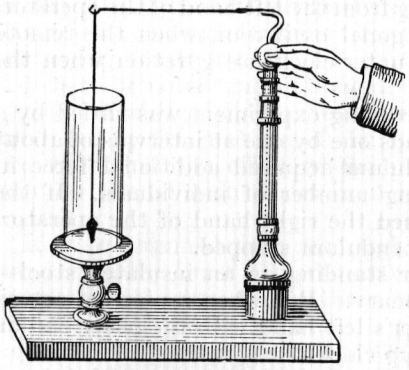
EARLY EXPERIMENTS WITH THE PENDULUM

In view of the discussions which still sometimes take place regarding the various movements of the pendulum and their dependence on muscular force, it seems not out of place to recall the experiments carried out over a hundred years ago by J. O. N. Rutter, of Black Rock, Brighton.

A brief reference is made to some of these experiments by Henri Mager in his book which was published in English under the title of *Water Diviners and Their Methods*, but some of the more significant experiments are not mentioned by him.

Rutter was an amateur scientist who took a particular interest in electrical phenomena when the science of electricity was still in its infancy. He was moreover a practical man and a pioneer in lighting by gas. He carried out experiments in his house at Black Rock, and received visits from well-known scientists, amongst whom was Baron von Reichenbach. He was the author of several books, one of which, entitled *Human Electricity*, was published in 1854, and it must have been from this book that Mager obtained his information.

The apparatus which Rutter designed for his experiments with the pendulum, called by him Magnetoscope, is illustrated on page 66 of *Water Diviners and Their Methods.*



Briefly, it consisted of a vertical mahogany pillar fixed to a platform of solid mahogany ; the top of the pillar ended in a brass cap from which projected a horizontal arm of brass. From the end of this arm an ebony ball was suspended by a single thread of unspun silk. Immediately below the pendulum was a disc, also of mahogany, covered by a piece of plate glass about $4\frac{1}{2}$ inches in diameter. For protection from air currents and from the breath of observers, the disc and pendulum were surrounded by a glass cylinder.

In using the instrument the operator placed the thumb and forefinger of his right hand, one on each side of the brass ball, touching it loosely, with the hand open. Rutter took particular care to see that all parts of the apparatus were firmly fixed ; to ensure stability it was secured by clamps to a firm and level table in a room, the floor of which was comparatively free from vibration.

The results of the experiments he records, the operator being of the male sex, were as follows :

1. Merely touching the knob with thumb and forefinger as described above—clockwise gyration.

2. Touching as in 1, but with the operator's left hand in contact with the thumb of a male—forward oscillation.

3. As in 1, but touched by the forefinger of a male—transverse oscillation.

4. As in 1, but touched by the hand of a male—diagonal oscillation.

5. As in 1, but touched by the thumb of a female—transverse oscillation.

6. As in 1, touched by the forefinger of a female—forward oscillation.

7. As in 1, touched by the hand of a female—counter-clockwise gyration.

8. As in 1 ; when gyration was fully established, if gold, platinum, silver, copper or magnetised iron were held in the left hand—counter-clockwise elliptical gyration.

9. As in 1 ; when the end of a bar magnet, or a piece of ivory, a feather, a dead fly (in other words dead animal matter) were held in the left hand—pendulum stopped moving.

10. As in 1 ; when any number of persons, male and female, arranged themselves with sexes alternating and hands joined, left hand to right hand, starting from the left hand of the operator, the pendulum changed to diagonal oscillation when the remote person was a male and to counter-clockwise gyration when the remote person was a female.

11. As in 1 ; when the preceding experiment was varied by a number of persons joining hands one by one at intervals of about five or ten seconds, the pendulum acquired additional force in accordance with the increasing number of individuals. If the last person in the series touched the right hand of the operator, thus closing the circuit, the pendulum stopped.

12. As in 1 ; the operator standing on an insulated stool—the pendulum remained stationary. But when a piece of cotton thread was held in the operator's left hand with the other end on the floor, the pendulum took up clockwise gyration.

13. A bar magnet was placed on a meridian near the left hand of the operator—conditions as in 1. If the left hand was held two or three inches beyond the S. pole—there was clockwise gyration ; at the same distance from the E. side of the centre there was clockwise gyration ; at the same distance from the W. side—counter-clockwise gyration ; at the same distance from the N. pole—the pendulum stopped.

14. The same movements were produced when the hand was held in different positions near the head of a person of either sex. The front of the head corresponding to the N. pole of the magnet.

15. If a piece of quartz was laid on the left hand of the operator its longitudinal axis in line with and pointing towards the fingers —diagonal oscillation took place, right front and left rear.

16. With the position of the crystal reversed, its base towards the fingers—diagonal oscillation, left front and right rear, when laid across the hand, base towards the operator—counter-clockwise gyration; laid in the opposite direction—clockwise gyration.

17. When the crystal was held steadily between the thumb and finger of the operator's right hand and placed against the brass cap, the various movements of the pendulum as in 16 were produced by contact with the ends and sides of the crystal.

18. When the crystal was placed on a stand entirely detached from the table supporting the magnetoscope, very near to, but not in contact with the brass cap, and the right hand of the operator was laid on the crystal, the pendulum, starting from rest, began to move in one of the directions already indicated, according to which part of the crystal was directed towards the instrument.

Rutter stated that : " The last-mentioned experiments are exceedingly interesting ; but require great care, quietness and attention. They admit of many variations with perfect crystals, as well as with native crystalline formations with metaliferous ores."

When experimenting with metals he found that the movements of the pendulum were irrespective of their quantity, the smallest identifiable particle causing its characteristic movement with unvarying constancy.

It is to be noted that in none of the experiments was the object placed *below* the bob of the pendulum, but that all effects were produced by the medium of the operator's hand. This supports the view that the effect of the numerous elaborate pendulums now on sale at high prices is in all probability mainly psychological.

If it be assumed that, although the contact of the operator's hand with the brass cap was extremely light, minute vibrations were caused, why should their nature be changed by human contact with the operator's other hand ? Why, too, should a negative effect be produced by " closing the circuit " as recorded in 11 ? The effect of insulation in 12 is also interesting, as is also the amplifying effect produced by contact with a number of persons joining hands.

Concluding the account of his experiments, Rutter wrote : " Whether the motions of a pendulum, produced in the manner I have been describing, be truly and entirely electrical, or whether they be of a mixed character partly dependent on vitality, and partly on electricity, and which cannot be dissociated, is more than I will undertake to decide."

Have we got much further to-day ?