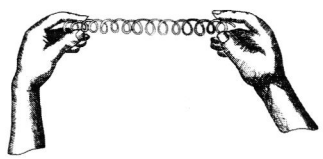


CHAPTER 7

Physical or Sidereal: A Pendular Question

". . . a coiled spring held between the forefingers and the thumbs . . ."

A Dangerous Frontier

While sojourning with the dowser Pennet in the Appenine village of Gualdo, Abbot Fortis was introduced for the first time to a practice that was as new to him as it was strange. A man secretly hid a handful of silver coins under a heavy blanket. One of his friends then appeared holding a cube of pyrite hanging on a silken string between his thumb and his index finger. As he moved it over the blanket, at one spot it began to swing in a tight elliptical pattern. When he retracted it, the motion ceased. The blanket was then stripped back to reveal the money lying directly at the spot over which the pendulum had been in motion.

When he returned home, Fortis, seeking an explanation for what he had seen, began experimenting and was surprised that his own "stone of the Incas," as pyrite was known, seemed to be affected not only by silver but by a variety of metals each of which would cause it to swing in a peculiar pattern.

When Fortis drew the phenomenon to the attention of a clerical colleague, the priest recalled that as far back as the first century A.D., the Roman writer, Marcellinus, had referred to a tripod, ornately decorated with snakes and other animals symbolic of divination, from which hung a ring on a thread. Used in conjunction with a circle showing the letters of the Latin alphabet on the circumference of the tripod, the ring was said to swing toward one letter or another in succession and thus spell out answers to questions whenever the thoughts of certain people were ritually focused on it.

That the practice had survived into the Middle Ages was also evident to Fortis from a bull issued in 1326 by Pope John the 22nd against the "use of a ring to obtain answers in the manner of the Devil," and a 1553 description of a peasant holding a threaded ring over a vessel half full of water and carrying them across country as an alternative to a dowsing rod.

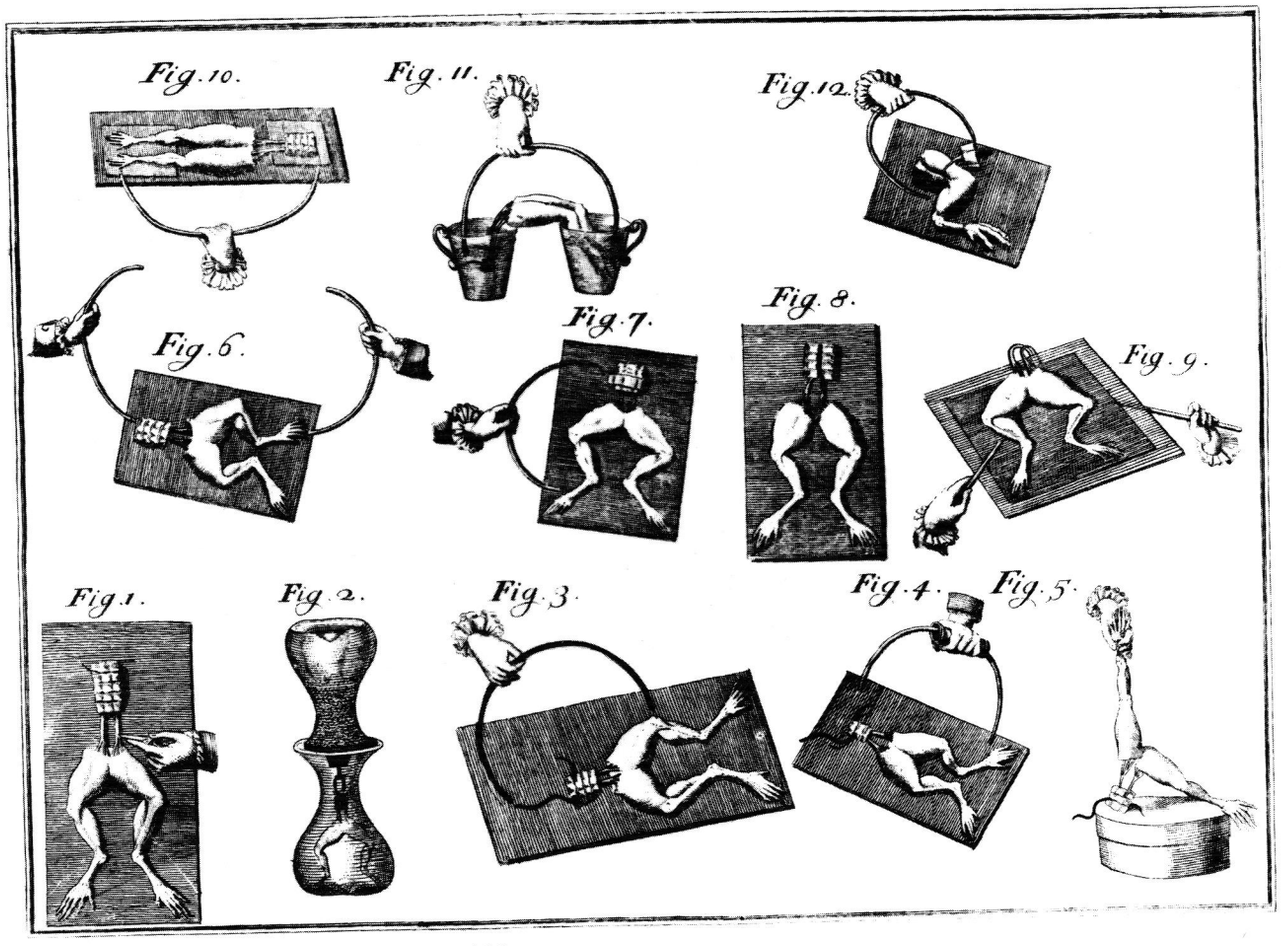
Why, wondered Fortis, did a pendulum on the one hand appear to respond to emanation from a *physical* body such as a metallic substance or an underground water vein and, on the other, to a simple act of mentation, an effort of the mind, or *psyche,* as the soul was known in Greek?

At the beginning of the nineteenth century the problem came to the attention of Johann Wilhelm Ritter, a younger

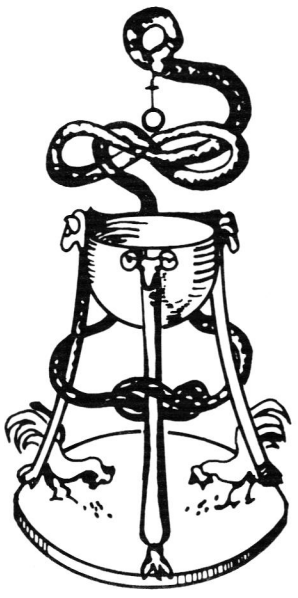
afflicted, just as over a dowsing zone, by a racing pulse, an excess of body heat, twitching muscles, and dilated pupils as verified on numerous occasions by physicians in attendance. Inexplicably, when chains linking him to the generator were held in Pennet's hands, or attached to his feet, the rod would turn in one direction; when put on his head in the shape of a crown, in the other.

It seems that, while the electrified Pennet was able to produce a rotatory motion in the rod, other subjects could not duplicate the feat. Several skeptics, insisting that the motion effected by Pennet could be caused by his bending the vertical glass rods with pressure, actually grew so desperate in their efforts to prove their assertion that they broke them. Especially puzzling to the experimenters was the fact that Pennet's ability to move the rod varied according to weather conditions.

The pioneering efforts of Thouvenel to relate the dowsing faculty to electricity, though not conclusive, renewed consideration about some kind of natural energy in the body that the "animal magnetism" of Franz Anton Mesmer and the "animal electricity" of Luigi Galvani had already anticipated. Thouvenel's own name for it was "organo-electricity" and it was to become the focus of attention by several dowsing researchers in the nineteenth century.



Galvani's experiments with frog legs and electricity. From Abbé Bertholon,* De l'Electricité des Végétaux, *Lyon, 1783.



Roman divinatory device with ring-pendulum as illustrated in a Ph.D. dissertation, "On the History and Theory of the Sideric Pendulum," by Father Andreas Resch, Innsbruck, Austria, 1967.

member of the Bavarian Academy of Sciences, who today is recognized as the father of electrochemistry, the discoverer of ultraviolet light, and the inventor of the dry cell battery. In 1806 Ritter, whose enthusiasm for dangerous laboratory work cost him one eye, one ear, and part of his nose, received a letter from a fellow scientist traveling in Italy revealing that one Francesco Campetti living near Lago di Garda appeared to possess a wholly inexplicable power to find water and minerals under the earth's surface.

Excited by the report of what to him was a completely unheard-of phenomenon, Ritter immediately applied for a Bavarian Royal Government travel order to proceed to Italy and study Campetti's ability. His request, stressing the potential importance of his research mission for physics, was supported by the romantic philosopher and superintendent of the Bavarian Mines, Francis Xavier von Baader who, like Hegel and Goethe, was to become fascinated with Ritter's new research project.

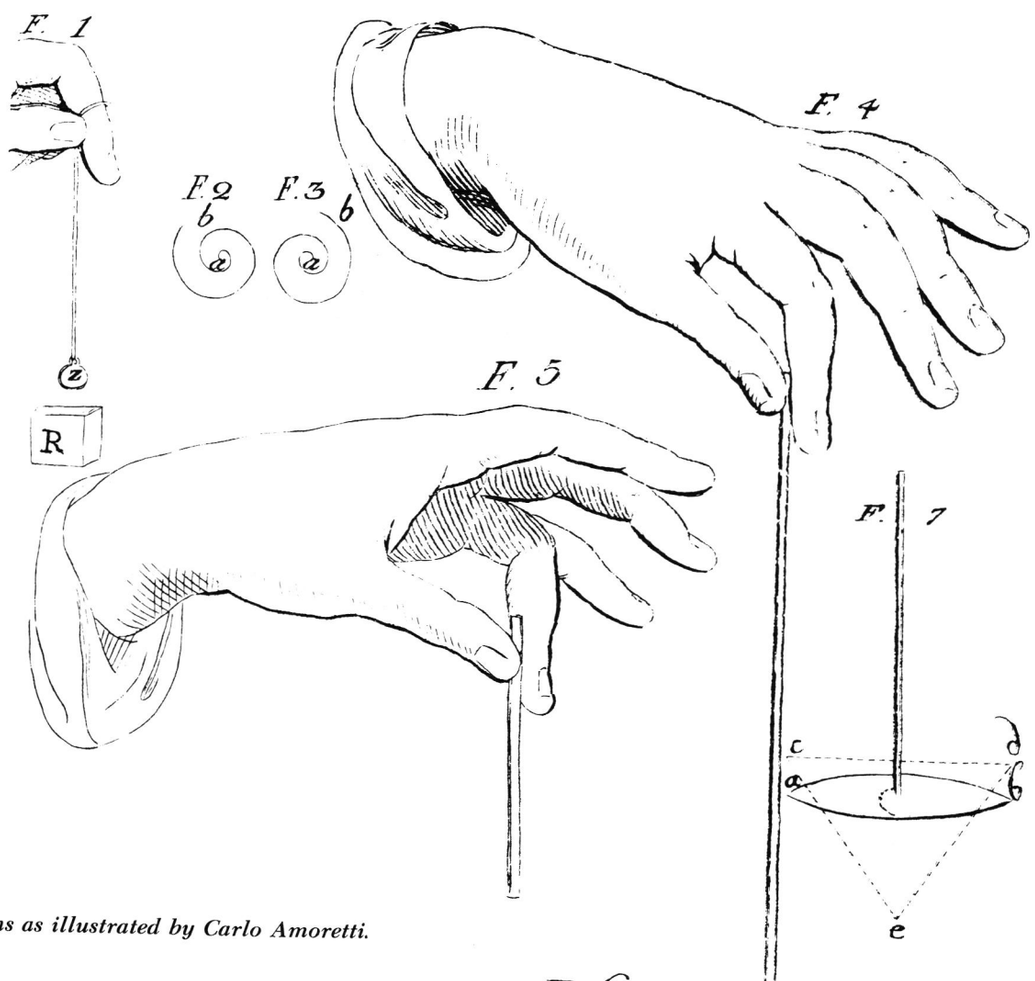
On November 21, 1806, Ritter set forth to Italy where, working with an Italian scientist, Cannella, who had performed many successful experiments with the "second Pennet," he became convinced that Campetti could do all that was claimed for him. After watching Campetti put to test by Abbé Fortis, Ritter felt that "having seen everything I was looking for, I was faced with a whole new world in physics." The experience was for him one of "fulfilling wonder: actually seeing for oneself something that cannot equate to hearsay however many times it may be reported."

In Como, Ritter was received by Volta with great warmth and hospitality. Though he was impressed with the Italian professor's "childlike vitality," he could not arouse Volta's interest in the dowsing feats of Campetti or get him to say anything about the subject of dowsing. This he reported in a series of letters to his close friend Karl von Hardenberg, brother of the philosopher and romantic poet, Novalis.

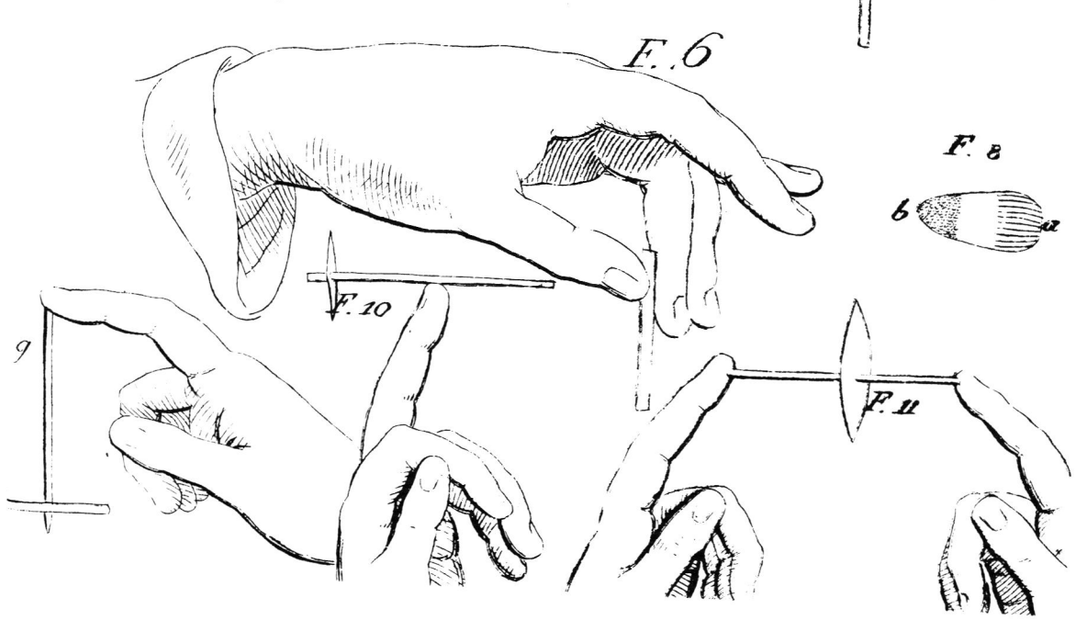
Ritter obtained permission from the dowser's parents to take him back to Munich for study. Elated, he felt this accomplishment to be "a triumph for science over prejudice and a new advance in the study of Dr. Thouvenel's 'subterranean electrometry.' " On his way home the scientist detoured to Milan where Amoretti introduced him to a series of seemingly inexplicable effects produced by inert substances and living matter on a number of delicately fashioned pendular devices, some supported by solid dowels, rather than threads, held between two digits of one hand.

To avoid exposing Campetti to the Munich public, Ritter installed the dowser in his own home where, before an audience of intrigued companions, he began to work out how dowsing rods or pendulums reacted to materials. In vain Ritter tried to get the same reactions as his experimental subject from the two instruments, succeeding only when, one day, Campetti suddenly grasped his shoulder. Subsequently, he was able to get dowsing responses unaided and became the first to record that the dowsing gift could apparently be communicated by touch.

The fact that pendulums nearly always swung in a specific



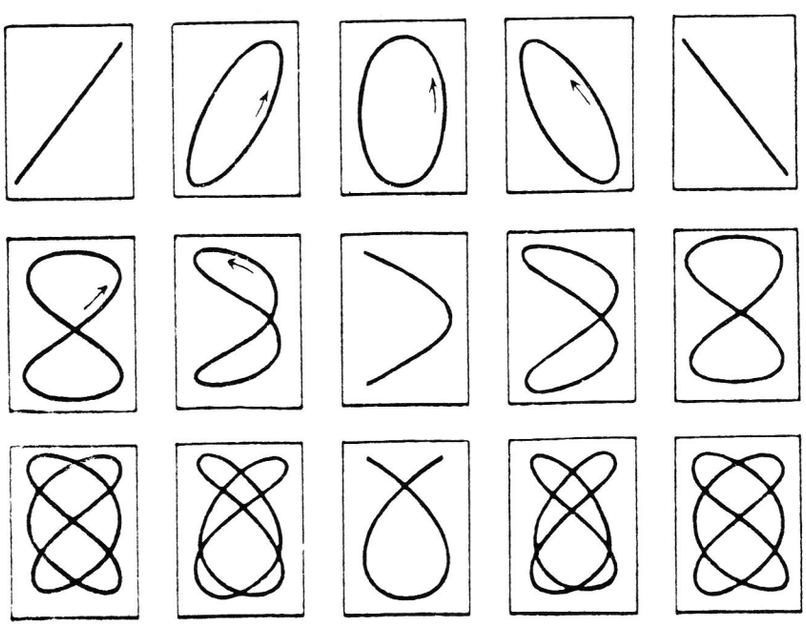
Pendulums as illustrated by Carlo Amoretti.



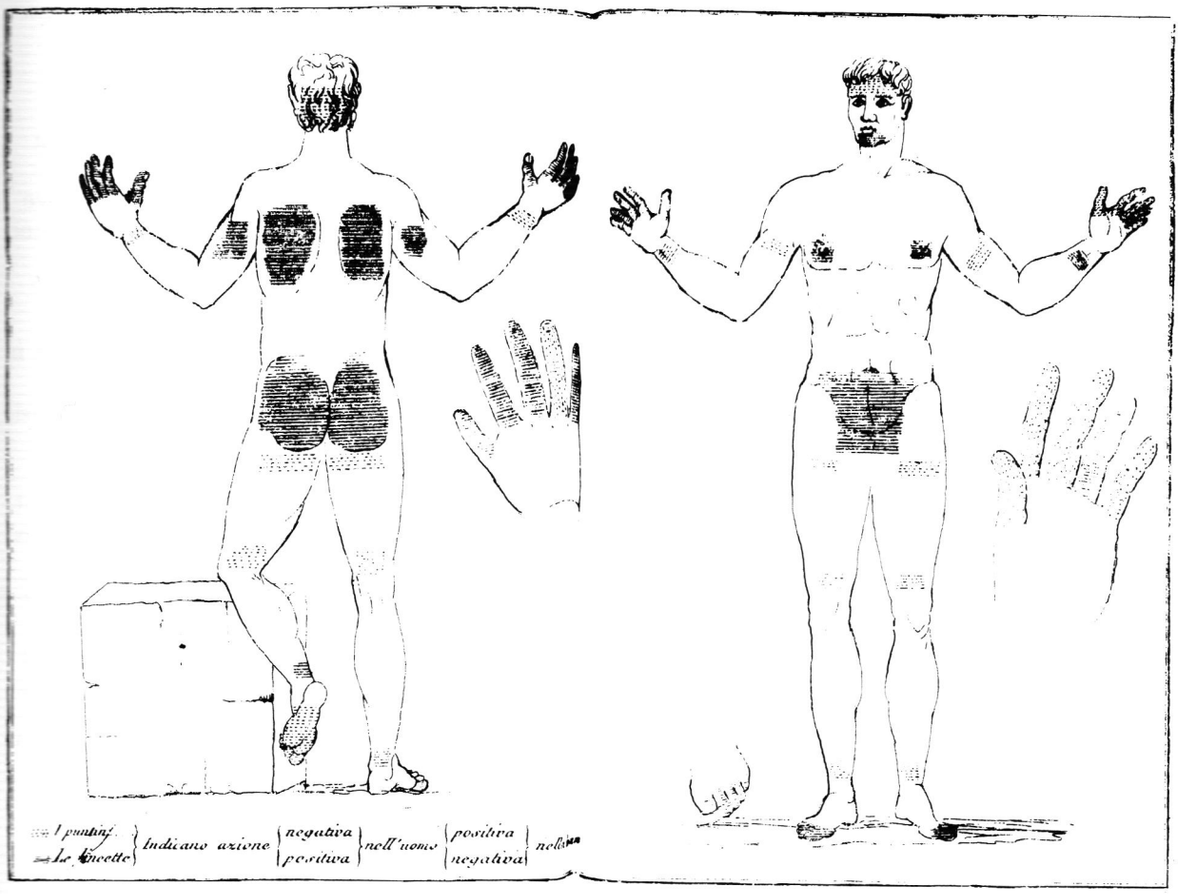
pattern over given substances suggested to Ritter that each kind of matter contained within it energy of a special signature detectable by the simple instrument. Over the north pole of a magnet the pendulum would begin to describe an elliptical clockwise motion which, as it speeded up, became circular, as it would when held over a piece of zinc or tin, near the obtuse end of an egg, the stem end of a fruit, and various parts of the human body including the palm of the hand. The south pole of the same magnet a piece of copper or aluminum, the tapering end of an egg, the side of a fruit opposite the stem, and the back of a hand would cause a counterclockwise rotation. Other substances provoked more complicated patterns of movement or a series of backward and forward swings which, when they had attained a specific number, would inexplicably cease.

Believing he had encountered a new property in the human body, Ritter used the pendulum to examine its every part. Salacious academic gossip in Munich had it that, at the Ritter residence, the pendulum swung far into the night over "the delicate parts of nubile and naked females," to quote one reporter who harshly attacked Ritter's work in a vitriolic book, *Conspiracy Against Common Sense.*

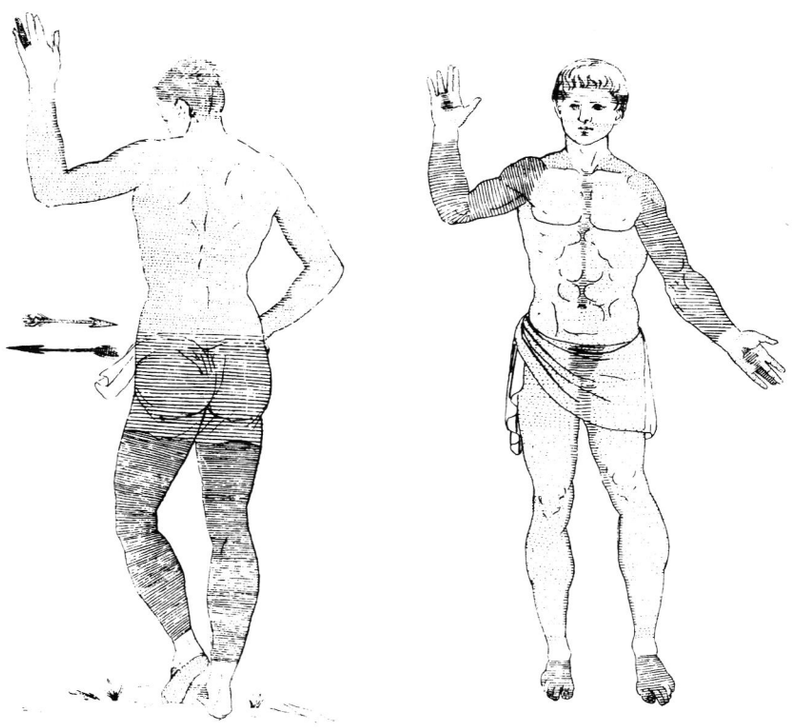
Because various parts of the organic bodies produced pendular movements in opposing directions, Ritter, likening them to magnets, now began to refer to their *polar* nature. In coming to this conclusion he was influenced by Baader's friend, the philosopher Frederich Wilhelm Joseph von Schelling, who insisted that the fundamental aim of science was not to study matter by mechanically breaking it apart and reducing it to its smallest indivisible units but intuitively to grasp the essence of natural functions and interpret how they fit into the universe as a whole. There was, said Schelling, a "force" in nature that could be revealed mechanically, chemically, electrically, magnetically, and also *vitally.* The pendulum, he believed, was able through the sensitivity of its operator to detect how this force expressed



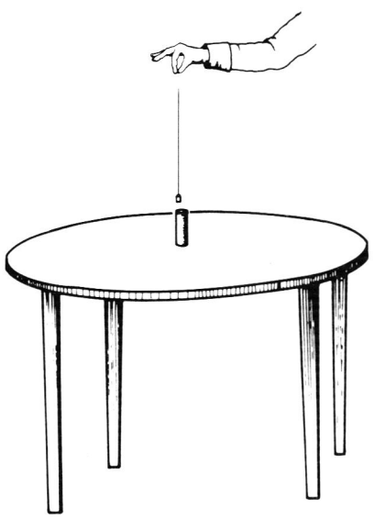
"Swing configuration of the pendulum as an expression of musical intervals. The top row illustrates unison intervals, the middle row, octaves, and the lower row, fifths. These patterns are also of material significance in the use of the sidereal pendulum." From Count Carl von Klinckowstroem's Die Wünschelrute *(see Bibliography).*



Polarities in the body as first visually illustrated by Carlo Amoretti.



Pendulum experiment illustrated by Antoine Gerboin. "A man will stand near a table on which he will set the bodies which will react to the pendular apparatus. He will suspend the pendulum above the table and lower it slowly downward to the body to be explored. During his experiment he will avoid touching the table with any part of his body or clothing. In this case the use of a small cylindrically shaped pendulum is advised and a much shorter thread supporting it than that using the spherical pendulum."



itself in matter and to confirm the existence of a basic *polarity* throughout the universe from which all organic and inorganic processes were derived.

In the pendulum's antics Ritter also detected not only *rotation* but *nutation*, a libratory motion similar to the nodding of a top. To Hans Christian Ørsted, professor of physics and chemistry at the University of Copenhagen, he wrote: "What we have, then, are the celestial movements themselves here repeated in microcosm. Could it be that the whole organism of the universe is reflected in the human body?"

At the time, Ørsted was preoccupied with laboratory experiments that sought an answer to a nagging question: What is the real nature of electricity? Ten years after Ritter's death in 1810, his efforts bore fruit when the Danish scientist laid the basis for electromagnetic theory with the discovery that electrical current flowing through a wire could deflect a magnetized compass needle. To him, as to many of his scientific colleagues, it seemed that, in his preoccupation with the pendulum, Ritter was straying from science's "highway," built with paving stones of observable fact, into byways of philosophical speculation or even mysticism. He therefore did not deign to reply.

Other scientists protested that hand-held pendulums did not move in response to physical emanations from matter but simply to an action, voluntary or involuntary, on the part of their operators. Wrote one: "It is hardly strange that bodies suspended on a string orient themselves in a manner that accords with the fantasy of the experimenter." Unimpressed with the criticism, Ritter replied: "Any supposition of error in these tests is easy to put to rest due to the fact that, even if the pendulum is given a mechanical movement contrary to the one it would naturally take, it will change back to the latter as soon as the mechanical force is no longer applied."

This exchange, with regard to a device no more complicated than a mechanic's nut hanging at the end of a bit of twine, represented yet another skirmish in the ongoing battle that has lasted to this day over the question: What actually moves the pendulum, or a rod for that matter, in the dowsing process?

To Ritter the answer was a combination of influences. Occult forces of an "animate" nature, similar but not necessarily equivalent to electricity, that were present in living organisms, dowsers included, were also imprisoned in inorganic substances. All of them could interact to cause motions in a dowsing device not only when it was in close proximity to an object under inspection but *at a considerable distance from it.*

This view borrowed, wittingly or unwittingly, from an idea of Mesmer's expounded in his doctoral dissertation that anticipated contemporary medical findings relating planetary influence to such phenomena as the outbreaks of epidemics, the conduct of the inmates in lunatic asylums, the state of health of patients (especially hypochondriacs), and the propensity of blood to clot quickly or slowly during surgical operations. Realizing that "modifications of the air," such as sound waves, could influence not only the organs of hearing but the whole of the body,

Mesmer asked: "If we assume that there exists a certain celestial power that insinuates itself in every particle of the body to its whole ensemble of nerves and the very nervous fluid itself, who would be surprised that its alterations affect the whole fabric? A force diffused in the vast spaces of the heavens influences the intimate recesses of all matter and moves and troubles the smallest particles of our bodily machines."

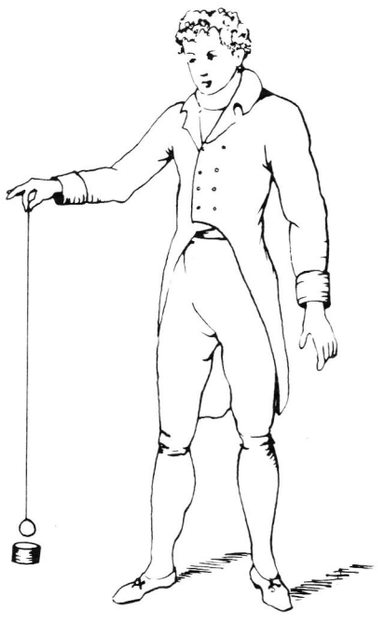
Believing the same force to act on pendulums both directly and through the bodies of persons manipulating them, Ritter called it *siderism,* from *sidus* and *sider* (Latin for "star"), characterized the pendulum itself as *sidereal,* and founded a journal, *Der Siderismus,* to publish articles on the new subject which he hoped would become a forum for the integration of knowledge from many branches of science.

In one of his letters to Hardenberg, Ritter warned that he could not be sure whether his friend would have success in repeating the dowsing experiments because while some eighty percent of neophytes who tried it seemed to be able to successfully operate a pendulum, only a quarter of those who manipulated the rod were successful. As for picking up emanations without the assistance of any instrument, simply by feeling them in the body, he believed this ability limited to only two or three individuals in a thousand.

All this was mere technical detail or, as Ritter worded it, "only ordinary physics," in comparison to what he next reported to his friend. "We now actually stand," he wrote, "on the threshold of a really new discovery. In the foregoing experiments, one can observe what nature, of itself, can produce under various circumstances but this is as nothing compared with what it can do if commanded."

What Ritter had stumbled upon at the start of the nineteenth century was the fact that a pendulum or dowsing rod could be used to extract pure information from the universe about any subject no matter how abstract or nebulous. This was because the instruments seemed able to produce a positive or negative movement *even when there were no physical objects present to affect them.* They appeared to respond to the desire or intent of their operators who, if they wanted, could receive a prophetically correct answer to any question requiring a *yes* or *no* answer. Thus, while holding a dowsing instrument, dowsers had to internalize a specific question, allowing it to settle into the very fibre of their beings. Should the pendulum move clockwise, a *yes* answer was indicated, should it move counterclockwise, the answer was *no.* For the hoopshaped dowsing rod, considered to behave like two pendulums working in concert, the equivalents were upward or downward motions.

The questioning process was not as easy as it appeared at first sight. Nor was it to be taken lightly. Just as in alchemy, Ritter warned, one should desire an answer with whole-hearted belief and dedication or otherwise one would obtain an unreliable one. Beside himself with excitement, Ritter also cautioned Hardenberg not to reveal his secret to anyone except Lüdwig Tieck and Friedrich Schegel who were at the time turning out German translations of William Shakespeare's plays so masterful that they



Pendulum experiment illustrated by Antoine Gerboin. "A man stands on the parquet of an apartment or in a given locale free of humidity and in which the air is not greatly agitated. He takes with his thumb and forefinger of his right hand the thread of a pendulum which he will hold about twenty centimeters above the ground on the parquet. If this operation will last for a long time, he should loop the thread several times around the last joint of his forefinger, pressing it with his thumb. In that way his hand, being more stable, will offer the apparatus a necessary degree of fixity."

have never been improved upon. He further warned Hardenberg to swear the translators to secrecy. "In fact," he admitted, "I used this very questioning method to ascertain whether you, as well as Tieck and Schegel, were worthy of being privy to my new discovery."

Ritter was as concerned about the moral implications of his find as were others before him. "Magic has been recreated," he added, "and, along with it, that dangerous frontier at which one is capable of deciding questions of good or evil. We are only at the beginning but I envision great things ahead along an adventurous road already welcomed last year in my address to the Bavarian Academy."*

Moral or Material?

In France, Ritter's ideas attracted the notice of a physician and professor at the medical school in Strasbourg, Antoine Gerboin, who for nearly a decade had been secretly experimenting with pendular movements ever since he had been informally introduced to them by an infantry captain in Paris—who had, in turn, learned about them on a trip to India. Impressed that a scientist of Ritter's caliber had dared to issue a public opinion on so complex and novel a problem, Gerboin decided to bring out a treatise on which he had been working for years, *Experimental Research on a New Mode of Electrical Action,* that presented 253 experiments with what he called an "exploratory pendulum."

The professor's most revolutionary conclusions were that certain persons, endowed with an "expansive" quality, were more adept at eliciting pendulum movements than others handicapped with a "deterrent" quality, and that the movements themselves could be affected by the shape or form of objects.

Gerboin's work aroused the curiosity of a brilliant young chemist, Michel-Eugene Chevreul who, like his predecessors, found that a pendulum seemed to produce a puzzling variety of movements when held over elements and compounds. After two decades of intermittent study of the phenomenon, he thought he had an explanation. In a letter to Andre-Marie Ampère, whose mathematical analysis, based on Ørsted's research, led him to found the science of electrodynamics, today called electromagnetism, he wrote: "The more these effects seemed extraordinary, the more I felt the need of verifying whether they were truly foreign to any muscular movement of my arm as had been affirmed to me in the most positive terms."

To carry out his verification, Chevreul supported his arm with a block of wood at various points all the way from his shoulder to his hand, only to find that the movement of the pendulum decreased as the block neared the fingers holding its thread. When the same fingers rested directly on the block in such a way that they could not intentionally be moved, all pendular motion ceased.

Something else bothered Chevreul. He observed that when he gazed fixedly at the movement of a pendulum as he held it, he seemed "to enter into a particular state or disposition which he

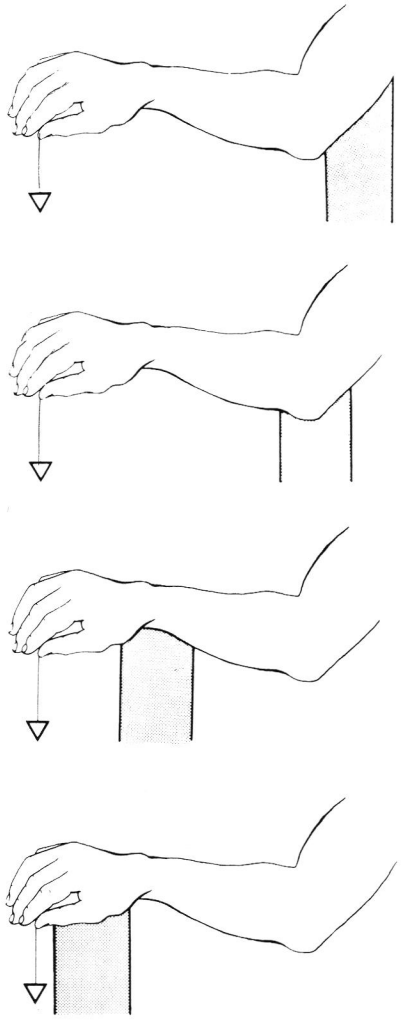
*"Physics as Art: An attempt to Interpret the Future of Physics from Its History."

felt might contribute to it." There was, he cautiously concluded, "an intimate liaison established between the execution of certain movements and a mental act relating to it, even if the thought is not yet the intent to command the muscular organs."

With this intuitive flash suggesting, as it did, that thought, or mind, might affect a pendulum independent of any muscular or motoric movement, Chevreul came within a hair's breadth of anticipating twentieth century experiments that have proved the ability of peculiarly gifted individuals to cause movement in stationary pendulums and other motionless objects at a distance from them solely by mental effort and, by altering the composition of matter at the microscopic level, to bend metal objects without touching them.

On the threshold of a momentous discovery that was to be awkwardly labeled *psychokinesis* (movement produced by mentation alone), Chevreul was not up to stepping across it. Instead he backed away with the lame excuse that, because his research demonstrated "how easy it was to take illusion for reality," it would be mainly of interest to psychologizers and historians of science. Nevertheless, Chevreul probably came closer to summing up the problem of dowsing in 1850 than any other contemporary scientist.

Experiment by Michel-Eugene Chevreul purporting to prove that the motion of a pendulum held on a thread is due to involuntary muscular movement. When the support lay under the thumb, all pendular motion ceased.



CHEVREUL'S SUMMARY OF THE DOWSING ENIGMA, 1850: *A dowsing device's movement can be explained either:*

1. *as being part of the* moral *world and having a* spiritual *cause derived from:*
   a. God *or the angelic hierarchy;*
   b. *the* devil *or his minions;*
   c. *the* mind *of the dowser;*
2. *as being part of the* material *world and having a* physical *cause derived from "occult" properties associated with matter which:*
   a. *the Aristotelian peripeticians called* sympathy *and* antipathy;
   b. *the Cartesians called* corpuscles, vapors, *or* subtle matter;
   c. *Chevreul's contemporaries referred to as* electricity, electro-magnetism, *or* electro-organism *(Galvanism).*

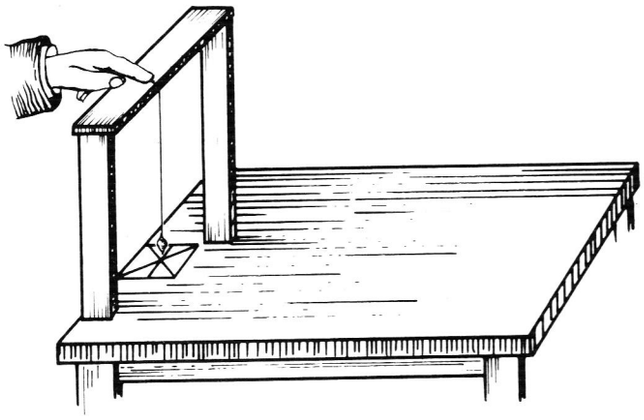
The movement could be augmented by the dowser's holding in his hands, together with the device:

1. *material* identical *with that of the target sought;*
2. *material* different *from that of the target sought.*

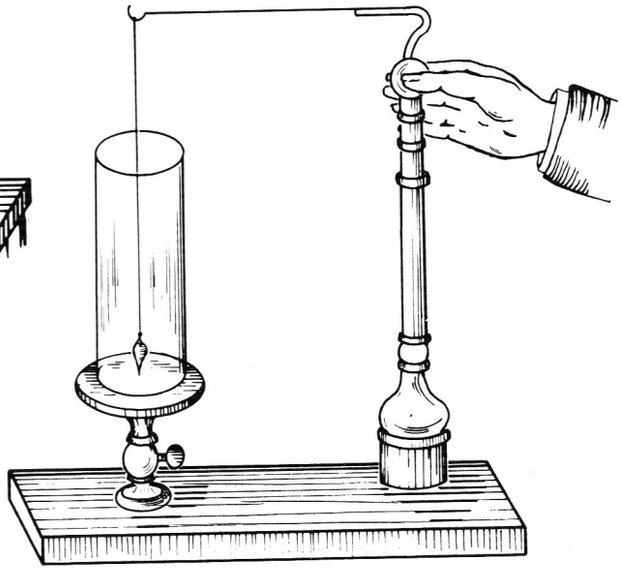
Because these two means for augmenting the device's movement were diametrically opposed, not a physical, *but a* mental, *cause would have to explain them.*

"Partisans of dowsing," wrote Chevreul, "whether practitioners or theoreticians, recognize the influence of thought *played in dowsing, whether this thought is to be equated to* will, desire, *or* intention."

"Thought," he continued, "could neutralize *or cancel out any physical cause or, otherwise, how could one explain that buried metal, which is considered to influence the rod through such a physical cause, has no influence if the dowser is seeking water, and vice versa?"*



(ABOVE)
Apparatus constructed by Monsieur F. de Briche, Secretary General of the Prefecture of Loiret, France, around 1838 that ostensibly proved a pendulum's movements were not due to involuntary muscular movement. On a table a crosspiece 20 to 25 millimeters thick, 13 to 14 centimeters wide, and 36 centimeters long was mounted on two uprights 30 centimeters high. To a silk, cotton, hemp, or linen thread 21 to 22 centimeters long, a pendulum made either of a ring, a tiny ball, or a metal cylinder (silver, copper, or lead) was attached, the upper end of the thread being fixed to the crosspiece by a ball of wax which stuck to the wood. It was said that the pendulum exposed to a substance placed beneath it would rotate or oscillate whenever a hand was placed on that part of the thread lying on the upper side of the crosspiece. Monsieur Albert de Rochas in his book, Notice Historique sur les Effets de l'Od, stated that the pendulum would move as desired by a sensitive operator holding his finger on the motionless portion of the thread.



Rutter's magnetoscope

Other experimenters, however, were to come to conclusions that had narrowly escaped Chevreul. One of them, a French civil servant, de Briche, tied the thread of a pendulum around a wooden support. He touched only that part of the thread that lay against the top of the support. Though he could not have imparted any movement to the hanging bob with his hand, it nevertheless produced oscillations that varied depending upon what substance lay directly below it.

Independently of de Briche, one Rutter, a resident of Brighton, England, constructed a more complex apparatus which, because it was assumed to detect "magnetic" currents emanating from all substances, was called a *magnetoscope.* It consisted of a piece of cone-shaped sealing wax hung inside a foot-long cylinder of glass by a silken thread attached to a metal arm. The other end of the arm ran through a copper tube, widened at one point to form a spherical protuberance, to be fastened to the top of a wooden column. It was sufficient that Rutter only lightly touch the sphere for the pendulum to leap into animated motion.

The Englishman's experiments came to the attention of a famous Austrian chemist, Baron Karl von Reichenbach, discoverer of parafin and creosote, who maintained that persons endowed with something akin to Gerboin's "expansive quality" were able to sense emanations coming off substances and even identify them in the pitch dark. These "sensitives," as he called them, could also feel cold at one end of a gypsum spar crystal and warmth at the other end from which the crystal grew and visually detect flames streaming out of the two ends of a bar magnet, orange-red from its north pole and bluish-white from its south, which suggested that there was something inherently different about the two polar energies. The same flamelike emissions were seen to radiate from the left and right hands of

the human body, tending to confirm Ritter's notion that it was somehow polarized. Plants, animals, and human beings, said the sensitives, were surrounded by multihued "auras" of energy depending on the state of their well-being and their age.

As had others before him, Reichenbach felt compelled to find a new name for the strange force emitted from inert and animate objects. In homage to the all-powerful Norse god, Odin, he called it *od* or *odic force* and claimed that, like Ritter's *siderism,* it was able to exert an effect at a distance as well as to travel over a silk thread and other nonconductive materials at a speed slower than electricity and even to penetrate glass. Nonsensitives could detect it only with a pendulum.

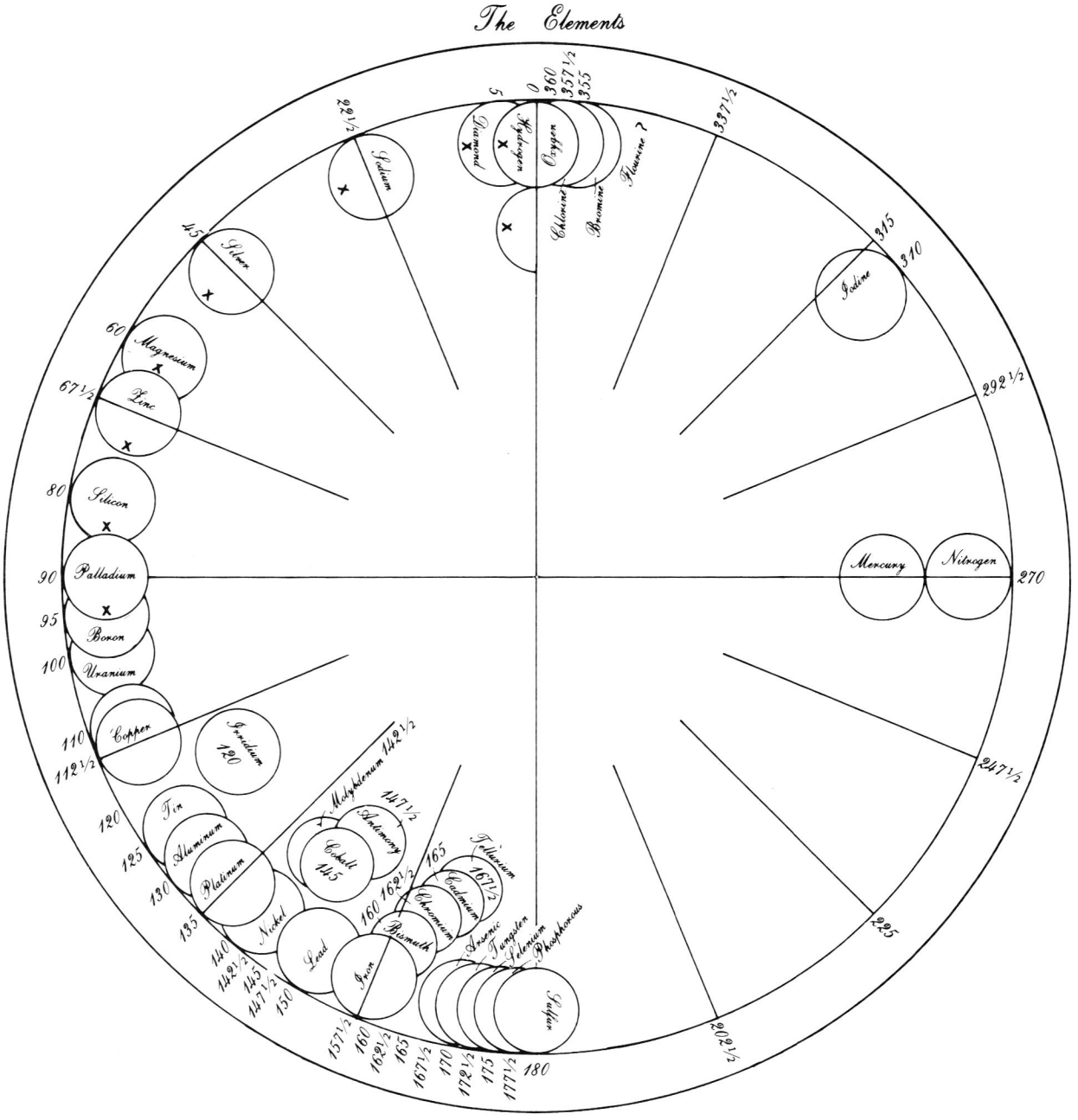
Reichenbach hurried to Brighton where he tested Rutter, and his daughter as well, and found them both to have the same high degree of sensitivity that his carpenter, Joseph Czapek, one of his most gifted subjects, possessed. When he returned to his castle outside Vienna, he constructed a device similar to Rutter's. Czapek had no trouble getting the pendulum to move simply by touching the spherical protuberance. "Sensitives" he concluded, "not only could passively *apprehend* odic energy but could actively *emit* it."

"Electrometry," "organo-electricity," "siderism," "odic force," and other new terms for an energy considered animate were as distasteful to orthodox scientists as they were appealing to antimaterialists who complained that contemporary philosophies of physics were dissatisfying because they lacked any doctrine concerning a spiritual world. "Once the nature of a spirit in man, conditioned by the stars themselves, is unshackled and can begin to shine forth," wrote Ritter's friend, Baader, "only then will it be understood that it may also be found in the lower forms of nature."

No one would have been more sympathetic to this idea than a Dresden professor of chemistry, Johann Karl Bähr, whose own pendular experimentation led him to conclude that many people able to detect forces within matter were also capable of knowing, like animals, exactly what comestibles were beneficial or inimical to their health. Labeling the forces "dynamic activity," Bähr noted that elements and substances produced pendular swings toward various azimuths and accordingly arranged them on a compass rose in a circular pattern which he felt correctly expressed the relationships among them.

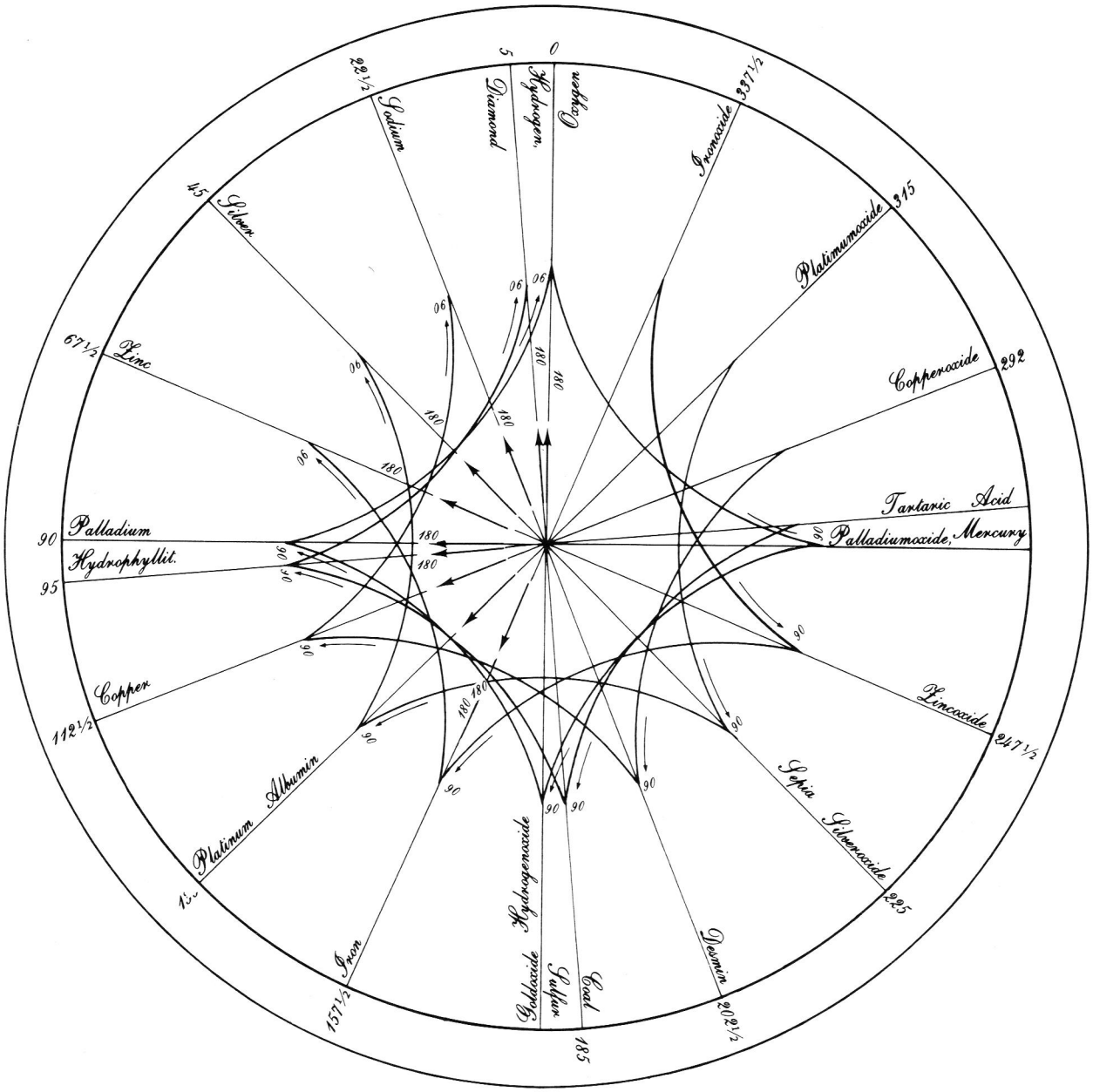
In his massive tome, *The Dynamic Circle,* he wrote: "I have to assume that any educated person not influenced by the prejudices of certain learned professors will have some knowledge of these phenomena." The pendulum's uniqueness, he added, lay in its allowing anyone, however insensitive, to recognize properties of materials directly without having to take them apart or dissolve them—an affirmation seeming to imply that the budding field of analytical chemistry could be bypassed.

Bähr held that the source of hidden influence within matter was, as the philosopher Immanuel Kant proposed, not fixed but "movable in space." Specific qualities of bodies depended not on their material substance but on "inner values" recognizable only



by such "outer manifestations" as the movements of a pendulum.

Bähr's system of classifying the properties of matter, elaborated on the basis of *subjective* analysis rather than *objective* proof and based on the essential claim of dowsing that, being directly accessible, knowledge needs no confirmation either by the five normal senses or repetitive experimentation, became the foundation upon which the edifice of dowsing inquiry has since been built. His arbitrary cataloguing of qualities according to a unit of angular measure on a circle, emphasizing the idea that dowsing was particularly suitable to determine *degree,* has been



Two circular diagrams worked out by Johann Karl Bähr to show attractive and antagonistic relationships between elements and compounds.

adapted under various guises to value or rate all sorts of phenomena to which, because it lacks instrumentation for their measurement, physical science can have no access. The catch in the process is, as German mining men realized in the eighteenth century, that the usefulness of data obtained in such a way depends upon the skill and probity of dowsers.

Bähr's other idea of ranking substances according to the effects produced by their "inner values" on dowsing instruments was able to endure. Between the two world wars it was taken up by Joseph Wüst, a physical chemist with a medical degree who