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no mesmeric or magnetic science of healing, any more than there exists a medical science: the one true science is spiritual."[16]

Thus did Quimby leave mesmerism and magnetism. He was to go on healing, but he was to do it with a new science, a science that was anathema to physicians, the same physicians he now regarded as deceivers and whom he was determined to expose. "There is a wisdom," he said, "that has never been reduced to language. The science of curing disease has never been described by language, but the error that makes disease is in the mouth of every child. The remedies are also described but the remedies are worse than the disease, for instead of lessening the evil, they have increased it."[17]

This was the remarkable figure who might have been forgotten along with the other mesmerists of the nineteenth century if it had not been for his most famous patient, who became one of his greatest admirers for a period, was awed by his powers, and then went on to found the Christian Science Church.

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REVIEW OF THE POSSIBLE PHYSIOLOGICAL CAUSES OF DOWSING

Solco W. Tromp

I. INTRODUCTION

In the field of the paranormal, there is probably hardly a topic that created so many emotional and controversial reports as the *dowsing rod* (known as *Wünschelrute* in Germany, and as *baguette divinatoire* in French-speaking countries). In its original form, the dowsing rod was but a forked wooden twig. The dowser, walking over a piece of land with such a forked twig in his hands, experiences at certain places a contraction of his forearm muscles, which forces the forked twig to turn either upwards or downwards.

Since the first published description appeared in 1556 in Georgius Agricola's *De re metallica,* more than 700 papers have been written on this topic. (In 1949, I compiled a list of the major publications in my book, *Psychical Physics.*)[8] In fact, it is doubtful whether as much investigation and discussion have been bestowed on any other subject with such a lack of positive evidence for the reality of the observed fact.

One of the major reasons for this situation is that most studies were carried out by non-scientists who exaggerated their claims. Their critics were very happy to check these claims, which, if not confirmed, they declared false. However, it is evident that this is a very unscientific attitude. If someone with an extremely sensitive sense of smell makes an exaggerated claim of pretending to be able to recognize an object several hundred meters away by simply analyzing its smell, it would be ridiculous to deny his great sensitivity of smell simply because his claim is incorrect. Critics of the dowsing phenomenon are only too happy to refute such fantasies but do not extend their thinking to include the possible existence of a non-discovered physiological sensitivity, even though it may have no practical application, such as finding water, etc. It is mainly due to this attitude, expressed in reports by the United States Geological Survey, the French, and the Netherlands Academy of Sciences, etc., that little scientific progress has been made since the first rod was used at least 7000 years ago. This apodictic denial of the possible existence of an unknown physiological sense organ by important scientific institutions and the fact that so many charlatans are interested in the subject create a great reluctance on the part of the scientist to enter this field of research. Also, research funds cannot be obtained, and therefore all studies can only be done as a hobby and not as serious, well-planned research projects. Despite these difficulties, the author entered this field of study as a hobby in 1943, after observing many dowsers in the course of his geological career.

One of the reasons for my firm belief that dowsing is a reality is based on the fact that in both all the old civilizations[4] and in recent times (e.g., in Western Europe, Scandinavia, and the United States), hundreds of people claim to have experienced a dowsing reaction as soon as they pass over a geophysical or geological discontinuity below the surface of the earth. Of course, it is still possible that these thousands of observations are based only on imagination; however, the evidence seems strong enough to warrant a scientific study of the possible reality of this worldwide phenomenon. The topic of dowsing came to the limelight in recent months, because United States soldiers have been using it to discover tunnels dug in South Vietnam around Khe Sanh by the North Vietnamese soldiers.

Since 1945, I have studied intermittently the possible physiological mechanisms involved in the dowsing reaction. It can be easily shown that the turning of the rod is not due to a strong external force, but is entirely caused by muscular movements in the hand, induced by cortical stimuli in our brains. The principal difficulty in accepting the phenomena as a reality is the problem of demonstrating beyond doubt that these muscular contractions are involuntary and not voluntary stimuli of our brain's motoric center.

II. TYPE AND SHAPE OF DOWSING RODS

SINCE THE FIRST DIVINING RODS were described by Agricola (1556) and Valentine (1651), a great number of different rods have been used which consist either of non-conducting materials (whale baleen, oxhorn, ivory, wood, etc.) or of conducting material (copper, wire, steel springs, etc.). The oldest and most commonly used material is wood, and as a rule, twigs are used either from the peach, willow, hazel, or witchhazel. The shape of the divining rod is either forked or looped, in the latter case usually a wire or spring is used. The loopshaped rod does not turn upwards and downwards but from left to right or vice versa. All these methods belong to the category of so-called *rhabdomantic phenomena* (rhabdos = rod, manteia = divination).

Apart from forked and loopshaped rods, a pendulum attached to a chain 10-20 cm. in length is also used, the chain being held usually between the thumb and forefinger, the hand and forearm holding the chain about 30-40 cm. in front of the body. The dowser walks with the chain and pendulum, which are kept from swinging or are swung in a plane perpendicular to the body at the beginning of the experiment. In either case the dowser experiences a deviation of the pendulum from the perpendicular plane at certain places; the pendulum may even start to rotate. The pendulum has been made of metal, ivory, wood, etc., while the chain sometimes is a single rope or a thin wire. The study of these phenomena is called *radiesthesia* (because many dowsers claim that the phenomena are due to an unknown radiation) or *pallomancy* (pallo = to pendle, manteia = divination).

Most scientifically trained dowsers agree that neither the shape of the dowsing rod nor its material is of fundamental importance. The same is true for the material and weight of the pendulum and the material, and length of the wire or chain holding it. However, each of these factors affect the speed and intensity of a dowsing reaction, as any non-dowser would find by purposely turning the rod or swinging the pendulum. Material which does not have a great elasticity causes the rod to turn more slowly and with more difficulty. The pendulum will react considerably faster than any dowsing rod, and a short chain with a heavy pendulum will deviate more easily than one with a long chain or wire. In other words, although in any scientific dowsing experiment for psychological reasons the dowser should be as free as possible to follow his own method, we should be constantly aware that a comparison of the results of different people using different methods, or even of the same person changing his method all the time, is impossible if we expect perfect coincidence of the dowsing spots or of the zones (i.e., spots or zones in the field where the dowser experiences the above mentioned turnings of the rod or deviations of the pendulum). The expectation of a perfect coincidence between dowsing zones determined by different dowsers is comparable to the illusion of a physicist who wants to measure the same electric current with a number of ampere meters of different sensitivity, and expects at the same moment the same scale readings on all his meters.

III. EXPERIMENTS ON THE POSSIBLE GEOPHYSICAL CAUSES OF THE DOWSING REACTION

BETWEEN 1946 AND 1950, in order to study the possible reality of dowsing phenomena, I carried out two types of basic experiments. These were planned in such a manner that they could assist in clarifying the physiological mechanism of the dowsing-reflex and at the same time explain the main failures if a number of dowsers were tested in the same area. This last point in particular is very important, because various research workers in the Netherlands, Switzerland, and Germany tested a number of dowsers in the same area or the same house, and found considerable differences in the location of dowsing zones, which discouraged the researchers, leading them to conclude that dowsing was due only to autosuggestion.

I hope to be able to demonstrate that such deviations in locality of dowsing zones are quite normal and in accordance with the normal physiological differences between men; but at the same time there is ample evidence that the dowsers experience a similar muscular stimulation at the same locality. However, only variations in reaction speed and differences in interpretation of the experienced stimulation are responsible for the observed differences.

Two main types of basic experiments were carried out in the past which seem to support this statement:

A. MAGNETIC EXPERIMENTS:

(1) using artificial magnetic fields (created by a ring-shaped tangent galvanometer);
(2) using local disturbances in the earth's magnetic field (indicated by an ordinary compass or magnetometer); the experiments were carried out in houses or in the open field.

B. CARDIOGRAPHIC EXPERIMENTS:

(1) measuring variations in electric skin potentials of dowsers, either by walking through dowsing zones or along human beings, with long wires attached to an Einthoven cardiograph and to the forearms of the dowser;
(2) indicating the existence of dowsing zones coinciding with concentrated electromagnetic low-frequency alternating fields in modern buildings (as a result of buried conductors), forearms of dowsers being connected with a cathode ray type of cardiograph (Elmquist cardiograph).

A (1) EXPERIMENTS USING ARTIFICIAL MAGNETIC FIELDS:

Experiments in Leiden in 1946, using artificial constant magnetic fields developed by a tangent galvanometer with a ring of 1 meter diameter and one single electric coil—creating by an electric current of 10 amps. a field strength of 0.125 gauss in the center and of 0.001 gauss at a distance of 230 cm. from the ring—have shown that changes in magnetic field strength could be registered by a blindfolded dowser holding a loopshaped rod in front of the ring. The variations in magnetic field strength were obtained either by movement of the dowser from a point outside the field into the field, by changing suddenly the angle of the ring of the tangent galvanometer (the dowser standing quietly in front of the ring), switching the current on and off, or by changing the direction of the current. In all these experiments neither the dowser nor the person who registered the dowsers' reactions knew whether the current was on or off; the contacts were completely noiseless, and the handling of the switch by a third person could not be seen, although all three persons were in the same room. As a special precaution, thick cotton wool was placed in the ears of the dowser. It was found that many dowsers, but not all of them, were able to register these changes in the magnetic field. They were not able to register the actual field strength but only changes therein. In other words, a difference between a field created by a 5 or 10 amp. current could not be distinguished, but a sudden change from one field into another could be.

The sensitivity to a changing magnetic field seems to have a certain threshold. Usually, if the electric current in the tangent galvanometer was less than 1 amp., the changes in field strength could no longer be registered by our subjects. The experiments showed that magnetic gradients of less than 0.001 gauss/cm. can be registered by sensitive dowsers.

The experiments are fully described in *Psychical Physics*[3] and in the Dutch Journal *Tijdschrift voor Parapsychologie*.[6]

A (2) EXPERIMENTS USING LOCAL DISTURBANCES IN THE EARTH'S MAGNETIC FIELD:

Two types of experiments were carried out: in houses and in the open field.

a) *Experiments in houses:*

In most houses, particularly modern ones, often narrow dowsing zones are located by dowsers which seem to be related to water pipes, central heating pipes, reinforced concrete beams, etc., below the floor. It was found that considerable deviation of the magnetic needle of an ordinary geological compass could be observed above those places previously indicated by dowsers. Deviations of up to 30 degrees are not uncommon in houses. As those dowsing zones could be found by dowsers before any magnetic measurement was done, any possibility of autosuggestion can be excluded.*

The deviation of the needle generally decreases rapidly at a certain distance above the floor: e.g., in the case of a 30 degree deviation (recorded on the floor) caused by an iron beam in a house, the deviation was only 15 degrees at a distance of about 30 cm. above the floor. At the arm-level of a person holding a dowsing rod, the needle no longer deviates.

A great number of such experiments have been carried out in which the dowser, walking along a straight line, first indicated the dowsing zones (the corridor or room in which the experiment takes place must be without any surface pipes). A magnetic survey was made afterwards along the same line with an ordinary compass (see Fig. 1). The pipes were found only if the dowser was standing with a pendulum exactly above the zones of magnetic disturbance.[7]

* Also telepathy or clairvoyance can be excluded, since the dowser could locate the dowsing zone only by walking through the zone with a pendulum. If he stood even a few meters away he could not predict its location.

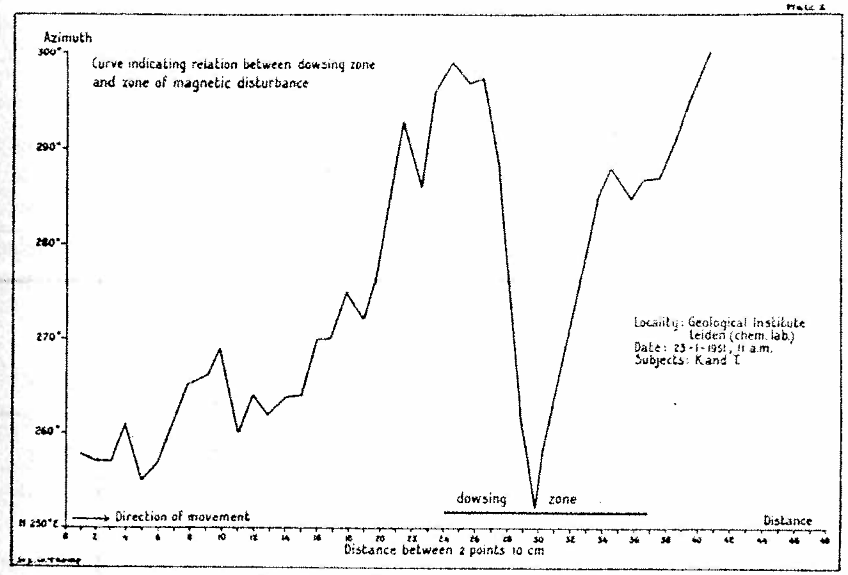

Fig. 1: Changes in azimuth of the compass needle, along a straight line of about 5 meters, in relation to a predetermined dowsing zone, which coincides with the drastic change in azimuth created by a pipe below the floor of the room.

b) *Experiments in the field:*

During geophysical work in Turkey in 1942, the author noticed a relationship between dowsing zones and zones of strong local disturbances of the earth's magnetic field. However, the first systematic studies in this field were undertaken by Dr. J. Wüst and Dr. H. Petschke in Germany. Their studies indicate that in Germany in the open field, dowsing zones usually coincide with local disturbances in the earth's magnetic field, as measured with magnetometers. Although in a number of experiments these correlations could not be confirmed, the positive results seem to be statistically significant.

In Holland in the open country with a flat sedimentary soil, the variations in the magnetic field are negligible (only 1 or 2 gammas). The observation that in the meadow country of Holland many dowsing zones occur, despite the fact that strong magnetic variations in the soil are absent, suggests that the dowsing effect may be due to another cause and that the correlations with magnetic phenomena, as observed in mountainous areas, is only a secondary accompanying feature.

B (1) CARDIOGRAPHIC EXPERIMENTS WITH AN EINTHOVEN STRING GALVANOMETER:

These experiments were carried out in order to register, with a kind of millivolt meter, the changes in skin potential of a moving dowser. The original cardiograph, invented by the Nobel prize winner Professor Einthoven in Leiden, proved to be extremely useful for this purpose, as it is not easily disturbed by external electromagnetic fields. In the experiment only Lead I (i.e., both pulses connected with the instrument) was used. It was found that a loopshaped flexible metal rod would not turn in the hands of a dowser (at least not in our subjects) if the rod endings were placed in two insulated grips in which they could turn freely. By using a special circuit (see *Psychical Physics,* Fig. 100), a current is made through the body, the rod enabling us to register fluctuations of skin potential while the dowser moves through a dowsing zone.

In order to be certain that this new circuit did not change the electrocardiogram, four basic experiments were made: a) sitting quietly in a chair without a rod; b) same experiment holding a rod in insulated grips; c) standing quietly outside the dowsing zone with a rod in insulated grips; d) walking with a rod in insulated grips outside a dowsing zone.

From these experiments it was evident that the new circuit did not change the electrocardiogram; neither standing nor slow walking changed either the level of the Q-peaks or the frequency of the electrocardiogram (see Figs. 2 and 3). Additional experiments showed that not only does slow walking not influence the electrocardiogram, even driving in a car has no effect on the string galvanometer, as long as the dowser in the car does not pass dowsing zones crossing the road.

After these observations were sufficiently established, the skin potentials and electrocardiograms were studied with the dowser moving through a strong zone. The electrocardiograms show considerable excursions of the general curve (not in the Q-peak frequency) as

Fig. 2: Ordinary electrocardiogram (recorded with an Einthoven string galvanometer) of a dowser with both electrodes attached to left and right hand pulses respectively. Male subject sits quietly in a chair, both arms at ease.

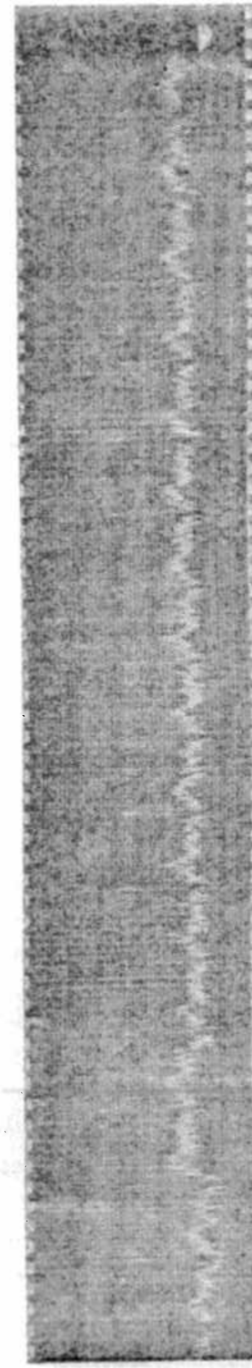

Fig. 3: Electrocardiogram of same subject as in Fig. 2, but subject holds a steel divining rod in two loose insulated grips. A current is made through the body, the metal rod and the string galvanometer. The Piper rhythm is superimposed on the ECG curve. This rhythm is due to the contraction of the arm muscles holding the rod.

soon as the dowser enters the zone, and becomes normal again after the dowser leaves the zone (see Figs. 4 and 5).

Similar phenomena were observed with people not sensitive to dowsing, except that the subsidence of the curve is less pronounced and slower.

During all the experiments the instrumental recordings were carried out by Mr. M. J. de Groot (former assistant of Professor Einthoven and technical constructor of the Einthoven string galvanometer) in order to be certain that the observed deviations in the electrocardiograms were not due to instrumental errors. After about 500 experiments the results were laid down in 130 electrocardiograms. A complete description of these experiments, carried out in a laboratory at Leiden, was published in my book, *Psychical Physics*.[8]

The dowsing zone, caused by a large reinforced concrete beam in the cellar below the floor of the experiment room, showed up also in a magnetic survey. A compass moved along a line perpendicular to the dowsing zone showed on the floor differences in azimuth of 7 degrees in and out of the zone. Similar diagrams with sudden deviations were obtained by driving in a car along the Hague-Amsterdam Highway.

A careful study of the various electrocardiograms clearly indicated that the excursions of the cardiographic curve are *not* due to *psycho-galvanic reflexes.*

It was found that if a dowser moved his hands above a person lying on a settee, interesting diagrams were obtained, which were different from those in the dowsing zones. The Q-peak level (without changes in frequency) jumped upwards or downwards depending on whether the dowser's forearms were above the upper or lower part of the other person's body. The central part of the body was neutral and the Q-level was the same as at a certain distance from the settee. In other words the human body showed a certain polarity in the cardiograms which was also experienced by the dowsers.

Apart from these phenomena, three important observations were made:

1. The electrocardiograms did not show any deviation if the dowser contracted his forearm muscles purposely, causing the dowsing rod to turn.

2. The same electrocardiograms were obtained if the dowser,

Fig. 4: Dowser walks slowly (electrode circuit as in Fig. 3) from a position outside the dowsing zone (left part of the cardiogram) into the zone of disturbance, perpendicular to the longest axis of the zone (right part of the cardiogram). Immediately upon entering the dowsing zone, the whole curve shows a considerable excursion downwards. It becomes normal again after the dowser leaves the zone. The subsidence of the curve took place immediately and not after one or more seconds, as we may observe in the case of psychogalvanic reflexes.

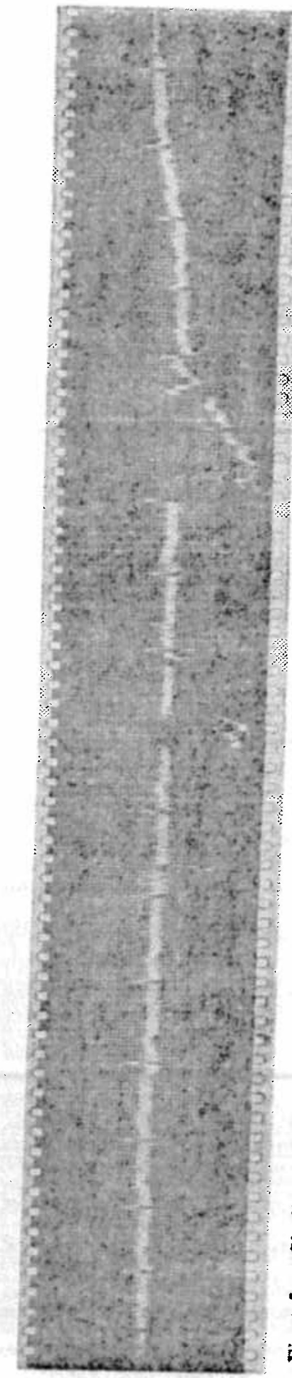

Fig. 5: Similar experiment as in Fig. 4, but electrodes attached directly to both pulses.

walking through the dowsing zone, did not use a rod but simply held his arms in front—pulses attached to the string galvanometer.

3. If the dowser remained in the dowsing zone for some time, the whole curve would rise slowly, without any changes in frequency. This did not occur outside the dowsing zone.

Two groups of experiments in the United States seem to confirm the above mentioned observations:

1. September 8, 1948, Mr. James L. Jenks, President of the Sandborn Electrocardiograph Company (Cambridge, Massachusetts), tested a well known American dowser, Mr. Henry Gross, in Maine, with a *cardiograph* (cathode ray type). If the rod was turned purposely by Mr. Gross, no large excursions of the electrocardiogram were observed. However, as soon as Mr. Gross crossed a dowsing zone, very large fluctuations were noticed indicating large electric potential fluctuations on the skin.*

2. On April 25, 1952, four electronic engineers in New York, H. Gallay, H. Cohen, A. Goldschmidt, and J. Levin, using a specially constructed and very sensitive electronic microvoltmeter, observed the same phenomenon when they tested Mr. Gross in a similar way.

Although I realize that all these observations may not be conclusive, they certainly warrant further research by competent electrophysiologists.

B (2) CARDIOGRAPHIC EXPERIMENTS WITH AN ELMQUIST CARDIOGRAPH (CATHODE RAY TYPE):

It is well known to most cardiologists that at certain spots in modern buildings no electrocardiogram can be taken, due to electrical disturbances in the buildings. This is called the "humming effect." However, the actual causes of this phenomenon have not been studied. Studies I made in 1950 indicated that the "humming effect" was caused by the presence of reinforced concrete beams or pipes underneath the floor of a room, which seem to concentrate the alternating electric fields (created by the lighting network in buildings) into narrow zones (see Figs. 6 and 7). These zones were also characterized by strong local disturbances of the earth's magnetic field which showed up as sudden changes in azimuth, up to 50 degrees of the magnetic needle of an ordinary compass. It is interesting that these zones of electromagnetic and magnetic disturbances could be located

* Personal communication from Mr. Jenks.

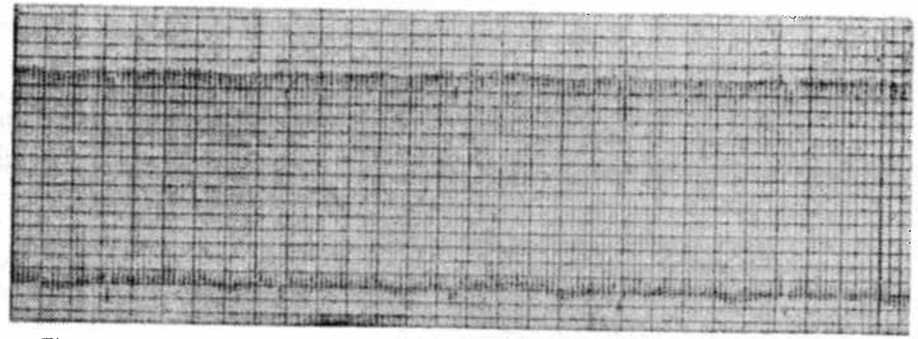

Fig. 6A: Subject stands in the center of the dowsing zone. Lack of the PQRST curve is due to the humming effect (see p. 374).

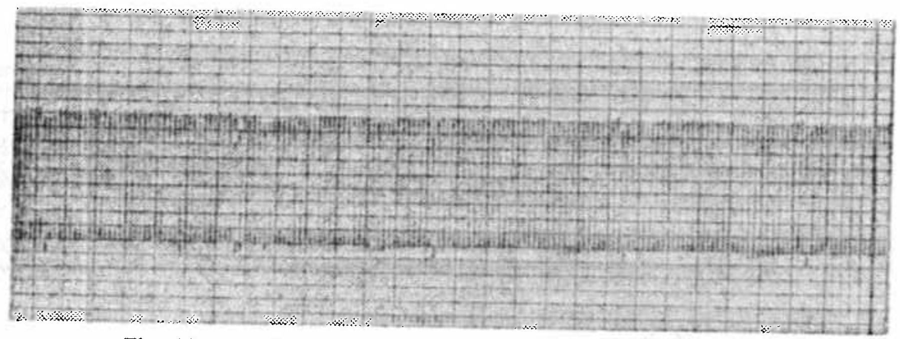

Fig. 6B: Subject stands near the edge of the dowsing zone.

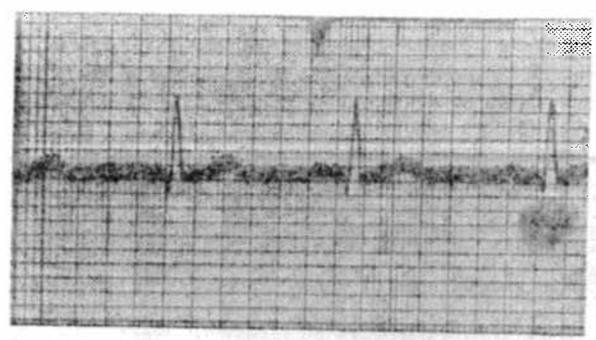

Fig. 6C: Normal cardiogram (electrodes attached to both pulses) of a dowser, recorded with an Elmquist cathode ray type of electrocardiograph, standing outside a dowsing zone caused by a metal pipe below the floor in a house.

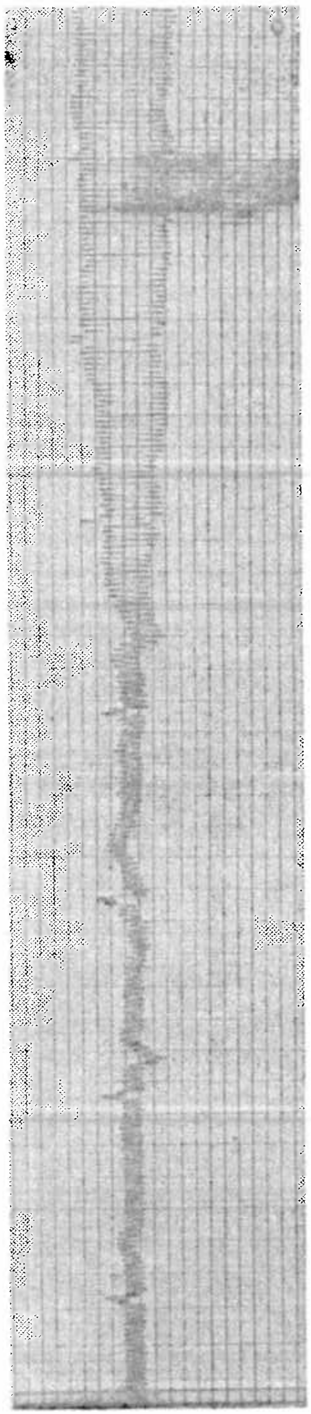

Fig. 7A: Humming effect observed in a dowser walking slowly from a point outside a dowsing zone (same as in Fig. 6) to the center of the zone. Gradual broadening of the humming band can be seen.

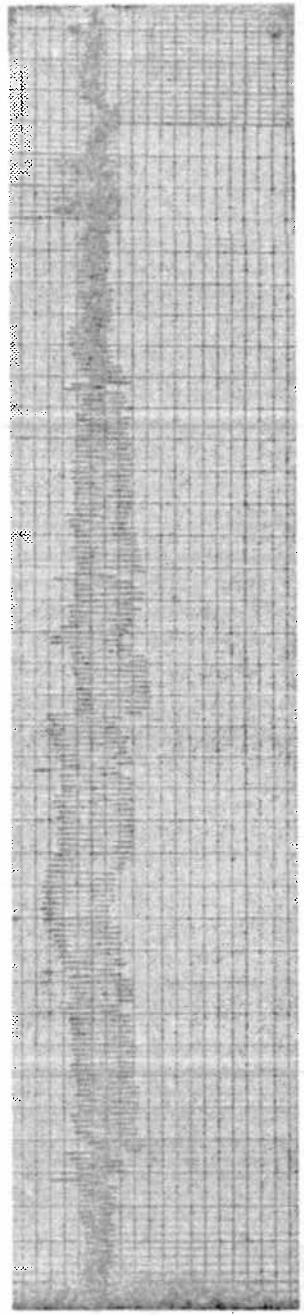

Fig. 7B: Dowser walks quickly through the same zone as in Fig. 7A. He enters the zone, passes the center and walks out again.

by dowsers before the instrumental measurements were taken, which indicates again that autosuggestion was not a factor in this experiment. A full description of these experiments with electrocardiograms was published in 1954 in *Hippokrates*.[9] It is interesting that in the dowsing zone used for our experiment it was noticed (long before the cardiographic and magnetic measurements were taken) that the intensity of the zone was decreasing from right to left. A recording with the cardiograph and compass confirmed this observation.

In the previous pages a summary is given of various experiments which were carried out between 1946 and 1950. The results obtained were so encouraging that further studies seemed to be warranted, despite the negative results obtained by other research workers who concentrated only on testing the claims of dowsers.

We had been looking for an objective method to indicate quickly in the field whether at certain places below the surface sudden changes in the subsurface soil occur (either in composition or structure of the soil), which do not show up in color, composition or structure of the surface soil or in its vegetation. In other words, the instrumental method should be able to reveal subsurface discontinuities, which in a normal way could not be predicted by the most experienced geologist or botanist.

For this purpose the author selected the *soil resistivity method,* which, although it did not reveal their causes, indicated changes in the subsoil. In new areas, shallow hand auger wells were drilled in order to be able to interpret the cause of the sudden changes in resistivity in a surface profile.

In geophysics, various electrical methods are used to determine the subsurface soil resistivity. The most common method uses four electrodes placed equidistant from each other in the surface soil. The current passes through the two outer electrodes and the potential differences are recorded at the two inner electrodes. The Central Institute for testing materials of the Netherlands Research Council (TNO) at Rijswijk developed a variation of the commercially well known Shepard Resistivity meter, using only 2 electrodes, through which a 600 Hertz alternating current is passed. With a number of resistances in the instrument, it is possible to neutralize this current and to establish by the zero-method the soil resistivity (or its inverse value: the soil conductivity).

It was found that a geological discontinuity, for example, an undulating peat layer under a surface clay bed or a shallow buried valley, will show up in the soil resistivity. The same results are obtained with the 2- or 4-electrode method.

The soil resistivity method enables us to verify quickly whether a dowsing zone, indicated by a dowser, coincides with a geological subsurface discontinuity, irrespective of kind. For example, in certain areas, with a rather constant soil composition and soil acidity, pronounced resistivity zones may still occur. If a dowser were to interpret these zones as, e.g., a water layer, a buried pipe, etc., we would be inclined to conclude that his claim was false. However, in reality certain changes occur in the subsoil, in this case only subtle changes in porosity and permeability of the surface layers, which do not show up even in a rough pH test.

In order to study the possible relationship between soil resistivity and dowsing zones, the following procedure was followed: First, the dowser walked along a 20 meter (or more) tape over a piece of land where no differences in color, soil composition, or vegetation were noticeable. In view of the greater reaction speed obtained with a pendulum in most of our experiments this method was used. The dowser walked slowly along the tape, and, as soon as he noticed the first deviations, the place of his heel was recorded by reading on the tape the exact distance from the starting point. The same was done for the places where the deviation of the pendulum reached its maximum and where the deviation stopped (i.e., the pendulum was swinging normally again in a plane perpendicular to the body). By following this method, a number of zones were recorded: 8.7 - 12.4 meters (max. 9.6), 21.4 - 29.7 meters (max. 25.3), etc. Apart from these recordings the type of pendulum and chain was registered, the direction of movement of the dowser, his speed, his height, the weather conditions (rain during previous days), etc. Examples of such resistivity surveys are given in Figs. 8, 9, and 10. Since August 1950 over 200 field sections were carefully studied, and both dowsing zones and changes in soil resistivity, along the same profile, were recorded. In all these experiments the dowsing zones were first established by a dowser, and then the soil resistivity was measured in order to exclude any possible suggestive factor. *In practically all the sections a very good or at least statistically significant correlation was found between dowsing zones and zones with a low soil resistivity* (i.e., high soil conductivity).

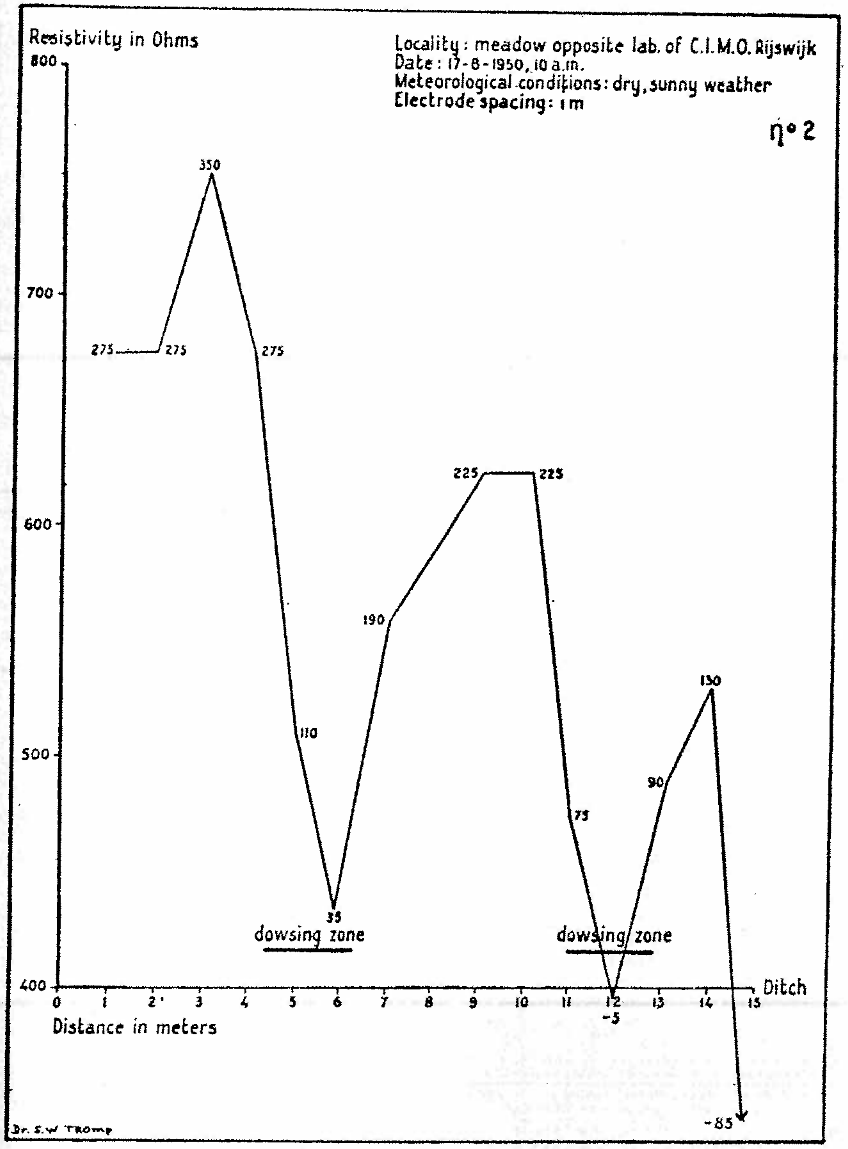

Fig. 8: Soil resistivity curve recorded in a meadow with clay soil at Rijswijk. Two minima in soil resistivity curve coincide with predetermined dowsing zones.

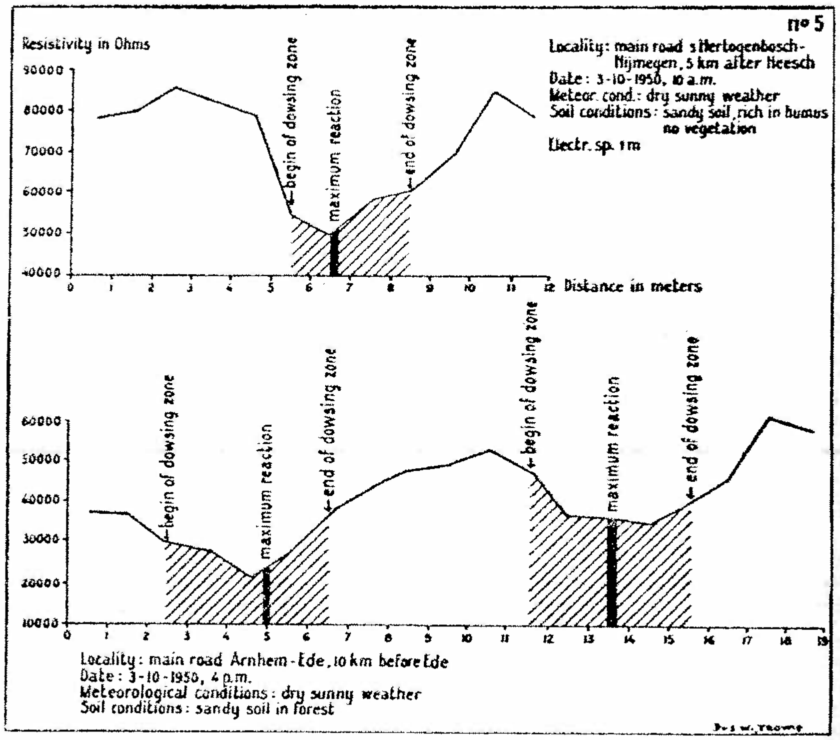

Fig. 9: Same observations as in Fig. 8. Curve recorded in an area in the eastern part of the Netherlands in sandy soils.

A difficult aspect of the soil resistivity dowsing experiment is the correct interpretation of the resistivity curves. If the dowsing zones do not coincide with the points in the resistivity curve where the resistivity values change abruptly and reach a minimum, there are two possible explanations: either the dowser made a mistake, or the changes in resistivity do not correspond with the geological subsurface discontinuities. As we want to check the ability of the dowser, *we must be certain that the soil resistivity curves indicate correctly the location of the subsoil discontinuities.*

In a completely homogeneous surface layer, the distance between the electrodes roughly indicates the depth at which the resistivity is measured. However, this is not true in a nonhomogeneous soil. Another problem is that we do not know whether a dowser reacts to a discontinuity near the surface or at a great depth. The soil resistivity curves obtained with different electrode spacings may vary con-

siderably, and therefore a comparison with the dowsing zones may be difficult in these circumstances. *In other words, for our experiments we should select areas where subsurface discontinuities will show up clearly in the various curves measured with different electrode spacings, and where shallow drilling at a number of places confirms the coincidence of pronounced minima in the resistivity curve with geological discontinuities.*

In the western part of Holland many resistivity zones occur, i.e., strips of land with a low soil resistivity (therefore, high conduc-

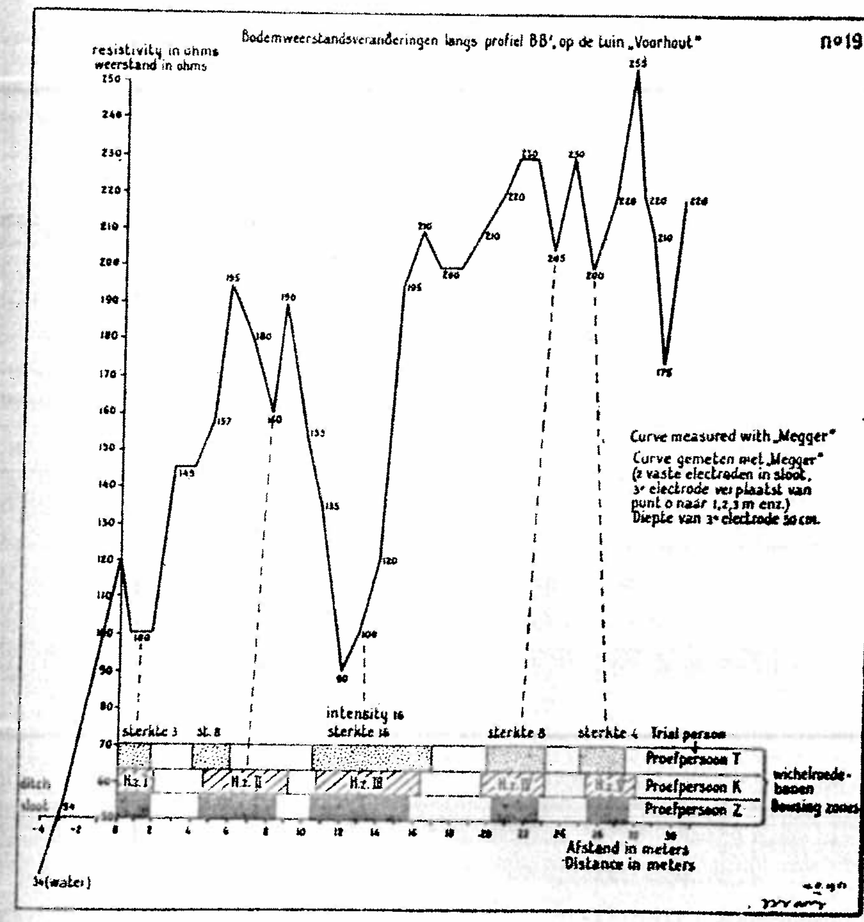

Fig. 10: Soil resistivity curve measured in a clay area. Three dowsers walked along the same line, after each other, without knowing the results of their predecessors.

tivity), surrounded by high resistivity areas. The greater the resistivity gradients (i.e., the change in resistivity per meter from low to high), the more pronounced are those resistivity zones. For example, in the clay areas between the cities of Leiden and Delft the gradient usually is only a few hundred ohms; in sandy areas near Hilversum or Almelo several thousand ohms per meter (with the 2 electrode method). Near Soestdijk even more than 40,000 ohms per meter was found.

In general we may say that an area with soil resistivity fluctuating between 0-8000 ohms is characterized by resistivity zones with resistivity gradients <1000 ohm/meter.

If the resistivity fluctuates between 8000-20,000 ohms the gradient usually is >1000 and <4000 ohm/meter. Between 20,000 and 100,000 ohms the resistivity gradient may reach 8000 ohm/meter; over 100,000 ohms areas usually have resistivity gradients of 20,000 ohm/meter and more.

In the meadow country of Holland the zones with low soil resistivity are usually caused by the sudden rise or fall of peat layers located one or two meters below the surface clay layer of the meadows (the humic acid causing the high conductivity). In sandy areas the resistivity zones may be due to pre-historic brook valleys filled up and covered by electrically better conducting material, for example, clay. During different periods of the year in certain areas one may observe considerable shifts of the resistivity zones (see Fig. 11), but usually the location is rather constant within a few meters. Only the resistivity gradient may change depending on fluctuations in ground water, rainfall, or other climatic conditions. However, the general type of resistivity curve usually remains the same.

As shown in Fig. 11, in certain cases where the soil conductivity is not related to an abrupt geological change in subsurface conditions, considerable changes in resistivity curves may occur; a minimum may even change into a maximum during a certain time of year. This observation is very important, because completely erroneous results would be obtained if a number of dowsers were tested in the same area during different periods of the year. This would explain the many negative reports of scientists who tested their subjects on different days, often weeks or months apart.

Another important cause of error is the erroneous interpretation

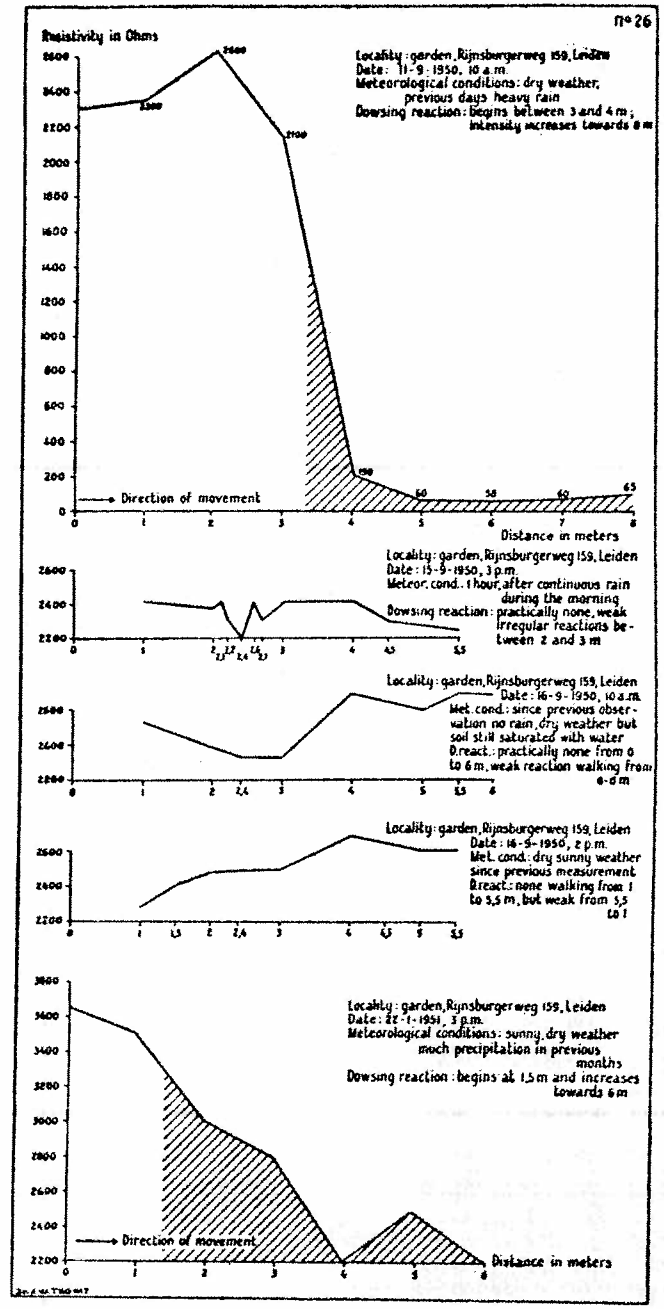

Fig. 11: Soil resistivity curves recorded along the same line but during different periods (from top to bottom: 11/9/1950, 15/9/1950, 16/9/1950 at 10 A.M., 16/9/1960 at 2 P.M., 22/1/1951. Dowsing reactions were also entirely different on these different days.

of the location of a dowsing zone, as shown in Fig. 12. A dowser may not pick up in each cross section all the low resistivity zones (e.g., because he may walk too quickly) as shown in sections B, C and D. He may connect the observed spots with low soil resistivity in different ways. The same error is often made by an inexperienced geologist or geophysicist, if the outcrops are scattered and cannot be followed continuously. However, an experienced dowser, particularly one with some geological training, will not make these errors.

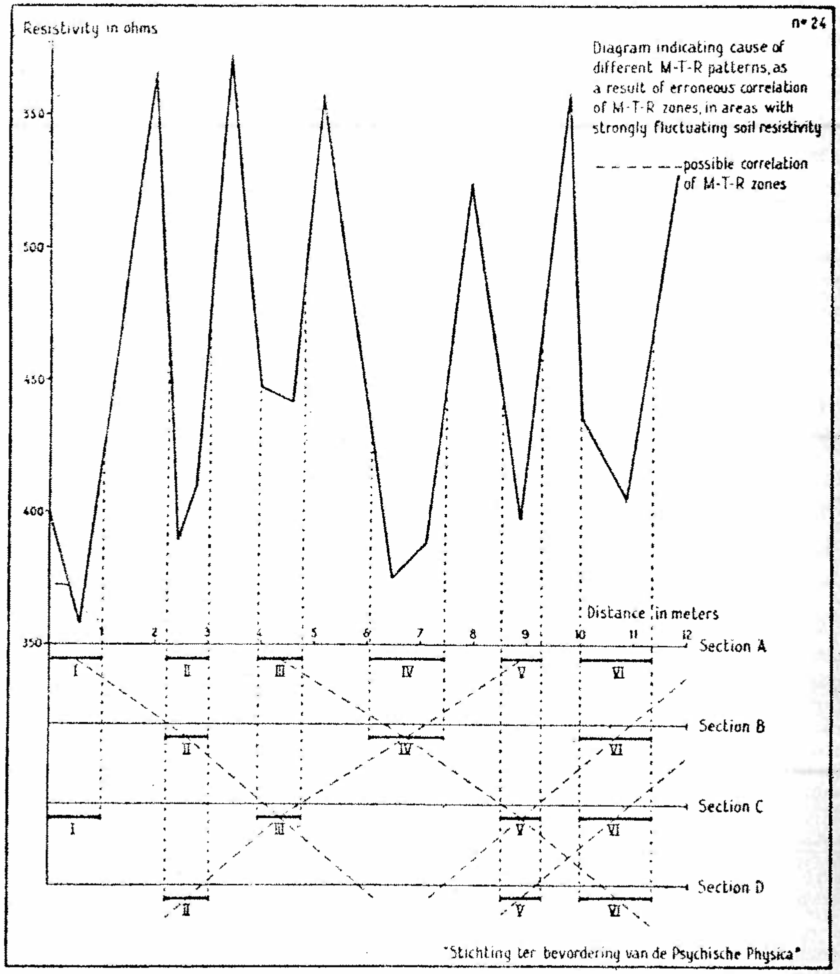

Fig. 12: Diagram showing the cause of different dowsing zone patterns, as a result of erroneous correlation of the dowsing reactions in an area with rapidly changing soil resistivity.

We must restrict ourselves to these general remarks. A more detailed analysis of causes of error is given in my paper, "Experiments on the possible relationship between soil resistivity and dowsing zones."[10]

IV. POSSIBLE PHYSIOLOGICAL MECHANISMS INVOLVED IN THE DOWSING REACTION

THE EXPERIMENTS DESCRIBED in the previous pages strongly suggest that the dowsing reaction is a normal physiological, albeit super-sensory, process in the human brain, although so far the mechanisms involved are unknown. The observation that in all these experiments the dowser cannot predict the location of a dowsing zone even if he is a few meters away from it, strongly supports the view that neither telepathy nor clairvoyance could be involved. Also, many experiments carried out by the author with serious dowsers, who claim to be able to do map dowsing and to locate water wells after dowsing a map of an area hundreds of miles away, showed clearly that so far none of them could accurately locate dowsing zones in areas far away. In our opinion, both groups of observations make it rather certain that the dowsing reaction can be explained by the laws of orthodox physics and physiology.

Experiments to clarify these reactions are not yet completed and may require several years of further research, particularly as the usual lack of sufficient funds for such unorthodox projects may delay the program.

The experiments carried out so far have shown us that a dowsing reflex correlates with the following geophysical fields, although not necessarily in a causal relationship.

1. Changes in artificial and natural constant magnetic fields: The lack of correlation in the meadow countries of the Netherlands, with very weak magnetic fields, suggests that the correlation observed in houses and mountainous areas is not causal, and that the reflex may correlate, in reality, with conductors below the floor of a house, electrically highly conductive zones in the soil, with electromagnetic fields created by the change in current intensity in the tangent galvanometer, or with pulsating magnetic fields.

2. The experiments with the electrocardiograph of Einthoven suggest the following possible correlations:

a) Sensitivity to conductors below the floor in buildings or to highly conductive zones in the soil (suggested by the experiments in driving cars).

b) Sensitivity to electrostatic fields created by the human body (suggested by the experiments with human subjects).

c) Sensitivity to infrared radiation of the human body and other non-living objects. The latter is supported by the fact that a dowser can determine on which bed or settee a subject has been lying, a considerable time after the subject has left. Sensitive infrared radiation recorders can do the same.

3. The experiments with the cathode ray cardiograph suggests:

a) Possible sensitivity to conductors below the floor or to their infrared radiation.

b) Sensitivity to changes in intensity of electromagnetic fields.

4. The soil resistivity experiments suggest:

a) Sensitivity to zones with greater electric soil conductivity than the surrounding areas.

b) Sensitivity to other geophysical forces related to soil conductivity, for example soil radiation (probably infrared).

5. The observation that rheumatics often experience muscular contractions or pains in their joints if they sit some time in a dowsing zone in a room, characterized by reduced infrared radiation of the floor as compared with neighboring areas, suggests that local differences in infrared radiation in the environment can be picked up by the body of sensitive subjects.

Although no definite statement can be made at the present state of research, it seems possible that the dowsing reaction is related to thermoregulatory processes in the body. Studies by the author[11] have shown that rheumatics have a poor, hypothalamically controlled, thermoregulation mechanism. As a result, even very minor changes in the thermal balance of the environment are observed by most rheumatics. A continuous stimulation of the poorly functioning thermoregulation mechanism of these subjects may lead to a hypothalamic disturbance. As the hypothalamus affects the hormonal functions of the pituitary and the functioning of the autonomic nervous systems, it seems possible that a continuous stay in a strong dowsing zone, for many hours a day and during many years, could seriously affect the hypothalamus and related physiological processes, particularly in those subjects with a poor thermoregulation mechanism. This hypothesis could explain also why not every subject is a dowser and why not everybody experiences unpleasant feelings if he stays some time in a dowsing zone.

Considerably more research work is required to test this hypothesis which could explain the field observations of dowsers and the contradictions in the results of different research workers.

V. REPORTS ON THE POSSIBLE EFFECTS OF DOWSING ZONES ON THE GROWTH AND HEALTH OF PLANTS, ANIMALS, AND MAN

One of the most violently disputed problems of dowsing is the claim of dowsers that most organisms, either plants, animals, or man, are unfavorably affected by living for a considerable part of the day in strong dowsing zones.

Two groups of experiments seem to support this statement:

A. EXPERIMENTS ON THE POSSIBLE EFFECT OF DOWSING ZONES ON MICE:

Dr. E. Jenny (formerly director of the Children's Hospital at Aarau, Switzerland) together with Dr. G. Wilhelmi (physician), Dr. P. Steinman (leading Ichthyologist in Switzerland), and engineer A. Oehler (director of the Steel Works at Aarau, Switzerland, who financed this expensive project) carried out a series of experiments with mice at Suhr (near Aarau) during a period of 12 years (1933-1945), which suggested that dowsing zones could affect animals living in such zones.[1,2,15]

Large cages with mice in a hut 6 meters long were placed partly above and partly outside a dowsing zone. Experiments during the period 1934-1940 gave the following results:

(1) mice seem to prefer to sleep outside the dowsing zone: during the 6-year period 6434 mice slept outside the zone, as against 1626 in the zone;

(2) mice treated with carcinogenic tar developed up to 30% more carcinoma if placed in the zones than outside of it.

During certain periods Jenny and his collaborators were not able to obtain any results, as periods of little rainfall and drainage of the ground water level in neighboring areas caused considerable shifts or even disappearance of dowsing and resistivity zones (see Fig. 11).

In September 1953, the author visited the area at Suhr where Jenny's experiments were carried out and which consists, at Gartnerei Hoch, of a fruit garden with surface clay deposits. The vegetation did not give any clue as to the possible location of a dowsing zone. Soil resistivity measurements were made across the dowsing zones, reported by Jenny's group in 1934 and following years. These measurements confirmed the existence of a geological discontinuity below the surface clay at the location of the dowsing zone used by Jenny and his colleagues. Most likely the low resistivity zone is caused by fractures in the subsurface molasse deposits. The soil resistivity and dowsing zones could be continued into the flower gardens bordering the fruit garden of Gartnerei Hoch. A resistivity curve was measured in one of the flower beds which is partly inside the dowsing zone. In the dowsing zone (resistivity values between 1500 and 2000 ohms), cucumbers would hardly grow. Outside the zone (resistivity 2300-3200 ohms), they grew prolifically.

An interesting fact is that although the flower beds were topped with artificial earth over the original soil, the effect of the dowsing zone could still be observed in the vegetation. According to Jenny and his collaborators, apparently not only cucumbers but also celery, onions, and maize showed the same effect.

B. EXPERIMENTS ON THE EFFECT OF DOWSING ZONES ON PRIVET (LIGUSTRUM) HEDGES:

Privet hedges seem to be very sensitive to slight changes in soil, even at a certain depth below the surface.

In January 1951, a number of non-professional dowsers agreed that on a meadow in Oegstgeest (the Netherlands), two dowsing zones occurred. These coincided with strips in the soil with a low resistivity as compared with neighboring areas. Later, a house was built, in December 1951, and in March 1952 a hedge of privet was planted around the garden, with a total length of about 100 meters.

During spring and summer 1953, the hedge developed perfectly, except on a 7 meter stretch in the rear garden, which coincided with the previously established dowsing zones (in January 1951). Also two new ash trees in this zone did not develop any leaves, whereas the others outside grew reasonably well. One of the consultants of a nearby agricultural research station visited the garden and analyzed soil samples. The soil was manured, but despite all this, the privet hedge died during the summer. New plants were placed after deep manuring of the soil. Leaves developed very thinly and still a pronounced difference could be seen from the other parts of the 100 meter hedge. During the summer of 1953, despite renewed manuring, the 7 meter stretch grew poorly.

In spring 1954, the whole 30 meter privet hedge in the rear garden was taken out, the soil was deeply plowed up, and manured; the poorly growing privet plants were put at the fertile end of the garden and healthy ones were planted at the place of the dowsing zone. Again during summer 1954 the plants in the dowsing zone developed poorly in contrast to the other 23 meters of the hedge. At the end of 1954 and during 1955, ground water conditions in the area changed considerably by drainage and filling up of ditches in neighboring meadows. In March 1955 (before the privet hedge had any leaves), a considerable change in the location of the dowsing zones was noticed. This change was confirmed by soil resistivity measurements. During summer 1955, the shift in dowsing and resistivity zones showed up clearly in the privet hedge, and similar observations have been made each year since then.

These observations show beyond doubt the reality of the dowsing phenomenon. A previously determined dowsing zone (in 1951) was confirmed in 1952, and in following years by vegetation, soil resistivity, and drilling studies. Also shifts in these dowsing zones, observed during winter, could be confirmed each year during the following spring and summer.

Whereas in the case of biological effects of dowsing zones on plants, it is most likely that ordinary biochemical processes in soil, related to soil resistivity zones, are responsible for the effect, we have no evidence about the nature of the possible effect of dowsing zones on animals and man. So far, Jenny's experiments are the only scientific data on hand. It would be highly important to repeat these experiments in an experienced cancer research laboratory with modern instruments for motility recording of mice in and out of dowsing zones. If Jenny's experiments could be confirmed, the cause of the biological effect of dowsing zones could be due to a continuous stress condition created in animals or man living there a great part of the day. Jenny observed greater cancer frequency and motility of the mice in the dowsing zone. If this can be confirmed, we should like to refer to various modern experiments which suggest that "stress" conditions increase the frequency of cancer and other diseases in man.[13,14]

These stress conditions, combined with thermoregulation disturbances as mentioned in chapter IV, may explain the many well established observations in subjects suffering from various pathological conditions (rheumatic diseases, insomnia, etc.), if they work or sleep continuously in a strong dowsing zone—a concept already known in ancient China.

Dowsing, one of the most common, reproducible, supersensory phenomena in man, has often been explained as a phenomenon due to telepathy or clairvoyance. In view of the facts given in this paper, we are convinced that dowsing is a purely physiological phenomenon due to a still unknown supersensory mechanism in the body.

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