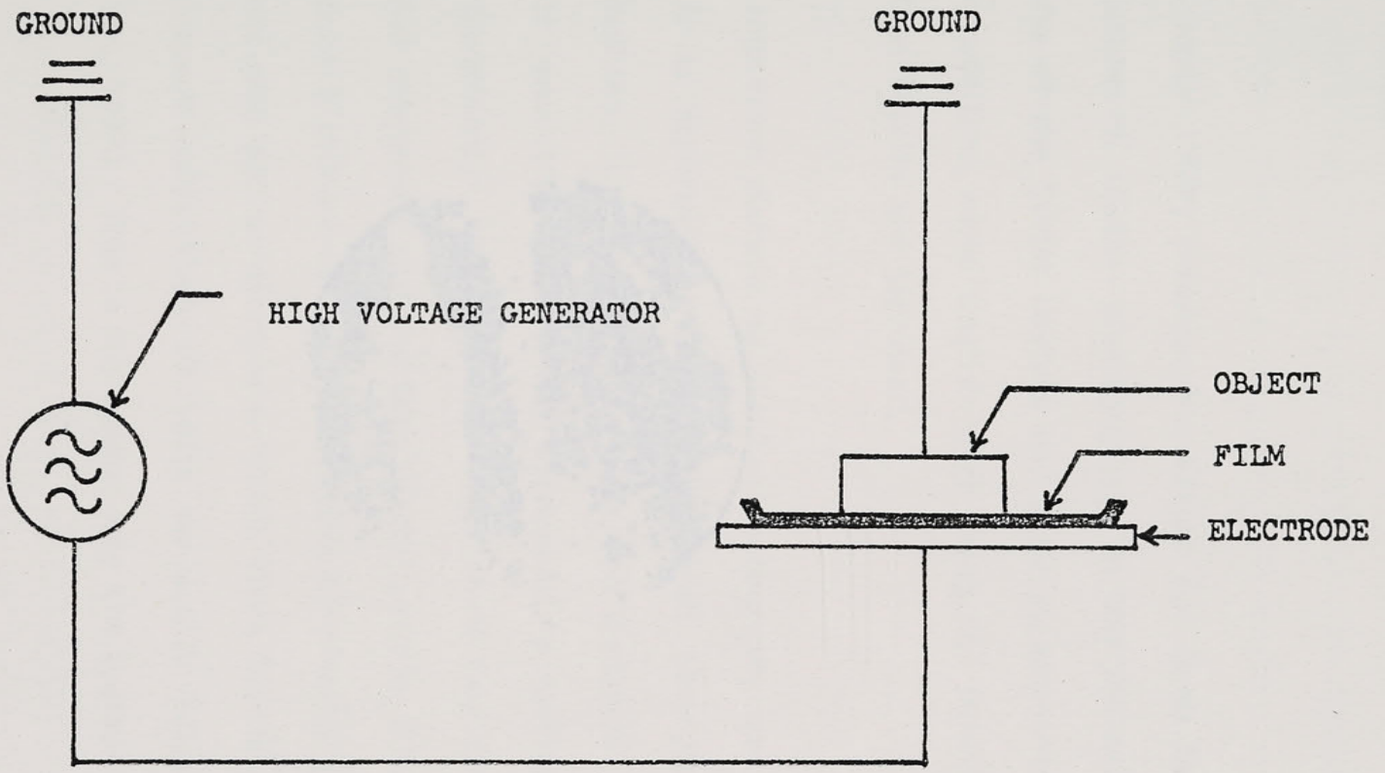


Figure 1- High Positive Charge on an Electrode

Figure 2 - Kirlian Effect on a Slice of Salami
(20 s exposure)

2) HISTORICAL NOTES

Since the early 1960's considerable effort has been focused on the different applications of Kirlian photography. In the following section, a description of some of the Soviet devices and their experimental results will be reviewed. In addition, some English work using DC pulses is presented and some American results are discussed.

Like many important discoveries, Kirlian photography was the result of an accident. It is reported by Toth (1974), that Semeyon Kirlian, an electronics technician, was called to a research institute to repair an instrument. It was there that he witnessed a patient receiving electrotherapy treatment. Noticing that there were tiny flashes of light between the metal electrodes and the skin of the patient, Kirlian wondered if he could produce a picture of that interaction by placing a photographic plate between the skin and an electrode. Since then, Kirlian and his wife, Valentina, have spent more than 40 years on active research into the phenomenon (Kirlian, 1974). This is the reason why the technique bears their name.

It is now thought, however, that the process was actually discovered by the Russian engineer Yakov Narkevitch-Todko who demonstrated "electrophotographic photographs obtained with the help of quiet electrical discharges" at the 5th Photographic Exhibition given by the Russian Technical Society in 1898 (Toth, 1974).

Renewed interest was shown in the 1930's by Drs Silvester Pratt and Jan Shlemer at Charlls University in Prague. Their findings published in the Journal of the Biological Photographic Association described an experimental photographic process, called electrography, that used a high-frequency electrical field to expose film.(Toth, 1974).

A) Review of some Soviet work

The Kirlians work still remains a base for all research whether American or Russian. Most investigators are trying to obtain photographs that are similar to what they obtained. A good part of their work is now directed towards medicine and more specifically to acupuncture. Since it has been noted by several workers, initially in the USSR and in the States, that the images produced by the Kirlian process are especially intense over acupuncture points. But their research investigate highly complicated biological systems , as well as simple forms of life and inorganic materials.

To obtain an emission image of an object the Kirlians had to use all their imagination to find different plates varying in structure in accordance with specifications of the object. In Figure 3 a number of different plates are shown.

(1) A disc plate on an insulated handle to isolate various biological details from the same part of an object.

(2) Flat square plates.

(3) Flexible, close-fitting plates for obtaining an image from a rounded object.

(4) A system of capacitors, the object itself serves as the centrifugal plate and the photo is made with a plate.

(5) A roller plate for obtaining prints by rolling an object of unlimited length. The rollers can be interchangeable, their width determines the dimensions of the photo.

(6) The assembly of these roller plates is in accordance with the configuration of objects.

(7) A plate in the shape of a frame, pictures are obtained from several flat objects simultaneously from both sides by one pulse.

(8) Capacitors which have been assembled in the shape of tongs to photograph leaves on the plant. The relative position of the plates and the object is regulated by compressing the tongs. With these phototongs, other flat objects may be photographed.

(9) A soft, flexible plate for photographing the entire surface of objects of diverse shapes.

In Figure 4 a shematic of the optical discharge plate is shown.

(1) Transparent plate

(2) Traction screw

(3) Stopper ring

(4) Mobile crossarm

(5) Recess

(6) Sleeve for evacuation

(7) Tube of the light detector

(8) Adjustment srew for sharp timing of the image

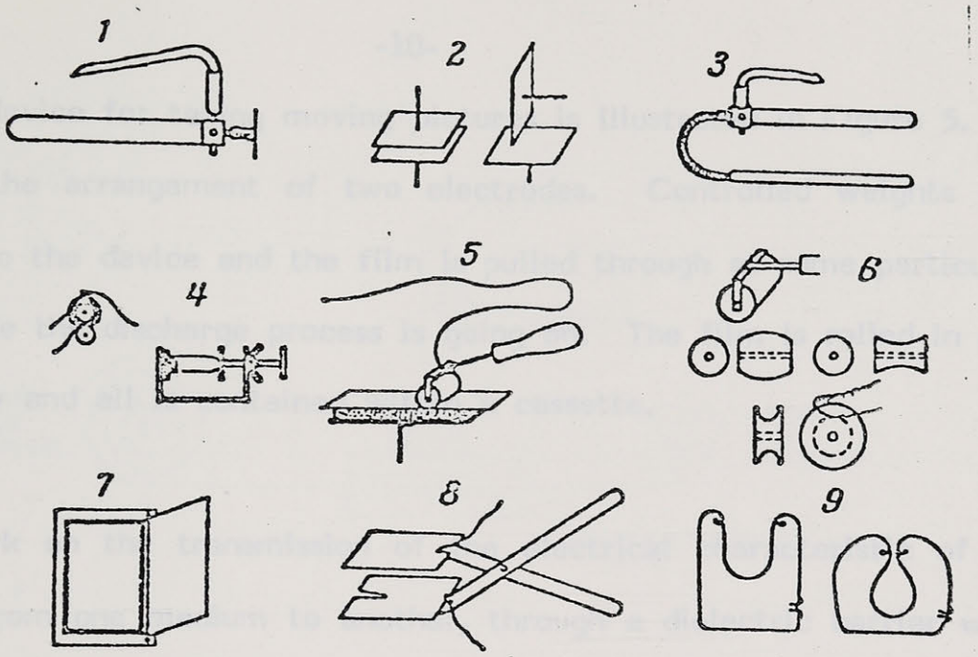


Figure 3 - Plate for Various Kirlian Photography

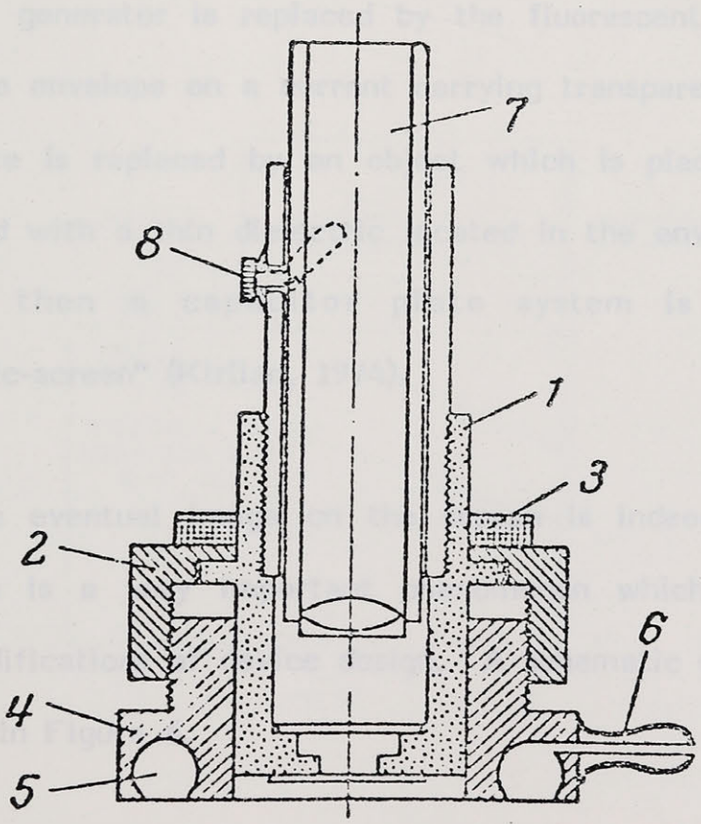


Figure 4 - Optical Discharge Plate

A device for taking moving pictures is illustrated in Figure 5. It utilizes the arrangement of two electrodes. Controlled weights are applied to the device and the film is pulled through at some particular speed while the discharge process is going on. The film is rolled in the usual way and all is contained within a cassette.

Work on the transmission of the electrical characteristic of an object from one medium to another, through a dielectric barrier with subsequent formation of the image led the Kirlians to the discovery of the following effect.

"If one of the capacitor plates of the oscillator circuit of a high-frequency generator is replaced by the fluorescent screen of an evacuated tube envelope on a current carrying transparent base, while the other plate is replaced by an object which is placed against an opening coated with a thin dielectric located in the envelope opposite the screen, then a capacitor plate system is obtain or a object-dielectric-screen" (Kirlian, 1974).

Thus, the eventual image on the screen is indeed that of the object. This is a very important phenomenon which allows many interesting modifications of device design. A schematic of the Kirlians CRT is shown in Figure 6.

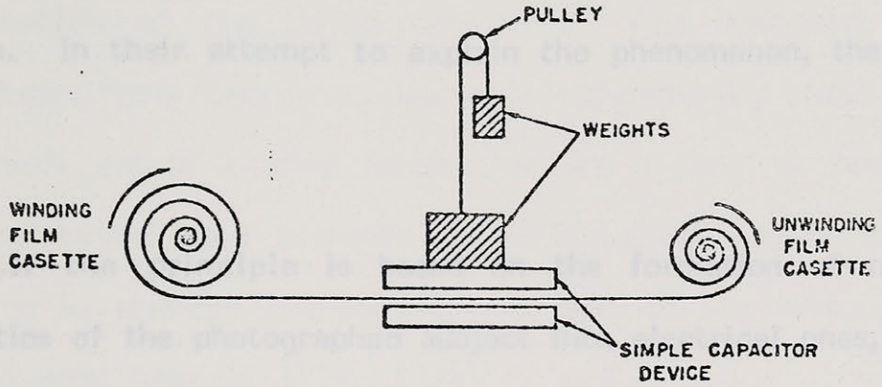


Figure 5 - Cinematographic Discharge Device

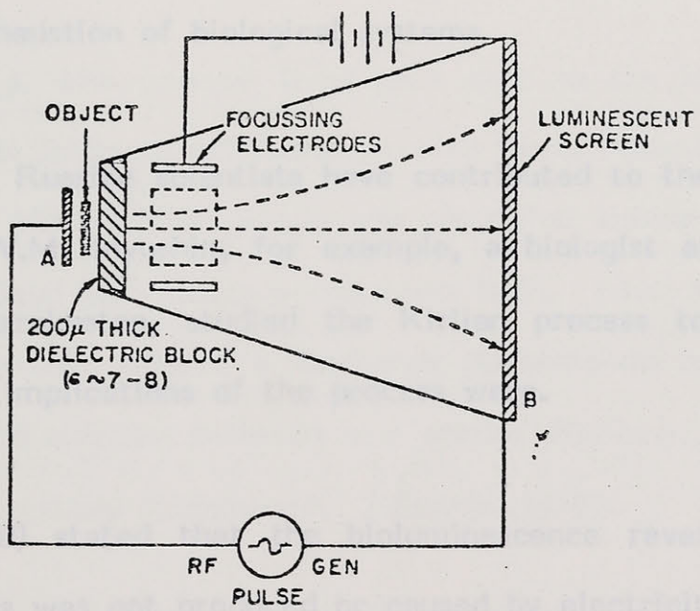


Figure 6 - Cathode Ray Tube Device

By using the previous devices, the Kirlians obtained very interesting results. In their attempt to explain the phenomenon, they suggested that:

"... the principle is based on the formation of nonelectrical properties of the photographed subject into electrical ones, via motion of a field involving the controlled transfer of a charge from an object to a photographic film or screen." (kirlian,1974).

Then the Kirlians concluded that electrophotography enables them to predict the illness of plants, animals, and human beings before the symptoms occur. So with the help of those electric impressions, they said that one is able to identify the organism's state of the nerves and the fatigue or exhaustion of biological systems.

Many other Russian scientists have contributed to the field over the years. Dr. V.M. Inyushin, for example, a biologist at the State University of Kazakhstan, studied the Kirlian process to determine exactly what the implications of the process were.

Inyshin (1970) stated that the bioluminescence revealed in the Kirlian photographs was not produced or caused by electricity. Instead, the phenomena were part of a previously unknown property of living organisms called "bioplasma".

This suggests that in living systems there is a single system of

elementary charged particles which are dominant in all biodynamic relationships of the living organism. This biological plasma, as distinguished from nonorganic plasma, is a structurally organized system. It is made out of internal forces that are minimal at rest, but when disturbed, reveal their presence. This biological plasma is, therefore, found to be strongly influenced by changes in temperature and other environmental factors. (Tiller,1974).

Ancient scientist thought that the universe was composed of four basic elements: earth, water, fire and air. Earth in contemporary terminology corresponds to solid matter, water to liquid, air to the gaseous state, and fire to plasma. Bioplasma will therefore be the fith state of matter in life.

V. Adamenko. who younger lived next door to the Kirlians, and spent many years in intimate collaboration with them, indicated that the power source for Kirlian photography was somewhat similar to a radar power source: a pulsed high frequency electric field. When this electric field is applied to the subject a discharge phenomenon occurs which appears to be a cold electron emission or a corona discharge. He denied the existance of Inyshin's "bioplasma". (Ebrahim,1982).

B) Review of some American and English work.

Although serious research on the subject has continued in the

Soviet Union since the 1930's, there was a marked lack of interest in the West until the 1970's. The Americans renewed interest at the Neuropsychiatric Institute of the UCLA Center for the Health Sciences under the guidance of Dr. Thelma Moss. She investigated the Kirlian phenomenon from her experience as a psychologist (Moss and Johnson,1974).

Using the Kirlian technique Moss and Johnson have produced more than ten thousands photographs, chiefly of the human finger pad, leaves, and metal object. In summary they believed that:

"... states of relaxation induced by hypnosis, meditation, and drugs produce, for the most part, a more brilliant, wider corona...". (Moss and Johnson,1974).

Milner and Smart (1974) have, for some years been experimenting with high-voltage photography using a sandwich type device. With this device they obtained a photograph that was showing another special Kirlian effect. They called that effect, an energy transfer-interaction (see Figure 7). It occured when a freshly picked leaf (right) and a dying leaf picked twenty-four hours earlier were put one beside the other.

Monteith (1974) found that a live leaf gave beatiful and varied emissions, but a dead leaf gave, at most, only a uniform glow (generally, it did not expose the film at all). Even when a dead leaf was thoroughly wet with water, in no way was the self-emission increased.

Figure 7 - Transfer of Energy (by Milner and Smart)

Dr. Stanley Krippner (1974) suggested that Pressman's concepts of the living organism as an energy complex with permeable boundaries resembles Lewin's field theory in psychology. So both Lewin's and Pressman's conceptualizations were put together to explain some possible functions of those phenomena observed in Kirlian photography (see Figure 8) He concluded that:

"... the use of field theory in explaining the Kirlian data may be an important step in the understanding of photographs which have been produced. If the fields on the photographs can be analyzed in terms of the boundaries represented, and the information which is being transmitted within and between boundaries, investigators might be able to develop a better understanding of these provocative phenomena." (Krippner, 1974).

Opalinski (1979) experimented with a technique of radiation-field photography using thin-film materials instead of photographic film. Examples are thin-films of colophony, or films of linseed oil exposed to water vapor and naturally solidified. The exposure time varied from 1 to 250 s. depending on the conditions. The voltage wave form was quite sinusoidal as it decayed rapidly toward zero in highly damped oscillations. He concluded that the resulting nonuniformity of the electric field was apparently affecting or causing the following physical effects:

1) The transport and deposition of moisture or other materials, mainly in a

direction normal to the elctrodes.

2) The transport of material parallel to the electrodes originating from sharp edges and points of the objects.

3) An orientation of the molecules of thin-film material, in alignment with the direction of the local electric field causing substantial changes in the reflectivity of the film.

4) A variation of the angle of incidence of the illuminating light introduces drastic changes in the aura observed around the objects.

OBJECTIVE

The objective of this work was to investigate any possible relationship that could exist, between the Kirlian effects (ie, aura, streamers, dying off effect, etc) and the quality of food products, by means of high-voltage photography.

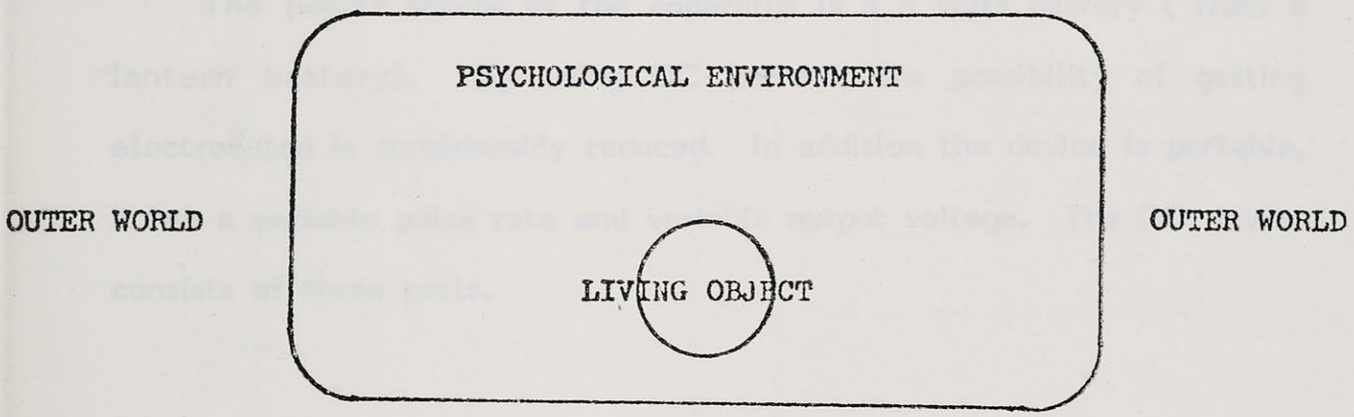


Figure 8- Field Theory and Kirlian Photography

II - EQUIPMENT AND APPARATUS

The studies carried out in this investigation all utilized a standardized piece of apparatus, with an undamped harmonic frequency. It is a low voltage Kirlian device (30-35 KV), compared to other apparatus used (100-200 KV), with a low impedance, positive-pulse output. Following is a description of this Kirlian device.

The power source of the apparatus is a 6 volts battery (from a lantern battery). By using DC current, the possibility of getting electrocuted is considerably reduced. In addition the device is portable, it has a variable pulse rate and variable output voltage. The DC device consists of three parts.

(1) An Inverter

(2) A High-voltage Discharge Section

(3) An Oscillator Firing Circuit

Figure 9 represents the complete schematic of the unit. Figure 10 shows the same circuit, but as it is connected in the apparatus (ie on a plastic plate). Finally, a simpler diagram, to facilitate the understanding of the reader, is drawn in Figure 11.

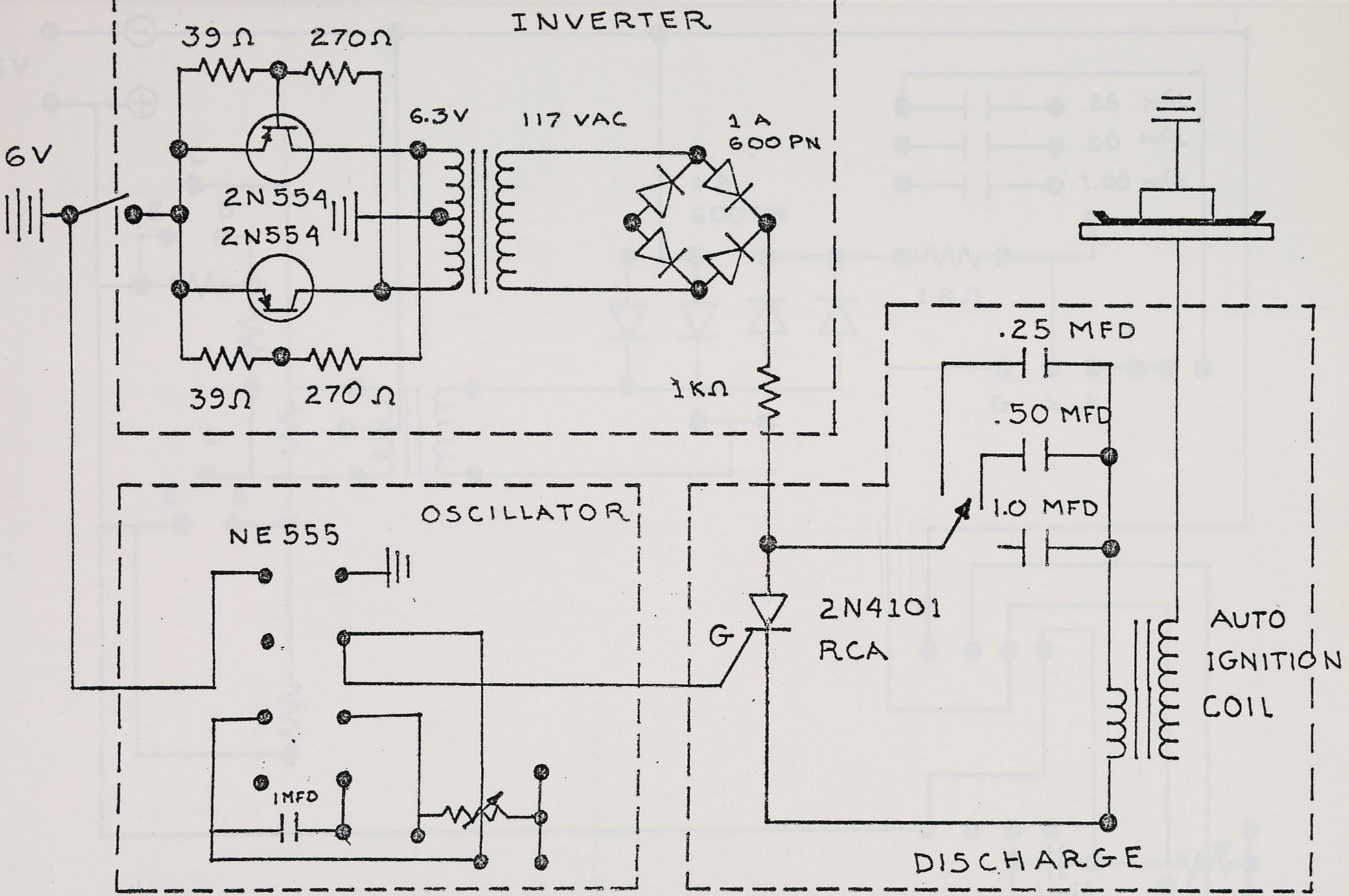


Figure 9 - Dc Kirlian Device

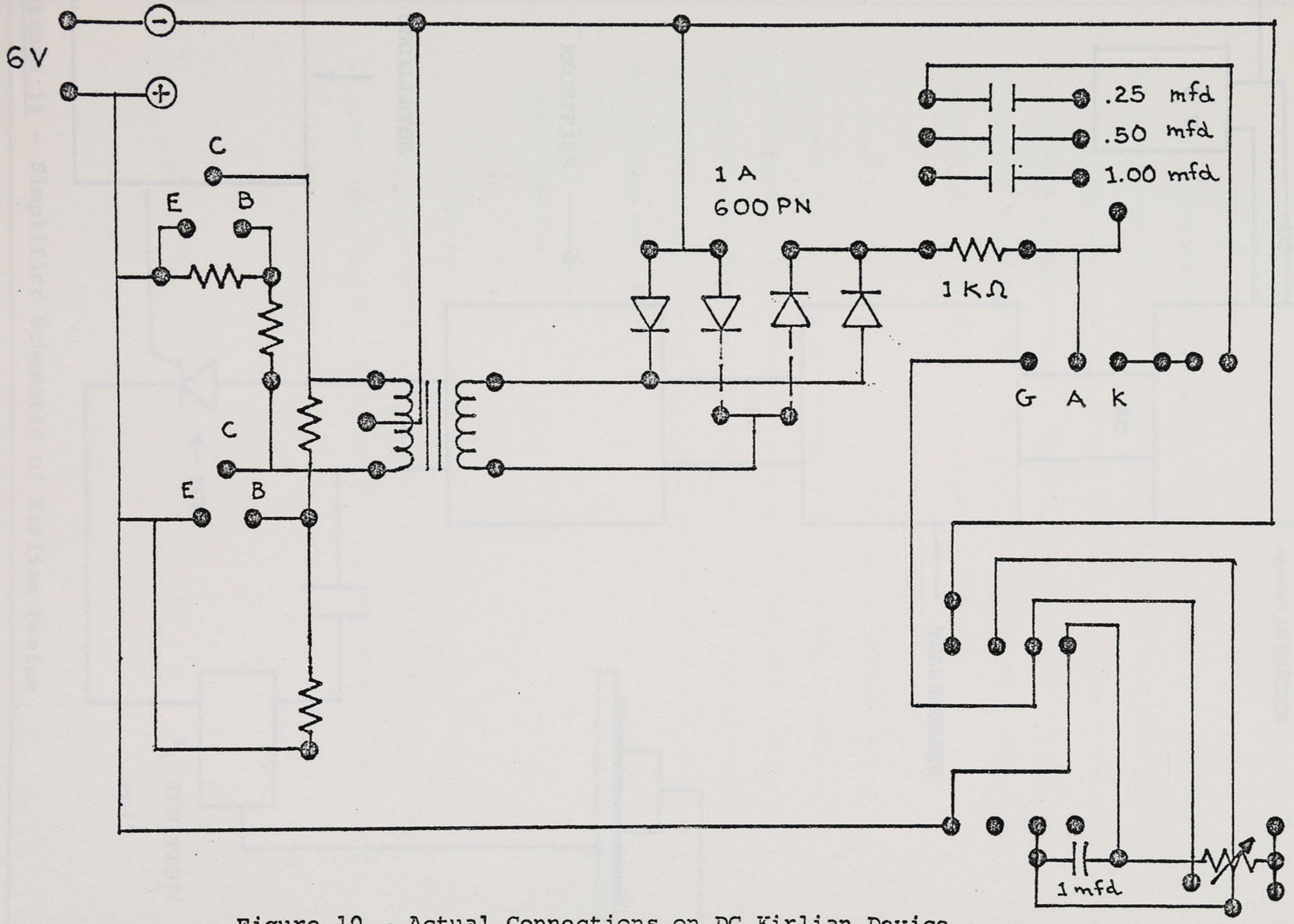
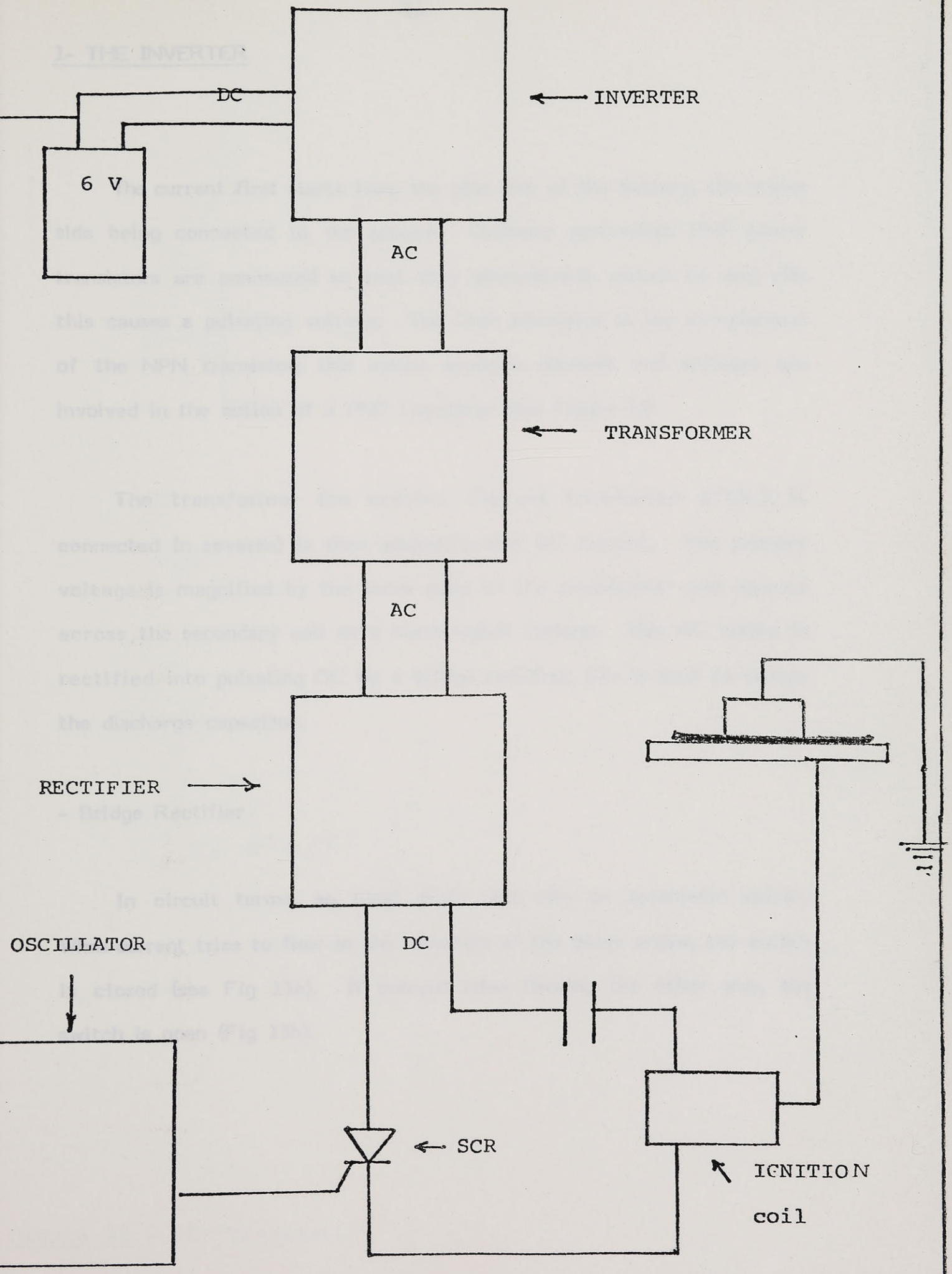


Figure 10 - Actual Connections on DC Kirlian Device



igure 11 - Simplified Schematic of Kirlian Device

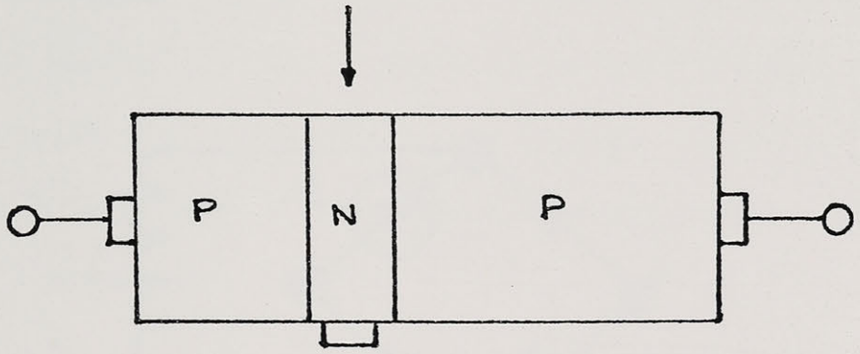
1- THE INVERTER

The current first starts from the plus side of the battery, the minus side being connected to the ground. Ordinary germanium PNP power transistors are connected so that they alternatively switch on and off; this causes a pulsating voltage. The PNP transistor is the complement of the NPN transistor; this means opposite currents and voltages are involved in the action of a PNP transistor (see Figure 12)

The transformer (an ordinary filament transformer 117/6.3 V. connected in reverse) is then accepting the AC current. The primary voltage is magnified by the turns ratio of the transformer and appears across the secondary coil as a much higher voltage. This AC output is rectified into pulsating DC by a bridge rectifier; this is used to charge the discharge capacitor.

- Bridge Rectifier

In circuit terms, an ideal diode acts like an automatic switch. When current tries to flow in the direction of the diode arrow, the switch is closed (see Fig 13a). If current tries flowing the other way, the switch is open (Fig 13b).



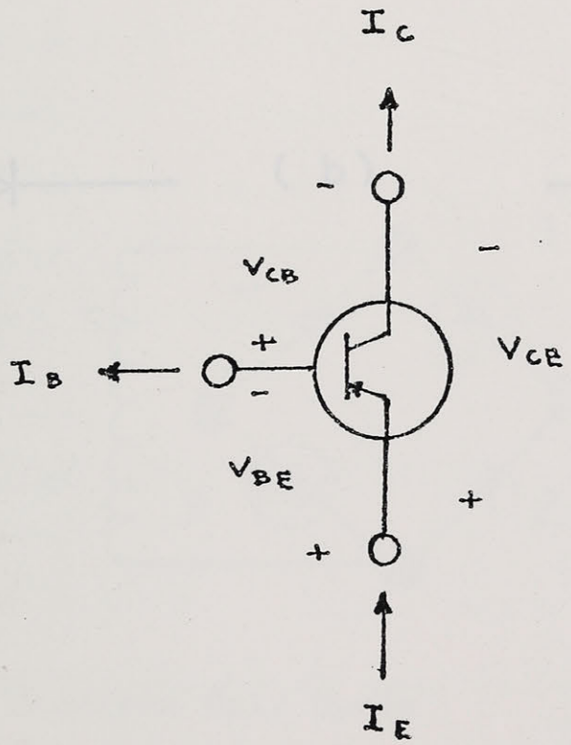


Figure 12 - PNP Transistor

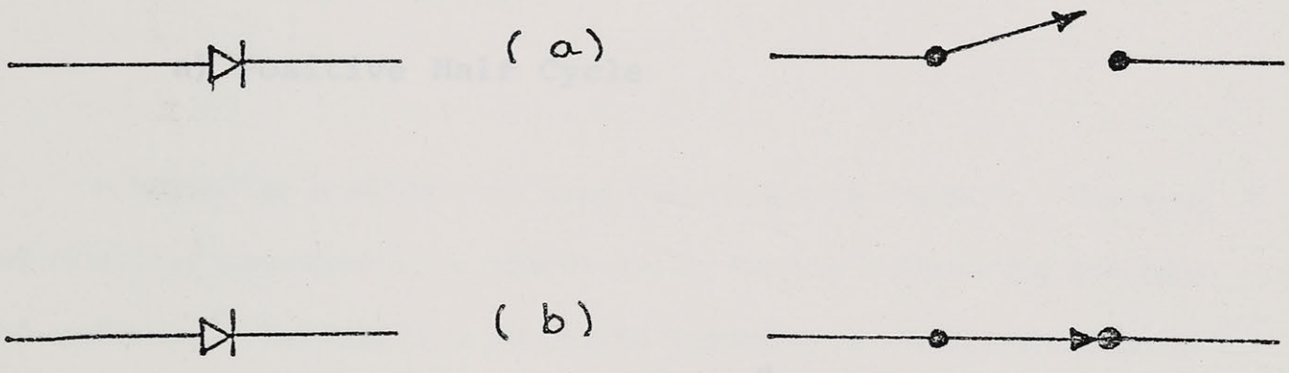
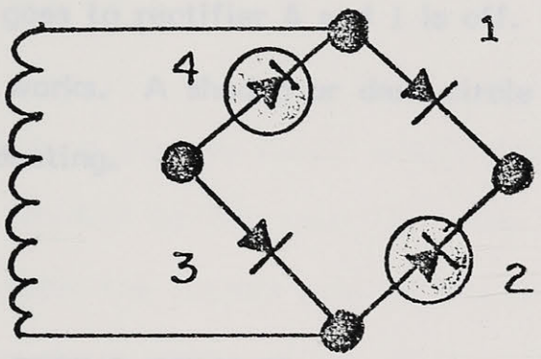
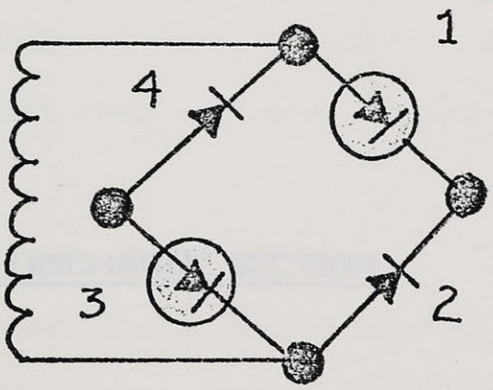


Figure 13 - a) Open Switch Analogy
b) Close Switch Analogy



a) Positive Half Cycle



b) Negative Half Cycle

Figure 14 - Bridge Rectifier Cycles

During the positive half cycle of input voltage, the current goes through rectifier 1, then to the SCR, comes back from the ground, 4 is off, goes to rectifier 3 and 2 is off. During the negative half cycle, it first goes through rectifier 2 than goes to SCR, comes back from the ground, 3 is off, goes to rectifier 4 and 1 is off. Figure 14 demonstrates how the retifier works. A shaded or dark circle indicates that a device is off or nonconducting.

2- OSCILLATOR FIRING CIRCUIT

A "timer" or a NE555 will send the charges to the SCR. The rate of charge is controlled by a potentiometer, thereby determining the rate of oscillation. The NE555 is connected according to the specification of the manufacturer.

3- HIGH-VOLTAGE DISCHARGE SECTION

The discharge section of the circuit consists of three components:

(1) a capacitor

(2) a silicon controlled rectifier (SCR), and

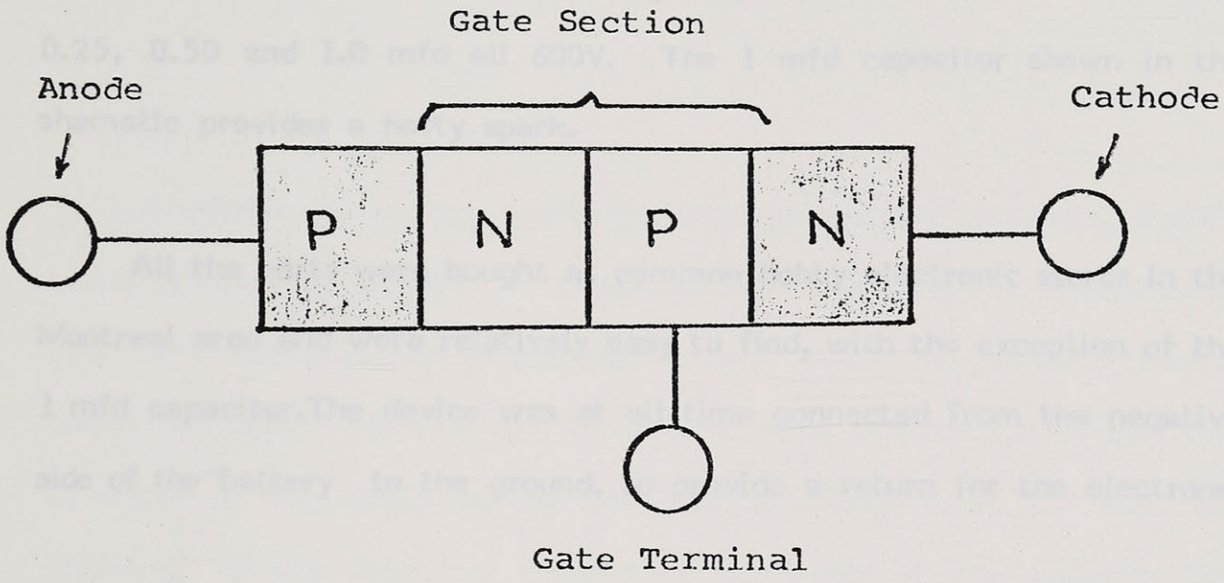
(3) an automobile ignition coil

From the inverter the current is divided into two separate paths, one of which is going to the silicon controlled rectifier. The SCR, or thyristor, is a four-layer, three-junction device, and is depicted in Figure 15 b).

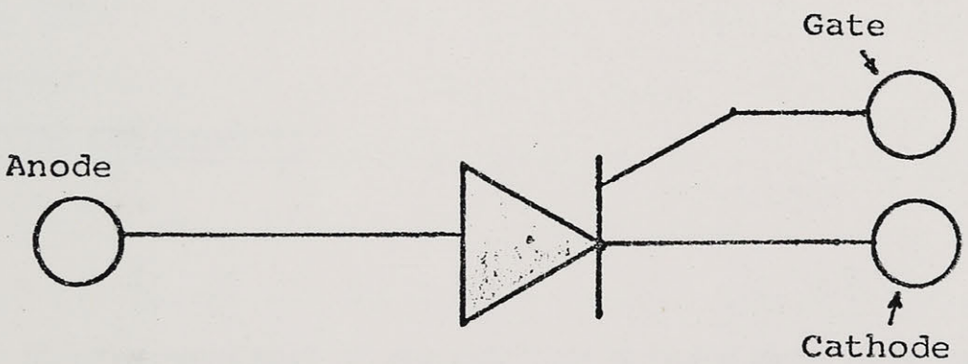
The SCR acts as a one-way switch which closes only when it receives a trigger pulse (applied to the gate G). The mechanism for starting conduction is to apply the current pulse at the gate-cathode circuit. The pulse neutralizes the blocking effect of the gate. The anode current increases markedly with a simultaneous reduction in the voltage drop across the SCR. Once conduction has started, the gate loses all control until the current has been reduced to approximately zero. (Fitzgerald et all, 1981).

The SCR provides a discharge path for the capacitor which was initially charged by the inverter circuit. The ignition coil is part of this path.

Essentially. a coil consists of two windings interlinked by a mutual magnetic field. One of the windings, the primary, is connected to the SCR. The mutual flux will link the other winding, the secondary, in which it will induce a high voltage. The ignition coil is therefore an elevator of voltage.



(a)



(b)

Figure 15 - Silicon-Controlled-Rectifier (SCR)
a) Representation
b) Circuit Symbol

The amplitude of the output can be adjusted with a rotary switch by changing the size of the discharge capacitor. In this case we have 0.25, 0.50 and 1.0 mfd all 600V. The 1 mfd capacitor shown in the shematic provides a hefty spark.

All the parts were bought at common hobby electronic stores in the Montreal area and were relatively easy to find, with the exception of the 1 mfd capacitor.The device was at all time connected from the negative side of the battery to the ground, to provide a return for the electrons.

III - EXPERIMENTING WITH THE KIRLIAN EFFECTS

According to previous work, the greatest problem encountered while using Kirlian photography for scientific experimentation is in controlling the variables that can affect the image. There are so many factors which can affect the resulting image that most scientists have said that it would be impossible to say with any reliability what the aura was showing. It was therefore decided to investigate all the variables that could affect the Kirlian image, and the influence they have on the final aura. The aim was to determine how easy it would be to keep them constant and achieve a repeatable result.

1) TYPE OF OBJECTS

Since a good part of our nutrition is based upon three major types of food, ie vegetables, meat and processed food, it was decided to experiment the Kirlian aura with those three different biological systems. Leaves will represent the vegetables, they are flat readely available, and in addition, results can be compared with the literature. Since meat is made of muscular tissue, an animal has to be used for those experiments. This animal had to be small enough to fit on a 4" by 5" film. The photographer was also restricted to a flat animal, since contact

photography was used. In addition, these animals had to be readily available for repetition of experiments and kept close to the darkroom without any storage problems. So it was decided to use worms. They were found in a pet shop at a low price. They are quite flat and easy to keep. For processed food, slices of salami were taken. Again they are flat and they were placed in the refrigerator between experiments.

2) PROCEDURE

All the photography was performed in a darkroom in a safelight condition , using a safelight filter No. 1A. All experiments were carried out at a temperature of 25-27 degrees Celsius. The object being photographed was placed in direct contact with the film emulsion and the electrical charge was sent through the copper electrode and film base onto the object. When the high-voltage current came into contact with the object, it was discharged as a luminous corona of various intensities. The radiation emitted was absorbed by the silver salts of the photographic emulsion and created a latent image.

Special care had to be taken to insure complete film flatness on the electrode, otherwise secondary ionization may occur in the trapped air pockets. Ionization is a term applied to molecules of air which carry a tiny amount of either positive or negative electricity. So these air pockets produced artificial color burst and had no correlation with the

object being photographed. A 4" by 5" piece of plexiglass, with a hole in the center to put the ground wire, was used to assure flatness. (See Figure 16 a, b and c).

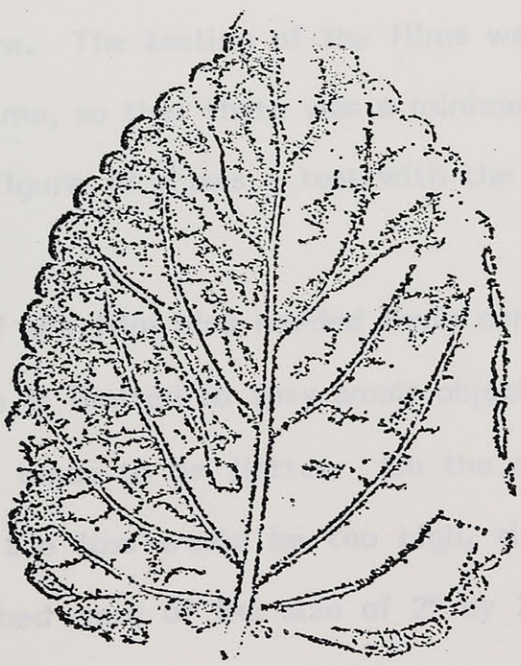
3) SAFETY MEASURES

The dangers attributed to the use of this type of photography seem to be based primarily on the fact that even low amperage can, under certain conditions, be hazardous. For this reason, it was decided to use only black-and-white film, since it permits the use of a red light. Color film, even if it shows some features which the black-and-white film does not render clearly, requires all operation to be performed in total darkness.

The computation of the Plank's equation (hv=eEle) suggests that shielding should be added around the device to protect the experimenter from X-ray dosage. But unfortunately that was omitted.

(a)

(b)



(c)

Figure 16 - Film Flatness

A) and B) Without Plexiglass

C) With Plexiglass

4) TESTING THE VARIABLES

A) Type of Emulsion

Two types of black-and-white emulsions were tested:

- Kodak Orthographic Type 3
- Agfa Gevaert Gevalith Ortho

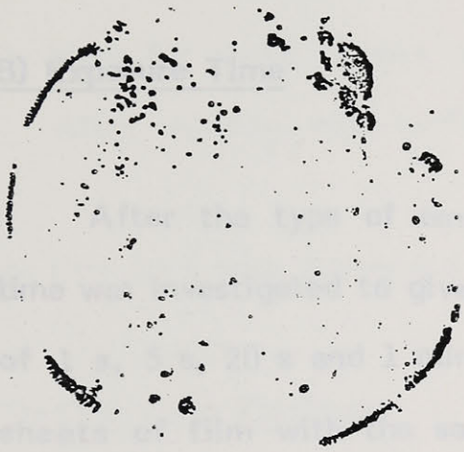
The results obtained are as one would expect. The higher the film speed, the shorter the exposure time that is needed to give an acceptable corona. In that sense the Kodak Ortho Type 3 was the best choice. It gave exposures of the order of 20 sec (for salami slices), and enabled one to work in fairly bright safelight conditions. The same subject was used in the testing of the films, and photography was carried out at the same room temperature. The testing of the films was accomplished within a short period of time, so that there was a minimum of change in the aura of the object. Figure 17 shows a test with the two emulsions.

The size of the film also needed some considerations. When using 35 mm film, one is limited to very small objects. Rolled film tends to curl, sheet film tends to be flatter. On the other hand if 16" by 20" film was used, the loss would be too high, since most of the objects being photographed were of the size of 2" by 2". In practice, the best compromise was a flat film of 4" by 5".

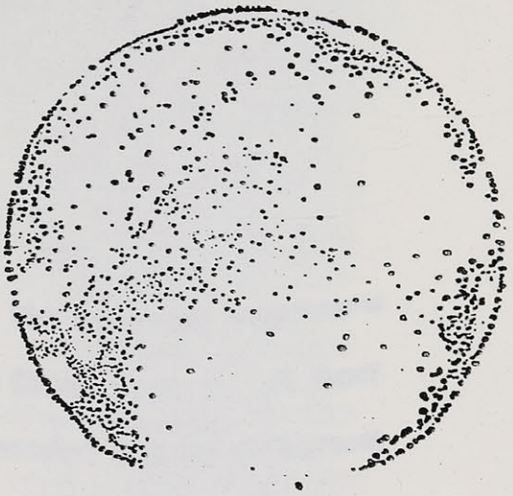
(a) (b)

Figure 17 - Type of Emulsion on a Coin

a) Kodak Ortho 3
b) A.G. Gevalith Ortho



(a)



(b)

(c)

(d)

Figure 18 - Exposure Time on a Slice of Salami

a) 1 sec.
b) 5 sec.
c) 20 sec.
d) 1 min.

B) Exposure Time

After the type of emulsion was finalized, the optimum exposure time was investigated to give an ideal result with Ortho type 3. A test of 1 s, 5 s, 20 s and 1 min exposure time was carried out on different sheets of film with the same object, keeping all other variables to a minimum. Figure 18 shows a 1 s, 5 s, 20 s and 1 min exposure test for a salami slice. Twenty seconds was the ideal exposure time using Ortho Type 3. Increasing the exposure gave an increasingly dense aura. It was absolutely essential to standardidize the exposure, otherwise very different auras would be obtained. For worms, the exposure was set at 5 s, and leaves at 10 s.

C) Processing

The processing of the results was carried out under strictly controlled conditions. The same procedure was used for all the tests. Batch processing was often performed to minimize variation of subject matter, owing to processing or other influencing factors.

1- Develop with Kodalith Super RT for 2 to 3 minutes (depending on how old the mixture is) with continuous agitation.

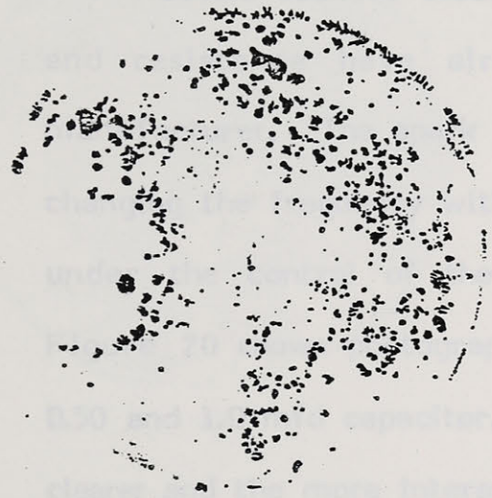
2- Fix with Kodak Fixer for 2 to 4 minutes (depending on how old the mixture is) and agitate frequently for 10 s every minute.

3- Wash for about 10 min in running water at 18-26 degrees Celsius. After washing, wipe surfaces carefully with a sponge.

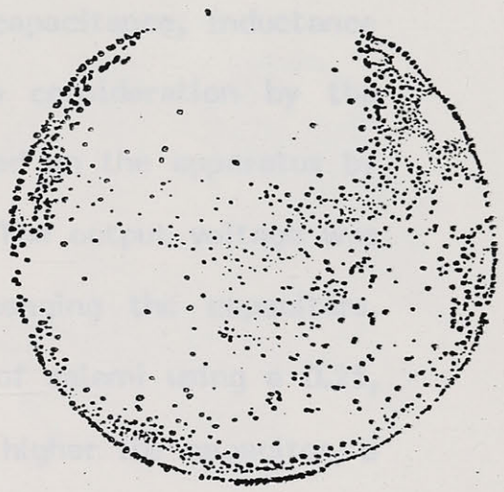
4- Dry on a rope suspended near the baths.

D) Dielectric Thickness

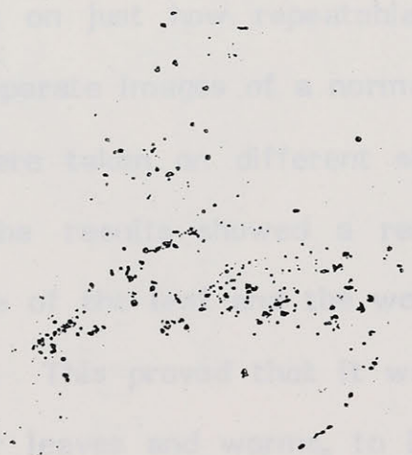
In Kirlian photography, film can be thought of as containing two important features. One is the emulsion recording the image, the other is the film substratum, which is acts as a dielectric. This is the spacer between the copper electrode and the photographic emulsion. (Dielectrics in physics are thought of as substances with electrons that are not tightly bound to the nucleus of the atom). Various theories are postulated with regard to the effect of the thickness of the dielectric, so it was decided to test this factor. A sheet of Ortho Type 3 film was used, and two spacers of varying thickness were placed between the subject and the film; and exposure was made with each spacer on different sheets of film. It was discovered that the thicker the spacer (dielectric) the weaker the image (Figure 19), hence the thin spacer gave an acceptable result, but an even better image was obtained when no spacer was used, ie using only the base of the film as a dielectric.



(a)



(b)



(c)

Figure 19 - Changing Dielectric Thickness

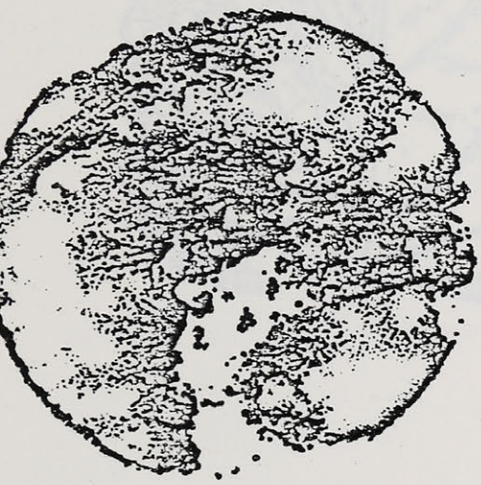
a) No Spacer
b) 1 Acetate
c) 2 Acetates

E) Electrical Parameters

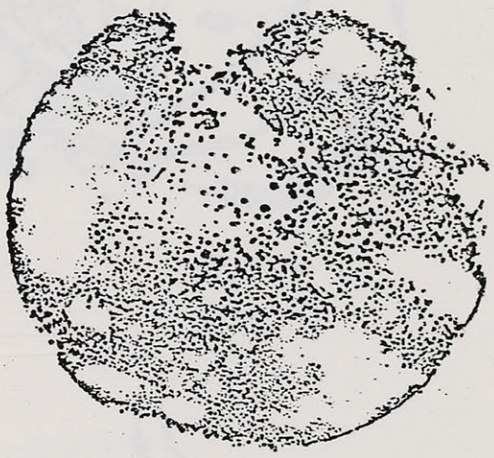
Factors such as electrical characteristics, capacitance, inductance and resistance have already been taken into consideration by the manufacturer. The spark is very easily controlled on the apparatus by changing the frequency with the potentiometer. The output voltage was under the control of the experiementer by changing the capacitors. Figure 20 shows photographs of the same slice of salami using a 0.25, 0.50 and 1.0 mfd capacitor. As one can see the higher the capacitor, a clearer and the more interesting photograph is obtained. Therefore, the 1.0 mfd, 600 V capacitor was used for all experiments.

F) Proof of Standardized Technique

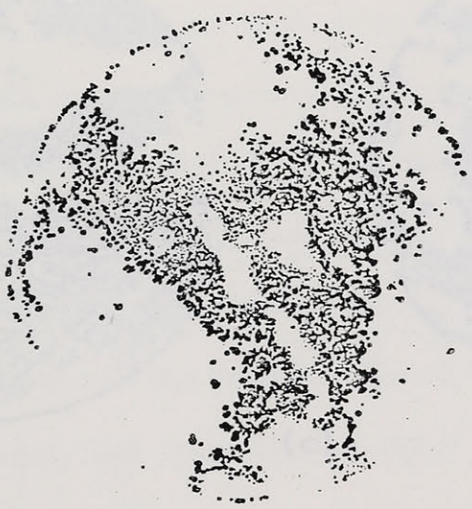
As an overall check on just how repeatable a result could be achieved, two completely separate images of a normal healthy subject in two separate occasions were taken on different sheets of film under identical conditions. The results showed a remarkable degree of standardization in the case of the leaf and the worm, but not for the salami slice. (Figure 21). This proved that it was possible, up to a certain point, at least for leaves and worms, to identify the physical variables, control them and get a close corona discharge from one photograph to the other.



(c)



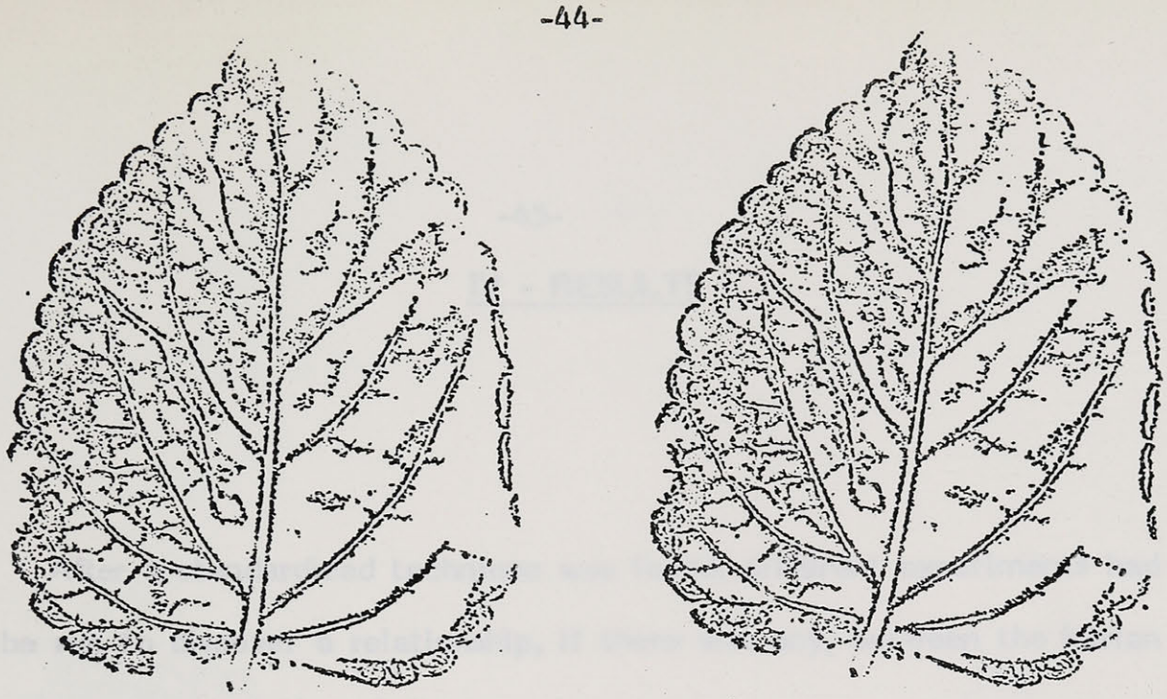
(b)



(a)

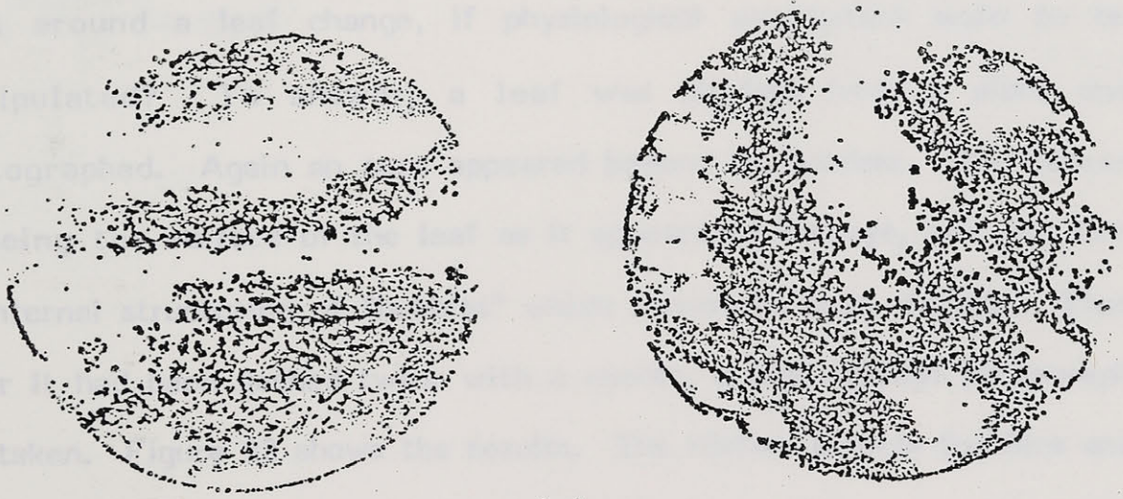
Figure 20 - Changing Capacitors

a) 0.25 mfd
b) 0.50 mfd
c) 1.00 mfd



(a)

(b)



(c)

Figure 21 - Standardization of Photographs

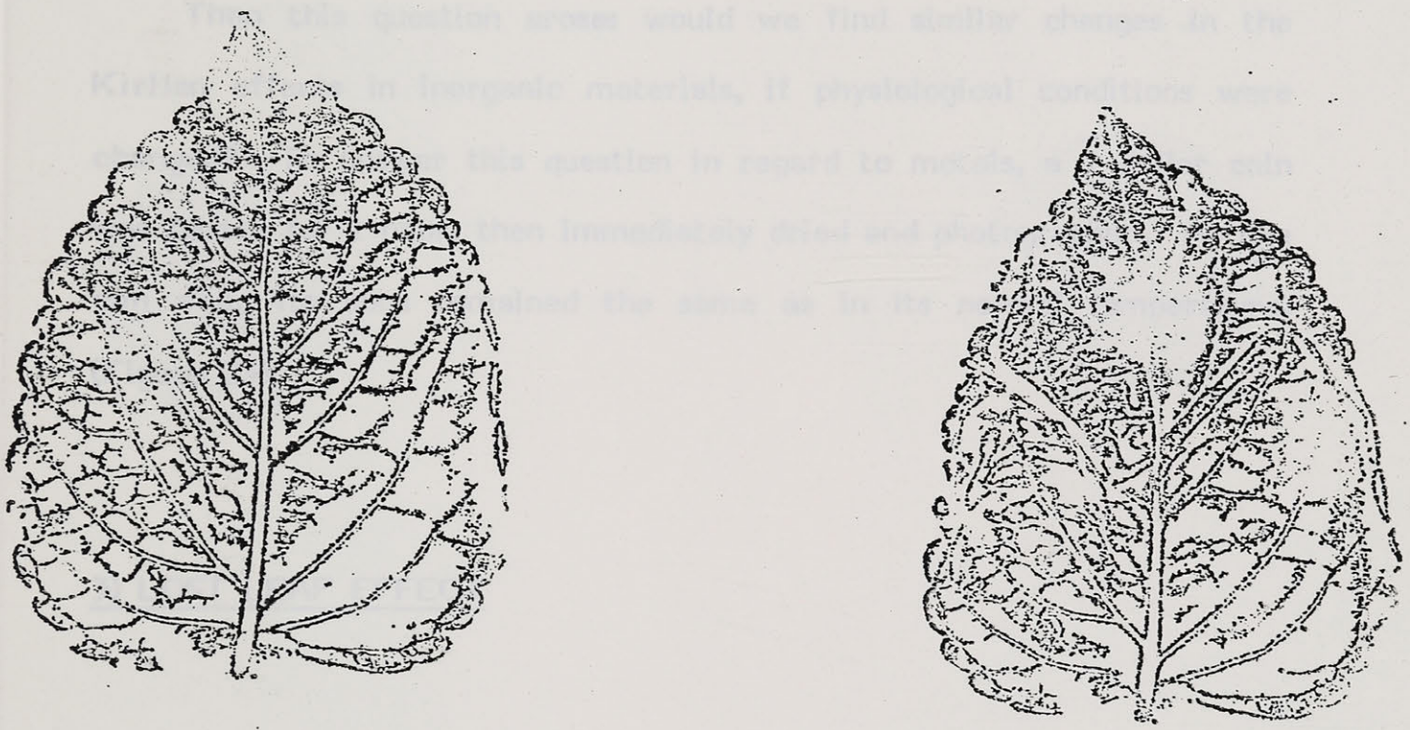
a) Leaves (10 sec)
b) Worms (5 sec)
c) Salami (20 sec)

IV - RESULTS

After a standardized technique was found, different experiments had to be run to discover a relationship, if there was any, between the Kirlan effects and the quality of food.

1) ENVIRONMENTAL FACTORS ON ORGANIC MATERIALS

The attention was first directed to the vegetable world. Would the aura around a leaf change, if physiological parameters were to be manipulated? To answer, a leaf was plucked from a plant and photographed. Again an aura appeared beyond its borders. But instead of seing the surface of the leaf as it appears to the eye, one can find an internal structuring of "bubbles" which cannot be seen visually. Then after it had been gashed twice with a needle, a high-voltage photograph was taken. Figure 22 shows the results. The Kirlian effects (bubbles and aura) are still present, but instead, two holes of about 1 cm diameter emerged from where the leaf was gashed. It was, therefore, learned that plants respond dramatically to mutilation.



(a) (b)

Figure 22 - Environmental Factors on a Leaf

a) Intact Leaf
b) Gashed Leaf

2) ENVIRONMENTAL FACTORS ON INORGANIC OBJECTS

Then this question arose: would we find similar changes in the Kirlian effects in inorganic materials, if physiological conditions were changed? To answer this question in regard to metals, a 1 dollar coin was frozen for 1 hour, then immediately dried and photographed. As one can see, its aura remained the same as in its normal temperature. (Figure 23)

3) LOST LEAF EFFECT

Soviet researchers in Kirlian photography reported the "lost leaf" or "phantom leaf" effect as represented in Figure 24, but this finding has not been duplicated in North America so far.

This effect occurs when 2 to 10% of a leaf is removed, and the Kirlian photograph still reveals the original pattern of the leaf. The experimenter tried to duplicate these results, but so far, has not had any success (see Figure 25).

(a)

(b)

Figure 23 - Environmental Factors on a Coin

a) Normal State
b) Stress State

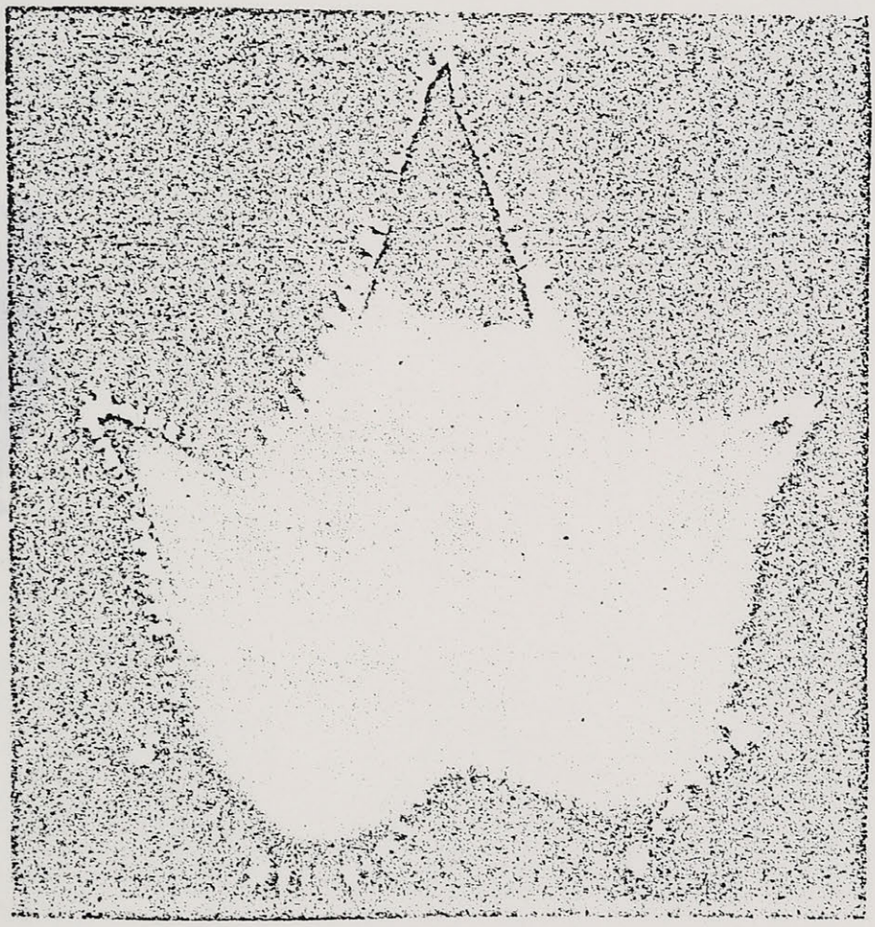


Figure 24 - Phamtom Leaf by H.G. Andrade

Figure 25 - Trial on the Lost Leaf Effect

0 hour

1 hour

24 hours

Figure 26 - Dying off Effect on Leaf

0 hour

1 hour

24 hours

Figure 27 - Dying off Effect on Worms

0 hour

1 hour

24 hours

Figure 28 - Dying off Effect on Salami Slices

4) DYING OFF EFFECT

During initial experiments, it has been noticed that the luminescence of the same subject, in contact with high-voltage, was diminishing from one photograph to the other. This dying off effect was associated to the fact that food is loosing its quality in terms of biological value, appearance (color) or taste, with time. Therefore, high voltage photographs were taken for three specimens. In all three cases, a dying off effect occured. (see Figure 26).

5) TRANSFER OF ENERGY

These experiments were performed by putting a healthy or fresh subject (marked "X" on all Figures) on one side of the film, and another subject that was dying off, just beside the fresh subject, without touching it, on the same piece of film.

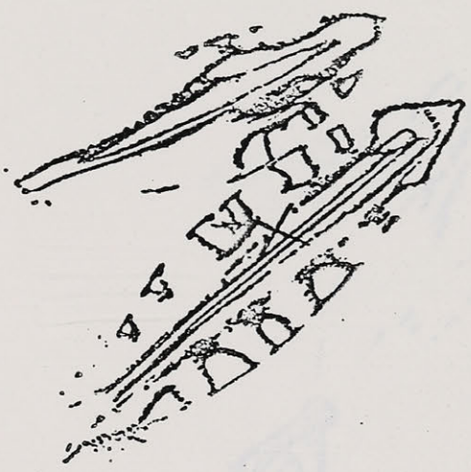
In the case of the leaves, they were first put side by side in a longitudinal direction at a distance of 2 mm apart (Figure 27a). But nothing occured, so the leaves were brought closer (Figure 27b). In that case the dying leaf was a little more illuminated but not enough to interpret it as a transfer of energy.

Since the aura was more relevant at the tip of the leaves, it was decided to put them tip to tip. First at a distance of 2 mm apart nothing occured (Figure 28a). Then at a closer distance, but without touching each other, a real transfer of energy occured but in the inverse direction of what was mentioned by Milner and Smart (1972). The freshly picked leaf seemed to absorb all the energy of the dying leaf (Figure 28b). This phenomenon remains unexplained to the author.

This experience was repeated for worms. In Figure 29a, the two worms were placed at a distance of around 1mm. At this distance nothing happened. Figure 29b shows the same two worms closer, but in that case a repulsion phenomenon seemed to occur; reaffirming what Moss (1974) said about the exclusion principle. When the two worms touch each other the exclusion principle does not apply anymore.

Then the same procedure was followed for the salami slices. Figure 30 shows a 20 s exposure for the two subjects. As one can see, it doest't reveal any transfer or repulsion. Therefore, a 60 s exposure was done to increase the effect and again nothing can be said.

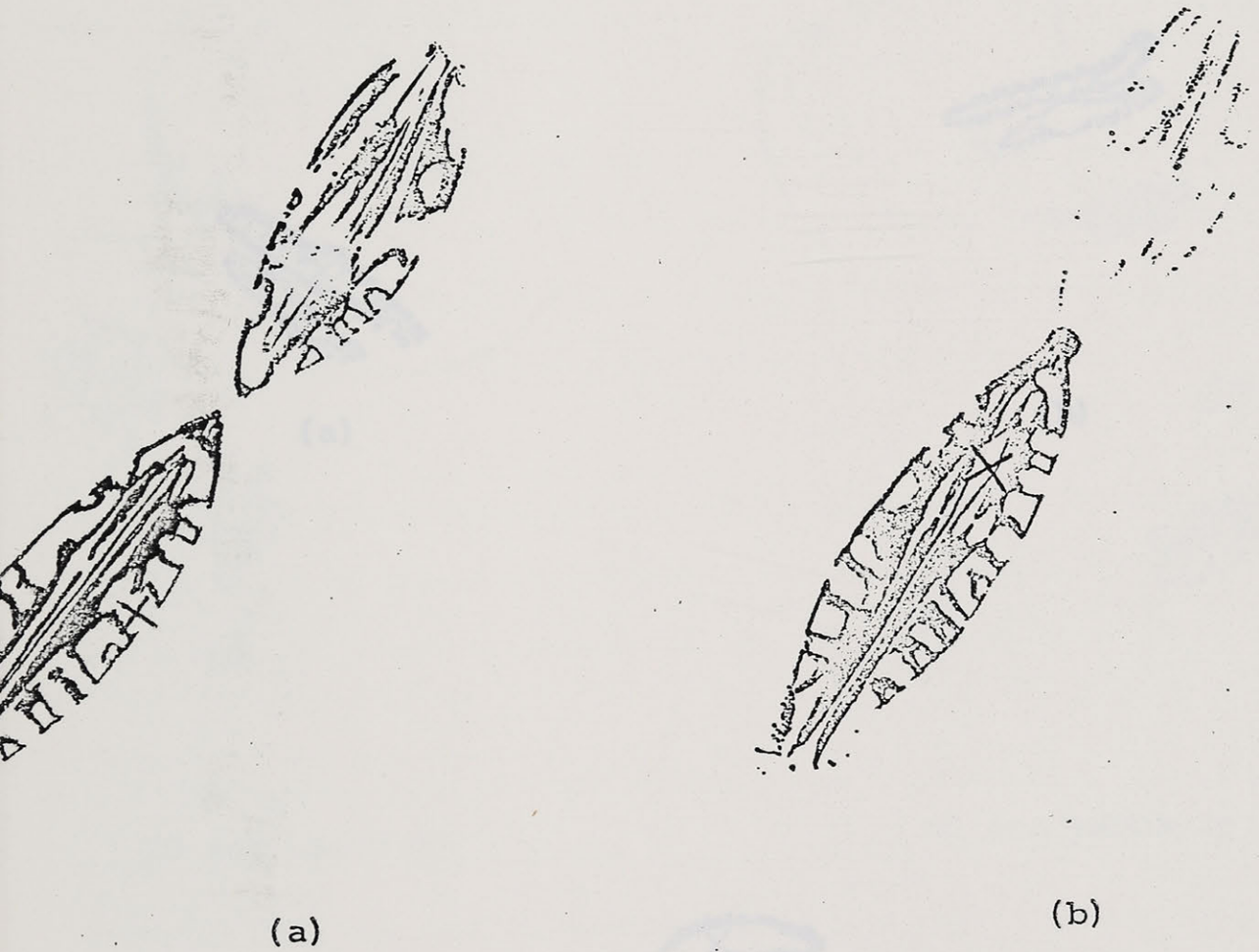
(a)



(b)

Figure 29 - Transfer of Energy on Leaves, Case I

a) At 2 mm apart
b) Closer

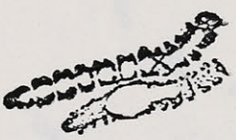


(a) (b)

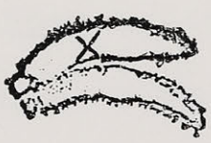
Figure 30 - Transfer of Energy on Leaves, Case II

a) At 2 mm apart
b) Closer

(a)



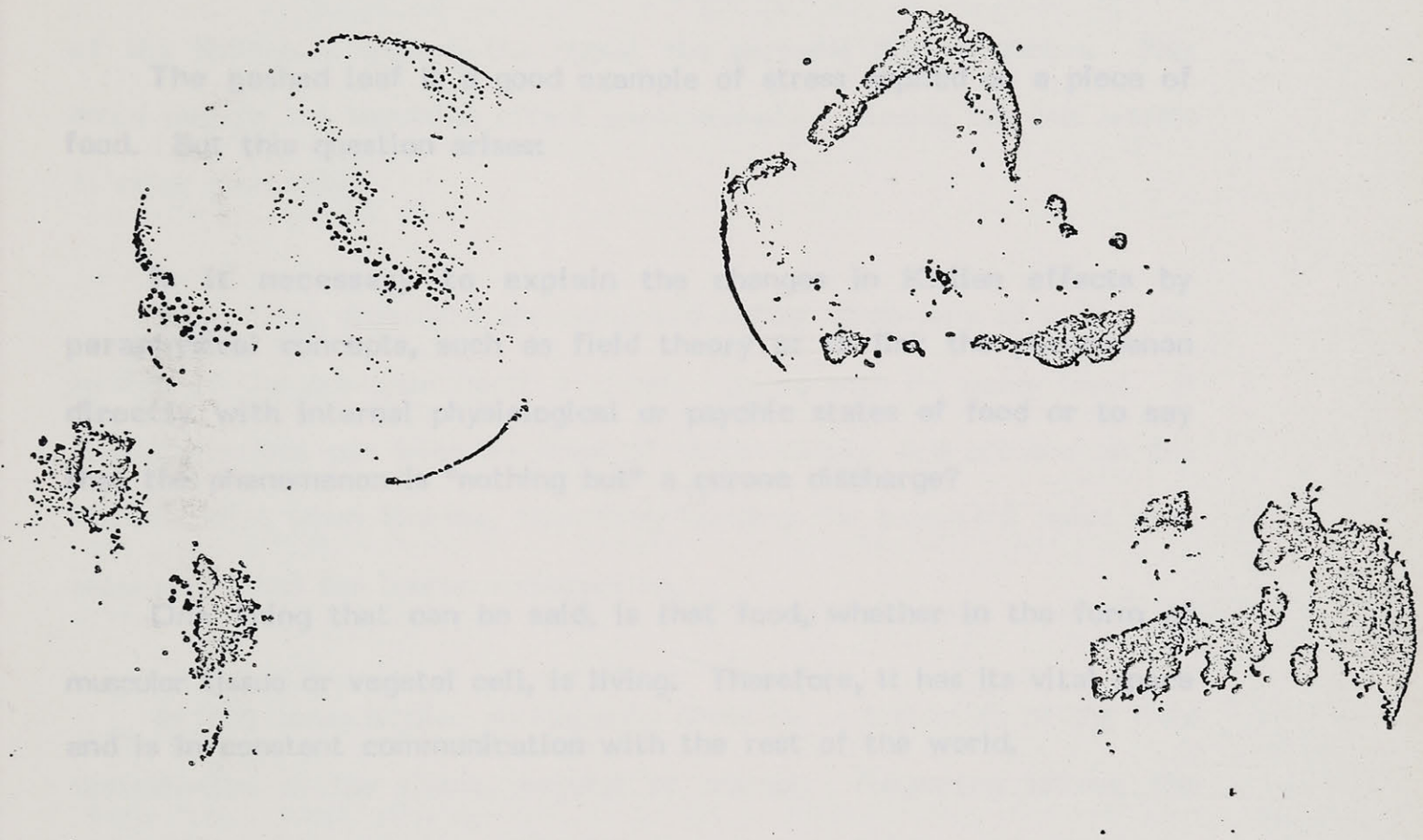
(b)



(c)

Figure 31 - Repulsion Effect on Worms

a) At 1 mm apart
b) Closer
c) Touching



20 sec exposure

60 sec exposure

Figure 32 - Repulsion Effect or Transfer of Energy on Salami Slices

V - DISCUSSION

The gashed leaf is a good example of stress applied on a piece of food. But this question arises:

Is it necessary to explain the changes in Kirlian effects by paraphysical concepts, such as field theory or to link the phenomenon directly with internal physiological or psychic states of food or to say that the phenomenon is "nothing but" a corona discharge?

One thing that can be said, is that food, whether in the form of muscular tissue or vegetal cell, is living. Therefore, it has its vital space and is in constant communication with the rest of the world.

The worms showed the most intensive aura and the salami slices the least intense. They are also fairly complexly organized biological systems. The fact that the sensitivity to high-voltage is greater in the worms, may attest organization as one of the basic principles of life.

In the field theory the aura represents the psychological environment. This boundary is permeable to allow the entrance of information. In the dying off effect, this boundary was diminishing for the three specimens. This phenomenon may be the result of the disruption of the organism's equilibrium. The boundary breaks down and

more of an influence is exerted by external forces.

Intraorganism connections may have been the reason for the changes noted when two specimens were put together. The higher the complexity of the biological system, the higher the personal differentiation. This could explain the repulsion effect encountered by placing the two worms in close proximity.

Since living organisms are composed almost essentially of water, the survival of the organism itself is closely related with its water level. A living organism can keep its level of carbohydrates and proteins at the highest point when healthy, therefore, keeping the biological value at a maximum level for human consumption.

In that sense Kirlian photography could be an indication of the fluid distribution in the tissue, vegetal or animal. Regarding leaves, the distribution of fluids and their density may reveal not only a particular phase of photosynthesis, but also the efficiency of the photosynthetic process insofar as the production of carbohydrates is concerned, and in the mean time revealing the biological value of that leaf.

Regarding worms, since more advanced in terms of organization, variation in the distribution of fluids could reveal the state of health and perhaps the emotional state of the worm. The presence or absence of anxiety can change the fluid balance of the worm's body.

Kirlian photographs may generate, in that sense, a great deal of interest regarding food quality assessment. Therefore, it is possible to link emotional parameters to a more physical explanation. Will it then be possible to completely abandon the idea of a paraphysical theory?

Dehydration of food assumes transport and deposition of moisture. The moisture of food specimens is evacuated to the surrounding air during the high-voltage charge. Then it can be said that, a stream of electrons produced by the the high-voltage on the copper electrode bombarded the water ions with a high enough velocity to cause photon emission from their atoms. It is this photon emission which causes the silver atoms in the photographic emulsion to darken. A variation of the angle of incidence with the living object of the illuminating light could be the reason for changes in the aura observed. The transport and deposition of materials in corona discharge is not restricted to water. Free electrolytes could also be the cause of a cold electron emission.(see Figure 31).

Although this theory has not been proved by the author during the course of this project, it could be the explanation of the various results obtained, while trying to find a relationship between the Kirlian effects and the quality of food. For example free electrolytes in the form of grease, in the case of the salami slices, could explain the difficulty the experimenter had in trying to repeat the results. Or during the dying off effect, less moisture was evacuated with time by the piece of food.

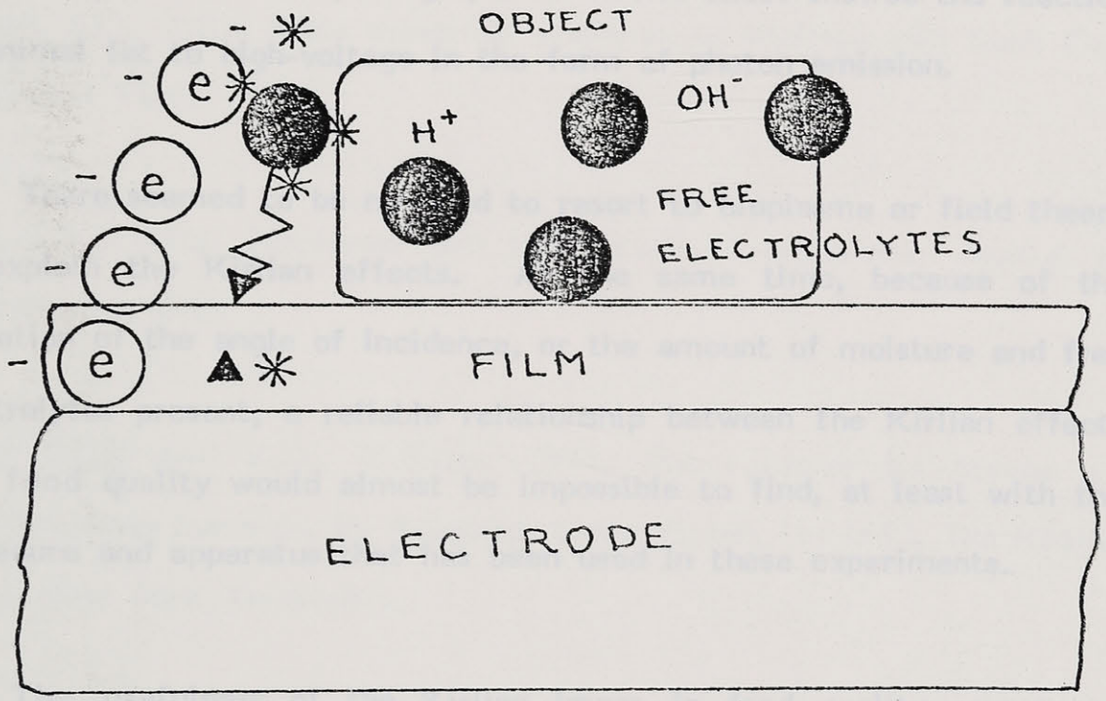


Figure 33 - Corona Discharge

CONCLUSION

Finally, it can be said that leaves and worms showed a repeatable aura because of constant but downwards moisture emanation from their body. Whereas Kirlian photographs of salami slices showed the reaction of animal fat to high-voltage in the form of photon emission.

There seemed to be no need to resort to bioplasma or field theory to explain the Kirlian effects. At the same time, because of the variation of the angle of incidence, or the amount of moisture and free electrolytes present, a reliable relationship between the Kirlian effects and food quality would almost be impossible to find, at least with the procedure and apparatus that has been used in these experiments.

The usefulness of the Kirlian image in food quality assessment remains to be seen until further investigation is carried out into transport and deposition of water and free electrolytes.

REFERENCES

Ebrahim, H., and R., Williams, 1982, Kirlian photography - an appraisal, Journal of Audio Media in Medecine, 5: 84-91.

Fitzgerald, A.E., 1981, Basic electrical engineering, McGraw-Hill Book Co., Inc., New York.

Inyushin, V.M., 1970, Bioplasma and interaction of organisms, Journal of Paraphysics, 3-50.

Kirlian, S.D., and V.K., Kirlian, 1974, Photography by means of high-frequency currents, In: Krippner, S. and Rubin, D., (ed.), The Kirlian Aura, New York, Doubleday.

Krippner, S., and S.A., Drucker, 1974, Field theory and Kirlian photography: an old map for a new territory, In: Krippner, S. and Rubin, D., (ed.), The Kirlian Aura, New York, Doubleday.

Milner, D.R., and E.F., Smart, 1974, There are more things, In: Krippner, S. and Rubin, D., (ed.), The Kirlian Aura, New York, Doubleday.

Monteith, H.C., 1974, Private communication, In: Krippner, S. and Rubin, D., (ed.), The Kirlian Aura, New York, Doubleday.

Moss, T., and K., Johnson, 1974, Bioplasma or corona discharge?, In: Krippner, S. and Rubin, D., (ed.), The Kirlian Aura, New York, Doubleday.

Opalinski, J., 1979, Kirlian-type images and the transport of thin-film materials in high-voltage corona discharges, Journal of Applied Physics, 50(1).

Tiller, W.A., 1974, Some energy field observations of man and nature, In: Krippner, S. and Rubin, S., (ed.), The KItlian Aura, New York, Doubleday.

Toth, M., 1974, Historical notes relating to Kirlain photography, In: Krippner, S. and Rubin, D., (ed.), The Kirlian Aura, New York, Doubleday.