Chevreul's Report on the Mysterious Oscillations of the Hand-Held Pendulum

A French Chemist's 1833 Open Letter to Ampère

An extraordinary paper written in 1833 by the French chemist Michel-Eugène Chevreul on his experiments and interpretation of the "magical pendulum" is remarkable in its prescience and astute, rational understanding of the nature of the true source of the pendulum movement. The authors here present the first complete English translation of this special document.

HERMAN H. SPITZ and YVES MARCUARD

The mysterious movement of a small pendulum held by an "unmoving" hand is a venerable example of the erroneous assignment of unusual properties to inanimate objects. The pendulum swings back and forth or in a circular path depending on what the holder is thinking, even though the holder is convinced that he or she is holding the pendulum perfectly still. The direction of the movement is said to provide yes or no answers that relieve holders from personal responsibility for decisions and choices. The pendulum allegedly reacts to the presence of certain objects or liquids, and even provides information, such as the sex of a fetus. Its actions are sometimes attributed to mystical forces or mysterious energies (e.g., chakras), but all

these magical effects occur only when the pendulum is hand-held.

Throughout history many learned men proposed weighty theories to account for the pendulum's movements and for many related phenomena. In 1808 Professor Gerboin of Strasbourg and a group of physicists published a book in which such phenomena were attributed to a new force that inaugurated a new chapter in physics, a belief supported by a number of his colleagues but not by, among others, the chemist Michel-Eugène Chevreul (1786–1889) (note that his name is not always hyphenated). The theories of Gerboin and his followers, and no doubt other such dubious theories, apparently prompted young Chevreul to perform experimental studies of the pendulum's astonishing properties in 1812. However, he did not publish his observations until 1833, and only after the urging of his friend, the eminent physicist André M. Ampère, to whom the publication was addressed as an open letter (and after whom the practical unit of electric current and the ammeter are named).

M. E. Chevreul, 1887. Archives & Special Collections, Columbia University Health Services Division.

In 1853 the French Academy of Sciences appointed Chevreul chairman of a three-man committee charged with providing the public with a scientific explanation of the apparently spontaneous movements of the divining rod, the pendulum and—particularly during séances—small tables. For many people, table turning (or table rapping) was evidence of spirits, or even of Satan himself. Chevreul authored the committee's report, published as a book, *De la baguette divinatoire, du pendule dit explorateur et des tables tournantes, au point de vue de l'histoire, de la critique et de la méthode éxpérimentale* (*Of the Divining Rod, the 'Explorer' Pendulum and Turning Tables, From the Point of View of History, Critique, and the Experimental Method*, Paris: Mallet-Bachelier, 1854). It attributed not only table turning but also such related phenomena as the pendulum and divining rod (dowsing stick) to a single principle: nonconscious (involuntary) muscle movements initiated by autosuggestion. The book included a historical survey and a discussion of the scientific method. Meanwhile, in 1852 in England, the eminent physiologist William Carpenter labeled these phenomena "ideo-motor" (now ideomotor), which nicely encapsulates the fact that an involuntary motor response can be produced by a dominant idea.

To the best of our knowledge Chevreul's 1833 paper was the first published description of controlled observations into the true source of the pendulum's mysterious oscillations. In recognition of those seminal studies the hand-held pendulum is now customarily referred to as the Chevreul pendulum. The first author became interested in Chevreul's observations while examining claims being made for facilitated communication (Spitz 1997), said to reach the competent inner person hidden behind the outer facade of incompetence presented by people with autism and/or severe mental retardation. In facilitated communication a "facilitator" holds the hand of an autistic partner who types messages on a keyboard. It turns out, however, that the facilitators are unwittingly controlling their partners' typing. (For more on facilitated communication, see SKEPTICAL INQUIRER 25[1] January/February 2001.) These movements of the facilitators place this phenomenon in the same family of automatisms as the Ouija board (Dillon 1993), automatic handwriting, mind-reading (muscle reading), table turning, dowsing, the Chevreul pendulum, and the Clever Hans phenomenon (in which superior intelligence is attributed to an animal whose responses are unwittingly cued by its human master or by observers), all of which are generated by nonconscious movements (Spitz 1997).

Chevreul is far better known in his native France than in the United States. It is difficult to understand why he is not more universally appreciated not only for the importance of his contributions to organic chemistry, color theory, and the history of chemistry, but also because of the breadth of his interests, evidenced by publications in natural history, photography, psychology, philosophy, archaeology, philosophy of science, and much more. According to Costa, when the still-active Chevreul turned 100 on August 31, 1886, it was a great national occasion. Numerous papers were presented and he was given many honors for his contributions to science and

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industry. There was an evening banquet, a torchlight parade through Paris, and special theater performances. When Chevreul died on March 27, 1889, at the age of 102, "His funeral at the Cathedral of Notre Dame attracted thousands of people who massed near the church despite heavy rains" (Costa 1962, 19).

A sizable excerpt from Chevreul's 1833 pendulum paper was quoted by the French psychologist Alfred Binet in his book *Alterations of Personality*, originally published in French in 1891 and translated into English by Helen Green Baldwin in 1896. Binet omitted a paragraph from pages 252–253 of Chevreul's paper, two paragraphs from the top of page 254 through the second line of page 255, and the final two and a half pages, all of which were of course also omitted in Baldwin's translation.

A translation by Yves Marcuard of the complete paper is given here. He tried to retain as much of Chevreul's writing style as possible.

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For details of Chevreul's life and work we have drawn from two sources. The first is the initial chapter of a book by Albert B. Costa on Chevreul as a pioneer in organic chemistry (Costa 1962). The second is Joseph Jastrow's article on Chevreul as a psychologist (Jastrow 1937), which, incidentally, includes five photographs of Chevreul in 1886, one in which he is working alone and four in which he is interacting with others. A portrait of Chevreul as a young man can be found in Costa (1962).

LETTER TO MR. AMPÈRE ON A PARTICULAR CLASS OF MUSCULAR MOVEMENTS

MY DEAR FRIEND,

You are requesting from me a description of the experiments I performed in 1812 in order to know if it was true, as several people had assured me, *that a pendulum consisting of a heavy body and a flexible thread oscillates, when one holds it in one's hand above certain bodies, even though the arm be immobile.* You think that these experiments are of some importance; as I yield to the reasons you gave me to publish them, allow me to say that all of the faith I have in your genius was necessary to induce me to place under the eyes of the public facts of a nature so different from those I have discussed until now. Be that as it may, I shall, according to your request, reveal my observations; I am going to present them in the order in which I made them.

The pendulum I used was an iron ring hanging from a hemp thread; it had been put together by someone who keenly wished that I would verify for myself the phenomenon which took place when that person held it above water, a piece of metal or a live being: I was made witness of the phenomenon. It was not, I confess, without surprise that I saw it reproduced when, after having in my turn grasped the pendulum's thread with my right hand, I brought the pendulum over the mercury of my pneumatic cistern, an anvil, several animals, etc. I concluded from my experiments that if, as I had been assured was the case, there were only a number of different bodies able to induce the pendulum's oscillations, it might be that by interpolating other bodies between these and the moving pendulum, it would come to a halt. In spite of my presumption, I was quite amazed when after having taken with my left hand a glass pane, a cake of resin, etc., and having placed one of these bodies between some mercury and the pendulum oscillating above it, I saw the oscillations diminish in amplitude and disappear entirely. They resumed once the intermediary body had been removed, and disappeared again at the interposition of the same body. This succession of phenomena repeated itself many times with truly remarkable consistency, whether the interposed body was held by myself or by someone else. The more extraordinary those effects seemed to me, the more I felt the need to verify whether they were truly independent from any type of muscular movement in my arm, as had been asserted to me in the most positive manner. That prompted me to lean my right arm, which was holding the pendulum, on a wooden support that I was able to slide forward from my shoulder to my hand, and bring back from my hand to my shoulder: I soon noticed that, in the first case, the pendulum's movement decreased progressively as the support was coming closer to my hand, and that it ceased when the fingers that were holding the thread were themselves braced, whereas, in the second case the reverse effect took place; meanwhile, for the same distance from the support to the thread, the movement was slower than previously. That caused me to think that quite probably a muscular movement that was taking place unbeknownst to me was determining the phenomenon, and I had to give even more consideration to this opinion, because I remembered, albeit vaguely, having been in *quite a peculiar state*, while my eyes were following the oscillations described by the pendulum I was holding in my hand.

I performed the experiment once again, with my arm totally free, and I was convinced that the memory mentioned above was not a delusion, because I was feeling very clearly that at the same time as my eyes were following the oscillating pendulum, there was in myself a *disposition or tendency toward movement*, which, as involuntary as it seemed to me, was proportionately more satisfied as the pendulum went into larger arcs: thus I thought that if I were to repeat the experiment with a blindfold on, the results might be quite different from those I had observed. That is precisely what happened. While the pendulum was oscillating above the mercury, a blindfold was placed over my eyes: the movement soon diminished; but even though the oscillations were weak, they were not noticeably reduced by the interposition of those bodies which had seemed to stop them during my first experiment. Finally, as of the moment the pendulum came to a halt, I held it above the mercury for another quarter of an hour without it resuming movement, while during that time, and still without my knowledge, either the glass pane or the cake of rosin had been interposed and withdrawn several times.

Here is my interpretation of these phenomena.

While I was holding the pendulum in my hand, a muscular move-

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Here is my interpretation of these phenomena.

While I was holding the pendulum in my hand, a muscular move-

ment in my arm, though unfelt by me, made the pendulum leave its resting state, and the oscillations, once begun, were soon augmented by the influence which sight exerted to put me into that peculiar state *of disposition or tendency toward movement.* Now it must be admitted that this muscular movement, albeit increased by this very same disposition, is yet weak enough to come to a stop, not even under one's deliberate will, but as soon as one merely has *the thought of trying to determine whether some given thing will stop it.* Hence there is an intimate relationship established between the execution of certain movements and the action of the thought relative to them, though that thought is not yet a deliberate will commanding the muscular organs.

Now one can easily understand how very trustworthy men, and enlightened men at that, are at times wont to make use of chimerical ideas in order to explain phenomena which do not really exceed the physical world as we know it.

It is in this respect that the phenomena I described seem to me to be of some interest to psychology, and even to the history of sciences; they prove how easy it is to take illusions for realities, whenever we venture into phenomena where our organs are somehow involved, and under circumstances that have not been sufficiently analyzed. Indeed, if I had limited myself to making the pendulum oscillate above certain bodies, and to the experiments where the oscillations were stopped, when one interposes glass, resin, etc., between the pendulum and the bodies that appeared to be determining its movement, then I certainly would not have had any reason not to believe in the divining rod and other such things. Now one can easily understand how very trustworthy men, and enlightened men at that, are at times wont to make use of chimerical ideas in order to explain phenomena which do not really exceed the physical world as we know it.[1] Once I was convinced that nothing really extraordinary existed in the effects that had so surprised me, I found myself in such a different disposition from that which was mine the first time I observed them, that much later, and at different times, I tried to reproduce them, but to no avail.

The medals minted to celebrate Chevreul's centenary in 1886, from *Oeuvres scientifiques de Michel-Eugène Chevreul* (Paris, 1886).

By invoking your testimony on the facts which took place under your very eyes more than twelve years ago, I shall prove to my readers that I am not the only person whom sight has influenced into determining the oscillations of a hand held pendulum. Surely you remember that while I was your guest, together with General P***** and several other people, my experiments became one of the topics of conversation; that the General manifested his desire to know the details, and that after I had explained them, he clearly expressed how contrary to all his ideas the influence of sight on the pendulum's movement was. You will also recall that, upon my suggestion to perform the experiment himself, he was dumbfounded when, after having placed his left hand over his eyes for a few minutes, then withdrawn it, he saw the pendulum he was holding in his right hand absolutely immobile, even though it was oscillating rapidly until his eyes ceased to see it.

The preceding facts and the interpretation I made of them led me to link them with others that we can observe every day. By that concatenation, the analysis of the latter becomes at once simpler and more precise than it was, at the same time they form an ensemble of facts whose general interpretation is susceptible to a wider extension. But before going any further, let us recall that my observations present two main components:

1. To think that a hand held pendulum may move, and that it may move without the holder having any consciousness of the muscular organs giving any impulse whatsoever; *that is the first fact.*

2. To see the pendulum oscillate, and that these oscillations become more extended through the influence of sight upon the muscular organs, still without any consciousness of the process; *that is the second fact.*

The tendency toward movement, determined in us by the sight of a moving body, is to be found in several other cases, for example:

1. When attention is entirely directed toward a bird in flight, a stone thrown slicing through the air, running water, the body of a spectator directs itself in a more or less marked manner toward the line of movement;

2. When a player of bowling or billiards follows with his eyes the body he has set in motion, he moves his own body in the direction he wants that moving body to follow, as if he were still able to direct it toward the goal at which he had aimed.

When we walk on a slippery surface, everyone knows how quickly we throw ourselves to the side opposite from that where our body is impelled by a loss of balance; but an occurrence less generally known is that a tendency toward movement manifests itself even when it is impossible for us to move in the direction of that tendency; for example, in a carriage, fear of overturning makes you stiffen in a direction opposite to the threat, and as a result your efforts grow more exhausting and anxiety and irritability increase. I believe that in ordinary falls, *letting fall* causes less inconvenience than the effort made to prevent the fall. It is in that sense that I understand the truth of the proverb: *There is a god for children and for drunkards.*

The instance I just cited leads naturally to the case where, being placed on a mountain ledge whose width offers a much broader path than would be strictly necessary if one were walking on a highway, one suddenly comes to realize the depth of the drop below. At the same instant, so to speak, one irresistibly throws oneself to the side opposite the abyss, pushed by the survival instinct that struggles against the tendency to movement in the opposite direction, determined by the

1. I readily admit that an honest man, whose entire attention is focused on the movement which a rod he holds in his hands may acquire from an unknown cause, may very well receive from the smallest of circumstances the *tendency to movement* necessary to bring about a manifestation of the phenomenon with which he is occupied; for instance, if this man is looking for a spring, if he is not blindfolded, the sight of green, lush grass, whereon he is treading, may determine in him, unbeknownst to himself, the muscular movement required to stir the rod, because of the link he established between the idea of vegetation and that of water.

sight of the sheer drop. That tendency is also noted when one is on a bridge with no railing, set above a deep gorge; the gorge, looked at from one side, makes you throw yourself to the opposite side, thus subjecting you to the same anxious state as the one you were just attempting to elude. Thus successively stressed in two opposite ways, you are transfixed and reduced to immobility unless the excessive fear of falling on the side where you are makes you run the risk of throwing yourself off the opposite side. Such is, in the case we are discussing, the case of a man who has not been trained to walk on narrow paths overlooking vertical drops, whereas the man who is accustomed to it walks in such places with as sure a foot as on a wide road, because, free of fear, he does not think of the danger that rattles the inexperienced man. Lastly, the latter's position could become even more critical, if he were to discover the depth of the abyss in a situation where, because he was following the flight of bird or a thrown stone, etc., he had already followed up to a certain point that tendency drawing us toward any moving body.[1]

The tendency to movement in a specific direction, resulting from the attention given to a certain object, seems to me the primary cause of several phenomena usually attributed to *imitation*; thus, in the case where sight or even hearing directs our thoughts toward someone who is yawning, the muscular movement of yawning is the usual consequence. I might say just as much about the communicability of laughter, and that example actually exhibits, more than any similar instance, an occurrence that seems to me to strongly support the interpretation I make of these phenomena: it is that laughter, weak at first, may, if it persists, *accelerate itself*, so to speak (as we saw the oscillations of the hand held pendulum increase in amplitude under the influence of sight), and the *accelerating* laughter can reach the point of convulsion.

There is no doubt in my mind that the sight of certain specific actions strongly influence our frail machinery, that a narrative of such actions animated through voice and gesture, or, even, the knowledge one acquires of them through mere reading, incline certain individuals toward those same actions, thus following a tendency to movement that mechanically determines in this way an action that they never would have thought of without an event distinct from their will, an action to which they would never have been driven by what one must call *instinct* in animals.

The consummate actor is one whose gestures and facial movement correspond to the movement which the feelings he translates onto the stage must have aroused in the character he represents.

The historical painter [painter of historical subjects] who studied nature knows how to grasp the position that the originals of the characters he is painting must have held, when they were contributing to the action that the canvas aims at reproducing.

A great poet is one whose verse arouses in the listener movements corresponding to the events he sings of: such is the narrative in a section of the Iliad in which Alexander lunges for his weapons.

In closing now the account of those facts that appear connected to my observations, I believe I must add a remark, indeed implicit in what I wrote, but that might have escaped some readers: it is that this tendency to movement to which I attribute the primary cause of a large number of our actions, takes effect only insofar as we are in a certain state, which is precisely what the magnetizers call the *faith*. The existence of that state is conclusively demonstrated by the account of my experiments: indeed, as long as I believed the movement of the pendulum I was holding to be *possible*, movement was taking place; but after I discovered its cause, it was no longer possible for me to reproduce it. It is because we are not always in the same state ourselves, that we do not constantly have the same impression of one identical thing: thus someone else's yawning does not always make us yawn; laughter does not always communicate itself from the person laughing to his neighbor, etc. The great orator who wants the listening crowd to share the passion that stirs him does not arrive at his goal right away, he begins by predisposing his audience to it, and it is only after having captivated them that he launches his final argument, his last stroke. The great poet, the great writer, make constant use of the same artifice; they prepare their reader to receive a final impression. There is nothing more curious in the study of the causes which determine man's actions, than the knowledge of the means used by the salesman to at first attract and then fix the buyer's attention on the qualities of the object *which he wants him to purchase*; nothing more curious than the knowledge of the means used by the conjurer in order to make you pick one card rather than another from the deck, or to bring the spectator's attention toward one certain thing, in order to distract him from another, distraction without which the prestidigitator could not cause the surprise which is the final object of his art. The outcome of these considerations is that completely different trades use quite similar means, though extremely varied, in order to reach one same goal, that of securing man's attention, in order to later exert a specific effect on him.

I believe my observations connect with the history of the faculties of animals; that there are such and such of their acts that have been attributed to instinct, which actually belong to the class of those I described. It is mainly with animals who live in groups that I believe it would be interesting to study, in this light, the influence of the leaders over the subordinate individuals. Finally, do not the cited facts shed some light on the cause of the *fascination* exerted by one animal on another?

As long as I believed the movement of the pendulum I was holding to be *possible*, movement was taking place; but after I discovered its cause, it was no longer possible for me to reproduce it.

I believe it is in the nature of my observations to attract the attention of physiologists who, like Mr. Flourens, have examined very closely the movements taking place in animals after selective ablation of parts of their nervous system; it would seem to me important to gauge the influence that could be exerted by the ablation of some of those parts on the manifestation of the phenomena that were the subject of this letter.

Such are, my dear friend, the matters which in your estimate were likely to be of interest to those people who think along with ourselves that the procedure to be followed in psychology is the one outlined by the men to whom the natural sciences owe their advances, and who share our conviction that there is no such thing as positive metaphysics for those who ignore the essential truths of the physical and mathematical sciences. The study of man's faculties is invariably linked not only to the knowledge of the means he put to use in founding each of the special branches of those same sciences, but it is also linked to the knowledge of animals' faculties. Before attempting to compose a general system of philosophy, it is necessary to have collected as vast a number as possible of groups of analogous facts, and moreover the facts in each group must have been previously investigated in depth by specific studies.

E. CHEVREUL □

1. It is not impossible that, in seasickness, something similar to what I just described happens in us.