PHYSICO-PHYSIOLOGICAL RESEARCHES

ON

THE DYNAMICS

OF

MAGNETISM, ELECTRICITY, HEAT, LIGHT, CRYSTALLIZATION, AND CHEMISM,

IN THEIR RELATIONS TO

Vital Force.

BY

BARON CHARLES VON REICHENBACH.

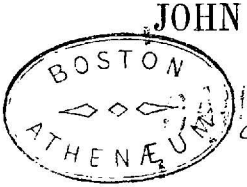
THE COMPLETE WORK,

FROM THE GERMAN SECOND EDITION.

WITH THE ADDITION OF A PREFACE AND CRITICAL NOTES,

BY

JOHN ASHBURNER, M.D.



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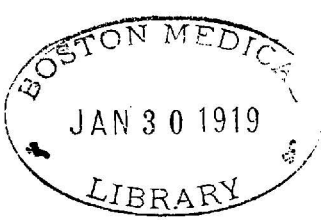
" Einer neuen Wahrheit ist nichts schädlicher, als ein alter Irrthum."

" Nothing is more injurious to a new truth than an old error."

Göthe.

" In science, nothing may be built upon uncertain possibilities; science may not be a tissue of conjectures: it must consist, as far as possible, of a system of demonstrated realities."

Berzelius.



Wilson and Ogilvy, 57, Skinner Street, Snowhill, London.

TO

JOHN ELLIOTSON, Esq. M.D.

ETC. ETC.

This Translation

OF THE COMPLETE WORK OF REICHENBACH IS DEDICATED,

IN TESTIMONY OF THE DEEP RESPECT ENTERTAINED FOR A

HIGH AND HONOURABLE CHARACTER.

SPLENDID TALENTS AND ACTIVE BENEVOLENCE,

RARE LIBERALITY AND EXTENSIVE CHARITY,

HAVE CHARACTERISED THE PROFESSIONAL CAREER OF THE MAN, WHO, MORE THAN ANY OTHER OF HIS TIME, HAS PROVED HIMSELF

A PROFOUND PHYSIOLOGIST — A THOROUGH MEDICAL INVESTIGATOR, — AND A PRACTICAL PHYSICIAN.

DISDAINING THE SERVILE DEVICES,

WHICH A DEBASING SPIRIT OF COMPETITION AND AN ENVIOUS DREAD OF SUPERIORITY HAVE SUGGESTED TO SOME OF HIS CONTEMPORARIES,

HE STANDS FORTH AS THE INTREPID CHAMPION OF THE HOLY PHILOSOPHY OF

Mesmerism,

THE KEY TO THE FUTURE PROGRESS OF THE SCIENCE OF MEDICINE.

HAIL!

DEVOTED AND UNFLINCHING MARTYR IN THE SERVICE OF

TRUTH,

WHICH IS FOR EVER THE TYPE AND THE ESSENCE OF THE

Great Supreme.

CONTENTS

OF THE FIRST PART.

PREFACE.

THE present edition of a translation of these Researches owes its existence perhaps to one, perhaps to a series of misapprehensions, with which the public may have little concern. Certain it is, that at no time, have I had the slightest intention to be guilty of a want of courtesy towards the gentleman who had, by the publication of a very skilful abstract of his labours in the year 1846, the merit of introducing the Baron von Reichenbach to the British public, as an investigator of the Philosophy of Mesmerism. Various efforts have been made to convince me that I did not act as I ought to have done, in omitting to place myself in communication with Professor Gregory, when I was applied to by the Publisher, through a well-known literary physician, to furnish some notes to a complete edition of these Researches; but I confess my obtuseness shuts out from my mind the light of all the reasoning that has been brought to bear on this matter. All that I can allow is, that, although I have no personal acquaintance with the Professor, I am very sorry in any way to have injured his feelings, and I am grieved to find myself in such a relative position with a man for whom I am bound to entertain a deep respect; for, besides his high scientific reputation, he is known to have the courage to avow his belief in Phrenology and in Mesmerism, "even in the spirit of truth, whom the world

cannot receive, because it seeth him not, neither knoweth him; but," to all like the Professor, it may be said, "ye know him, for he dwelleth with you, and shall be in you!" To me, feeling quite innocent of all wrong intention, in the perfect freedom of action which, under the circumstances, I claim for myself, it is sad to be at opposite poles with one who is of the salt of this earth. To those who cannot know of the dire consequences resulting from the aggregation of the petty and repulsive mental forces concentrating and directing in society the baneful powers of their various influences upon characters who dare to think for themselves,—who are hardly aware that new truths are met so frequently by sneers, taunts, ridicule, or that unworthy social persecution, at once the proof of a want of capacity to be noble and just, and the disgrace of an advanced civilization,—the exalted courage of such persons must be lost. To those who know how to respect scientific ardour, and a pure love of truth, the fortitude of a faithful and sincere man is for high admiration, and for deep respect.

Such observations are perhaps equally applicable to the Professor, and to his friend the Baron, and I may be regarded as bold in remarking, as freely as I have done, on some of the philosophy in the following pages. No one can entertain a deeper veneration for large cerebral organizations than I do. I am clear, from the work before us, that so much patience, so much ingenuity, so much caution, so much concentration, so much ideal resource, so much just and honest desire to be true, could not characterize any individual, who had not a rare combination of organs in his magnificent head. Regarding any person in this point of view, one is immediately at liberty to look out for all those inconsistencies that belong to humanity; deeply respecting the excellencies, and always, with due humility, doubting one's own power of detecting the weakness that may belong to any logical edifice he may construct.

There are not wanting persons who doubt entirely of the Baron's power of accurate and severe observation. They doubt some of his most striking facts. They deny the accuracy of his results with the magnet and photographic plate. Some, and among them are persons of no mean note as scientific characters, affect to hold him in very secondary estimation—pitying him for wild ideas, and denying that his researches deserve any rank as philosophy.

But the Baron is not the builder up of a tall house of loose cards to be toppled down by a breath. I have not tried all his experiments. I have tried, *comparatively*, only a few. Where I have found the suitable cases, the results have been, with few exceptions, identical.

Then, because I have been disappointed in the results of many other experiments, I have no right to conclude that the Baron is at fault, but rather that I have not yet been fortunate enough to meet with exactly the same description of case he terms the "*sick sensitive*,"—a vague expression of an idea, with which, surely, it is not criminal to disagree. Long before I had read Professor Gregory's abstract, I had arrived at conclusions on differences, as well as analogies, between electric, magnetic, and mesmeric agencies, and, operating differently, have witnessed many confirmations of the facts established by the Baron. Dr. Elliotson has noted many remarkable analogies in many pages of the *Zoist*. But then, the greater number of our cases have been in mesmerized persons. How the Baron would have fared, as to his conclusions, if he had not taken up the study of his subject, in its most elemental form, is another question. Seeing, as I do, the conditions of his patients, in a different point of view, from that in which he regards them, I cannot concede to him that, professing to contemn the mesmeric state, as one unfit for his purpose, he has not been operating with persons, who, though not at all asleep, have actually been in a state constituting the very condition which dis-

tinguishes some of the phenomena of somnambulism. One mistake has been, to suppose that the truthfulness of an individual depends upon a certain normal state of the general fibres of the brain, instead of the tendencies derived from a particular relative size, and combination of certain organs of that viscus. A patient, who is a sleep-waker, may, from a certain configuration of organs, be a most just and honourable character, and have that fine disposition considerably exalted by the state of somnambulism; while a wide-awake person may be a most cunning and habitual deceiver. Another mistake is, to suppose that the "sensitive," and "sick sensitive," form a category, independent of all phrenological, and all mesmeric considerations. They are, in fact, those most easily affected by mesmeric and crystallic agencies—those most obedient to the influence of the silent will—and those most easily stimulated to clairvoyance, in the state of wide vigilance. Certain I am, that with the advantages offered by the power of his head, the Baron would have advanced both further and faster, if, to all his other knowledge, he had combined a more extensive view of physiological pathology, with a study of phrenology and mesmerism. They may oppose the truth in Germany, as they do here. The Author exhibits some of their doings, but the Baron has the courage flowing from a sense of justice. He worships the spirit of truth, which must eventually prevail. I marvel at many of the objectors to his philosophy, for in regarding these researches with the eye of criticism, ready to seize a weak point, I feel that one is at a loss which most to admire,—the plain, straightforward, philosophical acumen which guides each consecutive inquiry, or the combination of ingenuity and common sense with which questions of great delicacy are made subservient to the progress of severe inquiry. Time and opportunity only are required to corroborate rather than to correct the facts he has advanced. Those who venture to risk their own reputations in throwing

doubts on the Baron's results, should remember that the *conditions under which the experiments were originally made, must, in justice, be strictly repeated.* The discoverer of creosote, paraffine, eupion, and many other new compounds, for the knowledge of which the world is indebted to his laborious researches, is not a common-place authority; and he has now taken up a subject, the truth of which will roll with tremendous force over all obstacles.

Those who regard the science of Physics, in the isolated form in which it is generally presented in most of the Elements of Natural Philosophy, must necessarily have a very limited view of the importance of the researches now presented to the public. Indeed, it would be, at present, almost impossible to indicate all the points in cosmogony, to which the Baron von Reichenbach's commencement, in strict logical deduction, on imponderable agencies, may not, at a future period, have a positive reference. It may be remarked, that the evolution of each new fact is a step in that progress, which may be ultimately connected with the forces, agencies, fluids, or powers that pervade space in universal nature.

Undoubtedly, the attempt to place Mesmerism within the domain of physics was a bold conception. It is an attempt to bring the whole of physiology into the strict limits of chemical philosophy. The establishment of the existence of the odic force is that which was wanting to reply to most of the questions respecting life. No doubt much is yet to be desired in order to clear the obscurities enveloping the innumerable modifications of this force; but enlightenment reaches us from the enlightened, and the Baron pursues his continued researches with a zeal which promises to unfold to us many a new principle, as well as many a new fact connected with this subject; and, considering the very curious investigations which will be published in the second part of this work, it is hardly too much to anticipate that we may,

siderations are for inquiry. They must meet with scrutiny, and new truths will be elicited, multiplying the facts, prolonging the interest and the fame attached to the genius of the discoverer of the odic force. We are but at the commencement of the wonders of clairvoyance, and can certainly be in no position to estimate the great fund of new truths, that, by means of its cultivated agency, are in store for us. We are so often met with objections as to the possibility of the phenomena of clairvoyance, that after the Baron von Reichenbach's arguments on the varying powers of various individuals to perceive the odic flames, one is tempted to adduce the fact discovered by Sir Isaac Newton, that the densest and heaviest metal, gold, has more pores* in it than solid metallic particles, and consequently that light may be transmitted through it; and if so, it is quite possible to conceive of its being diaphanous to certain individuals possessed of a highly sensitive nervous system. But what are the mar-

which they are mainly influential in inducing the various phenomena which nature exhibits,—as, for instance, the tendencies of the chemical elements (of which they are constituents), to enter into chemical action and produce new compounds. Upon their agencies depend the principle of gravitation, of the aggregation and segregation of the molecules of ponderable matter; of ordinary electricity; of voltaism and catalysis; and it is upon their operation, but more particularly on the influence of magnetine, that the vital functions, in all their modifications, are dependent.

With respect to electricity, Ignotus regards this principle as distinct from magnetism and voltaism, and attributes its phenomena to the disengagement of a hitherto undescribed ponderable chemical element, which he terms *electrine*, and which he assumes to be an essential constituent of oxygen.

I have reason to believe that, since his original publication, Ignotus has occupied himself with important alterations and additions, his views now extending to the creation of the universe, and constituting in fact a new chemical theory of nature.

* See "A Dissertation on the Æther of Sir Isaac Newton," by Bryan Robinson, M.D., p. 11.

vellous things of clairvoyance, compared to those contained in a supplementary note to the relation between Holy Scripture and some parts of geological science, by Dr. Pye Smith, to which I refer below in order to cause reflection on such matters?* Here our object is not to display wonders,

* In the 'Philosophical Transactions' for 1800, is a paper by the late Sir William Herschel upon the *Power of Telescopes to Penetrate into Space*, a property distinct from the *magnifying* power. By observations and calculations, which appear to have been corroborated by facts independently and previously ascertained, the space-penetrating power of his forty feet reflector is brought out to be a little more than 191 times that of ordinary natural vision, or extending to more than 300,000 times the distance of Sirius, which, on satisfactory grounds, is regarded as one of the nearest of the fixed stars. The light by which Sirius is seen by us, moving at its known velocity of 192,000 miles in a second, is at least six years and four months on its passage from our system. By applying the equation which Sir William had established, he brought out that the brilliant nebulæ, which only that telescope can reach, are distant from our earth such an immense number of miles, that to express them our arithmetical numeration requires twenty figures, of which the first eight are 11,765,475, the eleven denoting trillions, and the other number billions; the remaining part of the sum being much more than 948,000 millions. This almost unmanageable number is expressed by Sir William Herschel thus—'above $11\frac{3}{4}$ millions of millions of millions of miles!' It follows that the light by which those bright objects become visible to us cannot have been less than one million and nine hundred thousand years in its progress.

Yet when we have strained our minds to contemplate, in the extremely feeble manner to which our faculties are competent, this overwhelming distance, we have no reason to think that we have touched the circumference of the astral sphere; or that we have advanced beyond the threshold of God's creation.

If it be objected that, in accordance with these deductions, we might expect new portions of Jehovah's dominion to be frequently disclosing themselves, stars and clusters of stars 'blushing out' on our view, new to us, because their light had now first arrived at our earthly abode; I conceive the following considerations sufficient to meet the objection:—

1. The absolute distances of fixed stars and groups from each other may be such as to require respective intervals of years and even cen-

but while in passing we reply to objectors, we must continue to illustrate the leading purpose of these researches, really

turies for the light of the more remote objects to reach us; that light arriving successively from each according to the distance.

2. Our case refers to objects which, though self-luminous, are not visible to the naked eye. They may 'blush out,' even frequently; but men are not capable of being their observers. Only a few of mankind can enjoy, and be qualified to use, such telescopes as those of Sir William Herschel, and his still more accomplished son.

3. Granting the possession of these advantages, the opportunities for observation are too scanty for the construction of a negative argument. Sir William Herschel, in the same paper, says that the number of night-hours, suited to this kind of celestial observation, is averaged favourably in our climate at one hundred in a year; and that to 'sweep'—to examine as rapidly as is consistent with astronomical attention—every zone of the heavens, for the two hemispheres, would require eight hundred and eleven of such favourable years. The number of the objects to be observed is great almost beyond conception. Sir William Herschel, by counting the stars in a definite portion of the field of view which he observed in one hour, and estimating the rest, concluded that fifty thousand passed under his review in that hour. It is therefore within the scope of probability that new masses of light are achieving their first arrival in parts of our telescopic sphere, frequently, without its being possible for men to be aware of it; and, when any of them comes to be discovered, the date of their arrival is unknown.

I draw no argument from the fact that, within the short period of the last two or three centuries, stars have been discovered which earlier catalogues or descriptions had not noticed. The attention, requisite to give certainty in this matter, we cannot assume to have been exercised; and to look for evidence from this quarter would be forgetting that it can exist in the domain of only the greatest telescopic powers.

These views of the antiquity of that vast portion of the Creator's works which astronomy discloses, may well abate our reluctance to admit the deductions of geology, concerning the past ages of our planets' existence.—[Supplementary note to the relation between the Holy Scriptures and some parts of Geological Science. By Dr. Pye Smith.]

Nor ought it to be forgotten that these very principles and deductions of geology, that have excited so much of alarm and opposition among some friends of religion, and so much of premature and ground-

and truly the philosophy of mesmerism. Strange would it be if the wonders of clairvoyance; those of the phenomena detected by the telescope; the events accruing from the nature of living organisms, in all their infinite varieties, should finally be dependent on the same force, which Newton contemplated, in his acute conjecture that water was a compound body, and which gave rise to the wild but important speculations of Mesmer, on the existence of an universal fluid, when he led the way to the facts of a new science, which, after a struggle of eighty years, has emerged in the hands of Von Reichenbach into principles applicable to all nature.

A remarkable fact connected with the emergence of mesmerism into its present importance is the serious neglect of its merits which has marked the conduct of those who were bound to encourage them, by study and inquiry. Really, practically, mesmerism has deserved very different treatment. It has merited high civic honours. It has, under the patient philosophic guidance of Dr. Elliotson, conquered malignant cancer. It has removed enormous growths known as polypus, as I can testify. I know that it has chased away

less exultation among its enemies, have nevertheless, when taken in connection with astronomy, developed and established a LAW of God's natural government of the universe, *grand beyond all others known to man*, and undiscovered or only dimly seen by the great minds of other generations. I refer to the fact, that *perpetual* CHANGE *is made the grand conservative and controlling principle of the universe.* Men have always seen and felt this instability in respect to everything on earth; and they have regarded it as a defect, rather than as a wise law of the natural world. But they now find it to be equally true of suns and planets as of plants and animals. Perpetual change, perpetual progression, increase, and diminution, appear to be the rules of the material world, and to prevail without exception.—[Professor Whewell, quoted by Dr. Pye Smith.] Burke might be quoted on the same subject, for with the acumen and terseness of Genius, he says, in a letter to Sir Henry Langrishe, *Change is the great Law of Nature.*

large ovarian tumors, and dropsies that have defied all medical skill. It has cured malignant fevers in their advanced stages. It has removed tubercles, and healed abscesses. To enumerate all the good that has been done by this agent, combined with the essence of human kindness—for without that the practice of mesmerism is useless—would take many volumes. Thousands of cases are now extant of the benefits derived from this holy power. The *Zoist* is the grand English work of testimony on this subject, and it is full of useful information, as well as of noble essays to advance the cause of humanity. The defenders of mesmerism have, in that work, laboured hard for the truth, which they have advocated with the boldness belonging to sincerity. How much soever they have been opposed by the sordid and the mean, by those systematically opposed to the progress of expansion—with whatever success falsehood has retarded the march of useful knowledge—it is consoling to the writers in the *Zoist* to know that the great cause is advancing. Small-minded men, not capable, from unfortunate organization of brain, of believing in truths at variance with the idols they have been accustomed to worship, set themselves up as oracles of wisdom. Too many implicitly give up their convictions to such incompetent leaders! Fight, however, as they will against the truth, it is always too strong for its opponents. Time, which settles all differences, by changing old things and by bringing forward new, sweeps away the fallacies of the obstinately proud and ignorant. Would it were possible for small minds to reflect, that all their efforts to establish falsehood will not alter the laws of nature, and no folly of striving to prove that falsehood is truth can change these established laws! For nearly eighty years has the professional world of science opposed itself to the discovery of Mesmer, yet still the facts exist. Turn to the truths placed before mankind by the stupendous powers of observation and catenation of that rare genius, Gall! It is

sickening to note the causes which have hitherto deprived society of the advantages, destined to accrue to our race, at a later period, by the cultivation of phrenology. How curiously and strikingly has mesmeric science verified all the discoveries of Gall! Still the flood of opposition pours on, and the pretenders to religion, real enemies of the *spirit of truth*, with awful pride and cunning, endeavour by sly arts to crush its rising light.

It is remarkable that three great philosophers, each in succession, in some measure contemning the labours of his predecessor, should have arisen in the same spot; that each should have put forth a discovery of signal importance to the philosophy of mind; that Vienna should be the well-spring, whence these lights should radiate; that the sparkling, crystalline, luminous knowledge emanating from that fountain, placed in the central capital of European civilization, should have reflected a glory round the names of three philosophers, which will emblazon their researches as amongst the most important that can occupy the attention of mankind; that Mesmer, Gall, and Reichenbach, first announced their grand ideas from the capital of the Austrian empire.

The Baron von Reichenbach may not believe himself complimented by this allocation. He may have some scientific pride, notwithstanding the size and quality of the majority of the organs of his brain; nevertheless, the reflection must be made, that all knowledge is relative, as every atom of matter is relative. Nothing is fixed and absolute; but in the vast range of human acquirement, it would be difficult to exhibit three sets of facts, announced at separate intervals of time, having so intimate a relation to each other, and which are so interwoven in their dependencies, as those Viennese discoveries; having, moreover, such numerous alliances to all the circumstances to which man can, by turns, transfer his attentions.

Where will all this philosophy lead us? Can any sincere person entertain a doubt? It is the spirit of truth which is about to be victorious. It is not a question as to the appreciation, at the present moment, of the best knowledge, of the soundest philosophy. Educated in selfishness, we live in a world of hallucinations. It has been well said that we form one large lunatic establishment. We are surrounded by influences that are always tending to impress upon us a desire to succumb to the tyranny of falsehood. The conventional habits of our lives make us, more or less, hypocrites; and according to the energy, originality, or some other individual peculiarity of our character, we swerve from the leaning of our fellowmen. If the proposition be offered to his innate desire for justice, it is not that man does not essentially love truth, but that the progress of his organization, through ages, has not yet ripened sufficiently to allow that expanded development which, as science advances, must have place in a more perfect arrangement of society. Man cannot yet worship *truth as the best knowledge.* He has not yet passed the age of idols. The knavery of the selfish and interested is always ready to excite his lower feelings against that which is really holy and reverential, the sacred will of the Most Just. But the good time approaches—for science advances with immensely rapid strides. Those who are now young have to witness many improvements, all tending, like the researches of the Baron von Reichenbach, to expand the intellects and morals of man, and to lead him finally to the realms of light.

JOHN ASHBURNER.

65, Grosvenor Street,
April 25, 1850.

THE AUTHOR'S PREFACE

TO THE

SECOND EDITION.

THE following treatises were originally destined to appear singly in the monthly parts of Liebig's "Annalen der Chemie," and should, from the time they were given in, have been commenced in July 1844. Accidental circumstances delayed their publication, and thus it happened that several of them became united in entire parts of that work, and then were first given to the public in March and May 1845. This will explain their somewhat unusual form.

In the present Second Edition there are some corrections, but, as a whole, the principal contents have remained unaltered; my researches, continued without interruption during the several years that have elapsed, have strengthened and confirmed the earlier observations. I have considered that I could not abandon the half-historical, half-systematic course of the enumeration of my observations, and the detail of my judgments upon them, since it is that of natural science generally, in which the correction of earlier experiments always keeps pace with the extension of our knowledge.

It was to be expected that a subject of so unusual and peculiar a kind as the present researches would meet with objections; and I was aware beforehand that I should have to defend my experiments, and the deductions I had drawn from them, against ill-founded and groundless opposition.

The new field of research which was laid open pushes its lines too near the bastions of established formulæ, frequently involves, in too many convolutions, all that exists in the present doctrines of natural dynamics, for the necessary space to be freely allowed to it. Yet I thought only of *reasonable* criticism of my observations, perhaps of unsuccessful repetitions of my experiments, arising here and there from faulty arrangement; that my conclusions might be contested, or other views built upon the facts brought forward: but I was not prepared for an attack, which every true friend of science will unite with me in calling unprovoked, such as was made upon my work, and upon myself personally, by a Dr. Dubois-Reymond, in Kärsten's "*Fortschritte der Physik im Jahre* 1845." This naturalist does not find it at all neeessary to go into my experiments, and the conclusions deduced from them, but briefly and superficially designates my book as an "absurd romance," the details of which "it would be fruitless and to him impossible to enter." I believe both of these assertions. Fruitless; because he has not understood them, and an uncomprehended and incomprehensible criticism is *fruitless.* Impossible; because he has not read them in connection; and to enter into a matter of which one has acquired no knowledge, is *impossible.* And that he really has not read them, but turned over the leaves in the fashion of a superficial and unscrupulous reviewer, is proved by his calling my work "the New Testament of Mesmerism:" thus he has not seen that it is the very first, in this field, which runs counter to Mesmer's views in most points, and places the phenomena on wholly different ground. With silly jests he says, he "is greeted by the magnetic tub and complex magic wares of the Baron von Reichenbach," &c.: thus he has not read that it is myself who makes an end of that tub and Mesmer's magnetic wares, in tearing down the veil from the mysteries, tracing them back to their bare physical

contents, and replacing all previous phantasmagoria by sober investigation of nature. But as long as science exists, ignorance will have the most dogmatic judgment. This polished Berlinese then further pleases to throw commonplaces in my face, such as,—my treatise is one of the "most melancholy aberrations which have for a long time settled on a human brain;" they are "fables," which deserve "to be thrown behind the fire;" and more of the like learned vulgarity. Whoever assumes publicly to sit in judgment and pronounce sentence on a scientific work, is subject, first of all, to the duty of making himself thoroughly acquainted with its contents; he has, moreover, like every other judge, to support the decision with the motives upon which he believes he is justified in grounding the same. This duty is the more irremissible in him, that his judgment is but one-sided, and requires the control of public opinion, while the attacked party may, if necessary, take arms against it. But a slanderous criticism, which is not ashamed to strip itself of all these conditions, is nothing else, in one word, than literary insolence, and of such measure, that is perhaps unexampled in ancient or modern literature: for it certainly has never and nowhere occurred that a reporter has had the boldness, or rather the silliness, to pass over a scientific production peremptorily, and with unprovoked insults, without any account, or any statement of his reasons,—without a single syllable of analysis of its contents. I have said silliness, because it is silly to throw stones which one can see will rebound on one's own head. Either my statements contained truths, which have existence and consistence in the physical world,—consequently must sooner or later be recognized, and put the ignorant reviewer to shame; or they are based upon great errors, and in that case it must be an easy thing for him, in accordance with his duty, to disclose and elucidate them, and thereby to put away from himself the accusation of un-

fair trifling with the fame of his fellow-citizens: only, narrow-mindedness and silliness expose themselves thoughtlessly to both these dangers at once.

M. Dubois further says, he cannot enter into the details of my treatise, "because it would be altogether impossible for him to avoid unparliamentary language in so doing." The insolence he had poured out upon me was not unparliamentary, not rude enough; he had store of still coarser quality. He has given a specimen of the delicacy of his manners, which restrains him from the use of it. I will relieve him from the necessity of any hypocrisy, and tell the truth: *he had not the courage to venture on a discussion of the details of my treatises.* The matter does not lie upon the surface; the facts collected cannot be briefly set down by a fluent tongue; and the conclusions drawn consequently from them cannot be washed away with watery ink. A fundamental investigation, however, requires pains, and costs labour; this is inconvenient, perhaps fruitless, and perchance leads to scruples. And since, without such trouble, the matter cannot be thoroughly gone into, except at the risk of unripe judgments, the details are warily avoided, lest the critic should get rapped on the knuckles, or should subsequently be made to feel the scourge of the author. It is much easier and cheaper to skip away over the outside of a subject with a worthless superficiality, and by casting slurs upon it, to degrade it in public opinion, and then to shuffle out of it, in a cowardly way. M. Dubois need not lay the slightest compulsion upon himself to enter into the details of my treatise: I call him out into the arena, with his "unparliamentary language" of the Spree, and give him my word that he shall meet me, and I will give him just such an answer as he deserves.

The very nature of an experimental work renders it subject to defects; it is just *because* we feel these defects in our knowledge, that we institute experiments, to perfect

it, through the discovery of new facts. While we are engaged in these, we again become aware of ten, nay a hundred, new deficiencies; the reader, too, on his part, probably desires another dozen, which have escaped the author; and the reviewer perhaps still more. It is quite right, then, that they should be publicly indicated and be brought into discussion, so that the matters may be further worked out in new directions, or that what has already been obtained be safely placed beyond all doubt. This benefits every one, including the first discoverer of each new scientific fact.

My works will be as little free from defects as those of much more exalted men than I ever could be, least of all in the natural sciences. No one can have felt this more strongly than myself. Every criticism expressed in a good spirit I shall receive with thanks, and try to improve my work accordingly. But imperious abuse, from one who is profoundly ignorant of the work he reviews, must be repelled, and the reviewer must be taught to know the limits of decency. It is the interest, not only of myself, but of all who work and write, that weeds of this kind should not be left to flourish, but be raked out and cleared away.

That much more exalted men than myself do really fall into the greatest mistakes in their scientific works, I will not be content merely to have said, in my own defence, but I will at once prove it. M. Johannes Müller, our great physiologist, and the pride of Germany, whose excellent works are the oracle of his contemporaries, in his Handbook of Human Physiology (4th edition, i. 26), where he mentions the "so-called animal magnetism, the passes, imposition of hands, transfer of the so-called magnetic fluid," says, word for word: "Their stories are, however, a *lamentable maze* of lies, deceit, and superstition; and it has only proved how incapable most physicians are of empirical investigation, and how little conception they have of a mode of examination which has become

the universal method in the other natural sciences." But how, if it now turn out that it is, on the contrary, M. Müller himself who is and moves in that *lamentable maze?* How, if in my treatises exactly that mode of proof be applied which is carried out in the *now universal method of the other natural sciences?* And how, finally, if exactly *these tests* have demonstrated and established by evidence, through hundreds of facts, the actual existence of such a fluid or dynamic, that produces surprising physical and physiological effects, by *passes, imposition of hands, and transference,* as distinctly as any other physical or physiological truth can be established in the same way? Then, one would and must say, that the great Müller had considerably erred in a matter on which, without a previous examination, he had allowed himself to pronounce an injurious and hasty judgment, and that in a new edition of his Handbook he will expand those parts so hurried over. It will be noted as a striking instance of how the most distinguished men may fall into the greatest errors through prejudice or preoccupation; may be subject to mistakes of such magnitude, that exactly that which they bitterly and unsparingly attribute to other people, finds its most accurate application in their very selves, and falls back upon their own heads.

M. Dubois, meanwhile, is under the scientific influence of M. J. Müller, as he tells us himself in the 58th volume of "*Poggendorff's Annalen,*"—is indeed his pupil,—and thinks that in proper respect to his exalted master he must swear "*in verba magistri,*" for it is evident that his attack, where he honours me with "the most melancholy aberration of a human brain," agrees almost *verbatim* with M. Müller's "lamentable maze," (both appear to have a store of compassion for lamentably erring authors); and where the latter speaks of lies and deceit, the former thinks to hurt me with obscure and suspicious hints, as,—of concealed "peculiar

and hidden ground of my treatise." . . . But these gentlemen "cannot see the forests for the trees" this time. An unconnected mass of the strangest phenomena, in nervous patients, is reported to them; there is no rubric for such facts in the "system;" and while the spectators were regarding theastonished faces and the embarrassment of the doctors, a Berlin grisette has made one of the learned gentlemen the sport of her wantonness. When he at last saw, in the mirror, that his ears were growing too long, he cried "Treason!" and all the thousand truths that now came crowding to the door for examination and recognition, were pitilessly hurled, unheard, from top to bottom of the stairs, as "lying, deceit, and superstition." This is, indeed, a convenient way of getting over the trouble of a fundamental investigation, but it is at the same time as one-sided and hasty, as unscientific and unconscientious.

Natural science, and all its branches, have originally run through a period of obscurity and error: physics were preceded by magic; chemistry, by alchemy; medicine, by the philosopher's stone; astronomy, by astrology, &c.; philosophy, theology, and jurisprudence, have passed through their phases of extravagance. Our first conceptions are always unclear, confused; hence adapted to the wonderful, the mysterious, and so on to superstition and misuse. But it does not follow from this, that the enigmatic shell conceals no solid kernel. It is quite in character with the matter, and anything but unexpected, that the subject of sensitiveness, and the peculiar force on which it depends, should have to go through such a period of infancy in our notions; and the more so in proportion as it shows itself, on the one hand, the less capable of limitation, and on the other, to have a deeper hold on the hidden sphere of the nerves. That these days of rudeness should have endured for seventy years, is really rather long in these enlightened times, but in great part owing to the almost criminal narrow-minded

opposition of the gentlemen of the "exact sciences," who have turned to it, not only deaf ears, but even a kind of foolish hostility. Berzelius, who, as is known, accepted my researches with ardour, has assured me that for forty years he has always nourished the desire that some one would undertake this matter—which could not be groundless, —who would make it the subject of a special and fundamental examination, according to the present methods of investigation in the natural sciences; and he rejoiced at last to have found, in me, one who would make a rational inquiry into it. The reason why this has been so long delayed, why the groping round about has come to no end, lies moreover in the fact that people so often begin to build the pyramid at the point; they would wish to do first what they should do last—*undertake to cure diseases!* Before striving for the slightest knowledge of the inner nature of the hidden force, they made a trade of the matter! Then somnambulists and clairvoyants were met with, everywhere manifestations of force at its maximum, and in complication with inexplicable exalted conditions of disease. While struck with the phenomena on a large scale, and feeling unable to find an explanation of them, people neglected to inquire after the small beginnings, on which alone the basis of a scientific structure could be raised. Not from the lightning and the thunder have we gathered the theories of electricity and of sound; not from the eruption of volcanoes have we drawn our knowledge of the expansive force of steam; but just as our forefathers fabled about these natural phenomena, because they did not understand them, even so have the modern *savans* of the category to which M. Dubois belongs, talked nonsense about the so-called animal magnetism, because they did not know it. I will not speak of medical men, but it is no better with the physicists and physiologists; the majority of the former have rejected all cognizance of it, because they *cannot* understand the con-

nection of cause and effect; and of the latter because they *will* not. However, this is not the path of the investigation of nature, and the offence against enlightenment is really greater in the latter than the former. It does not redound to the honour of our contemporaries to stand obstinately firm in that primitive condition of blind ignorance, and to refuse to see at all how monstrously they lay themselves open on this side.

Yet I have not found the difficulty of penetrating to the truth of these matters nearly so insurmountable as it is generally, timidly, asserted to be. All that gossip about lies and deceit is in reality quite misplaced; when we examine more closely, it lies essentially not in the sensitive, but, on the contrary, in the subjectiveness of the pre-occupied, or not unfrequently incompetent inquirer. One must understand how to investigate, one must know how to question nature, if one would obtain a clear and instructive answer; but it is not every one who can do this, so far as we know. I must say it, to the credit of the mixed population of Vienna, that among some hundreds of persons whom I have, up to this time, received more or less deeply into the sphere of my researches, and sixty of whom are publicly named in my writings, that there was scarcely a single one who gave me more than one or two exaggerated answers, and this rather from misapprehension than from dishonest intention, but which were immediately discovered and reformed by me. From the intimate, natural, and regular connection in which all these phenomena stand with each other, the threads of which I now hold surely in my hand, it is impossible for any one to continue to answer me falsely, even for a few minutes, without my at once detecting it. None of these people think of lying and deceiving; they simply express what they see and feel, when I react upon them; most of them evince a sincere and encouraging desire to make as clear as possible, to me, what they

perceive and detect, in which zeal I find some compensation for the mortifications from parties who ought rather to feel that they have reason to be thankful for my endeavours. All these almost countless answers to my questions agree in every case so perfectly, that all reasonable doubt must disappear before the evidence of the truth; and in this beautiful agreement lies the warrant of their thorough credibility. When, however, the inquirer does not know how to put the questions, from want of skill how to manipulate with the apparatus, from ignorance of the conditions how to arrange the experiments, from want of tact to comprehend the answers, and from want of acuteness of understanding how to discover the relations of the observations to each other: then confusion and perplexity begin, misinterpreted results contradict each other; and rather than look in the face his own weakness, and confess it to himself and others, he, a thousand times sooner, takes the dishonest subterfuge of accusing the observed person of deceit. But the betrayer of nature and science is no other than the man who, from incapacity, has the rashness and foolishness to desire to stamp the truth with the mark of a lie.

REICHENBACH.

Castle Reisenberg, near Vienna,
February 1848.

THIS work was already completed and printed in the spring of last year, but the occurrence of the German revolution threw obstacles in the way of its publication. These are now removed, and communication is re-established. It was necessary to make this note, in order to enable the reader to understand some dates which occur in the book, and which could not be reprinted.

R.

DYNAMICS

OF

MAGNETISM, ELECTRICITY,

&c.

INTRODUCTION.

If a strong magnet, capable of supporting about ten pounds, be drawn downward over the bodies of fifteen or twenty persons, without actually touching them, some among them will always be found to be excited by it in a peculiar manner. The number of people who are sensitive in this way is greater than is generally imagined: sometimes three or four are met with in such a number as above mentioned: indeed, I know an establishment where the experiment was tried, and of twenty-two young ladies who were collected there, no less than eighteen felt more or less distinctly the passage of the magnet. The kind of impression produced on these excitable people, who otherwise may be regarded as in perfect health,* is scarcely describable; it is rather

* What is meant by this expression? Ordinary health would be more consonant to the Baron's meaning. Great or even modified impressionability is not a condition of perfect health. A nervous system which gives a proclivity to disorder from keen susceptibility to external impressions, is not one which belongs to an organism in every part of which the configuration is the most convenient for the perfect performance of the functions to which that organism or any of its parts is destined. Perfect health belongs only to a body in which no part is unduly developed. A law exists which establishes the fact that every undue development of a part is at the expense of some other part; and it will be found, in endeavouring to establish most incontrovertible facts, that all individuals who have an impressionable nervous fabric are the

disagreeable than pleasant, and combined with a slight sensation either of cold or warmth, resembling a cool or gently

subjects of more or less imperfect development. At page 3, the Baron says, "vigorous men and healthy women usually feel nothing of these sensations." Sedentary occupations, and a variety of the circumstances surrounding man in his present imperfect state of civilization, render him more impressionable, because they irregulate and unbalance the harmony of his system. It is more difficult to induce anæsthesia, or any of the nervous states analogous to it, in a perfectly healthy and vigorous person than in one who is susceptible of the influence of those poisons which unbalance the accounts between the two systems of blood-vessels. A man in the last stage of typhus, or the fever of unhealthy venous congestion, may be saved by mesmerism, as has happened in several cases; while in a person under the condition of perfect health the mesmeric passes produce little or no effect for a great length of time. It is the same with the impressionability to magnets. Those who feel the influence of the magnet are in a *greater* or in a *less degree* in the same category of the imperfectly developed and unduly balanced. "The sensations of drawing, pricking, or creeping," from the application of the hands to a strong magnet, which I caused to be *repeated* daily in two impressionable cases, terminated in one in rigidity and deep mesmeric sleep in four days; in the other, in nine days.

Since the above was written (24th of March, 1850), I have a strong corroboration of the view given in this note. A young woman had applied to me six weeks ago for a set of symptoms which indicated great debility. She had passive hemorrhage, under which, complicated with hysteria, leucorrhœa, &c., she had laboured for some months previously. It was a case which mesmerism would have cured rapidly. I tried some passes; the pupils dilated, and other symptoms of mesmeric sleep were present. She felt a warm air from the large magnet. I tried the pointed end of a large crystal, which made her very sleepy. At last I put her to sleep by the gaze. She awoke in an hour, refreshed and strengthened. Finding that she could not be mesmerised at home, I prescribed a solution of persulphate of iron in diluted sulphuric acid, to be taken three times a day. I find she has strictly attended to my directions, and she is quite well, with a healthy florid complexion. I try her with the same large magnet, and she experiences no sensation. I try for half an hour to make her sleep mesmerically: in vain. The pupils of the eyes refuse to dilate. She says if I proceeded with my experiments she is sure I should make her head ache. Here has been a clonic state of system, in which the nerves and blood-vessels have induced "a temporary derangement of organization," in which some parts

warm breath of air, which the patients imagine to blow softly upon them. Sometimes they feel sensations of drawing, pricking, or creeping; some complain of sudden attacks of headache. Not only women, but men in the very prime of life, are found distinctly susceptible of this influence; in children it is sometimes very active.

To produce this effect, it is essentially indifferent whether we use a horse-shoe magnet or a straight iron bar, with either pole, if it be but strong enough and possess something like the sustaining power above mentioned. The passes must be made from head to foot, and not with too great rapidity. The magnet must be carried as near the body as possible without actually touching the clothes; and to ensure the absence of deception on either side, the pass may be made downward from the back of the head over the neck and back. The person magnetized is then unaware of the passage of the magnet, and his movement must be unconstrained.

Vigorous men and healthy strong women usually feel nothing of these sensations. Nevertheless, I have met with individuals who have been distinctly affected by the passage of the magnet when in the full enjoyment of health, and these, active light-hearted men and women. But the excitability presents itself more frequently in people of sedentary habits, who may otherwise be considered as healthy, especially in men who are occupied continuously in writing, or girls who pass the greater part of their time at needle-work; moreover, in those who are depressed by secret troubles, anxiety respecting their means of support, neglect, or the loss of relatives. Next to these imperfectly healthy, the slightly diseased are very frequently the most sensitive to the magnet, especially those persons of whom it is commonly said they suffer from weak nerves, who are readily

have suffered a while at the expense of others, in which a "*sick sensibility*" has supervened, in which the individual has become unduly impressionable, and in which restored health has removed the liability to be influenced by magnetism and by mesmerism.

frightened, or have received a shock from some fright they have experienced; besides these, the truly sick in innumerable cases, especially in those whose complaints are accompanied by local or general cramps; during abnormal developments of puberty; many hypochondriacs, valetudinarians as they are called; persons who are very disagreeably affected by odours; but above all, those suffering from catalepsy, St. Vitus's dance, palsy, many of the hysterical, and lastly, those who walk in their sleep, and the true somnambulists without exception. Thus from the healthy person to the sleep-walker a chain is formed, at one end of which stands a powerful man, and at the other a weak somnambulist. Any one may readily convince himself of those facts in every large hospital.

The magnet thus declares itself as *a general agent upon the vital principle;* a property of it which individual physicians have indeed endeavoured, though as yet without solid results, to bring into more extensive application, in reference to the possibility of deriving from it a curative treatment in cases of disease,—which, however, has not yet been received by natural philosophers into the realm of physics; and from the uncertainty of the observations, hitherto, has been altogether passed over by natural science generally. Nevertheless, magnetism, when more closely examined, presents an infinitely varied and exalted interest on this side. If a portion of the phenomena here assert an influence upon life, this occurs exactly and especially at the point where the boundaries of the organic and inorganic are intermingled. Since a doubt exists whether it shall be attributed to the domain of physiology or of physics, it is neglected on both sides. Thus it is left over to medicine, and has not always fallen into the best hands there. I hope, in the following pages, to disentangle some of the threads of this knot, and to combine a number of phenomena under a common point of view, at the same time arranging them under fixed physical laws.

FIRST TREATISE.

LUMINOUS PHENOMENA AT THE POLES AND SIDES OF STRONG MAGNETS.

1. SENSITIVE persons, who are actually or apparently healthy, perceive nothing particular in the magnet beyond the excitement above mentioned, and bear the circuit of it without injurious influence. But this is not the case with the sick sensitive.* The effect upon these is either pleasant,

* There are many persons in the category of the *sick sensitive* upon whom, in England, these experiments have been repeated, and they have not *always* exhibited the phenomena detailed. In affording a most willing and respectful testimony corroborative of the greatest part of the facts reported above, whenever I have had it in my power to repeat the experiments with strong magnets, I nevertheless believe it to be of importance that the class of the sick sensitive to whom these facts are applicable should be more strictly defined. I have no doubt that many of the individuals above described could be most easily mesmerised into sleep; and of those who would not readily sleep, some would probably, by repetitions of mesmeric passes, be rendered more favourable for the development of the phenomena which the Baron has noted. The very impressionable conditions sometimes present without sickness or disease is not one of perfect health—certainly not usually of vigorous health; but there are many states of disease in which that impressionability not only does not exist, but in which a sensitiveness of *some organs* is present without any of others. If it be absolutely necessary to yield to party considerations for the sake of advancing truth by a side route; if it be requisite to assume, in order to meet the silly prejudices of the ignorant, that experiments of the nature described in the text are valueless unless they be performed upon persons *awake*, who happen to have "*an extraordinary exaltation of the sensuous*

unpleasant, or fearfully adverse, according to the nature of their disease; and the last sometimes to such a degree

perceptions," then many of the very numerous corroborations here, of the facts established by the Baron von Reichenbach in Vienna, must be thrown aside. But I am inclined to contend for their value; and no one can read the review in the 4th volume of the *Zoist*, by Dr. Elliotson, of the Abstract of the Baron von Reichenbach's Papers, by Professor Gregory, without being struck by the strong analogies adduced from mesmeric experience of the Baron's facts. When it becomes more known that the mesmeric condition is simply a state of nervous system, sometimes artificially produced, sometimes spontaneously present, of an "*exalted sensuous*" state, or the *very reverse*, and that at pleasure, in many individuals, can be produced those conditions which the Baron endeavours to indicate at pages 6, 7, 8, there will be no more hesitation in preparing a mesmeric test than the chemist now experiences in producing a litmus test. The truth is, that we are at all times, while life remains in us, in a mesmeric condition, each varying in degree; and without the agency of the mesmeric forces we neither think, nor move, nor have our being.

It is a want of sufficient reflection on the use of terms that leads us astray from clear ideas on the various conditions of the nervous system. Because the matter has not been studied as it ought to be, the Baron von Reichenbach deprecates experiments on subjects who have been mesmerised. Suppose, which is actually the case, that the same phenomena are offered to our observation in the persons who have been made, by artificial expedients, highly sensitive—very impressionable, the facts are really just as valuable as if they had been displayed in those naturally impressionable. The only question is as to the numbers of mankind readily influenced to exhibit phenomena which prove the existence of the Baron's new force. If all men could conduct investigations as logically, as clearly, as philosophically as the Baron, we should now have it in our power to arrange the characters of each condition of the nervous system in an unmistakeable category. They would easily be tabulated. They would present a very interesting series. I have attempted to sketch my meaning in Essays on Mesmeric Phenomena, and on the Theory of Sleep (Zoist, Vol. iv.) Whatever may hereafter prove to be the varieties of the states in which individuals may be, when aberrant from the condition of "perfect health"—a condition upon the definition of which physiologists as yet might not agree—it is clear, to those who have studied this matter, that the gradations in the series of the phenomena have some connection with attrac-

that fainting, cataleptic attacks, and cramps, arise of such violence that they may at last become dangerous. In the

tion and repulsion. If I observe in a hospital a patient who, in result of an accident, has been deprived of a portion of the frontal or parietal bone of his skull, so that the brain is exposed, I shall find, what Boerhaave long ago found, that this viscus, during sleep, occupies less space than in the vigilant condition. The particles of brain-matter are approximated, and an attraction is active among them. If this patient be awake, and I apply very gentle pressure on the surface of the brain, I induce a tendency to sleep. If I increase the pressure, I occasion coma; I continue to increase, and the stertor accompanying coma may cease, but the nervous condition is one of tonic spasm. The simple paralysis goes on to a rigid condition of the muscles. Convulsions supervene when the surface of brain pressed upon is not extensive enough, because partial irritation is produced upon certain nerves. I have made these experiments on several human beings; but the fairest mode of obtaining accurate results is to expose the brain in a rabbit, cat, or dog. Tickle the brain with a soft brush, and clonic spasms ensue. The brain appears to swell out, it occupies more space under irritation, and is subjected to a repulsive agency among its particles. So that the state of sleep and of coma, quietude, paralysis, rigid tonic spasm, are degrees of a condition influenced to exist under attraction; the state of vigilance, restlessness, activity, agitation, clonic spasm, are varieties of a condition influenced by repulsion. In "perfect health," there is no extreme state of attraction or of repulsion. But if health be disturbed by some poison, the inconvenience produces an improper state of the balance between the attractive and repulsive forces; the brain and nerves influence a want of due balance in the arterial and venous systems. With arterial fulness there is inflammation; with venous fulness there is congestion. The degrees of variety in nervous phenomena dependent on these opposite states are very numerous; but still a law exists which we have yet to trace out. The varieties of those nervous phenomena called psychological, closely allied to the varieties of the conditions of the arterial and venous systems, fall particularly as subjects of inquiry into the province of the student in mesmerism and phrenology; and the satisfactory solution of many problems suggested by facts in the text of the Baron von Reichenbach can never be arrived at without arranging all the gradations of facts belonging to the nervous system, under a scale of which the extremes are the deep tonic, and the deep clonic spasms. Complicated as the human nervous system becomes by the many varieties in cerebral

latter cases, among which somnambulists also are found, *an extraordinary exaltation of the sensuous perceptions* is usually met with; the sick smell and taste with uncommon delicacy and acuteness,—many kinds of food become as insufferable to them as the at other times most pleasant odours of flowers become disagreeable; they hear and understand what is spoken three or four rooms off, and are often so sensitive to light that, on the one hand, they cannot bear the light of the sun or of a fire, while, on the other, they are able, in *great darkness*, not only to perceive the *outlines of objects*, but to distinguish colours clearly, when the healthy can no longer perceive anything. These things are to a great extent well known, and require no further proof here. The intelligibility and possibility of them are by no means so far off as they appear, at first sight, to many who mistrust all such things as supernatural or incredible. Not only do most animals surpass civilized man in the delicacy of particular senses, but savages—there-

structure offered by varieties in development of size, delicacy, or coarseness, and other characters and relations of phrenological organs, there nevertheless exist certain salient pathognomonic signs by which to establish the distinctions on which logicians may reason with accuracy; and in time it will be found that the condition of sleep mixed up with the second consciousness usually accompanying the modified waking state (the sleep-waking of Elliotson) is no obstacle to the attainment of truth in such experiments as those instituted by the Baron von Reichenbach. Indeed, one is sometimes convinced, in reading his details of experiments, that, however strenuous he is to avoid the imputation of mesmerism, he is all the while describing facts occurring in what is commonly and vulgarly called the mesmeric state. Here is the mischief of the want of definite terms. Certain events occur in a condition of the nervous system accompanied by full vigilance, identical with those which take place in the condition of sleep-waking. The Baron is quite content with the fact in vigilance, but thinks that in sleep-waking unsatisfactory. Deeper reflection and further experience would convince him that in a vast majority of cases, as a testing meter, the state of sleep-waking is the more complete—the more delicate.

fore man himself—not unfrequently equal dogs and other animals in smell and hearing: as to sight, horses, cats, and owls are ready examples of capacity to see tolerably well with the optical apparatus in dark night.

2. Through the kindness of a surgeon practising in Vienna, I was introduced, in March 1844, to one of his patients, the daughter of the tax-collector Nowotny, No. 471, Landstrasse, a young woman of 25 years of age, who had suffered for eight years from increasing pains in the head, and from these had fallen into cataleptic attacks, with alternate tonic and clonic spasms. In her all the exalted intensity of the senses had appeared, so that she could not bear sun or candle-light, saw her chamber as in a twilight in the darkness of night, and clearly distinguished the colours of all the furniture and clothes in it. On this patient the magnet acted with extraordinary violence in several ways, and she manifested the sensitive peculiarity, in every respect, in such a high degree, that she equalled the true somnambulists (which she herself, however, was not) in every particular relating to the acuteness of sensuous irritability.

At the sight of all this, and in recalling to mind that the northern light appeared to be nothing else but an electrical phenomenon produced through the terrestrial magnetism, the intimate nature of which is still inexplicable, in so far that no direct emanation of light from the magnet is known in physics, I came to the idea of making a trial whether a power of vision so exalted as that of Miss Nowotny might not perhaps perceive some phenomena of light on the magnet in perfect darkness. The possibility did not appear to me so very distant, and if it did actually present itself, the key to the explanation of the aurora borealis seemed in my hands.

3. I allowed the father of the girl to make the first preparatory experiment in my absence. In order to profit by the greatest darkness, and the maximum dilatation of the

pupil, from the eye having been long accustomed to the total absence of light, I directed him to hold before the patient, in the middle of the night, the largest existing magnet, a nine-fold horse-shoe capable of supporting about ninety pounds of iron, with the armature removed. This was done, and on the following morning I was informed that the girl had really *perceived a distinct continuous luminosity* as long as the magnet was kept open, but that it disappeared every time the armature was placed on it.

To convince myself more completely, and study the matter more closely, I made preparations to undertake the experiment with modifications myself. I devoted the following night to this, and selected for it the period when the patient had just awakened from a cataleptic fit, and, consequently, was most excitable. The windows were covered with a superabundance of curtains, and the lighted candles removed from the room long before the termination of the spasms.

The magnet was placed upon a table about ten yards from the patient, with both poles directed toward the ceiling, and then freed from its armature. No one present could see in the least; but the girl beheld two luminous appearances, one at the extremity of each pole of the magnet. When this was closed by the application of the armature, they disappeared, and she saw nothing more; when it was opened again, the lights re-appeared. They seemed to be somewhat stronger at the moment of lifting up the armature, then to acquire a permanent condition, which was weaker. The fiery appearance was about equal in size at each pole, and without perceptible tendency to mutual connexion. Close upon the steel from which it streamed, it appeared to form a fiery vapour, and this was surrounded by a kind of glory of rays. But the rays were not at rest; they became shorter and longer without intermission, and exhibited a kind of darting rays and active scintillation, which the observer assured us was uncommonly

beautiful. The whole appearance was more delicate and beautiful than that of common fire; the light was far purer, almost white, sometimes intermingled with iridescent colours, the whole resembling the light of the sun more than that of a fire. The distribution of the light in rays was not uniform; in the middle of the edges of the horse-shoe they were more crowded and brilliant than toward the corners, but at the corners they were collected in tufts, which projected further than the rest of the rays. I showed her a little electric spark, which she had never seen before, and had no conception of; she found it much more blue than the magnetic light. It left a peculiar lasting impression on the eye, which disappeared very slowly.

The interest with which the subject necessarily inspired me, made me wish to multiply my observations, and to test them by repetition and by carrying them further out. The patient had already began to recover; her irritability diminished daily, and there was therefore no time to be lost. Two days after, I joined her relations in a resumption of the experiment. It proceeded exactly in the same way and with the same results. Allowing a day to elapse, we repeated the experiment in the first instance with a weaker magnet, without informing her of the alteration; the observer did not see the phenomenon in the same manner now as at first, but only perceived what she called two fiery threads.* These were evidently the edges of the two poles

* In repeating these experiments with persons of great impressionability, I have not been so fortunate at any time as to witness in a wide-awake person any other phenomenon than the appearance of one or sometimes two fiery threads, said to have been seen, in a room perfectly darkened, emanating from the poles of a powerful horse-shoe magnet. Some ladies have clearly distinguished these beautiful bluish threads of light proceeding upwards to the height of a foot or more. Some have seen a hazy cloud at a little distance on each side, "like that of a wet *moon*." One gentleman saw a hazy light very distinctly; another something like a piece of red-hot iron wire, varying from six inches to

of the magnet, which were all that her eyes could perceive of the weaker luminosity. When we then opened before her the stronger 90lbs. magnet, she at once recognised the

a foot in length. These persons were brought into my dining-room, which had been previously darkened and prepared, without being informed of the purpose for which they were introduced.

Into the same room, and under the same conditions, I have introduced persons who instantly fell asleep, became clonically convulsed, and passed rapidly into the deeply rigid or tonic spasm, so that I have withdrawn them into another room while they have been as stiff as if they were frozen; and there I have gradually produced a relaxation of the muscular system, and complete wakefulness, by the application of unmagnetised iron to the nape of the neck and to the soles of the feet. Some individuals under these experiments wake up by the ordinary mesmeric manipulations, remaining fixed with tonic spasm until I applied the unmagnetised iron. In the same individuals, twelve in number, I have produced the same phenomena without the previous clonic spasm, by touching the nape of the neck with pure gold, or with platinum, or with rhodium, or with nickel, or with cobalt, or with antimony, or with bismuth. In every case, except in one (M. A. D.), I was always able to dissipate the spasm and awaken the patient by means of iron applied to the nape of the neck. In that one—the case will be well remembered by Mrs. Charles Lushington and by Dr. Thomas Mayo, who were present—I held a newly-cast disk of cobalt about two yards off, without the patient's knowledge, directed towards her back. She fell forward insensible upon Mrs. C. Lushington, who was talking to her. She was rigid and insensible. The pulse was for a time imperceptible. A current from a single-coil electro-dynamic apparatus, which happened to be in action, was passed from the pit of the stomach to the nape of the neck. Colour gradually returned to her cheek, and her pulse and breathing removed our alarm. She slept on that occasion fifty-six hours. A fortnight afterwards I was induced to repeat the experiment, and she slept forty-seven hours. If I endeavoured to awake her by mesmerism, I found her idiotic, and I restored her to the influence of deep sleep, out of which she always awoke spontaneously, much refreshed and improved in vigour. This experiment, repeated in this case very often, has been attended with beneficial results to the patient's health; but she now never sleeps under the cobalt influence more than three hours. I have performed many of the Baron's experiments with magnets of different numbers of layers and with various powers. When the subjects of the experiments remain in the sleep-waking state, they

former luminosity, of the form and colour already known. After another interval of several days, during which her convalescence had greatly advanced, we renewed the experiment; but the light no longer made its appearance, even with the large magnet. The patient saw it less distinctly than before, smaller and rather unsteady: often it seemed

describe almost exactly what the Baron has stated as fact regarding Miss Nowotny, and his other cases.

For some remarkable experiments with a large apparatus thirty-three inches high, made of iron wire a quarter of an inch in diameter, coiled fifty-six times in a circumference of eight feet, I refer to page 137 of the 4th volume of the *Zoist*. This coil was of an oval form, so constructed in order to enable me to place it with ease over any individual seated in an arm-chair. By means of one, two, three, or four of Smee's elements, each ten inches by five, a more or less powerful current was established, enabling me to use a magnetic force adapted to different susceptibilities. For nearly six months daily, for two hours, a nervous, highly sensitive, and strumous young man, aged 17, who had been twelve or thirteen years lame from an ununited fracture of his right leg, used to sit within this coil urged by four pairs of Smee's plates. He never was sensible of any light or of any cloud. He was very somnolent, but became wide awake again on being removed from the magnetic influence. Under this treatment he became stronger, and the bones of his leg were united. Acupuncture was occasionally practised where the local appearance indicated the measure. If, when he came out of his cage, he went into the next apartment, where six or seven young women were waiting, he touched any of them, instantly sleep and rigidity supervened. Sometimes in sport he would touch every one of them, and leave them all in deep sleep. I have myself often obtained this same result in various persons, male and female, who, being of impressionable constitutions, have gone into a deep sleep upon my touching them, after having in another room, without their knowledge, rubbed my hands upon the poles of a powerful magnet. I have notes of three lads, of different ages, cured of epilepsy by mesmerism, who could be instantly put to sleep and rendered rigid in this manner. Dr. Elliotson's celebrated case of cancer cured by mesmerism, became rigid on touching a magnet. I know three different females so susceptible of magnetic influence that they are made ill, being seized with painful spasms, if I bring a middle-sized magnet concealed in my coat pocket into the room. These persons do not know each other.

to sink, then to brighten up again; sometimes almost to disappear, and then after a short time to return again. On the following evening she perceived in the large magnet only the two luminous threads; and the night after, the phenomenon was so imperceptible to her vision that she beheld only two flashes, vanishing rapidly like lightning, which appeared and disappeared every time the armature was pulled off.

4. So far Miss Maria Nowotny. Her rapidly increasing health had now so far lessened her sensitiveness that no further experiments were practicable, or productive of new results. I had every reason to consider her statement as true and exact, since she was an intelligent girl, and, for her station, well educated and sensible; at the same time, to give it certainty and scientific reality, it was indispensable to seek about for corroboration from other quarters. Through the present investigations I had become acquainted with an accomplished physician, Dr. Lippich, House Physician to the Hospital, Clinical Professor in Ordinary in the Vienna University, and by his kindness I was introduced to a patient lying under his treatment in the hospital. This was Miss Angelica Sturmann, nineteen years of age, daughter of an inspector of farms in Prague, suffering from tubercular affection of the lungs, and long subject to somnambulism in its slighter stages, with attacks of tetanus and cataleptic fits. The influence of the magnet displayed itself so powerfully in her, after a few experiments, that she far surpassed Miss Nowotny in sensitiveness. When I stood in the darkened ward, holding the 90lb. magnet open at a distance of six paces from the feet of the patient, while Professor Lippich stood beside her, and she was previously perfectly conscious of what was going on around her, the patient ceased to answer. She fell into tetanic spasms and complete unconsciousness, from the action of the magnet, immediately I had pulled off the armature. This did not hold out a

very hopeful prospect of the results of my experiments; but they were not in vain. After a while the girl came to herself again, and said that at the moment I removed the armature from the large magnet she had *seen a flame flash over it*, about the length of a small hand, and of a white colour mingled with red and blue. She had wished to look at it more closely, when suddenly the action of the opened magnet took away her consciousness. I had an intense desire to repeat the experiment, to obtain more exact information of the circumstances. The patient, also, was perfectly willing; but the physician considered it injurious to the complaint of his patient, and I was therefore forced to abandon any further investigation of the matter. At the same time, I had attained my principal aim: a confirmation of Miss Nowotny's statements respecting the luminosity over the magnet was obtained: it had now been seen by a second person suffering from quite a different disease, without any communication with the first.

5. In another ward of the hospital, Dr. Lippich took me to a young lad of some eighteen years, a journeyman glover, suffering from intermittent spasms, produced by fright and ill usage. When I approached him with the magnet he at once spoke of *fire and flames appearing before him*, and which returned every time I removed the armature. But the lad was so uneducated that it would have been impossible to make any accurate experiments with him; and in the meantime I found more interesting opportunities of tracing out my subject in detail.

6. Miss Maria Maix, 25 years old, daughter of a groom of the chambers in the Imperial Palaces, residing at No. 260 in the Kohlmarket, was the next person who was brought to me, through the kindness of her physician. He was treating her for a paralytic affection of the lower extremities, with occasional attacks of spasms. She was neither a somnambulist, nor did she talk in her sleep; she had never

experienced any attacks of insanity, and was in all respects a young woman of clear good sense. When a large magnet was opened before her in the night-time, which was often done, *she always immediately beheld a luminosity over it, resting on the poles*, about a hand's breadth in height. But when she was labouring under spasms, the phenomena increased most extraordinarily to her eyes. She then saw the magnetic light, which now appeared greatly increased in size, not merely on the poles, but also *perceived rays of light flowing from all over the outer sides of the steel*, weaker indeed than at the poles, but spread universally over the whole horse-shoe, which appeared as a bright light, and, as in the case of Miss Nowotny, left a dazzling brightness before her eyes, which would not disappear for a long time. We shall see the meaning and connection of all this. Meantime I had now obtained the fourth confirmation of the observation of the magnetic light. But by far the most remarkable and clearest of the observers was yet to come.

7. This was Miss Barbara Reichel, 29 years old, stoutly made, daughter of a servant in the Imperial Palace at Laxemburg. When a child of seven years, she had fallen from the window of the second floor of her dwelling, and from that time forward had suffered from nervous attacks, which passed in some degree into true somnambulism, and into talking in her sleep, and wandering in her dreams. The complaint was intermittent, coming and going at long intervals. The girl had just recovered from a violent spasmodic attack, but still retained all the irritability of her sharpened power of vision. She was at the same time quite strong, clearly conscious, looking well, and, moreover, walked alone through all the bustle of the town, to visit her relations. I invited her to my house, and received visits from her as often as I wished, in order to make use of her extraordinary sensitiveness to the magnet, in investigations with

physical apparatus which could not well be taken to other houses.

This person united in herself the rare gifts, that she saw the magnetic light as strongly as any exhausted, helpless, sick patient, while she was outwardly healthy, active, and sensible, and that, with the greatest sensitiveness to the luminous appearances, she could bear the circuit of the magnet almost as well as a healthy person; which, with most of the sensitive, as we have an example of in Miss Sturmann, and as also occurred in a slight degree in Miss Nowotny, is so far from being the case, that an open magnet is liable to throw them into convulsions, and even render them senseless. Little can be done with such; but with Miss Reichel I could follow every investigation quietly to the end. Individuals like her are invaluable for scientific inquiries: and thus I have through her been able to obtain most valuable elucidations of the electro-magnetic theory. In this place I shall in the first instance only indicate those observations which relate to the emission of light from magnets.

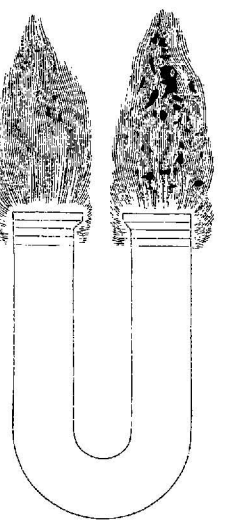
She saw the magnetic light not only in darkness, but in the dim light which I required to perceive all objects, and thus manipulate, to modify, and repeat the experiments. If the obscurity was moderate, the magnetic light appeared shorter and smaller, she saw less of it; that is, those parts in which the light was weakest were first overpowered by day-light; but she saw the flaming effluences most brilliantly, their size greatest, their definition sharpest, and the play of colour most distinct, when the darkness was perfect.

8. When a magnet was laid before her in darkness, she saw *it emit light, not merely when open, but when it was closed, like a horse-shoe, by the armature.* This may at first sight appear surprising; but the sequel will show that this statement of the observer corresponds perfectly with the intimate nature of the matter. The two luminous pic-

tures were naturally different in every respect. On the closed horse-shoe she could not detect any place at which the flaming appearances were especially concentrated, as they were at both poles when it was open; but the magnet emitted from all its edges, points of junction of the plates, and angles, a short flame-like luminosity, with a constant undulating motion. With a horse-shoe composed of nine layers, capable of supporting ninety pounds, this was not longer than about a finger's breadth.

9. When the horse-shoe was opened, it exhibited the beautiful appearance represented in fig. 1. The drawing was prepared by Miss Reichel herself, as well as she could execute it; but she lamented that she was not able to attain an exact imitation of nature. While an arm of the horse-shoe measured ten inches, the flaming light reached up almost to an equal length, and arose of greater breadth than the steel. At every break formed by the layers of the magnet, smaller flames stood around the edges and angles, terminating in sparkling brushes. She described these little flames as blue, the main light as white below, becoming yellow above, passing then into red, and terminating at the top with green and blue. This light did not remain still, but flickered, waved and darted continually, so as to produce, as it were, shooting rays. But here also, as had occurred in the observation of Miss Nowotny, there was no attraction, no intermingling of the flames, not even an indication of a tendency to this, from pole to pole; and as there, too, no observable distinction between the condition of the two poles of the horse-shoe. Fig. 2 gives a side view, in which a separate

Fig. 1.



tuft, of a lighter, flame-like appearance, spreads out from the edge of each component layer of the magnet. This was necessarily omitted in fig. 1, for the sake of distinctness. Along the back and inner sides of the steel, weaker lights streamed out universally, like those which had been partially described by Miss Maix: on the inside they were all curved upward, but on the outside they were only turned upward for a short space, then were straight for a moment, and next took the directly opposite direction downwards. They were shortest at the lowest part, on the curvature of the steel; therefore on the magnetically indifferent space. These shorter weaker rays are very delicate, and also more fixed. They are drawn, from a single layer of steel, in fig. 10. The condition of the luminosity along the four longitudinal edges of each of the nine layers of steel fitted upon one another, is worthy of remark. At places where the edges of two lamellæ are accurately and closely fitted alongside one another, and almost form a continuous line, they were still clearly distinguished by the emission, on each side, of lines of flame, which one must suppose were necessarily confluent at the bottom. Directly above their point of origin they diverged, consequently converged toward the other lateral radiation of the same lamella; whence it follows, that a transverse section would exhibit such a figure as is represented in fig. 3.—Weaker magnets, from which Miss Reichel made drawings, gave the same picture, but the emitted rays were shorter.

FIG. 2.

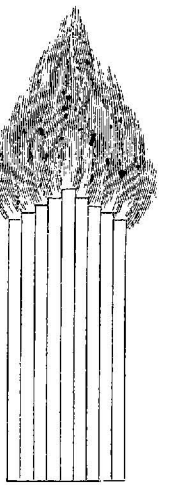


FIG. 10.

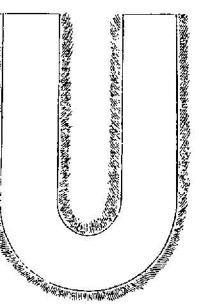
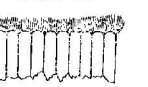
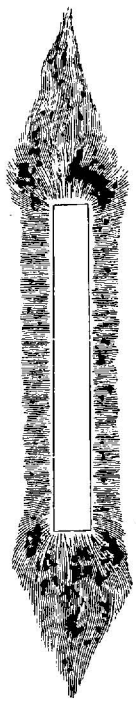


FIG. 3.



10. I laid before her a straight magnetic rod. It was about 1½ feet long, quadrangular, and about 1½ inches broad, like common bar iron. She made from this the drawing subjoined in fig. 4. At the pole directed towards the north, therefore at the negative end of the magnet, she saw a large flame; at the opposite, positive end, a smaller, about half as large, waving, dancing, and shooting out rays, as in the horse-shoe, red below, green in the middle, and blue above. From each of the four edges of either polar extremity issued a strong light, each independently flowing out at an angle of 45° to the plane of the base, and having a somewhat rotatory motion, not exhibited by the chief, central, flickering flame; thus there was a twofold distribution at each pole. A similarity exists in the statements of Miss Nowotny, who also perceived a stronger and more elongated flame at each solid angle of the horse-shoe. The four edges of the rod were clothed with a weaker light, just like the individual layers of the horse-shoe; this exhibiting the red, green, and blue colours, but otherwise issuing steadily and without motion. It did not present any decrease along its whole extent, and neither edges nor indifferent points could be recognised, as was the case in the horse-shoe.

FIG. 4.



11. Placing the magnetic bar in the meridian or in the magnetic parallel, with the poles directed forward or backward or in the direction of the dip, did not appear to exert any important influence in the shape or direction of the flames, the terrestrial magnetism not being strong enough to effect any considerable opposing action.

12. I now took an electro-dynamic apparatus, on the one hand to make an electro-magnet before her eyes, on the

other to bring to observation the action which this and a common steel magnet would produce upon one another in reference to the luminous phenomena. It consisted of a horse-shoe magnet with the poles widely separated, between which a horizontal coiled electro-magnet could be made to rotate. The magnet itself, the poles of which were directed upwards, had legs of square section measuring about three-fourths of an inch on a side. In a dim light it exhibited a condition essentially similar in all respects to that which the large horse-shoe magnet had presented; at the four solid angles of the polar extremities obliquely ascending flames, but in the middle of them, issuing from the centre of the plane of the base, a longer, erect, ascending flame. But this latter was not a dense fiery mass here, for it had assumed the shape of a thin, straight, and vertically erected needle; a modification of the condition which might depend on the relative strength of the magnet, on its size, or on other accessory circumstances of its form. It is possible that a very slight excavation, which had been drilled in the two ends of the steel, for the rotation of fine points fitting on to them, may have contributed to this. The luminous appearance was stationary in this form, and, with a slight difference in size, almost exactly the same at both poles. When I caused a current from a single pair of Grove's elements to pass through the stout silk-covered wire coiled round the iron which served for the electro-magnet, this emitted flaming lights from both ends, and exhibited in an instant all the luminous phenomena of a magnetic rod. Nay more; when it was removed out of the voltaic current, and had thus ceased to be a magnet, it continued to emit magnetic light from the poles, and, as regards luminosity, like the Ritter's pile, went on acting after the removal of the cause. (I shall return to the reason and explanation of this phenomenon in one of the succeeding treatises). *Consequently, in the eyes of a sensitive person, an electro-magnet exhibits exactly the*

*same behaviour in its emission of flaming light, as the common steel magnet.**

13. But the reciprocal action exerted by the two flames upon each other was remarkable. *The flame of the steel magnet was completely turned aside by that of the electro-magnet,* and that as distinctly as the current of a blowpipe directs the flame of a candle. To shorten as much as possible the descriptions, which are tedious to read and at the same time difficult to comprehend, I briefly direct attention to figures 5, 6, 7, and 9. Fig. 5 represents the steel magnet with its luminosity alone, fig. 6, *a* and *b*, the electro-magnet underneath the poles of the latter, with the outline,

* I had five years ago a beautiful case of somnambulism, in a female, who could in her sleep see the light from the poles of magnets, exactly as in this case; even where the armature was applied, she saw lambent blue flames issuing from between the magnet and the armature, and between the plates of which the magnet was composed. Awake, she saw nothing; but on looking at the magnet a while, she fell asleep, and then saw the light again. If she touched the magnet, instantly a deep sleep and rigidity seized her. When I operated with an electro-magnetic single coil apparatus, the same phenomena occurred as in the magnet. While the keeper or contact-breaker continued its action, she saw volumes of blue light and cloud emanating from the coil around the bobbin; if the circle were closed, the current still passing, she still saw a subdued light, but the grey cloud as before; and if in this state she touched the coil, instantly she became unconscious and rigid. From this it is manifest, that besides that force which can influence the galvanometer, some other agent powerfully influences the human system; and that certain individuals in the mesmeric sleep-waking are as good tests of the presence of this agent as any sensitive individuals in an analogous condition of nerves, who may happen to be awake. Since the time above mentioned, several of my somnambules, separated from one another, each ignorant of the purpose of the experiment, have been, at different times, introduced to a room where an electro-dynamic apparatus has been in action, and they have seen an emanation from the coil *exactly* as in the above case. Moreover, in corroboration of the fact noticed by the Baron, each of these persons has repeatedly been put to sleep by touching the helix, at various intervals, from one hour to two hours after the Smee's battery has been removed.

FIG. 5.

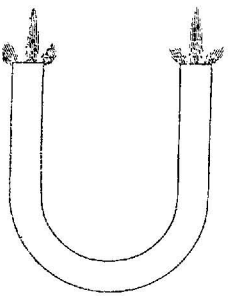


FIG. 6.

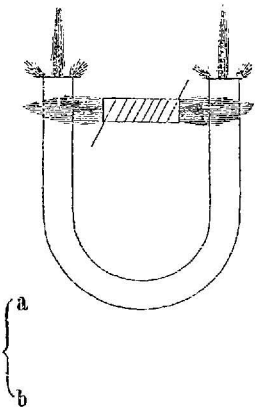


FIG. 7.

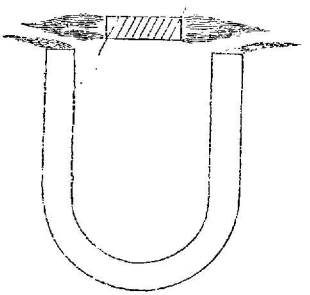


FIG. 8.

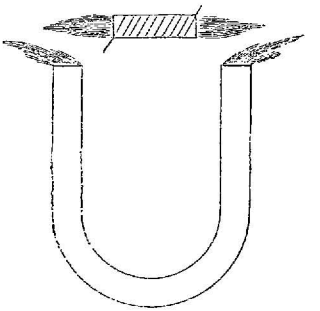
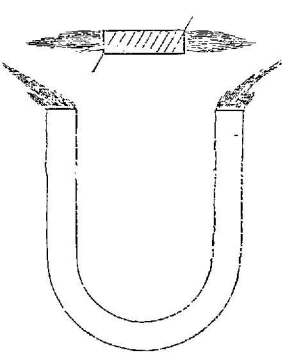


fig. 7, beside it, fig. 8 close above it, fig. 9 high over it, and showing the remarkable divergence of the flame of the steel magnet. The question whether this is to be attributed to a difference of strength or to some other cause, is reserved for future investigation.

FIG. 9.



Thus in Miss Reichel we have the fifth and at the same time the clearest testimony for the luminous phenomena at the poles of the magnet.

Lastly, I must mention a Miss Maria Atzmannsdorfer, a girl 26 years old (Golden Lamb, in the suburb Alte Wieden). She is the daughter of a pensioned military surgeon. She has an affection of the head, with spasms and sleep-walking, but walks about the streets looking like a healthy person. I brought her to my house late in the evening, when it was getting very dark, and into a room which I could darken perfectly by closing inside shutters. She was sensitive in a high degree, and saw the magnetic poles flame here in a most lively manner. She described the luminous appearance as still larger than Miss Reichel, from the nine-layered horse-shoe more than twice the height, and gave an exactly similar account of the light, the colours, and the mobility of the flame; like her she saw the whole magnet luminous, and its entire surface clothed with a delicate light. She makes the sixth witness.

14. Let us now briefly compare the different statements: the same nine-layered horse-shoe magnet displayed at its poles, to the eyes of the greatly convalescent—

a. Miss Nowotny, a kind of luminous vapour, surrounded and intermingled with rays of shining, moving, darting, white and sometimes iridescent light, about one half to three quarters of an inch long.

b. Miss Maix, when free from spasms, saw a white flame about a hand's breadth high.

c. Miss Sturmann, a white flame as high as the length of a small hand, with an intermixture of colours.

d. The journeyman glover, a flame a hand's length in height.

e. Miss Maix, in a spasmodic state, a general light, distributed all over the magnet, dazzling her eyes, and issuing largest and strongest from the poles.

f. Miss Reichel, a variously-coloured, flickering, radiating flame, as large as the whole horse-shoe magnet, therefore 10 inches long; lateral flames out from each layer of the magnet; a general weaker efflux of light along all the edges of the layers inward over the whole horse-shoe.

g. Miss Atzmansdorfer, the same appearances more strongly marked, and the entire magnet in a delicate glow.

15. From all this it follows, that *those sensitive persons, who are so in a high degree, perceive in the dark, at the poles of powerful magnets, a luminous appearance of a waving, flame-like nature, less or more according to the degree of their diseased sensibility, or the more or less perfect degree of darkness;* that they do indeed differ in their observations as to its size, in consequence of their varying powers of perception, but agree unconditionally in all their general statements; such a luminous appearance of considerable magnitude, of which healthy persons see nothing, does therefore actually exist on magnets. Since, with the exception of an acquaintance between Miss Maix and Miss Reichel, none of the witnesses had any communication with each other, or did even know one another, but lived leagues apart, and in my innumerable experiments never contradicted one another, much less themselves; and since they never stated anything opposed to the fixed laws of electricity and magnetism; lastly, conscious of the precaution and accuracy of my own method of investigation,—I feel no hesitation in expressing the conviction I have arrived at,—that I regard the reality of the perception, by persons of exalted sensibility, of luminous phenomena at the magnetic poles, as incontestible, and as an ascertained and settled fact of science; so far, that is, as an individual observer is in a position to complete it. I am certain that we shall not have to wait long for its confirmation from other quarters. The sensitive are not indeed so numerous in small towns, that they may be found almost everywhere, if sought; but in large cities they are far from rare, and I do not consider it a difficult task to find hundreds at once, if requisite, in a place like Vienna. My statements may therefore be readily tested in Berlin, Hamburgh, or Paris.

16. We will now turn to some of the properties of the

magnetic light. That it is invisible to healthy eyes, is not in itself very wonderful. When we consider the difference between sun-light and candle-light, the former of which Wollaston found 5560, Leslie even 12,000 times stronger than the latter; when we see how very weak is the luminosity of alcohol, wood-spirit, carbonic-oxide gas, pure hydrogen, and other combustibles, the flames of which are not only wholly invisible in strong sun-light, but become to a certain extent imperceptible in strong reflected daylight, we are aware already of such extreme differences between the luminosities of different flames, that the step to the complete invisibility to our eyes is no longer a great one, and hence the possibility as well as the comprehensibility lies tolerably near. It therefore cannot be regarded as strange, that other lights exist, which fall beneath our powers of vision, and that a luminosity pervades magnets, which, from its weakness, we are usually unable to see.

17. To convince myself, where possible, whether it was actually light then, and not some different kind of appearance, that was perceived by the sensitive persons, I wished to make an experiment with the daguerréotype, and to see if an impression could be produced upon the iodized silver plate. To carry out this experiment, I invited my obliging friend, M. Karl Schuh, a private teacher of physics in Vienna, known by his improvements in the gas-microscope and his skill in daguerréotyping. He shut up an iodized plate, in front of which an open magnet was placed, in a dark box, and at the same time deposited another plate in another dark case, without a magnet. After some hours he found the former, when it had been treated with mercurial vapour, affected by light, the other not; but the distinction was not very strong. In order to make it perfectly clear, he took the magnet, turned towards an iodized plate, with extreme precautions for keeping out every trace of light during the manipulation, of which I was witness, and

placed it in a case in a thick bed, and left it there sixty-four hours. Taken out in darkness and exposed to mercurial vapour, the plate now exhibited the full effect of the light which it had received, over the entire surface. It was clear from this, that unless other causes are capable of affecting the photographic plate after considerable time, it, in fact, *must be light, real, though weak and acting but slowly, which issues from the magnet.*

18. I made another *experiment, with a similar view, with a large burning glass.* The lens was about eight inches across, and had a focal distance of about twelve inches for a candle standing about five feet behind it. In a completely darkened room, I brought the magnet, of which the flame was ten inches long, about twenty-five inches behind the lens, and directed it against the wall, calling Miss Reichel's attention to it. The clever mechanist of this city, Mr. Ekling, was present. We removed the lens gradually four feet six inches from the wall, during which the observer saw the picture of the light continually diminish in size, and first at that distance contract to about one-eighth of an inch. But in spite of this, no one present was able to perceive a trace of the light, even under this considerable concentration. Yet it furnished us with a sure means of testing the accuracy of the observer in a variety of ways. Among others, she laid her finger on the spot where she saw the focal point; I followed her, and, by feeling in the dark, placed mine upon it. Mr. Ekling, who held the lens, now altered its direction a little, without saying in what way. The position of the focus on the wall was thus of course altered in the same direction. The observer immediately gave another, which I traced out with my finger, and then made Mr. Ekling state in what direction he had diverted the axis. Whether he said to the right, downward or upward, my finger was in every case already on the right, below or above. The exactitude and genuineness of the observation

was consequently beyond all doubt. She described the colour of the focal point as red; and she also said that the whole of the large glass lens was illumined red by the magnet.

19. *The magnetic light emitted no heat;* at least none appreciable by our most delicate instruments. Directed on to a Nobili's thermoscope, I could not detect any movement of the astatic needle of the differential galvanometer, even after a lengthened trial.

20. It was very desirable to obtain some more intimate knowledge as to the substantiality of the flame, light, or whatever we may please to call it, waving over the magnetic poles. Since it did not issue in a radiant form from its source, but in a flickering shape, forming all sorts of curved and changing lines, it could not well consist of a simple and pure emission of light. In fact, when I turned the poles of the magnet downward, it flowed downward in the identical shape in which it flowed upward when I reversed them, and in each direction sideways as I held them to either side. This testifies strongly to its more than probable imponderability, but proves nothing positive as to its nature. But the answer I obtained to the question, how the magnetic flame behaved when blown upon, seemed to me more important in this respect. The observer said that it flared divergently to the side like any other flame. When a solid is brought too near, the points curl round it: when in the last experiments, also, the large glass lens had been brought too near the open magnet, the flames had applied themselves upon the glass exactly in the same manner as happens when another glass is placed in the flame of a candle to blacken it; when the hand was placed on the magnet, the flames passed between the fingers and out behind the hand, &c. It follows from this, that the *magnetic flame* is *evidently* either itself *something wholly material,* or has such for a substratum; further, that the *magnetic*

light is something different from it, and the *magnetic flame is a compound*, in which some kind of materiality is united with the immaterial essence of the light.* The sensitive

* In a logical work, the meaning of such words as material and immaterial should be strictly defined. The question relates not here to Theology, but to Natural Science. Great confusion of ideas must inevitably result from misapprehension of the accurate import of terms. If I understand the adjective material, it relates to *matter—something*. On the other hand, immaterial relates to *immatter—nothing*. Divisibility is infinite. The attenuation of any substance in space is bounded only by the opposition offered to its expansion by the pressure of other matter; otherwise its expansibility would be infinite. It is impossible to conceive of its annihilation—of its being reduced to *nothing*. Without clear ideas, logic is nothing—philosophy is nothing—reason is nothing—truth is nothing. Their provinces are in entity. It is absurd to speak of reasoning upon *nothing*. We cannot conceive of nothing. Our faculties have no relations to *nothing*. Being in themselves something, we can have no faith in nothing. Move for an instant from physics to theology. It is the atheist who believes in *nothing*. The believer in a God, clearer in his logic, confessing, in great humility, his perfect and complete inability to grasp the idea of nothing, can never measure more than the attributes of an all-wise, all-just, all-holy, and all-powerful *Being;* still, cannot believe that being non-existent. He *talks* perhaps of that Being being immaterial. He does not for one moment mean constituted of *nothing!* He would be wiser to avoid the use of terms which have no meaning. . . . Real humility, which characterizes real philosophy, leads him to say—"I do not know, but in future I will not talk nonsense about immaterialism. I will not get angry, I will not dispute about what no imagination can conceive. A being must be something, although I may be quite ignorant of the nature of that thing." It is highly important that, in all considerations on those agencies which are sometimes designated as *imponderable* forms of matter, we should not use such terms as *immaterial*. The term can be used only when there is an absence of a clear idea, or a willingness to envelop the mind in hazy cloudy clothing.

It is a mistake to suppose that accurate definition is necessary only in metaphysics. All the phenomena relating to the subject of light may one day be proved to belong to the science of psychology; and the researches now presented to public notice may indeed be regarded as the commencement of very numerous investigations hereafter by men of

person actually sees the magnetic flame curve round the glass lens, while the light itself passes through, and its rays

science, which must establish the relations of light to the phenomena of the human mind. It is silly and idle to oppose to the progress of clear ideas the confused nonsense which pervades the brains of men who cannot help hating all new truths. Those who are really *honest* and *sincere* in their religious faith, need never fear the advance of science. A wise and just God, permitting the developments of truth, decrees that man cannot alter the laws which regulate Nature in her operations. The repulsive agencies of his brain may malignantly oppose the revelations of science, which are the revelations of God's will to man given out at progressively advancing *periods* of that time which is a fragment of Eternity; but they cannot overwhelm the truth, and are able to stay its progress only as the midge intercepts the progress of the sun's light for a moment. To our limited ken, all Nature's truths are material. Mathematics have enabled wondrous philosophers to calculate the speed at which light travels, and the admirable observations in paragraph 16 of the text are sufficient to prove that the materiality of all light, when man's ken shall be enlarged by science, may come to be easily established. I have known at least fifty persons who have seen a grey silvery, or a blue light emanating from my hand and fingers, when they have been wide awake. I have known a great many persons who having been put into mesmeric sleep have declared that they have seen blue light issuing in copious streams from my eyes, when I have concentrated my thoughts in the acts of volition or study. This is so common, that as the investigations into mesmerism proceed, I know there must be thousands of corroborations of the fact, instead of hundreds, as at present. Will any one venture to say that a force having relation to such a light is not a material power? The light proceeds from the brain of a person willing, and impinges on a sleeper—sent to sleep by a magnet —or by a crystal. The light is sent forth by the will of that person, and becomes a motive power, for the recipient sleeper moves and obeys the mandate received through the luminous agency. I have repeatedly performed an experiment under these circumstances, and the results have been as above stated. But though I have often willed persons awake as well as sleep-wakers, and even magnetic and crystallic-sleepers, to do my silent bidding, proving that the light from my brain is a motive power, I regard some other experiments on rare subjects to be still more conclusive as to the material agency of the light which emanates from the human brain. I have caused it to travel 72 miles, producing immediate effects. I have witnesses who can testify that I

may be collected in a focus. Miss Nowotny and Miss Sturmann both assured me that the light spread a bright-

have repeatedly willed an individual to come to me when at the distance of nearly two miles. I have witnesses who can testify that a patient for some months required the force of the light emanating from my brain by the exertion of the will, to enable her to sleep at all, when she was at the distance of nearly two miles from me. Hundreds of persons have seen an individual made insensible and rigid by my imagining a circle round her. In her delirium, which made her muscles enormously powerful, she would occasionally master several persons. My will, impinging its light upon her, rendered her not only tractable for a time, but set her fast, for hours, in a deep sleep and rigid spasm. If I imagined a bar on the carpet, she could indicate with accuracy the position and limits of that bar. She described it as a bar of blue light on the carpet; and if she were desired to get up and pass over it, she became insensible, and fell on the floor like any inanimate object. Sometimes I have placed this bar of light across the threshold of a door, and it has been impossible for her to pass over it. The sight of the blue bar of light, placed by an effort of my will, even after many repetitions of the experiment, made her fall down insensible; and she has remained insensible to all external impressions, like a person dead asleep on the floor, until I have willed the bar to disappear. Hundreds of persons have seen me perform this experiment. On one occasion I left the bar for one hour and a half, and she remained quite unconscious, getting up instantly when I willed its disappearance. Though not a common, this has not been a solitary case illustrative of such a striking fact. Charpignon (Etudes Phys. sur le Magn. Anim. Paris, 1843) has proposed physical tests to establish the existence of the mesmeric fluid. One of them consisted in collecting the fluid from the ends of the finger into a glass tumbler, and then getting patients to inhale the air collected in that glass vessel. This put the individuals to sleep. Several persons have seen while awake the blue light proceeding from my fingers, and collecting in the glass. I have directed their attention to other objects, so that they could not be aware of my resuming hold of the glass I had left, and have been unawares put to sleep by my pouring the fluid on the back of their necks. On several occasions lately, I have sat in one room willing the mesmeric light into a wide-mouthed phial of a pint capacity, and have taken it into another room, where, pouring the substance on a patient's head, she has instantly fallen asleep. These experiments, performed with every precaution to avoid sources of fallacy, can succeed only in cases of most extreme susceptibility. Repeated occurrences of

ness around it, and illuminated neighbouring objects; and Miss Reichel marked the exact distance to which the visible light of the magnetic flame spread over the table on which it lay; I measured this, and found it to extend to about nineteen inches in diameter. Whether that which issues from the magnet in the form of flame is really a substantial emission, or only indicates an alteration of condition which the magnet produces in the surrounding air, or according to the newer theories, in the ether, which then in further progress becomes associated with an evolution of light, are questions to solve which many more things, among others the slow spontaneous loss of power of the steel magnet, must be placed in the balance, and they must remain as subjects for further research. For the present, only this much is established;—that the magnetic flame, turning aside before mechanical obstacles, is not identical with the independent, simultaneously issuing magnetic light, which possesses a higher radiant nature.

21. And now I return to the introductory consideration of § 2. The first practical use to be made of these observations would be an endeavour to apply them to the elucidation of the aurora borealis. We are in possession of the valuable explanations given by Sir Humphry Davy, who applied the influence of the magnet on the electrical current in rarified air, to the aurora, and endeavoured to make out the probability that this phenomenon was produced by a current of this kind on the outermost limits of the atmosphere. But since, through the recent polar expeditions, it has been found how deeply this frequently descends in the atmosphere, Davy's ingenious comparison has lost much of

these facts, and, as they are easily reproduced, we shall have have accounts of many of them, will establish the conclusion that *a force which is a material agent, attended by or constituting a coloured light, emanates from the brain of man, when he thinks—that his will can direct its impingement—and that it is a motive power.*

its certainty; the rarified space, the ground on which he based it, has disappeared, and with it the diffusion of the free electricity, which, derived from our thunder-storms, he claimed for the aurora. The certainty which we possess that the aurora is only formed under the influence of the magnetic poles of the earth, the total absence of any direct phenomena of light on magnets, which we have hitherto assumed; the facts now gained, that although invisible to common eyes, coloured, especially white, yellow, and red emissions of light do issue from magnets, certainly must lead us to surmise that the aurora may be either actually the magnetism itself issuing from the polar regions, or else a direct effect of it. It is known that the aurora, when it appears, affects and disturbs the magnetic needles of whole countries, as does the magnetic flame, or the magnet producing it, at a certain distance: lastly, it is, in fact, only the emanation from the magnet, and not the magnet itself, which produces the movements at a distance; and thus, therefore, the deflecting action of the aurora upon the needle completely agrees with those of the magnet. Finally, if we compare the special phenomena in the appearance of the magnetic light and the magnetic flame, with those of the aurora, the probability of such an assumption evidently increases. The aurora is known as a white arc, according to others as a white vapoury or cloud-like mass on the polar horizon, from which shoot out towards the equator flickering, brush-like, wandering rays, the lines of which have indeed a principal direction, but are not parallel to each other, nor straight, but appear curved slightly in various ways, and sometimes scintillate. Their colour changes from the white of the arc to bluish, emerald green, yellow, and above all, red, which light they then spread over whole zones. The same mobility of emitted rays, the same flickering flame running in curved lines, the same brilliant play of colour, the same reddening of illuminated objects, we find

described in exactly the same way by the observers of the magnetic phenomena. The observations, it is true, do not agree perfectly with each other, but they coincide in all important points. The distinctions between them depend chiefly on the different size of the flaming objects, which is of minor importance; it is explicable by the different degrees of sensibility to the magnetic light of different observers. In particular, we see two different pictures of light appear in the eyes of Miss Maix, according as she was either in a quiet condition or in an attack of spasms: in the former case, a flame of only a hand's breadth rested on the poles; in the latter, not only had this much increased and become more brilliant, but the entire large horse-shoe was covered with gushes of light. In the same way we find with Miss Nowotny, that the apparent size of the magnetic light, in her observation, kept pace with her convalesence, and that the picture of it appeared to become smaller, from period to period, in the same proportion as her disease diminished, till at last it became wholly imperceptible to her senses. At one particular period she recognised a kind of luminous vapour immediately over the steel, which the far more sensitive Miss Reichel never saw; from this cloud of vapour she saw the tufts of light issue in the same way as the latter perceived the tufts of light from the corners of weaker magnets. This vaporous cloud, immediately upon the steel, resembled in a high degree the polar luminous arc of the aurora; and if Miss Reichel, as she stated, saw nothing of it, the reason certainly is, that in her sight, which perceived the far more flickering light and the flames ascending from the shorter layers of the magnet, the vaporous cloud was covered or eclipsed by these so that she could not possibly see them. It might be expected that, with the progress of her recovery, a period would ensue in which the flames of the sides of the layers would disappear, and then the vaporous cloud would be free to

her eyes, and would be seen as well by her as by Miss Nowotny.

It is this calm, bright, cloud-like appearance, however, which brings the resemblance to northern light to such a high degree of agreement, that one is involuntarily led to the acknowledgment of the complete identity of the aurora and the magnetic light. But I must not be misapprehended: I do not wish to say that I regard the identity of the two phenomena as proved; for between lights visible and invisible to healthy eyes lies a chasm which is not yet filled up, and cannot even be filled up by the hypothesis of a different intensity of the two phenomena: but I believe this much to be certain, and that I may venture to express it, that an astonishing analogy exists between the two; so great, that the *identity of the magnetic flame and the aurora* rises unmistakeably to a high degree of probability.

22. RETROSPECT.

a. A strong magnet exercises a peculiar action upon the senses of many healthy and sick persons; it is an agent upon the vital force.

b. Those who manifest this sensibility in a high degree frequently exhibit a great exaltation of the acuteness of the senses, and are then in a condition to perceive light and flame-like appearances upon the magnet. The strength and distinctness of this perception increases with the sensibility of the observer and the obscurity of the place.

c. The pole $-$M gives the larger, the $+$M the smaller flame, in the northern latitude of Vienna. Its form and colour change according as the magnet is open or closed,—a magnet made by touch, or an electro-magnet,—free, or under the influence of other magnets.

d. Positive and negative flames display no tendency to unite.

e. The flame may be mechanically diverted in various directions, just like the flame of a fire.

f. It emits a light which is red, that acts upon the daguerréotype, and may be concentrated by a glass lens, but is without perceptible heat.

g. Magnetic flames and their light exhibit such complete resemblance to the aurora, that I believe myself compelled to consider the two as identical.

SECOND TREATISE.

CRYSTALS.

23. Previously to my visits, Miss Nowotny's physician had repeated some of the observations of the older physicians in cataleptic cases, in particular those which Dr. Petetin, at Lyons, in 1788, as well as other persons, had investigated and made known;—that when a powerful magnet was placed upon the hand, it adhered to it in the same way as a piece of iron to the magnet; moreover, that water through which the magnet had been passed a few times, was accurately distinguished by the patients from common water. The latter was first observed and made known by Mesmer, often enough ridiculed, and as often re-asserted. We shall see in the course of the present investigation how much of it is found true, and how much false, by the test of physics. The adhesion* of a living member to a magnet

* I have seen two persons whose hands, when the individuals have been awake, could not be kept away from the poles of a powerful horse-shoe magnet presented to them at a distance of six feet. The attractive power of the magnet always induced these ladies to move the head and to incline the body forward. But I have witnessed the phenomenon of the attraction of the hands to a magnet in more than twenty cases of individuals in a condition of sleep-waking. A boy, aged 14, who occasionally came to my house in Wimpole Street, used to rush forward from a distance of six feet to a magnet with a ten pounds sustaining power; if I took off the armature while I sat opposite to him, the poles being directed towards him, he would fall asleep on his way to the magnet, and remain unconscious while his hand adhered to it. I must continue to regard the sleep-waking state as no obstacle to the conclusions arrived at by the Baron, and I look upon the facts in mesmerism as corroborative of the establishment of truths erroneously

is a fact totally unknown both in physics and physiology, and few persons have satisfied themselves on the point by inspection; it is necessary, therefore, to examine and elucidate it in some measure in this place. When the sick Miss Nowotny lay unconscious and motionless in a cataleptic condition, but free from spasms, and a horse-shoe magnet, capable of sustaining some 22 lbs., was brought near her hand, this adhered to it in such a manner that when the magnet was raised, or moved sideways, backward, or in any desired position, the hand remained constantly attached to it, as if it had been a piece of iron cleaving to it. The patient remained perfectly unconscious all the while; but the attraction was so strong, that when the magnet was drawn down in the direction of the feet, beyond the reach of the patient's arm, she not only did not leave it, but, in an unconscious state, rose up in the bed and followed the magnet with her hand as long as it was at all within her reach: thus it looked as if the patient had been grasped by the hand, and her body thus been drawn toward her feet. Finally, when the magnet was removed beyond its distance of attraction, she was indeed compelled to leave it, but then remained unalterable and immoveable in the position in which she had been placed, according to the well-known manner of cataleptic patients. This I saw daily, between six and eight o'clock in the evening, when the patient had her fits; and eight or ten persons, physicians, physicists, chemists, and friends of science, were usually

imagined to be arrived at in a condition of system non-mesmeric. The simple act of falling asleep may establish the existence of a tonic state of nerves, but that tonic state of nerves is not incompatible with acuteness of perception in perceptive organs—with acuteness of apprehension in intellectual organs—with extreme delicacy of conviction, refinement, and grace in the moral organs; and of great increase of sensibility and force in the organs of passion and desire. It is phrenology that must be studied to enlighten us on the relations of physics to the phenomena of vitality.

witnesses of it, to name whom can be of no essential use to me.

When I visited the girl at other times of the day, in the morning for instance, I found that the phenomena were still the same at the time of her best and clearest consciousness. Her hand followed the magnet which I placed on it, exactly in the same way as when she was in the unconscious cataleptic condition. The account of the matter which I obtained from her added little to the explication of this physical singularity; she described her sensation as an irresistible attraction, which she felt compelled to follow unconditionally and involuntarily, and which she was obliged to obey even against her will. It was an agreeable sensation, as if connected with a cool gentle wind, issuing from the magnet on to the hand, which seemed to be attached to it as by a thousand fine threads, and to be drawn along by it. In other respects she knew of nothing at all like in life, and the whole was a peculiar, indescribable sensation, in which lay a refreshing, infinite pleasure, when the magnet was of the right size and not too strong.*

* Since the thing appeared far too strange, and stood too completely in contradiction to the known laws and powers of the magnet, for me to see my way clearly, I confess that, at first, doubts arose in my mind whether all was quite right here, and whether some intentional deception was not going on, however much this might stand in opposition to the visible manifest honesty of all around, and the respectability of the patient. I therefore took various measures of precaution,—bound up the eyes of the patient in the cataleptic state, operated in variously modified ways with the magnet, &c.; but the reactions were always the same. It will be necessary to mention here some of the tests to which I subjected the patient. Among others, I concerted with a friend, that while I stood beside the bed and observed the patient, he should stand at the other side of the stone wall against which the bed was placed, and at an appointed sign should alternately open and close with the armature a strong magnet capable of sustaining 90 lbs., keeping it directed toward the patient when open. It was easy to find the place of her head on the other side of the wall in the next room.

I subsequently had opportunity to observe exactly the same phenomenon in Miss Reichel. The complaint was different here, but also connected with periodical cataleptic fits, and both in these and in the awake condition her hand

Scarcely was the armature removed when the patient became restless, and complained that a magnet must be open somewhere, desiring that some one would look, and relieve her from the pain; for large magnets always caused her great uneasiness from over-excitement, while smaller ones were pleasantly cooling. The armature was replaced without her knowledge, and she became quiet again. When this was secretly repeated she became perplexed, and could not conceive the cause of this changeable uneasiness which seized her and left her again, just as if a magnet had been turned towards her. The magnet had, therefore, acted through a stone wall without the patient being aware of its vicinity, exactly in the same way as it did when lying open before her, in correspondence with the known laws of magnetism, which penetrates irresistibly through all bodies. Lastly, the riddle was explained to her, and the experiment repeated with her conscious participation; every time the large magnet was opened it produced the same varying unnatural redness in her countenance as I had seen appear and disappear during the secret treatment. Another exceedingly well-selected test was undertaken by M. Baumgartner, well known in his former capacity of Professor of Physics, at a visit for his own satisfaction. When the phenomena with the magnets had been exhibited to him, and their strange effects upon the patient repeated one after another before his eyes, he took from his pocket a horse-shoe magnet of his own, which he told the bystanders, in the presence of the patient, was the most remarkable of all the magnets in his collection of apparatus, and that which had always proved itself the strongest; he was desirous, therefore, of knowing the strength of the action it would exercise upon the patient. To our astonishment, however, Miss Nowotny declared that she could not confirm this; on the contrary, she not only found it much weaker than any, even than the weakest of the magnets present, but it seemed to her almost without influence; she did not smell it, she did not taste it, it did not make her hot, and it did not attract her hand at all. M. Baumgartner laughed at our astonishment, and now told us that the horse-shoe, which was indeed his best magnet, had been deprived of its magnetism before he left home by friction in the reverse direction, and, therefore, its power had been reduced almost to nothing; that it, therefore, was little else than a mere plain piece of iron; in fact, it no longer evinced any attraction

followed a strong magnet, exactly in the way I have described it in Miss Nowotny. Professor Lippich reported the same to me of a stage of the disease of Miss Sturmann, which I was prevented from examining myself; and I have every reason to place unconditional trust in the accuracy of the statement. These different cases, compared with those of a similar kind which Petetin, Rick, and others furnish from past times, leave no doubt of the correctness of the fact, *that in certain diseases, especially those in which catalepsy exists, a distinct attraction occurs between the human hand and strong magnets.**

for its armature[1]. M. Baumgartner had desired to assure himself of the truth of all that took place here, and thus furnished us all with a new warranty of it. After such tests, of which I could mention others similar in their nature, I hope I shall not be required to give new securities for the truth of these things, the accuracy of which will, moreover, be sufficiently tested by itself in the course of that which I am here endeavouring to explain.—*Author's Note.*

* The Baron is most correct in this conclusion,—that in constitutions of a tendency to catalepsy "*a distinct attraction occurs between the human hand and a magnet;*" and he enlarges the proposition by the words, "*in certain diseases.*" Now, what are these diseases? All affections of the nervous system which fall under a great class of those exhibiting proclivity to clonic spasms, may be considered as opposed to another of those evincing a tendency to tonic spasms. In the one set there is an attraction between the particles of nerve matter, and in the other there is a repulsion between those particles. In the opposite conditions of brain and nerves which obtain in sleep and in vigilance, we have illustrations of this idea. Constitutions vary according to degrees of tone and clone, and there are thousands of *grades* of these

[1] Among several other remarkable instances in my own experience corroborating this fact, I may notice a striking case of a lady who felt very unpleasant effects when a powerful magnet, in my possession, happened to be in the room where she was present. It was accidentally upon my table one day that she came in, and seeing it she remarked that her constitution must have undergone a change, since she perceived that without inconvenience she could remain in the room with that magnet; in fact it had been deprived of its magnetism.

I also made an experiment on the feet of Miss Nowotny; there also I found a like attraction, but far weaker; but no other place, sensitive in this way, existed in any part of the body.

24. The first and most immediate question that arose now was, whether the attraction which the magnet exercised upon the patient was reciprocal, or whether it was exerted by it upon bodies capable of participating in the diffusion of magnetism, and, like iron, temporarily converted into magnets by the approximation of a magnetic body; in other words, whether, through her diseased condition, magnetism, and, with this, magnetic attraction, resided in herself? To decide this I took some iron filings and brought the patient's finger over them; they did not adhere

opposite states. If, in vigilance, tone gives a character to the frame, and is habitually carried to its extreme point short of sleep, with rigid spasm, the individual is in perfect health, and is in a condition bordering on that which is characterised by a want of sensibility to magnetic impressions. Remark the opposite extreme: hysteria,—fragile frame, with debility and very delicate susceptibility to impressions. Inflict the poison of hydrophobia on the tonic individual, and the extreme clonic spasms are not long before they become evident. A reversal of polarities ensues, which makes the person more extremely susceptible than the most fragile hysterical female. The brain and nerves in tone are compact and tense; in clone, loose and wanting in firmness. In the course of a long mesmeric treatment, patients exhibit in some cases various phases in degrees of sensibility to impressions. The organs of the five senses may become more acute, and their powers exalted. The intellectual, the moral, or the lower animal nervous functions, according to the individual peculiarity of fabric, may be more strikingly manifested. A time arrives when tone assumes the mastery. Deep sleep, the best test of the progress towards tonic health, balances the relations between nerve and blood, and the patient is restored to a state of mind and body in which neither mesmeric manipulations nor powerful magnets have much more than the slightest influence in producing attraction or repulsion. The diseases, then, in which the magnet influences the hand by attraction towards it, are those in which a proclivity to clone preponderates, and in which a due course of mesmerism or magnets have not perfectly conquered this disposition.

in the slightest degree, even when she was in contact with the magnet, and might thus have been more strongly influenced than she might have been naturally. A suspended magnetic needle which I brought to her, and which I bade her hold her finger close to at both poles, and in variously modified alternating ways, was not caused to diverge or oscillate in the least. Another experiment in reference to this point was made at the desire and in the presence of M. Baumgartner. When the hand, and with it the whole arm, were lifted up by the magnet, it seemed to many that the horse-shoe became as much heavier as the weight of the attached burden, the arm, amounted to. I could not find this myself, but many persons believed that they felt it distinctly. The horse-shoe was therefore attached to the beam of a pair of scales, and its weight balanced by a counterpoise. After the patient's hand had been spread out flat, with the back on a firm support, I held it fast down upon this by the tips of the fingers, and the freely suspended magnet was brought near to it: the hand strove to move toward this, and I was obliged to exert some force to keep it back; but the index of the balance did not stir in the least, even when the magnet almost touched the fingers, and then strove so convulsively to contract, that I had much trouble to retain them in their flat position.

While I was busied with these investigations, the known statement of Thilorier, that he had magnetised steel by induction from nervous patients, appeared in the journals: whether the induction here depended solely or only in part upon the disease, I must leave unsettled: the result in Vienna was, that I soon received news from their physician that both Miss Reichel and Miss Maix converted every steel needle into a magnet, by holding it in the hand for some time. I went to see the patients, who assured me of the correctness of the matter, and showed me knitting needles which supported common sewing needles. I made the

experiment with them myself; procured knitting needles which were not at all magnetic, removed all magnets from the vicinity of the patients, and gave them the needles. At my desire they held them in the hand, first the same length of time, then twice as long as in the previous experiments, in which their medical attendant stated he had produced magnets with them, but the needles were not magnetic now, and all endeavour to make them so was in vain. Doubtless it had been neglected before to examine the condition of the needles previously to the experiment, for among a dozen knitting needles always half are more or less magnetic. Lastly, I was assured that Miss Sturmann was so magnetic that she caused the magnetic needle to diverge from 20 to 30 degrees. I was invited to a trial by Professor Lippich, and really saw a freely suspended needle considerably deflected. As the needle was not sufficiently secured from currents of air, I undertook the experiment next day, with the precaution of placing the needle in a vessel which was covered by a glass plate at the top, so that we could see all that took place. At the side I had made a round hole just large enough to admit a finger. By this means the patient could bring her finger quite close to the needle without setting the air in motion, while the breath of those standing round could no longer exert any influence on the experiment. When the finger was introduced, it appeared this time that some attraction occurred. I examined the tip of the finger, and as it seemed rather moist, I rubbed it over with flour for another trial: then all attraction for the magnet was at once at an end; the needle remained motionless. It was evident that in the former case the very mobile needle had adhered to the finger from the presence of slight perspiration, and when the slight stickiness of this was removed by the flour, all attraction ceased directly. It was not of magnetic nature, but an effect of adhesion. Quite superfluously I afterwards

introduced Miss Sturmann's finger into the helix of a differential galvanometer: neither when inserted or taken out was any induced current perceptible, and the astatic needle remained immoveable.

25. From the preceding it follows, that the attraction exercised by the magnet upon the hands and feet of cataleptic patients is nothing ponderable; *it has no supporting power*, cannot even raise iron filings, and is equally incapable of affecting the magnetic needle and inducing a magnetic current. The arm lifted up in catalepsy therefore supported itself, and its passive *attraction was quite different in its import from that of iron toward the magnet*, or, more accurately, toward magnetically oppositely polarized matter in the sense hitherto received.

It is known well enough that we are not acquainted in physics with any attraction which is not reciprocal. On the other hand, it is equally well known that a person in a state of cataleptic unconsciousness, which cannot be feigned, not only has no free will, but in fact no will at all:* since,

* This is the subject which is the keystone of all the objections to the application of magnetism or of mesmerism to the human system. To shew that man is not a free agent is bad enough, but to prove it by physical facts should be atrocious. The instinct of those who have large organs of cunning, acquisitiveness, and self-esteem, is instantly on the alert; and forgetting that they do not wholly belong to the baser animals, they give way to the lower feelings of their nature.

Instinctive feelings operate powerfully upon mankind as well as upon the animals not gifted with the organs of the reasoning faculties, and the condition of the brain of the man who anticipates disagreeable change, or something adverse to his foregone conclusions, is just that which is analogous to the magnetised brain which has no free will. The being of prejudice with his very limited power of understanding is, of necessity, no free agent; he is not more so than the tiger, who, following the law of his organization, flares his eyes with ecstatic delight while he mangles his prey. It is the decree of such that Man is not to know of his brain being influenced by external agencies. With a penalty before him, the risk of disease, or of death, he may be permitted to indulge in the dead-

therefore, the magnetic mechanical attraction by the magnet is a fact, which is not only established here by sufficient ex-

drunkenness of chloroform, of opium, or of brandy, in its many shapes, for then he is not placed in those gradations which excite in his fellow man the reasoning faculties. Sinners have free will, and are accountable beings, even when drunk; but a man rendered fatuous, ecstatic, or unconscious by a magnet, is too evidently a being without a will. There are various degrees of the influence exerted by magnets on the brain. It is not a necessary consequence that unconsciousness should accompany the catalepsy which results from this agency. A man may be quite conscious, and yet be unable to exercise *will:* or the organs of his brain, influenced by a force analogous to the magnetic power, may be placed in a condition such that the individual is unable to act, except at the bidding of another. *Apparently* there are other influences, but a stricter study of the philosophy of this subject will show us that they are *really* what were formerly called magnetic, but which Reichenbach's discoveries will establish as crystallic or mesmeric, operating upon the brain of man, and obliging him to form convictions, to do deeds, that prove him as much a machine without free will as if he had actually been the victim of the Baron's largest magnets. All influences, all impelling forces, acting upon the phrenological organs of man, are motive powers. Do we not in common parlance speak of the influence of *motives?* No one acts without a motive: so that the immediate antecedent motive or force is the necessary impellent to the production of the consequent action. The will of the Jesuit, like that of the snake persuading Eve, is as much an overpowering magnetism as the flames from the light-spreading magnet: they both act by an influence of attraction. The serpentine luring is attractive, like the rattlesnake's, to destruction, to arrieration, and perdition. The magnetic light, a symbol of Baron von Reichenbach's illumination against superstition, attracts to the establishment of health—the parent of many blessings. But in each case the victim is the creature of a necessity. To speak of his free will is an absurdity. He is trained to his actions as much as a vine is trained against a wall to grow in a direction about which it has no choice. The Negro victim to the superstition of Obi is in a magnetic groove, in which he runs his course and dies. Then, is man in all his actions to be considered as a machine obeying the impulses received upon his brain from the thousands of crystallic forces that are playing upon him incessantly? Look at him proceeding along a crowded thoroughfare;—is he not receiving from a plane below the axis of the sphere in which his brain may be supposed to be placed, a constant series of varied impressions, acting in the sense of the centrifugal

periments, but may readily be tested and confirmed in every large town, where such patients are never wanting, it acquires, in spite of all its apparent strangeness, a solid, scientific certitude, and imperiously claims further investigation. Not in order to explain it, but to render it provisionally in some degree comprehensible, I venture to refer to all the attractions and repulsions which the vegetative life of animals and plants unceasingly brings to pass, in thousand-fold variety, without our being able at present either to perceive or even to infer a counter attraction. A root penetrates strongly into the hard soil, breaks and bursts powerful mechanical obstacles: we perceive no cause for the counter-attraction or counter-expulsion which so powerfully impels it thereto, and yet it happens. Similar conditions lead the hand of the patient toward the magnet, whether we now comprehend it or not.

26. When, instead of a middle-sized magnet of some 20lb. capacity, we took a strong one capable of bearing 90lb. and placed this on the flat hand of Miss Nowotny, she

forces, which are repellent and have the tendency to keep him awake and thinking? and his thoughts under such circumstances, are they not without his control forced upon his attention? A carriage goes over a child;—can he help the start of sympathy? He could have helped it, if . . . if he had had other *motives* offered to him, more powerful than those which obliged him to act as he did; but the *impulse* he received had its legitimate consequences. Regard him under the influence of centripetal forces. They are, like the large magnet, attractive. He is so fatigued he cannot keep his eyes open. Does his free will prevent him from sleeping? The attractive forces are too much for him. All resistance is in vain. He yields, and he sleeps.

Will man never learn the principle upon which all real charity depends! Will man always acknowledge that he is truly the victim of the power of surrounding circumstances, and yet constantly act towards his brother man as if he were free to command the events that control him! Glorious Von Reichenbach! the lights that emanate from your magnets, from your crystals, and from your crystalline brain, are destined to aid in liberating your fellow-beings from their irreligious thraldom of superstition.

grasped, both in the conscious and unconscious state, the presented ends of the horse-shoe, and laid hold of it so firmly that it could not be taken away from her without great effort. She herself was unable to loosen her hold. The whole hand was clenched spasmodically, and the cramp knitted the fingers round the magnet, and contracted the whole hand so violently that all voluntary power of motion ceased.*

27. I have already (§ 2) mentioned the magnetized water which the patient immediately distinguished from common water, when ignorant of what had been done to it. Nothing could be more disagreeable than the reappearance of an apparently so absurd thing, which all physicists and chemists are horrified even to hear of. But in spite of this, I could not refuse to admit what I saw before my eyes as often as I tried it; namely, that the girl always determined, and unfailingly distinguished, a magnetized glass of water from an unmagnetized. The force of facts cannot be combatted by any reasoning; I was compelled to recognise what I was by no means able to comprehend. But when I again met with the same subsequently in Misses Sturmann, Maix, Reichel, Atzmannsdorfer, and others, and saw it in a still

* This has been witnessed here very frequently, and we consider the patient to be in a deep mesmeric sleep, with the addition of strong spasm. In my paper on the Theory of Sleep (see the Zoist, Vol. 4, pages 260 to 267, *passim*) I have endeavoured to show that however the cerebral tissues may be arranged to produce results analogous to those caused by our artificial electric and magnetic agencies, attractive forces tend to soothe the individual, and, *by degrees*, induce *quietude, somnolence, sleep,* and *the tonic spasm;* while *inquietude, pain and restlessness, wakefulness, full vigilance, delirium tremens, clonic spasms,* result from repulsive forces. To illustrate the facts here stated, cases analogous to those selected by the Baron should be chosen; but the confusion ought not to arise in the mind that the individuals do not exhibit mesmeric phenomena. Brown study, reverie, absence of mind, are slighter degrees of the state exhibited in Miss Nowotny's case, and are to be produced by a magnet in some individuals.

stronger degree, I gave up all doubt and opposition to a phenomenon, the actuality of which no longer admitted of contradiction in any reasonable manner.*

28. But the singularity seemed to reach the height of incomprehensibility when it proved that not merely the magnet, but even a simple glass of magnetised water, possessed the power of drawing along the hand of Miss Nowotny. It is true that this occurred in a much weaker degree, but her hand was unmistakeably attracted, both in the catalepsy and at every other time, by a magnetized glass of water, in such a manner that a tendency to follow this in every direction made itself evident.

29. Contemplating this, and convinced that so strange a phenomenon could not exist isolated in nature, I was desirous of trying whether the same effect as that of the water might not be brought about by means of some other body; if this proved to be so, I hoped to see cases occur with various modifications, from which some laws might be deduced. With this view, all sorts of minerals,

* These admissions are the proofs of the greatness of Von Reichenbach's mind. This man must have a large brain, with well-developed organs of causality, comparison, and conscientiousness. The facts stated in this and the next paragraph have been exhibited in my house hundreds of times. Water has been magnetized with magnets, mesmerised by the fingers, by breathing, by the exertion of the will: over and over again, the tumblers in which these specifically treated quantities of water have been contained have been instantly detected by somnambulists in the lucid state of sleep-waking, who have been in another room when the fluid was charged; and yet most absurd nonsense has been talked by even Fellows of the Royal Society, let alone those of other scientific or learned bodies, as to the impossibility of the phenomenon. "I won't believe it," and "I would not believe it if I saw it," has been a very common mode of expression with these wise leaders of public opinion. It would be a glorious immortality for them to hand their names to posterity, with a proper measure of the circumference of the head of each individual. But Mesmer, Gall, and Reichenbach will be remembered when they are forgotten.

preparations, drugs, and other things, were rubbed with the magnet, and the patient was tried with them in the same way as with the magnetized water; and it actually happened that all reacted at once upon her, more or less, in the same way as the magnetized water: they attracted the patient's hand more strongly or weakly, but in variously modified ways. Some produced spasms throughout the whole body, others only in the arms, others only in the hand, others scarcely caused any effect, although all had been equally strongly magnetized. It was evident, therefore, that some difference lay in the matter itself, and required to be taken into account here.

30. To investigate this, I now tried to bring the same substances into contact with the patient, *without having been previously magnetized, in their natural condition.* To my great surprise, they also acted now upon the patient, with a force which very often yielded but little to that which they had exhibited in the magnetized condition. But the action was not always accompanied by a solicitation to follow the object; on the contrary, that other effect (§ 5) which had made the patient grasp the magnet convulsively in her hand, presented itself in various gradations of force. The method of experiment which I followed here, consisted in this: I first placed the various bodies in the patient's hand while in the cataleptic state, and observed the effect, then repeated the same when he was in a state of perfect consciousness, out of the catalepsy. By these comparisons, it was made evident that the action was qualitatively the same in both cases, but it showed itself incomparably stronger quantitatively in the catalepsy than out of it. The effect essentially consisted in this: that the various bodies, when placed in the hand of the unconscious patient, either—

a. Determined an actual tonic spasm in the fingers, as the magnet did, and compelled an involuntary clenching of the hand which held the bodies. These again could be

divided into such as simultaneously solicited the hand to follow them, and such as no longer visibly produced this effect; or

b. Those which appeared inactive, and left the hand at rest; the former effect presented itself in various degrees of energy. It either ensued suddenly, directly the hand came in contact with the bodies, or it followed gradually, slowly, or rapidly. The fingers began to curl, by degrees were drawn more inward, after some time closed into a clenched hand, and then remained in a state of tonic cramp. This was precisely the effect produced by placing a very weakly magnetic rod in the patient's hand while in the unconscious state of catalepsy.

Comparing the applied bodies one with another, they arranged themselves in this respect, not according to the character of their substance, nor even in the electro-chemical series; in fact, the same chemical substances in specimens of different kinds sometimes produced the effect, sometimes did not: for example, calcareous spar, sugar, quartz, &c. First of all I perceived that there was *not a single amorphous body* among those which re-acted so as to make the hand close upon them; and, on the other side, *that all bodies which did so were crystallized.* There were, nevertheless, a good many crystalline bodies without the power. When, now, excluding all amorphous substances, I arranged the whole of the crystalline bodies in two groups, opposing those which showed themselves powerless to those which exerted the magnet-like influence upon the hand, I found upon the former, the inefficient side, all the *confusedly crystallized*—such as loaf sugar, carrara marble, and dolomite; and further, the substances composed of *many oppositely directed groups of crystals*; such as prehnite, wavellite, lumps of sugar of lead, masses of Konigsberg crystallized silver; on the latter, the effective side, all simple, free crystals, and all those where the crystalline masses had parallel principal

axes,—such as celestine, many specimens of gypsum, and fibrous red and brown ironstone. For the sake of distinctness, I give here a list of the bodies with which I made the experiments.

I. Inactive bodies.

a. Amorphous :—

Ivory, wood, &c.
Anthracite.
Cannel coal.
Bitumen.
Amber.
Glass of all kinds.
Osmium, rhodium.
Palladium.
Mercury.
Silver, gold in coin.
Copper, brass.
Bar iron.
Zinc, lead, cadmium.
Dense limestone.
Red copper ore, dense.
Potassium, sodium.
Hydrate of potash, dried.
Chromate of iron.
Selenium.
Liver of sulphur (sulphuret of potassium).
Melted sulphur.
Talc, dense.
" Gurhofian."
Magnesite.
Pumice-stone.
Obsidian.
Menilite.
Opal, common.
Fossil wood.
Egyptian jasper.
Quartz, dense with fatty lustre.

b. Crystalline :—

Granular limestone.
Dolomite.
Orpiment.
Wavellite.
Kakoxene.
Loaf sugar.
Native silver from Konigsberg (an irregular mass of crystals).
Speiss-glance ore.
Prehnite.
Natrolite.

II. Active bodies, all crystalline, good, mostly large and splendid, free crystals from the imperial collection at Vienna.

a. Those which compelled the fingers to close up and grasp the object, with scarcely sensible cramp.

Rough Diamond, very small.
Antimony, metallic.
Mesotype.
Witherite.
Tin ore.
Mica.
Corundum.
Ferrocyanide of potassium.
Sugar-candy.
Leucite.
Granite.
Augite.
Hornblende.
Staurolite.
Sulphate of copper.
Graphite, lamellar.
Wolfram.
Bismuth, metallic.
Argentiferous copper-ore.
Rutile.
Lievrite.
"Spargelstein."
Sphene.
Iron pyrites.
Analzim.
Adular.
Felspar.
Boracite.
Celestine.
Topas.
Apatite.
White lead ore.
Crystallized gold, half an inch thick.
Alum.

b. Those which caused the hand to close upon them convulsively, but did not attract it.

Pistacite.
Glance cobalt.*
Zinc-blende.
Iron-glance.
Magnetic iron-ore.
Rock salt.*
Rock crystal.*

* I am clear that when these experiments are repeated, many modifications of their results will be found according to the degrees of susceptibility in the individuals selected for the experiments. I have found some cases in which glance-cobalt, rock-salt, and rock-crystal, not only caused the hand to close upon them convulsively, but attracted it so powerfully as to produce an appearance of fatuity in the patients who followed the articles in my hand about the room in order to grasp them with avidity. The attraction of these and many other substances

c. Those which acted so strongly that they caused the hand to clench upon them with violent spasm, and attracted it when brought near.

Meteorite, from Macao.
Quartz crystal, from Fontainebleau.
Calcareous spar.
Arragonite.
Tourmaline, cold as well as warm.
Beryl.
Selenite.
Fluor spar.
Heavy spar.

All these comparisons may be finally concentrated into the facts, that finely granular crystalline carbonate of lime, dense quartz, and loaf sugar, were inactive; but a free crystal of calcareous spar, a prism of rock crystal, or a good crystal of sugar-candy, therefore every perfectly free crystal, when placed in the patient's hand, irresistibly and arbitrarily excited the fingers, attracted them and drew them inward so as to grasp the crystal, and this in some of the cases with the most violent tonic spasms. Consequently, *simple crystals here furnished a peculiar means of detecting a primary force*, which had hitherto been altogether unknown. So far as is at present made out, this property does not belong *to matter, as such, but to its form, and in fact to its condition of aggregation.* Pouillet, in Müller's translation of his "Manual of Physics," p. 167, says expressly, that "it has never yet been observed in ponderable matter, that the form, the arrangement of the molecules, can be the cause of new forces acting at a distance." But this is exactly the case here; the matter must be crystallized, otherwise it does not re-act in this manner.*

which act energetically on certain individuals, induces a desire of possession of the object which amounts to ecstacy. The consummation of desire constituting temporary fatuity . . . Orgasm.

* All crystallized matter is essentially and ultimately composed of globular, spherical, or spheroidal molecules; and by a number of simple

32. When I now tested one of these bodies separately, I found that the capability of producing spasms of living

experiments which I have performed on some very impressionable cases, I have been led to the conclusion that all gaseous and fluid bodies are susceptible of a submission to those laws which regulate crystalline forms of matter. Reasoning on the Baron von Reichenbach's facts, and having previously arrived at certain analogous conclusions before I had seen Professor Gregory's abstract of his researches ; from reasoning, too, upon the facts in Petetin, upon the facts detailed by Tardy de Montravel, and by De Puységur and Deleuze, and especially on the influence of magnetized or mesmerized water, examples of which influence in the sense indicated by the older writers as well as in that of our author I had seen some hundreds of times, I arranged a number of finger-glasses varying from three to twelve, containing always the same description of fluid, whether it was water or a solution of some salt in water. These I connected together by means of cotton moistened in the contained fluid, and then passed a current of electricity through it. A few minutes of the current from a dozen of Smee's plates ten inches by five, sufficed to give the fluid properties which it had not before possessed to so striking an extent. Plain water treated in this manner was taken from the current into another room, into which were separately introduced one of six, eight, or sometimes ten patients awake. Plain water not electrised was at the same time introduced to the notice of each, separately, of the same individuals. The effects were very remarkable, for the degrees of impressionability of the subjects were clearly brought out; not one was affected by the unelectrised water, and the electrised water produced different degrees of attraction of the hands or of the head in each patient, and each, in different periods of time, varying from half a minute to five minutes, fell into a deep sleep, the fingers being in the fluid. Electrised solutions of four neutral salts—sulphates of magnesia, soda, and potass, and nitrate of potass, in each caused almost immediate deep sleep, while unelectrised solutions were weaker in effect, varying the access of sleep from three or four minutes to twelve, and in two cases there was no sleep at all, although the taste of the salt was perceived in the mouth. I inferred that the electric current had established a polar arrangement of the molecules of these fluids which developed the Baron's new force, since, like mesmerised water, each was easily detected by the impressionable persons, and each was attended with mesmeric consequences.

Some common air not electrised was contained in a bottle, and the stopper being removed, the wide mouth of the bottle was applied to

organs did not reside in equal degree in all parts of its surface. Points were formed; and the patient readily detected those which possessed the power either very weakly or not at all; others, on the contrary, where it manifested itself in increased strength. It was discovered that every crystal presented especially two such points, in which the force peculiarly resided. And these points lay diametrically opposite to each other in every crystal; *they were the poles of a primary axis of the crystal.* Both acted in the same way, but one always much more strongly than the other, and with the distinction that from one appeared to issue a cool, from the other a softer, gently warm (seeming) current of air.

33. Endeavouring to trace the expressions of this force in various directions, I now made the experiment of drawing the stronger pole of a moderate sized crystal which I had at disposal, a rock-crystal two inches thick and eight inches

the nape of the neck of a highly susceptible patient. No perceptible effect. Into the same bottle removed into another room, an iode and a cathode were introduced, and the air was electrised. Now the application, as before, of the open mouth of the bottle, was productive of deep sleep and rigid spasm:—both quickly dispelled by the application of unmagnetised iron.

A wooden, a porcelain, and a glass tube were successively used in four cases, selected for their very delicate impressionability, for the following experiment. One extremity of the tube was held close upon the organ of sympathy, without touching it. I blew through the tube, and deep sleep with rigidity immediately supervened. The tube was turned, and the other extremity was held at a little distance from the organ of sympathy. The patient wakened up, the muscles slowly relaxing. The tonic result was more rapid than the clonic. This experiment having been frequently repeated with the same results upon four different individuals, I inferred that the air blown through the tube in one direction had a polarity among its molecules diametrically opposed to the polarity acquired by the molecules of the air passing soon after through the same tube. If any of the tubes were laid down for a few minutes, it became indifferent which end was first used.

long, a certain distance down along the inside of the hand, in the same way as is customary with the magnet, when it is intended to throw the patient into the usual sleep. It was found *that the effect was exactly the same as that produced by a small magnetic needle, such as is used in a compass,* which I had at hand for comparison. This needle was nearly six inches long, one-eighth of an inch broad, and one twenty-fifth of an inch thick, weighed about one hundred and eighty-five grains, and supported about twice its own weight. When I drew the point of the crystal along downward from the wrist, slowly through the palm of the hand to the tips of the fingers, the patient had the sensation of a pleasant, light, cool breeze directed over her; when I took the little magnetic needle, it produced the same in the like degree. When I reversed the experiment, so that I carried the pass from the middle finger upwards to the wrist, the magnetic needle produced a contrary, luke-warm sensation, evidently disagreeable to the patient;—the point of the crystal produced exactly the same when the reverse pass was made with it in the same way. Another time I brought a crystal three times as large: when drawn downward over the hand, it behaved like a magnetic bar capable of supporting a pound and a quarter of iron; but the reversed pass, up the hand, acted so violently, that the spasmodic condition produced by it ascended along the arm as far as the arm-pit, continued for several minutes, and by its violence rendered a repetition improper.

34. Furnished with these facts, I repaired to the hospital of our University, with a view to try whether the observations which I had gathered from Miss Nowotny could be repeated on other similar patients, confirmed, and brought to some degree of generality. Under the kind permission of Dr. Lippich I again directed my attention to Miss Angelica Sturmann. I made the pass over her hand with the apex of a rock crystal six inches long and two inches thick.

The effect ensued immediately, the patient felt the warm and cool sensations very distinctly when the passes were made over the hand. When I applied the other pole of the crystal in the same manner, the sensations were just of the same kind, but weaker and reversed: these two patients therefore agreed with each other. The action on the sick Miss Sturmann was so strong that it affected the whole arm as far as the shoulder, the warm and cold sensations being prolonged all the way up. When I subsequently applied a crystal three times as large, this acted so powerfully upon the hand, immediately upon the first pass, that her colour came and went suddenly, so that I did not venture upon a second experiment with it here.

I now tried the pass from the head down over the face; she described everything here exactly in the same way, and the sensation was especially perceived along the temples. Counter-experiments with the above-mentioned magnetic needle produced exactly similar effects, only the needle was here evidently felt more weakly than the rock crystal. Finally, I afterwards made the same experiments on Miss Maix. On this very sensitive patient, who, however, always remained fully conscious, the crystals acted not merely on the line of the pass, but over a broad strip up and down the hand, which action ascended all up the arm. Two months later, I tried Miss Reichel. This, to outward appearance, healthy and strong girl, possessed such sensibility to the crystal pole, that she perceived its approach even at considerable distances. Like her predecessors, she found the pass downward cool, upward warm, with the northward pole (—M); with the southward (+ M), on the contrary, that downward warm, that upward cool. Lastly, I became acquainted with Miss Maria Atzmannsdorfer, and found in her a *sensitive* subject,* who felt the pass of the

* I borrow the term "sensitive," for magneto-physiological reaction, from vegetable physiology, in which plants of definite irritability—such

crystals, strongest of all. Even little crystals of fluor spar, selenite, sulphuret of iron, &c., an inch or so long, produced a sensation of cold when passed down the hand: with rather thin acicular crystals, I could, so to speak, describe lines upon the hand; but the pass upward produced warmth of the hand, and so adversely upon her, that it affected her whole body unpleasantly, and began to produce spasms as soon as I repeated it.

35. As I was recounting all this to a friend, and, in order to show him distinctly how I had operated upon my patients, drew the same rock-crystals along over his hand, he looked at me with wondering eyes, and said that he *himself felt the same* that I had been describing to him of my patients, —the cool breeze, quite distinctly,—as often as I passed the point of the crystal over his hand. He was a strong healthy man, in the prime of life, who allowed me to name him openly, and to call upon him, as a witness,—Mr. Carl Schuh, a private gentleman residing here, well known for his great knowledge in natural sciences. After that, I made the experiment on all my own circle of acquaintance, and on many strangers, among whom were physicians, physicists, and chemists. I have permission to name especially among these, our renowned naturalist, Prof. Endlicher, chief of all the public botanical institutions. It appeared that not only my sick patients, but a great many other persons, shared these sensations, and that a large crystal of quartz, selenite, heavy spar, fluor-spar, and other substances, carried along sufficiently close over an open hand, produced, and rendered evident to the consciousness, in a tolerably large number of persons, certain peculiar sensations, which manifest themselves in the first place as heat and cold. This was equally the case when I previously heated the crystal to the tem-

as certain Mimosas, Berberis, Dioncea, Hedysarum, &c., are called "sensitive," in distinction to "sensible," belonging to the theories of animal life, which, as is well known, involve a more general idea.—*Author.*

perature of the blood, to meet the objection, that the sensation might be accounted for by the radiation of heat from the hand to the stone. Many could tell me at once, with the face averted, whether I had made the pass over the hand with the positive or negative, *i. e.* with the weaker or stronger pole.

It results from all this, that the following laws exist in nature :—

a. *A peculiar, hitherto overlooked force, resides in matter which, when the latter has taken the form of a crystal, appears effectively in the direction of the axes.*

b. *It manifests itself most strongly at the two poles, but differently, and in an opposite manner, at each.*

c. *Its effect agrees perfectly with that of the magnet, and the magnetic poles, in every case, where it is directed upon sensitive human organs.*

36. In order to put every one in a position to repeat the experiments on his own acquaintance, I observe expressly, that a large free crystal, with a natural point, is requisite; larger in proportion as the person is less sensitive. Heavy spar, fluor spar, and selenite, are especially well adapted. It makes no difference whether the skin is delicate or coarse; I have sometimes found the roughest mechanic's hand more sensitive than the softest skin of a professional person. The point of the crystal must be carried slowly, as closely as possible without actual contact, sweeping from the end of the arm over the inside of the expanded hand, through the palm, and over the middle finger as far as the tip, at such a rate that one pass occupies some five seconds. The crystal is to be held perpendicularly to the surface of the hand. Among my own acquaintance I have found more than half the persons sensitive. I never told them what I had in view; I asked for the hand, passed the crystal a few times over it, and then asked whether any effect was felt, and of what kind? The answer usually was, a cool or a

warm breeze. It need scarcely be mentioned, that this sensation is very delicate and fine; for, if it affected the hand so strongly as not to require any particular attention, it would not have remained to be discovered, and brought forward now, but would have been long since generally known. Persons who do not feel it one day often feel it the next, or the day after, or a week later. I met with a remarkable instance in my own younger daughter, Ottone. She always felt a large selenite crystal very distinctly, while her brothers and sisters could scarcely feel anything. She suffered for some time from head-ache, which gradually increased; at last she was obliged to lie down. Two days after, she was seized for the first time in her life with violent spasms, lay sick a fortnight, and then recovered. Now, however, she scarcely felt the selenite crystal at all; the attack of illness had wholly removed the sensitiveness to it. Thus this sensitiveness varied even in the same persons at different times, and with their state of health. Very frequently the sensation did not become evident at the first, but at the second or third pass. Sometimes a person felt the first pass most strongly, the second and third were not perceived, while with the fourth and fifth the sensation again distinctly presented itself. It would not do to make the pass too rapidly; the full action requires some little time. It occurred, also, that it preceded the crystal, and was felt at the points of the fingers when the crystal had only reached the palm of the hand; on the contrary, it only manifested itself distinctly in other persons, after the crystal had completely passed off the hand. In some places the eyes of the persons have been bound, and then varying statements have been received. This cannot astonish, after what has just been said; the answers will always be the same from sensitive persons; from persons but slightly sensitive they will be the most uncertain: the binding of the eyes places people in an unnatural and inquiet con-

dition, so that their attention is divided and distracted, and the requisite calm for such delicate observations is usually wanting. If many persons are present, saying and asking all kinds of things, walking to and fro, and the agitation and distraction are increased, it is natural that the answers to the questions should be incoherent concerning a sensation which does not sweep over the hand like a wire brush. To many persons the reversed pass, from the hand upward toward the arm, is more evident than the downward pass. But some persons are absolutely insensible; and these perhaps are the healthiest. The one, the northward pole,* usually acts more strongly than the other, the southward pole: the slight warmth is generally less perceptible than the coolness. It almost always contributes to increase the distinctness and strength when the hand is extended in the direction of the meridian, with the fingers directed to the south. Unfortunately, no further contacts may be allowed to exist during this, because they injure the delicacy of sensation, and divert the attention, which must be wholly concentrated here. It is worthy of remark, that this, like every

* On account of the difficulty of language, to name the poles of magnets in contrast to the poles of the earth, in so far that the latter possess a magnetism of the reverse direction to that of the oscillating needle, and in order briefly to dismiss all circumlocutions and misconceptions, I shall in this work name that pole of the needles which freely turns to the north, the "northward pole" *(gen Nordpol)*, and that which points to the south, the "southward pole" (*gen Sudpol*). These terms will perhaps be found fault with here and there; but in their compressed brevity, they will everywhere be readily understood. Even in the newest German text-books of physics, those just issued from the press, that of MM. Pouillet and Müller, and that of M. Baumgartner, the terms are in direct opposition; and what the former called north polar, the latter speaks of as south polar. That the German and French on the one hand, and the French on the other, have long used opposed expressions, is otherwise well known. Hence results difficulty and confusion, and this may justify the proposition of an expedient.—*Author's Note.*

other sense, becomes improved by practice. A person who never drinks wine, coffee, or tea, can seldom distinguish the different kinds of them; while a practised drinker discovers the slightest difference at once and distinctly. Mr. Schuh prepared for me in a short time series of crystals completely agreeing with those which the sensitive patients had formed. The same was speedily effected by Mr. Studer, a young man from Zürich, staying here, and his series agreed almost perfectly with that of Mr. Schuh.

37. Up to this point it was made out that in crystals resides a force of a polar nature, which they possess in common with magnets. It was next to be inquired whether this was of the same kind, and perhaps only quantitatively different, or was qualitatively different from that which we have hitherto understood by the term magnetism. If the former, it must be capable of being reduced to the same laws. It should attract iron filings, like not only magnetic nickel (chromium, manganium, cobalt*), but also oxidised bodies, even impure ores like magnetic iron-stone. Moreover, it ought in like manner, in quartz, selenite, &c., as it does in steel, not only to influence organic living bodies, but also convert bodies capable of becoming magnetic, such as steel, iron, nickel (cobalt, &c.), into magnets, when applied to them in the same way. When I dipped the polar end of my crystal into fine iron filings I could not detect any attraction. In order to have at my disposal the crystalline force, in its greatest possible strength, I bought the largest crystal that I could obtain, a prism of rock crystal from Gotthard, of eight inches in diameter, a six-sided colossus, with pyramidal ends, which I had some difficulty in using, and the action of which on the hand of the most sensitive of my healthy friends, Mr. Schuh, was so strong that he

* It must be borne in mind that the present treatise was written more than a year before Mr. Faraday's researches appeared.—*Author's Note.*

described it as feeling as if cold air were gently blown upon him through a straw. I placed a fine sewing-needle before this powerful crystal, and rubbed this with it in the same way as we do with a magnetic bar when desiring to convert it into a magnet. I made a dozen passes over it, and tried it with iron filings; it did not attract any. I repeated the passes more than a hundred times: but still it did not lift even the most minute of the iron filings. As a counter-experiment, I made a single pass over the sewing needle with the small magnetic needle which Miss Sturmann had found weaker than the little rock crystal previously applied to her, and it at once took up a long beard of filings from them. *Therefore the points of the crystals could not inoculate the needle by rubbing, with a force capable of acting on iron.* However, were this the case, it was still possible to excite such on it, after the manner of magnetic distribution, under the immediate influence of a crystal pole, and to render it capable of attracting iron filings in the same way that an iron rod is made to do so, by placing the pole of a magnet upon it. To try this, I attached a fine steel needle to the points of various large crystals, and dipped it, in this connexion, into filings. *It did not take up the least trace of them.*

38. When I approached the polar points of any crystal, even of the great rock crystal, to the most sensitive suspended magnetic needle, they never disturbed it in the least; it remained motionless. On the other hand, I suspended a large crystal (free from iron), for instance one of selenite, by the middle, with a twisted, very fine, silkworm thread, so that it swung with its long axis horizontal, placed it under a glass shade, and laid a magnet quite close to it; but this exhibited no action, and no kind of turning occurred.

39. I wished to see whether a polar wire would act upon a suspended crystal as upon a magnetic needle. I arranged

a small voltaic pile of a few elements, each of about ten square inches surface, and connected the poles by a stout copper wire. I then suspended a selenite crystal, free from iron, and about four inches long, by a silkworm thread, so that both poles were free to move in the horizontal direction. When approached to a horizontal part of the polar wire, the crystal and wire were indifferent, and not the slightest visible reaction took place.

40. It still remained to be investigated whether the crystal would induce a momentary current, like a magnet, when brought near a conducting wire. I formed a helix of about twenty-five turns of strong, covered copper wire, and connected it with the couplings of an extremely delicate Schweigger's multiplier, the well-known differential galvanometer: when I rapidly inserted into the helix a selenite or rock crystal, each of several inches long, the astatic needle did not exhibit the slightest divergence. When withdrawn the case was similar, the needle was motionless; the weakest magnetic needle that I substituted for the crystals, in a counter-experiment, immediately produced a divergence of twenty-five degrees.

41. The relation to terrestrial magnetism was here a question of the greatest importance. We have some old researches by Hauy, Biot, and especially Coulomb, in which, not indeed the proof, but the possibility is made good, that all bodies may possess magnetism to some extent, or are capable of acquiring it. Those of Hauy (Mém. du Mus. Par. 1817, p. 167) may be passed over. M. Biot, in his essay on this subject (Gilbert's Annal. v. lxiv. 395, 1820,) is uncertain whether it is magnetism; or, as he interrogatively expresses it, "some other analogous force," which acts upon bodies. But in this treatise also we find throughout only such bodies denoted as more or less evidently contain iron. An experiment was made with two silver needles, one of which was made of chemically pure silver,

the other of silver which had been melted with iron, and which, as no trace of iron could be detected in it by chemical analysis, was also regarded as perfectly pure. But the latter acted 416 times as strongly upon the magnet as the former. It was thence concluded that this also must contain iron, even though it could not be detected chemically, and that, as a general rule, inconceiveably small quantities of iron are always sufficient to give a body the capacity to acquire magnetism; indeed, that, consequently, even the needle made of chemically refined silver must have retained traces of iron. The most detailed account of these matters was read by Coulomb, before the French National Institute, in the year 1802 (ext. in Gilbert's Ann. xii. 194): in this he left the question unsettled whether the bodies which he tried were free from iron or not, and Gilbert remarks, with reason, that they scarcely could be. The experiments consisted essentially in this: needles of about one-third of an inch long, suspended by silk filaments, were brought between the magnetic poles, and made to oscillate previously and afterwards. The number of oscillations in the same time was always smaller previously than when they were counted between the poles; and thus the effect of the magnet was indicated. But what effect? one must ask. And every one must see that it may be one of three kinds:—1. Dependent on the presence of iron in the bodies. 2. On the bodies themselves. 3. On "another analogous force," as M. Biot conjecturally expressed himself. The decision of these questions, so far as they bear reference here, appeared to me to require a new direct experiment. I possessed crystals, especially of selenite, which acted upon all the patients as strongly as a magnetic bar capable of supporting five to seven lbs. A bar of this kind, suspended by a common linen thread, invariably arranged itself in the direction of the magnetic meridian. If, then, the peculiar, equally powerful force, which resided in the

crystals, were the same as that in the magnet, the crystal when freely suspended ought to arrange itself in the meridian. To ascertain this I freely suspended various crystals, free from iron, and in particular the selenite of two inches long, by a silk thread, three twenty-fifths of an inch long, and untwisted, just as it had been wound off from the cocoon, and I brought these under a glass shade. They stood at rest for several hours, but never in a direction toward the north, or indeed in any determinate direction whatever. When I turned the point of suspension a quarter of a circle, the crystal was also diverted ninety degrees after some hours' rest. I could thus bring it completely into any direction I pleased. Therefore not the slightest opposition to the force of torsion of the finest silk filament occurred, and the *crystal force does not endow its conductor with the slightest directive power; it does not stand in any relation of direction to terrestrial magnetism.*

Consequently, as on the one hand the behaviour of the magnet and of the crystal to animal nerves was exactly the same, so on the other hand, to iron, to the electric current, to the opposite poles of the magnet and to terrestrial magnetism, it was wholly different.

42. It is therefore established *that, the polar force which resides in crystals,* and renders its existence manifest by sensuous excitations of a peculiar kind, in the healthy and diseased animal nerves *is not identical with the magnetic force,* as we at present know it. It does not attract iron, does not act upon the magnetic needle, is in its strongest concentration incapable of exerting the slightest power of magnetically attracting iron, in the smallest steel fibres, does not influence the polar wire when placed in the helix, does not produce any induced current, and does not obey terrestrial magnetism.

43. On the other side it holds good that, *the magnetic force, as we at present know it in magnetic iron-ore and*

in the magnetic needle, is associated with that force which we have just become acquainted with in crystals. For since the magnet acts upon animal nerves in the same way as crystals, it possesses, in addition to its own properties, which are wanting in crystals, at the same time that force also which resides in crystals.

44. From which it further necessarily follows, that *the force of the magnet is not,* as has been hitherto assumed, *single in its nature, but of two kinds, since to the older known one is now added a new unknown one, distinctly different from the former,—that of the crystal.* It may appear divested of the other properties of the magnet, and in nature is displayed in a separate condition by the crystal.

The phenomena which the magnet presents may be divided therefore into two sections, which become complicated with each other in their manifestations; and it will be necessary to subject a portion of the great store of them which science has accumulated, to a process of revision.

45. I now instituted investigations as to the nature of these new properties of crystals. In the first place, I sought to make out whether this force might be transferred, conveyed, or accumulated? Whether, and what analogies, it possessed in these respects to magnetism and electricity, which can be conveyed, displaced, conducted, and concentrated. Since first of all I possessed no other magnet but the excited animal nerves of healthy and nervously diseased persons, while the excitability of the healthy persons I have hitherto met with is so weak that a distinction by degrees did not warrant sufficient accuracy, I was compelled to apply myself to the more acute sensations of the sick. For since the persons with whom I undertook the researches, placed in the most varied circumstances and suffering from different diseases, not only were consistent in their sensations, but also the statements they made, when arranged

under a theoretical point of view, harmonized with each other, every reason existed to attribute value to them. I am fully aware of the objections I shall meet with here; but with the cautious naturalist, who keeps his certain steps within the boundaries of experience, they have no weight. All that we investigate of the outer material world we must, to the end, gather by our senses; we have no other instrument of perception.* We count five senses and no more;

* Even with the veneration that attends our regard for such clearness and power as are in every page evinced by the philosophical author, occasions arise to strike us with wonder that he has not studied the great work of Gall, the doctrines of which would have given so decided a direction to his extraordinary powers, that passages like those in the paragraph above could not have escaped from his pen. It is most true that in every infinitely small interval of time, countless electrical movements proceed around us, but if we study the phrenological structure of our heads, and apply the experience which numerous trials with crystals have given us, we shall easily arrive at the conclusion that the pointed end of a rock crystal, or of selenite, or of sulphate of alumina, or of nitrate of potass, or indeed of many more which have been tried, applied to the attractive organs of the brain, will excite the individual to actions agreeable to his neighbour, while the same termination applied to a repulsive organ of the brain will excite the victim to an action disagreeable to his neighbour. This is not a simple matter of theory. Numerous repetitions of the experiments have established the matter of fact. Take, for instance, a female of impressionability in a condition of lucid somnambulism: apply to her organs of adhesiveness or of pure affection the points of rock crystals, and she is excited to the tenderest manifestations of pure affection. Change the direction of the crystals, point to amativeness, and the woman, if her organs are at all full, is unable to control her actions. She burns with desire. Reverse the ends of the crystals, the feelings are calmed, or perhaps the reaction is attended with head-ache. Blowing or breathing on the organs equally dispels the feelings. Now try the points of the crystals on the organs of self-esteem—most repulsive organs, and the woman becomes imperious, angry, egotistical, and desires you to stand off, for she detests you. Does all this power reside in the optical axes of crystals? The Baron von Reichenbach has beyond all doubt established the existence of a force residing in the principal axes of crystals, and the manifold relations of this great fact have yet to be fully developed

but we are already sufficiently aware that things go on in nature, and, in fact, around and in us, which we are unable

by thousands upon thousands of experiments. If these crystals can excite the organs of the brain in man, and can oblige him to act according to the impulse he has received, is he not the victim of impulses? "Electrical and magnetical movements!" What are crystals but spherical or spheroidal molecules arranged by electrical currents according to determinate laws of aggregation? What are those globular molecules but imitations of the spheres which occupy space, each having its polarity, each its north and south, its east and west; each its magnetic, each its diamagnetic relations. If the crystals of Von Reichenbach can excite these phenomena, they can do much more. Many an impressionable individual may be put into a profound sleep by pointing such crystalline apices to the eyes, and awakened again with rapidity by applying the positive or butt end of the crystal to the eyes or to the pit of the stomach. I have done this upon numerous patients hundreds of times. Some individuals are so easily impressed, that I have often put them to sleep with the point of a small crystal of Epsom salt, and as often awakened them with the flat end. This force of molecular arrangement suggested to me some experiments on very susceptible patients, the details of which ought to be full of interest to philosophical physicians, for they open up fields of inquiry that should lead to the *modus operandi* of all medicinal agents. I dissolved different neutral salts in water, and experimented upon one at a time. I took chloride of sodium first; and a solution of this substance being poured into ten finger-glasses, they were connected together by cotton moistened in the solution, and a couroune des tasses was completed. A current of electricity from four of Smee's elements was passed, and sensitive persons, who could be readily put into mesmeric sleep by crystals, were desired to put the fore-finger into one of the glasses so as to allow it to be moistened by the solution. In the first trial, seven young women tried the experiment. In different periods of time, varying from half a minute to five minutes, each fell into mesmeric sleep, previously complaining of a strong taste of brine in the mouth. The next trial was with a solution of sulphate of alumina. Sleep came on in each case, varying from one to three minutes. Each tasted alum in the mouth. Two had intense head-ache. These in the next experiment I placed first for trial. The solution was nitrate of potass; the taste of which was very cooling and agreeable. Sleep did not supervene in one for four minutes; in the other for seven minutes and a half. Some of the others slept more quickly, varying from three to six minutes. The

to detect, only because we possess no instrument for their perception. In every infinitely small interval of time countless electrical movements proceed around us; we do not perceive the slightest trace of them. If any one were to come down from the clouds who had a sixth, an electrical sense, with which he could detect and could describe the finest electrical changes around us, with the accuracy that we do the phenomena of light by means of our optical organs, should we not eagerly listen to his teachings, and ask him thousands of questions, to clear up and extend our know-

nitre cured the head-aches. Sulphate of soda, of magnesia, of potass, were tried separately; then together. Sleep in a comparatively short time. In some, weight about the head; in others, head-ache. These results made me try the effects of various substances in solution. In one trial with sulphate of copper, finding fearful sickness and ulceration of the mouth, which was cured with great difficulty, I was induced to reflect on the danger of such trials with poisonous metallic salts; and I left off for a time, inferring that mercury might be advantageously employed where ptyalism was desired by these means of operating. I had already in several cases of somnambules made the mouth very sore, and induced salivation, by simply placing a minute globule of mercury in the palm of each hand; establishing, by producing the rigid spasm in the first place, the dictum of my two revered masters, Abernethy and Macartney, that mercury, among its many properties, was, judiciously applied, a tonic medicine. The further reflections on the influence of two poles of crystalline agency led me to pass currents of electricity through baths, which I afterwards found more extensively and ingeniously applied by Mr. Tylee, of Bath. The first experiments I tried were on myself. The currents being passed from the head towards the feet, the bath was tonic and exhilarating; but being induced on one occasion to try the current in the inverse direction, I had a most intense head-ache. Mr. Tylee, and Mr. Bagshaw, at Bath, have had great success in the treatment of intractable forms of disease by means of this agency. We are as yet but at the threshold of the practical applications of this subject. In every point of view, the existence of the force which Von Reichenbach has established is a vast advance upon our old stock of knowledge. There is, to the reflective mind, no limit to the relations which the force he has indicated has to all the objects in nature.

ledge? One born blind, who has never had a conception of light and colour, allows himself to be led by one that sees; and when he always finds the stone, by feeling, which the seeing guide had forewarned him of, he believes that the seer has eyes, which enable him to see things. Now, a nervous patient is one of this kind, in whom a sensitiveness for electrical and magnetic movements exists, and with which is unfolded to a certain extent a peculiar sense, so to speak, of which, as it will appear, the healthy are deficient. Among the nervously diseased, referable here, I do not mean directly somnambulists, sleep-walkers, &c., but, as a general rule, most persons who suffer violently from spasms. The somnambulists are only those in whom these disturbances of the normal condition of the nervous system have reached the highest degree, and in whom the excitability has reached its maximum. They give us the strongest testimony of the reactions, and show us the most delicate differences; but they are not absolutely necessary in the researches to which I devoted myself. Miss Nowotny, on whom I made my experiments, was far from being a somnambulist* during the

* It is clear that though these patients were not somnambulists, not in that which Dr. Elliotson calls the sleep-waking state, they were in the deep mesmeric sleep, of which the other is only a condition. In the hands of an experienced mesmerist, Miss Nowotny would not have failed to exhibit an immense number of phenomena known as mesmeric phenomena. I dispute not the Baron's right to establish a stand point; but while I yield to him the deep respect which is due to so philosophic a mind, I regret to observe his tardy acceptance of the truths to every one of which he will be obliged on enlarged experience to yield his assent. Without mesmeric sleep, the Baron's are just the cases which could not fail to convince him of the truths of Gall's phrenology. His fingers applied on their heads to Gall's organs for a short time, would produce manifestations that could not fail to strike such a mind as his that he has been making distinctions without differences, while he has bestowed the sneering remarks in the above paragraph on the physicians who have brought reproach on the philosophy of magnetism. Every thing does "follow rule and law;" but these rules and laws are to be traced by all

whole time of my six weeks' study; she only suffered from cataleptic spasms. Miss Maix never exhibited a trace of somnambulism. The surgeon, Mr. Schmidt, of Vienna, who experienced the most striking effect from the crystals and the magnet, as well as the terrestrial magnetism, was a young, otherwise perfectly healthy man, who merely was attacked by cramps in one arm for a short time, through exposure of one side to cold. And the sensitiveness might be thus traced onward to the healthy, who only felt the pass of large crystals upon sensitive parts, like a cool breeze. Finally, there was a further distinction even among these, that some felt the cooling strongly, others more weakly, some not at all.

If, therefore, all this stands in regular connection, cause and effect cannot be disputed away, and, in my opinion, it would not be well done to throw away results which may become so valuable a key for the investigation of truths of nature, in those branches of physics and chemistry where she seems to wish to conceal her mysteries from us most obstinately. The singular sense, the peculiar irritability of nervous patients, is chiefly directed to magnetic phenomena; they are an invaluable reagent while we possess no other. They are not vague sensations, as has hitherto been often believed, and as like those by which many physicians and visionaries have brought reproach upon themselves; but everything follows rule and law, and these are soon discovered, when one does but investigate them intelligently, trace them with the aids of physical and chemical know-

the lights that can be brought to bear upon them, and when certainty cannot be attained in science at first, we must be contented with probability. When we cannot establish a theory, we must satisfy ourselves with the amusing haziness of an hypothesis. If we, at last, arrive at the truth, we shall not regret the toil it has cost us, albeit much of it has been devoted to stem the torrents of prejudices, and the foregone conclusions directed against us.

ledge, and apply to them the touchstone of experimental criticism.

I could not avoid this digression; it is indispensable to the definition of the stand-point of these researches. I now turn again to the questions, whether the peculiar force which displays itself in crystals is communicable, conductible, and condensible? When the most incongruous things, a piece of wood, a glass of water, leather gloves, paper cuttings, or any thing else, were rubbed with the pole of a crystal, every sick patient detected without delay, when placed before them, the difference between such and others which had not been rubbed. The sensation was sometimes a cool, sometimes a warm feeling, perceived by the hand in which the object was placed; and this gradually increased until it became unpleasant. The conveyance upon paper was found to be the weakest. Miss Sturmann did not feel a book which had been once rubbed with the large rock crystal; often rubbed, scarcely at all. Finally, when I had held it for a time in contact with the point of the crystal, and at once quickly placed it in her open hand, she felt a slight warmth. A piece of porcelain touched with the crystal-point, felt cool to her. A German silver conductor of an electro-magnetic apparatus, when treated in the same way, she felt very warm. A piece of soft iron, a piece of a blue steel saw blade, a hard steel file, all at first found indifferent, produced a sensation of heat in her hand after the crystal point had been drawn over them. I placed my hand in her's, first let her get accustomed to it, then took it away, and drew it backward and forward a few times above the point of the great rock crystal, and then again laid it in her's: the patient at once felt a great difference; she now found it far warmer; and this apparent elevation of temperature endured, decreasing, for more than four minutes, during which I repeatedly extended it to her for trial. A similar series of experiments were gone through with Miss Maix,

and subsequently with Miss Reichel. The charge was here conveyed to copper, zinc-plates, linen, silk stuffs, and water. They gave wholly similar results. Miss Atzmannsdorfer perceived immediately whether the German silver conductor had been previously in contact with a selenite crystal or an amorphous body, and particularly whether with the warming or cooling end of a crystal the heat conveyed was stronger or weaker, or replaced by cold. The crystallic force may therefore be transferred or conveyed to other bodies. It may be transferred to iron and steel, and, at the same time, these bodies, so charged, do not attract iron filings, as I have already shown above.*

* The Baron very satisfactorily establishes his positions. But I have tried all these experiments with great care on impressionable patients, and have frequently been disappointed in the results. I have repeated them on somnambules, and have found every one of them come out as above described. Then I am bound to value the testimonies afforded by good sleeping-waking persons. I am often told that confusion arises from the use of such cases. Yes, in the hands of bother-headed persons, confusion naturally takes place; but with due precautions the results obtained are far more interesting, because more definite. Having prepared a case for such experiments as those detailed above in the case of Miss Sturmann, I passed the pointed end of a rock crystal on a smooth deal board, on a piece of writing paper, on the bound leather cover of a book successively. Each in turn was offered to the right hand of the patient, Miss J. D., who had been eight times put into a state of placid sleep, undisturbed by the influence of other mesmerisers. Each object felt warm and agreeable. I repeated the crystalline applications a dozen times on each object; the effect was to make the patient smile contentedly, and to place the hand eagerly on the object: at last, by repetitions of the experiment, the sleep was deepened. Now I applied the opposite pole of the crystal to the board, the paper, and the book successively, and the patient being in a deep sleep, the hand was gently laid upon the objects in turn. First, from the deep sleep, the state of sleep-waking took place, and the hand was speedily drawn away from each object as if it were disagreeable; and on being asked as to the nature of the sensation produced, she said it was cold, and made her chilly all over. I repeated the application of this repulsive end of the crystal many times to the paper, and on each renewed application of

I endeavoured to ascertain whether this conveyance could be effected, like that of magnetism, by rubbing from pole to

the hand the sensation became more unpleasant, and at last the patient woke up suddenly. A piece of porcelain touched with the pointed end of the large rock crystal was warm and agreeable to her, but did not put her to sleep. I held the point of the crystal to the forehead; she fell deeply asleep instantly. I touched the porcelain cup with the blunt end of the crystal, passing it a dozen times, and then touched the fingers of the right hand with the cup: the hand was hastily withdrawn, with an exclamation of "*don't—it is like ice.*" The patient had instantly passed into sleep-waking. The iron poker was treated with the pointed end of the crystal, and the application of it to the hand deepened the sleep. The same result took place when it was applied to the nape of the neck. When the opposite end of the crystal was applied, the iron being well charged with the crystallic force, the patient on feeling it got up suddenly wide awake. A three-cornered file, and a pair of large polished scissors, similarly treated, produced identical effects. To detail the repetitions of the experiments on this patient, and on two others where identical results were obtained, would be tedious. Insisting upon the fact which Dr. Elliotson's experience has fully established, and which mine and that of several other experienced students in mesmerism sufficiently corroborate, that no phenomenon is observed in artificially induced mesmeric states which has not occurred in Nature, I am induced to draw attention to some cases in which the polar relations would appear to be reversed. In general, when I took the hand of a patient mesmerised into sleep by myself, with a piece of pure gold, in a longer or shorter time, according to circumstances of impressionability, the hand and arm became rigid. If I apply the gold to the nape of the neck, the whole body becomes rigid, and the sleep is so deep that the patient is insensible to all impressions. If, in this state, any of the metals easily oxidable are applied to the same spot, the sleep and rigidity in times varying according to circumstances are dissolved, and the patient is restored to the vigilant and conscious state. I have performed analogous experiments with different metals hundreds of times; but I have occasionally met with cases of a high degree of impressionability, in which most unexpectedly the phenomena were nearly all reversed. By the induction of the rigid state with gold and platinum, I have repeatedly cured menorrhagia in females. A married woman, aged 23, with dark hair and eyes, highly nervous temperament, afflicted with passive hæmorrhage, occurring for a fortnight at each catamenial period, was mesmerized easily into a sleep-waking state, in

pole, or, like that of electricity, by single points. It proved to be indifferent whether I rubbed the object in the direction of its length, or kept any point whatever for a short time in contact with the point of the crystal; the warmth or coolness thus produced were not found to differ. A large crystal, when the point was applied to a glass of water, produced magnetized water, as well as a horse-shoe magnet.

46. The question now was, whether a coercive power existed in matter, whether this charge was persistent or transient, and after what intervals of time? I charged various objects,—the German-silver conductor, the steel file,

which she remained quiet and comfortable for a couple of hours each morning for a week. She was cured, and remained well for four months. The vexations arising from questions relating to a drunken husband made her suffer much from headache, and I applied a disc of pure gold to the back of her neck. Instead of sleep and rigid spasm increasing, she was affected with the clone of hysteria, and sudden passive hæmorrhage. I applied soft iron to the neck and soles of the shoes, and in half an hour she was quite well, and in high spirits. I persuaded her to come the next day, and put her to sleep by passes, after which I applied a disc of platinum to the nape of the neck. The same results as with gold immediately supervened. Waking up suddenly, she became very hysterical, and hæmorrhage quickly came on. The cure was just as soon effected as before, by the application of iron to the neck and soles of the feet. The general conclusion at which I have arrived, that all attractive agencies tend to produce a state of nervous system favouring tone, and that all repulsive agencies tend to produce an opposite state favouring clone, was here subverted by an exception; but what does it evince? only that cases exist in which the relations to the metals, and to the poles of crystals, are directly the reverse of those usually met with. I have seen two other cases, in which, though not identical, yet very analogous facts were exhibited, in which the pointed extremity of crystals induced wakefulness and headache; while the blunt or butt end being offered to the eyes or to the pit of the stomach, deep sleep was immediately brought on; in which magnetized water induced no attraction of the hand, and in which the presence of a powerful magnet brought on hysteria and headache; but no subsequent rigidity or sleep. They were of a nervo-bilious temperament, liable to frequent attacks of nervous and sick headache.

the soft iron, the piece of porcelain, and the book. The last soon lost its power. The piece of porcelain tried on Miss Sturmann retained it two minutes, the conductor five minutes, the iron the same, and the steel ten minutes. In this operation I did not take the objects in the free hand, but moved them backwards and forwards in a fold of paper; when the patient had taken hold of them, I made her lay them down, and wait till the sensation which continued to thrill through her hand had disappeared. This required about a minute. Then I made her take the object up again, without having touched it myself, and continued thus until the sensations of heat or cold were no longer produced. From this it follows that the retention of the charge, under the above circumstances, is not, even at night, of long, but of short duration, and, indeed, at most of ten minutes; that the charge soon disappears again, and, unlike magnetism, it cannot be permanently ingrafted upon steel. Since the iron filings fall from an iron bar which has been placed within the sphere of distribution of the magnet directly and instantaneously when the magnet is removed, but here an effect of accumulation does occur, although but for a short time, the question must be answered thus: that some, even if weak, coercive power over the crystallic force does actually exist in all bodies, which for magnetism, so far as we know it at present by its polar effects, is not the case, since the coercive power, according to our actual knowledge, is limited to an exceedingly small number of bodies; in fact, according to the most recent researches, strictly to iron and nickel.*

47. Is the crystallic force capable of being isolated, arrested, or is it universally distributed through matter? The first experiments were made with Miss Sturmann, who, though sensitive to the magnetic excitement, was less clear in her perception

* Written a year before the recent researches of Mr. Faraday.
Author.

of it as to the distinction between warmth and cold. When I placed a book upon her hand, and brought the point of the large rock crystal upon it, the hand felt nothing of it through the book. Since she had previously felt the approach of the crystal to the inside of the bare hand at a distance of 18 or 20 inches, while now the distance was no greater than the thickness of the book, that is, four-fifths of an inch, this experiment showed that a thick mass of paper was a substance capable of arresting, at least for a short time, the action of the crystallic force upon the nerves of this patient. A piece of deal board acted in a similar way, but less perfectly.* After a short interval the alteration of temperature began to be weakly perceptible beneath it. Eight folds of printing paper soon allowed the force to act through them; four folds of woollen stuff scarcely offered any perceptible obstacle. A porcelain dish, lying in her

* The crystallic force, residing most probably in the optical axis of the crystal, since it has so close a relation to light in some form, in producing sleep and vigilance, according to the pole of the crystal offered to the face or pit of the stomach of a very impressionable subject, has been demonstrated here very frequently. I have seen cases in which the pointed end of a large rock crystal has, by being presented in the direction of the individual, whose back has been turned to the operator, induced sleep instantly at the distance of 42 feet. The other end immediately caused wakefulness; and in this manner sleep and wakefulness were alternated just as often as the crystal was turned round. But even in less susceptible cases, the point of a rock crystal would, with its attractive or repulsive pole to the individual, induce sleep, and the other pole would awaken. Often and often has the experiment been satisfactorily performed by an operator going into one room, leaving the patient in the adjoining apartment, separated by a partition of deal wood painted, which was covered on one side by prints framed and glazed. As often as the respective ends of the crystal were held towards the patient, instant sleep or instant vigilance were produced. Any person standing in the door-way, so as to observe both the operator and patient, could at once see that there was no possible source of fallacy in the experiments. Many patients have been submitted to the test of this experiment, and the results have been identical.

hand, touched on the upper side with the point of the crystal, was felt to be cool when I turned it over after the contact. On the contrary, an iron plate gave a warm sensation, when placed on the hand, as soon as I brought the crystal near; when I put it in contact the effect was like a shock, ascending through the elbow-joint to the shoulder.* Various metallic wires, held in the hand by one end and touched with crystal points at the other, gave sometimes warm, sometimes cool sensations, without exception. I placed one end of the German silver conductor in her hand, and placed the other end in contact with the point of a small crystal; the sensation of an alteration of temperature shot instantaneously from the hand to the elbow joint; when I operated in the same way with the large rock crystal, it ran up as far as the shoulder, and produced cramp-like sensations.

When I subsequently repeated the same experiments on Miss Marie Maix, action took place through all bodies without exception, only it was more rapid through metallic, more like a shock, so to speak, than with vegetable substances, tissues, &c., which required a short interval of time for the effect. I made experiments with wool, silk,

* These experiments I have repeated on somnambules with precisely the same results; but in sleep-waking persons, as in those quite wide awake, there are many varieties in the degrees of susceptibility. A piece of cylindrical wood has been held in the two hands of a sleep-waking patient; it has been touched with the pointed ends of a rock crystal; immediately the wood has been strongly grasped by the patient, in some cases with, and in some without, the shock being experienced, but deeper sleep has supervened. The opposite end of the crystal touching the wood, wakefulness has taken place, and the piece of wood has dropped from the relaxed fingers. If an iron rod, of the diameter of an inch and a half, has been used instead of the wood, the sense of shock up the arms has been more decided, and some have complained of its burning the hands. Some have slept only more deeply. The law regulating the results I believe to be dependent upon the presence of attractive and repulsive agencies exercised by the crystals.

glass, and zinc on Miss Reichel. The transmission through wool required a short moment of time in a cord 40 inches long; but with silk, glass, and zinc, it was instantaneous, and of immeasurable rapidity. My experiments on the very sensitive Miss Atzmannsdorfer furnished similar results; brass wire, the German silver conductor, glass tubes, leaden bars, platina foil, bar iron, gold threads, and copper plates, which I placed in her hand, were instantaneously traversed by the force which passed into them by contact with the crystal. The conclusion is, that the *crystallic force acts through all bodies, but in different degrees.** Paper, wool, and wood, render the passage difficult, at least for a short time; porcelain less so; silk and glass are perfect conductors. Metals permit the passage not only on actual contact, but in slight degrees even before the contact, on mere approximation; but on contact an immediate action ensues. So far as these preliminary tests allow of a conclusion, they indicate that the difference of conducting power of bodies depends less upon their nature than on their continuity. All tissues conduct worse than solid bodies; cotton and wool worse than wire, silk, &c. The completeness and rapidity of the conduction were experienced in different degrees by patients of different states of sensitiveness, in such a way that while to the more sensitive everything is permeable, with the less sensitive occur distinctions among the bodies in the degrees of the permeability by the crystallic force.

48. I still wished to test the magnitude of the capacity for being charged. I made passes and contacts on the conductor and the steel file a varying number of times. One pass acted evidently more weakly than several; but when I had occupied a minute in the charging, it attained

* A just conclusion, strongly corroborated by numerous facts observed in the course of experiments on sleep-wakers.

a magnitude which, under the given circumstances, was insusceptible of further increase, at least of an increase of strength of the sensations of warmth and cold thereby produced on the hand of the patient; to which corresponded the frequently repeated trials of the persistence of the charge, which never endured more than about five minutes, however much time I might have consumed in it, excepting only on steel and water, where it was felt about ten minutes. The charge was not effected instantaneously, but increased during the contact for a short time, and then attained its maximum. *This capacity for a charge was satisfied in a few minutes.**

49. In reference to the magnitude of the force and its relation to the size of the crystals, the experiments showed that a small crystal, from the size of a lentil to two inches long, if of gold, rock crystal, selenite, diamond, or hornblende, was weak, and only actively perceived in the reversed pass upward; *that from this point the force increased with the size of the crystals.* The exponent, of course, could not be made out as yet.†

* The same conclusion is arrived at in relation to charging bodies with the mesmeric fluid. Water holds only a definite charge, according to the concurrent testimony of many lucid sleep-waking individuals, taken at separate times. Thus, I have darted my fingers two hundred times on the surface of a tumbler of water, and have been told that the blue haziness has overflowed the tumbler. Several persons have said precisely the same thing. In mesmerizing a decanter of water, I have placed a watch before me while I held the tips of my right-hand fingers in the mouth of the decanter. Several lucid individuals have separately indicated the precise height of the blue haze in the water at the same interval of time. A few minutes were sufficient to charge a quart decanter. All concur in the fact that the fluid sinks in the water. Is it, then, imponderable? Has it not a specific gravity?

† Experiments in sufficient numbers are wanting to determine the relative powers of dissimilar crystals. There is no doubt of the crystalline force being, cæteris paribus, augmented in a ratio to the volume of the same kind of crystal; but the force willl be found to vary much

50. The distinction of the poles, in reference to their power of affecting the nerves, was expressed by an opposition of cold and heat. Almost in every case the crystal produced cooling with one pole and warmth with the other when drawn over the hand. Miss Nowotny, and the surgeon Mr. Schmidt, in the upward pass felt, like the healthy, a cool pleasant breeze; in the downward pass a not disagreeable gentle warmth. I tried crystals of tourmaline, arragonite, rock crystal, selenite, and cleavage forms of Iceland spar and tellurium, on Miss Sturmann. All presented a stronger cooling pole, and a weaker warming one. This difference was very clearly marked with Miss Reichel, who distinguished the poles of all crystals, even at some distance, by a sensation of cold and heat; and this with very great accuracy. As I have already mentioned, Miss Atzmannsdorfer felt it most strongly. But even healthy persons, *e. g.* Prof. Endlicher, as already mentioned, Mr. Studer, my servant Johann Klaiber, and others, distinguished the two poles of all crystals very accurately, even of very small ones. *The opposition of the two poles of crystals, therefore, expressed itself upon the nerves at once by slight heat and cold.* I shall hereafter detail some other contrasts.

in power according to the nature of the constituent substances of the crystal. Clear rock crystals are more agreeable to patients than fatty crystals. A rock crystal containing titanite was disagreeable, but it put patients into a deeper sleep than the clearer specimens. A very small crystal of cobalt is more powerful than a large rock crystal. In highly susceptible cases, the pointed end of a very small crystal of Epsom salt held to the forehead or to any part of the face has been sufficient to induce sleep immediately, and wakefulness has been speedily produced by holding the opposite pole of the same substance in the same direction. A crystal of morphine held in the same manner has been attended with the same results, but accompanied by headache. "The opposition of the two poles of crystals expressed itself upon the nerves at once by these striking contrasts."

51. The high degree of distinctness which the excitement possessed in sick persons is worthy of notice. Not only do they perceive it universally on the masses of bodies which are brought to them, but they clearly perceived that there are points at which the force is concentrated. Miss Nowotny pointed out to me very definitely, in every crystal, the spots where effective poles were situated, which she very quickly discovered with the tips of her fingers. In double crystals the axis always passes through the line of junction of the two crystals. Miss Maix, Miss Sturmann, Miss Reichel, and Miss Atzmannsdorfer, had the same power, in some cases with still greater readiness. Even Mr. Schuh and Mr. Studer accurately felt out the points on large crystals, and their observations all agree accurately with one another.

52. *The crystal-electricity*, as excited in tourmaline and other minerals by heat, does not exhibit any perceptible effect upon the nervous excitement produced by the crystallic force. I heated these bodies to different degrees, but they produced *no evident modifications* in the effects.*

53. Does the crystallic force stand in no relation of direction to terrestrial magnetism? Starting from the manner in which crystals are built up, one would be induced to conjecture that the two forces are really to a certain extent independent of each other. Whoever has seen a nucleated mass of quartz crystals broken into, in a mine, and noticed how they stand in all directions, cannot have

* I have coiled copper wire enclosed in silk thread round eight large rock crystals, and have thus produced an instrument like an electro-dynamic coil, furnished with a platinum keeper. The crystallic force was not increased in the least perceptible degree, nor have I found the crystallic force modified by heating or cooling crystals. As mesmeric sleepwakers of high susceptibility are so much more delicate than any person awake can possibly be, the testimony derived from experiments on these must be powerfully corroborative of the Baron's conclusions.

overlooked that the entire cavity is clothed on all sides, above and below, with crystals whose axes are directed in every possible direction. But without going into a mine, this observation may be made at once in a cabinet of minerals, upon the well-known balls of chalcedony, the cavity of which, *i. e.* the nucleus, is clothed all over with crystals of quartz and amethyst: I have never been able to detect anything like an uniform direction. Other crystallizations, again, which are grouped in stalk-like heaps around a common central point, like natrolite, zeolite, mesotype, arragonite, pharmacolite, &c., form tubercular globules, the rays of which spread out in all directions, and no indications lead us to imagine an influence or any kind of external directing force on their formation. Our own crystallizations, as they go on in our laboratories and manufactories, are in like manner usually altogether confused; prussiate of potash, alum, sugar of lead, sugar-candy, &c., deposit their crystals, in large vessels, without any choice of direction. This appears to agree with the indifference which free crystals observe towards the magnetic needle and the polar wires. *On this side, therefore, the crystallic force is independent of terrestrial magnetism, in reference to the direction of its structures.*

54. Since now the crystallic force shows itself to be free from that attraction to inorganic substances which so remarkably distinguishes the magnet from all terrestrial things, it must, on the other hand, prove the more striking,—nay it seems to claim the highest degree of interest in natural science,—that *it shares with the magnet the singular power of attracting living organic bodies.* For as I have already minutely described, I saw the effect produced by the magnet upon the cataleptic Miss Nowotny, repeated when she was brought in contact with the points of large crystals. It contracted her hand, in some cases produced cramp, and attracted her hand to follow it, not so strongly as a large

magnet, but exactly in the same manner as a weak one. I am certain that if I had possessed a crystal large enough, her hand would have adhered to it, both in the unconscious and conscious state, just in the same way as it did to a strong magnet. *This elective affinity of the crystallic force* to attract living and not dead matter is the most extraordinary character it displays, and points to the powerful connexion in which it stands with the inmost essence of that which we call life, and respecting which, if I am not most grossly mistaken, it promises closely imminent and most important results.

55. In a former treatise I gave an account of the light which issues from the poles of a strong magnet. After that observation, it was very natural to imagine the possibility of the same at the points of crystals; indeed, there was great probability in the anticipation. I therefore instituted an experiment with the heightened vision of Miss Sturmann. A room was made as dark as possible; she entered, remained some time, till her eyes became accustomed to the obscurity, and then I placed before her the large rock crystal. She actually *at once perceived a flame-like light over it*, half the size of a hand, blue, passing into white above, remarkably different from the magnetic light, which she described as much yellower and redder. The experiment was repeated twice on the following night. In order to obtain as complete conviction as possible before Miss Sturmann came into the darkened room, I placed the large eight inches thick rock crystal upon a place which she could not be aware of. As soon as the obscurity was fully restored by shutting the door, she in every case immediately detected the place where the crystal stood, and saw the flaming light exactly the same in all these three experiments. She described it as somewhat resembling a tulip in shape, and beginning below with a curve directed outward, like one of the petals, or like a candle-flame, but then soon taking

an erect position and rising to about the height of her finger's length. She again spoke of the colour as blue, passing into perfect white above, and in such a manner that isolated scattered streaks or filaments of a reddish colour ran up in the upper part of the white. The flame was moveable, in a waving and sparkling condition, and threw a light glare over the support on which the crystal rested, of the diameter of almost forty inches, just as a magnet had done, when flame-like appearance and light radiating from it could be clearly distinguished. From her I turned to Miss Reichel, and placed various crystals before her in the dark. She everywhere found the flaming appearances bright, surpassing those of the magnet in brilliancy of colour and regularity of form. The light was with her visible not only over the poles of the crystals, but even in the interior of their substance. She described the flame over the poles much in the same way as Miss Sturmann, but the appearances of light in the interior essentially different from this. She said that they were of peculiar, star-like forms, which assumed different shapes when the crystals were turned. It was evidently the crystalline structure of the stone, its lamination in different directions, which caused the production of luminous appearances and internal reflections, such as of course could not exist in this way in a steel magnet. She furnished me with drawings of the lights of large and small crystals, which represented most astonishing appearances. I reserve all the various magnetic luminosities, which I became acquainted with, to bring them together hereafter in a special comparison, and shall give figures of Miss Reichel's drawings of the crystallic luminosities with that. Miss Maix also, whose calm and accurate mode of observation I especially valued, for many nights that I left the great rock crystal upon her stove, beheld in her sleepless hours the beautiful spectacle of a whitish star, half the size of her hand, on the apiculated summit. Miss Atzmanns-

dorfer in all cases pointed out the luminous pole in the dark, in a number of different crystals, and placed them in a series for me, according to their strength.

Since, then, all the crystals, which I had subjected in such great number to the test, exhibited the same reactions in reference to that peculiar force, which they manifested at their poles, as occurred in its maximum in a large rock crystal, one is led to the conclusion that *crystals in general, like the magnet, emit a fine flaming light from their poles,* usually invisible to healthy eyes, but seen by those of excited nervous patients, in whom all the senses exist in an unusually acute condition. I need scarcely mention that this bears relation to the luminous appearances frequently observed during crystallization itself by chemists, which have long found place in the text-books. The nature of these radiations has not yet been explained; they have generally been assumed to be electrical, because they look like such, but no direct proof exists. Prof. H. Rose, however, has lately shown that this light is not connected either with heat or electricity, since neither the air-thermometer nor the telescope is affected in the least when dipped in a crystallizing solution of substances which exhibit the highest known degree of evolution of light in the moment of crystallization; for example, sulphate of potass and soda (Poggend. Annal. LII. 443, 585). But now that we have become acquainted with the permanent luminosity of crystal poles, which at present exhibits no agreement with electricity, but indeed a great difference, it becomes highly probable that the said light is dependent, not on electricity, but on the evolution of phenomena of crystallic light, and that circumstances arise in the sudden conveyance of the molecules suspended in the fluids into solid crystalline bodies, under which the crystallic light becomes so concentrated as to be visible to common eyes. What this light is, which *like sunlight beams continuously,* without in the least diminishing the body

from which it radiates, whether it is a vibration propagated in the surrounding fluids, I leave here untouched. We assume that the atoms, still more the molecules of matter, are polar; we regard them as the elements for the construction of the crystal. Is their arrangement into a large solid crystal, which again has its own polarity and is luminous at its poles, a sum of all these little polarities, and are its poles an expression of this, as the open poles of a voltaic pile afford the sum of the shares of electricity of all the individual elements? Is a crystal a pile for the crystallic force, as the voltaic is for the electrical? These are approaching questions reserved for further investigation; meanwhile the consistent observations here made, and often repeated, on five different sick persons, will soon find confirmation in other places and by other observers; only I caution them not to undertake the experiments with somnambulists in the sleep-waking condition, but either with others, not somnambulist, nervous patients, or, if none such can be found sufficiently sensitive, to take the somnambulists only in the awake, conscious condition, when their senses are clear; and not to make use of the sleep-waking condition at all, or at most solely for the control of the former. I have never employed the patients in the magnetic sleep or somnambulism in my physical investigations, but when in this condition have left them in the hands of their physicians, and contented myself with the position of a spectator. To prevent errors, I again remark, that when it is wished to repeat my experiments, the place must be completely darkened, so densely that even after a long stay in it, after one or two hours, no trace whatever of light can be detected; finally, the crystal must be very large, for mine, as I have already mentioned, was not less than eight inches thick, and proportionately long. With those, however, who are strongly sensitive, smaller crystals will answer the purpose, since Miss Reichel and Miss Atzmannsdorfer saw light issue from

almost every crystal, especially from compounds of sulphuric and fluoric acids, which in all cases surpass rock crystal of the same size.

56. All these researches finally unite to show, that the peculiar force of crystals here developed, opens a new page in the book of dynamics,—that it certainly falls within the general laws of these, but possesses its special code, to study which, and bring their axioms to mathematical expressions, must be henceforth one of the tasks of physics. It will be above all desirable to find some universal inorganic re-agent upon it, to discover an instrument of detection and measurement, which shall free us from the often worse than painful dependence on sick persons, hospital patients, and unscientific persons of all kinds.*

* The reflection that it would be desirable to find such a reagent is natural. It is not so difficult to measure heat, light, electricity, and magnetism. These are agencies that are common to inorganic and organic matter. But it is a question whether it is easy to devise a test for a force owing its existence to a combination of molecules that constitutes an organic arrangement, which in its own nature shall not be organic. Is it possible to find an inorganic test for an organic force? We may probably, by tracing the laws regulating organic forces, be enabled to find out the means by which the human being can be stimulated to become so highly sensitive as to detect the presence of very subtle re-agents, odours, metallic lodes, streams in the bowels of the earth, but it may be problematical whether, per contra, we shall be able to frame an inorganic instrument sufficiently delicate to detect thought, the impulses of ambition, hate, or cunning; the bewitching influences of love, benevolence, veneration, or conscientiousness. These depend upon organization; upon arrangements of living matter, so distributed in the brain as to have their own attractive and repulsive relations, but having no corresponding antagonistic forces in inanimate matter. In order to study the physics of organic arrangements, we must lay aside our repugnance to the numerous delicate phenomena offered to us in organic nature, and be content to enlarge, though in a degree hazily, our bounds of enquiry, paying respect to classes of facts that appear, and appear to proud ignorance only, the creations of fancy. Phrenology teaches us the causes of the philosopher's repugnance to new classes of ideas. Mostly, it is to pride that he is indebted for his refusal of truth, and the silly institutions of

RETROSPECT.

a. Every crystal, natural or artificial, exercises a specific exciting power on the animal nerves, weak in the healthy, strong in the diseased, strongest of all in the cataleptic.

society foster and encourage the acquisitive, the approbative, and the pride-creating organizations of man to habituate him to a love of contempt, and an adhesion to errors and fallacies. A most eminent Professor, justly celebrated for much that he has nobly wrought in science, was heard to say openly before a large audience, "Had I been *sharp*, I should have hit upon the discovery on which my competitor has stumbled:" by no means ashamed to acknowledge publicly, that he did not rejoice in the success of a fellow-labourer, who had poured the blessings of a new truth on mankind, to elevate the thoughts, to exalt the aspirations of beings whose organizations improve by an indulgence in noble aims. However vulgar and absurd, because perhaps not severely exact, to habitually erroneous thinkers themselves, may appear much of the knowledge floating among boors and peasants, a very remarkable proof of the importance of some of it may be traced to a singular though rude anticipation of a part of the most brilliant of Professor Faraday's discoveries on magnetism and diamagnetism, by means of an instrument, the name of which has been sufficient to excite the contempt of some so-styled *savans* of repute. If knowledge be not in the range of the thoughts of certain severe cogitators, it is then, forsooth, no knowledge at all. The unmerciful contempt which has been cast on the divining rod—virgula divina, or baguette divinatoire—by certain cultivators of science, may be estimated by a reference to the earlier editions of a translation, by Dr. Hutton, of Montucla's improvement of Ozanam's Mathematical Recreations, a book full of most interesting matter. In the last edition of that work, however, Dr. Hutton proved himself to be, what he always was, a sincere lover of truth. Led into error at an earlier period, he was open to inquiry, and became, subsequently, convinced of facts on the existence of which he had at one time doubted. My friend, Mr. Charles Hutton Gregory, lent me a copy of the *Speculum Anni* for the year 1828, in which he pointed out some passages relating to this matter, which I cannot avoid extracting here, premising a few observations on the instrument called the divining rod, virgula divina, baculus divinatorius, baguette divinatoire. This has been supposed to be a branch of a tree or shrub necessarily of a forked or letter Y shape, by the assistance of which certain gifted persons were enabled to discover mines, springs of water

b. The force manifests its abode principally at the axes of the crystals, most actively at its opposite extremities; it therefore exhibits polarity.

under ground, hidden treasure, and to practise other occult doings. This, with regard to shape, is just as vulgar an error as that which supposes that a stick of any kind of wood held in the hand serves as well as the hazel or the whitethorn for the production of the phenomena. In the counties of Somerset, Devon, and Cornwall, the facts on this subject are well known, and the practice of dowsing, as it is called, has been cultivated time out of mind. In France the men of scientific pursuits have for the most part ridiculed the use of the baguette, notwithstanding abundant evidence in various parts of the country being extant of the success which had attended the practice of the sourciers. The Baron von Reichenbach has established facts regarding the emanations of light from graves, which are quite as remarkable as the proofs of emanations taking place from metals or from running water. Now that the Baron's researches, and the concurrent testimony of the cultivators of mesmeric science, have established that certain individuals are more susceptible of magnetic impressions than others, it will not be pronounced *impossible* that subterraneous running water may influence some persons, and not others. In different classes of animals the sensitive powers are known to vary greatly, as they do indeed among those of the same species. "But," it has been asked, "granting that emanations from subterraneous waters may powerfully affect certain persons, what connection is there between this impression and the motion or rotation of the hazel rod, which is held in the person's hand or laid over his fingers?" What! is it fact that the hazel rod moves or rotates in the hand of a person of a certain impressionability, when that person passes over any ground, underneath his footsteps on which there happens to be a metallic lode, or a subterraneous stream of water, which we call a spring? I have been informed by highly respectable persons who have, in the West of England, witnessed the facts, that under these circumstances a hazel or a whitethorn rod does rotate and does move, and occasionally dips with so energetic a force, that on one occasion the bark of a fresh hazel rod was stripped from the stick and left in the grasp of the operator's hand.

The following extracts will further illustrate this subject:—

"Although the effects or motion of the divining rod, when in the proximity of springs, has been and is to this day considered by most philosophers a mere illusion, yet I think the following brief observations relating to this subject, and which were communicated to Dr. Hutton by a lady of rank, with the account of her subsequent experiments performed

c. It emits light at the poles visible to acutely sensitively eyes in the dark.

before him, his family, and a number of friends (as given in the doctor's translation of Montucla's edition of Ozanam's Recreations), must convince the most incredulous that in the hands of some persons, in certain situations, the baguette is forcibly acted upon by some hitherto unknown invisible cause. Notwithstanding the incredulity expressed by Montucla relative to the indication of springs by the baguette or divining rod, there appears to exist such evidences of the reality of that motion as it seems next to impossible to be questioned. This evidence was brought about in the following manner. Soon after the publication of the former edition of the Recreations, the editor received by the post the following well-written pseudonymous letter on the subject of this problem. The letter in question is dated Feb. 10, 1805, and as with the whole of the correspondence it would be too long for our limits, I shall select such parts only as are immediately essential to a right understanding of the subject.

"The lady observes, 'In the year 1772 (I was then nineteen) I passed six months at Aix in Provence. I there heard the popular story of one of the fountains in that city having been discovered some generations before by a boy who always expressed an aversion from passing one particular spot, crying out *there was water*. This was held by myself and the family I was with, in utter contempt.

"'In the course of the spring, the family went to pass a week at the Chateau d'Ansonis, situated a few miles to the north of the Durance, a tract of country very mountainous, and where water was ill supplied. We found the Marquis d'Ansonis busied in erecting what might be termed a miniature aqueduct, to convey a spring the distance of half a league, or nearly as much, to his chateau, which spring he asserted had been found out by a peasant, who made the discovery of water his occupation in that country, and maintained himself by it, and was known by the appellation of *l'Homme à la Baguette*. This account was received with unbelief, almost amounting to derision. The Marquis, piqued at being discredited, sent for the man, and requested we would witness the experiment. A large party of French and English accordingly attended. The man was quite a peasant in manners and appearance: he produced some twigs cut from a hazel, of different sizes and strength, only they were forked branches, and hazel was preferred, as forking more equally than most other trees; but it is not requisite that the angle should be of any particular number of degrees. He held the ends of the twigs between each fore finger and thumb, with the vertex pointing downwards. Standing where there was no water, the baguette remained motionless;

d. In particular diseases, it attracts the human hand to a peculiar kind of adhesion, like that of iron to the magnet.

walking gradually to the spot where the spring was *under ground,* the twig was sensibly affected; and as he approached the spot, began to *turn round;* that is, the vertex raised itself, and turned towards his body, and continued to turn till the point was vertical; it then again descended outwards, and continued to turn, describing a circle as long as he remained standing over the spring, or till one or both the branches were broken by the twisting, the ends being firmly grasped by the fingers and thumbs, and the hands kept stationary, so that the rotatory motion must of course twist them. After seeing him do this repeatedly, the whole party tried the baguette in succession, but without effect. I chanced to be the last. No sooner did I hold the twig as directed, than it began to move as with him, which startled me so much that I dropt it, and felt considerably agitated. I was, however, induced to resume the experiment, and found the effect perfect. I was then told it was no very unusual thing, many having that faculty, which, from what has since come to my knowledge, I have reason to believe is true. On my return to England I forbore to let this faculty (or whatever you may term it) be known, fearing to become the topic of conversation or discussion. But two years afterwards, being on a visit to a nobleman's house, Kimbolton, Huntingdonshire, and his lady lamenting that she was disappointed of building a dairy-house in a spot she particularly wished, because there was *no water* to be found—a supply she looked on as essential—under *promise of secresy* I told her I would endeavour to find a spring. I accordingly procured some hazel twigs, and in the presence of herself and husband, walked over the ground proposed, till the twig turned with *considerable force.* A stake was immediately driven into the ground to mark the spot, which was not very distant from where they had before sunk. They then took me to another and distant building in the park, and desired me to try there: I found the baguette turn *very strong,* so that it soon twisted and broke: the gentleman persisted that there was no water there, unless at a great depth, the foundation being very deep, (a considerable stone cellar), and that no water appeared when they dug for it. I could only reply that I knew no more than from the baguette turning, and that I had too little experience of its powers or certainty to answer for the truth of its indication. He then acknowledged that when that building was erected they were obliged to drive piles for the whole foundation, as they met with nothing but a quicksand. This induced him to dig in the spot I first directed; they met with a very fluent spring; the dairy was built, and it is at this time supplied by it. I could give a long detail of other

e. It does not attract iron, does not cause any freely moving body to assume directions referable to the terrestrial

trials I have made, all of which have been convincing of the truth, but they would be tedious. For some years past I have been indifferent about its becoming known, and have consequently been frequently requested to show the experiment, which has often been done to persons of high estimation for understanding and knowledge, and I believe they have *all been convinced.* Three people I have met with, who have, on trying, found themselves possessed of the same faculty. I shall only add one more particular incident. Having once shown it to a party, we returned into the house to a room on the ground floor; I was again asked *how I held the twig;* taking one in my hand I found it turned immediately; on which an old lady, mother to the gentleman of the house, said *that room* was formed out of an old cloister, in which cloister was a *well,* simply boarded over when they made the room.

"'L'Homme à la Baguette, from experience, could with tolerable accuracy tell the depth at which the springs were, and their volume from the force with which the baguette turns; I can only give a rough guess. In strong *frost* I think its powers not so great; on a bridge or in a boat it has *no effect,* the water must be *underground* to affect the baguette, and running through wooden pipes acts the same as a spring. I can neither make the baguette turn where there is *no water,* nor prevent it from turning where there is any, and I am perfectly ignorant *of the cause why it turns.* The only sensation I am conscious of is an emotion similar to that felt on being startled by sudden noise, or surprise of any kind.

"'I generally use a baguette about six inches from the vertex to the ends of the twigs where they are cut off.

"'I shall most probably be in London next winter, and will (if you wish it) afford you an opportunity of making your own observations on this curious fact.'

"The lady having arrived in London, wrote to Dr. Hutton to inform him that she proposed being at Woolwich on Friday the 30th inst. (May 1806) at eleven in the forenoon.

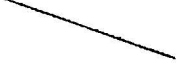
"Accordingly," says Dr. H., "at the time appointed, the lady with all her family arrived at my house at Woolwich Common, where after preparing the rods, &c., they walked out to the grounds, accompanied by the individuals of my own family and some friends, when Lady —— showed the experiment several times in different places, holding the rods, &c. in the manner as described in her Ladyship's first letter above given. In the places where I had good reason to know that no water was to be found, the rod was always quiescent; but in other places, where I knew

poles, does not affect the magnet, does not induce a galvanic current in wires, and consequently it is not a magnetism.

there was water below the surface, the rods turned slowly and regularly, in the manner above described, till the twigs twisted themselves off below her fingers, which were considerably indented by so forcibly holding the rods between them.

"All the company present stood close round the lady, with all eyes intently fixed on her hands and the rods, to watch if any particular motion might be made by the fingers; but in vain; nothing of the kind was perceived, and all the company could observe no cause or reason why the rods should move in the manner as they were seen to do. After the experiments were ended, every one of the company tried the rods in the same manner as they saw the lady had done, but without the least motion from any of them. And in my family, among ourselves, we have since then, several times, tried if we could possibly cause the rod to turn by means of any trick, or twisting of the fingers, held in the manner the lady did; but in vain, we had no power to accomplish it.

"The annexed figure represents the form and position of the rod, about six inches in length, cut off just below the joint or junction of the two twigs."



There can be no impropriety in stating now that the lady in question was the Honourable Lady Milbanke, wife of Sir Ralph Milbanke, Bart. (afterwards Noel) and mother of the present Dowager Lady Byron, the wife and widow of the great poet. A very interesting analogous statement relating to the same person will be found in the *Quarterly Review* for March, 1820: No. xliv. Vol. 22.

Lately in France, the Count de Tristan has published a work on the subject, which I have been unable to procure; but I have a most interesting volume containing two memoirs by M. Thouvenel, a physician of reputation in France, who was commissioned, in the year 1781, by the king, to analyse and report upon the mineral and medicinal waters of the kingdom. The author undertakes a patient and laborious investigation in the spirit of a philosopher, and regards his inquiries as leading to a new thread in the tangled skein of physics, which, like any single fact of science, may lead to the discovery of a thousand others; a fact which

f. It may be charged and transferred upon other bodies by mere contact.

may have escaped the vigilant sagacity of observers, or which may have been totally abandoned to the blind credulity of worthy soft-headed persons, or in short, since the reign of a kind of false philosophy the offspring of scientific pride, may have been delivered over to the presumptuous disdain of men of false wisdom. Thouvenel found a man named Bléton, whose business was that of a sourcier, or discoverer of springs by means of a divining rod; and upon this man he made more than six hundred observations, many of them in the presence of above 150 persons, mostly of important stations, and very credible from their high character, who testify to the truth of the observed phenomena. Among others was M. Jadelet, Professor of Physic at Nancy, a man eminent for his abilities, who was not only a witness of these experiments, but was actually concerned in the greatest part of them. As in the case of Lady Milbanke, with Bléton, an *internal feeling* was coincident with the movement of the rod. Whenever this man was in a place where there existed subterraneous waters, he was immediately sensible of a lively impression, referable to the diaphragm, which he called his "*commotion*." This was followed by a sense of oppression in the upper part of the chest; at the same time he felt a shock, with general tremor and chilliness, staggering of the legs, stiffness of the wrists with twitchings, a concentrated pulse, which gradually diminished. All these symptoms were more or less strong according to the volume and depth of the water, and they were more sensibly felt when Bléton *went in a direction against* the subterranean current, than where he followed *its course*. Stagnant water underground did not affect him; nor did open sheets of water, ponds, lakes, or rivers affect him. The nervous system of this man must have been susceptible, since he was more sensibly affected by change of weather and variations in the state of the atmosphere than other persons: otherwise he appeared healthy. A severe acute disorder had absolutely at one time deprived him of the faculty of perceiving water, and his sensibility in this respect did not return until three months after his recovery; so that if he were sensitive, he could not be classed among the *sick sensitive*. But however remarkable these constitutional peculiarities may have been, there was in Bléton's case a more than usual distinctness in the behaviour of the divining rod. Unlike many sourciers, he did not grasp it closely; he did not warm it in his hands; he did not prefer a young hard branch forked, newly plucked, and full of sap. His custom was to place horizontally on his forefinger and thumb a rod of any kind of wood (except elder), fresh or dry, not forked, only a little curved or bent. A very straight rod failed to turn on its axis, but a bent rod turned on its axis,

g. Matter possesses a certain coercive power over it, but only for a limited time, during which the transferred force disappears.

with more or less rapidity, according to the quantity of the water and the force of the current. Thouvenel counted from thirty-five to eighty revolutions in a minute, and always noted an exact proportion between the rotation of the rod and the convulsive motions of Bléton. If these memoirs be critically examined, it will be found that the author experimented with full care to avoid every source of fallacy. The natural motions of the rod on Bléton's fingers was backwards, but as soon as he withdrew from the spring over which he stood, in any direction whatever, the rod, which instantly ceased to turn, was subject to a new law, for at a determinate distance from the spring an action of rotation in a direction contrary to the former one took place. This was invariable, and upon measuring the distance of the spot, where this retrograde phenomenon took place, from the spring, its depth could generally be found.

I pass over an account of numerous experiments made by this intelligent and careful observer, pointing out the analogies of the known phenomena of electricity and magnetism, by modifications resulting to the sensibility of Bléton, and the rotation of the rod by various ingenious electrical and magnetic trials suggested by the inventive sagacity of Thouvenel, in order to arrive at the curious anticipations of some of Professor Faraday's discoveries, by means of the sensibility of Bléton and the invariable laws which regulated the rotation of the divining rod, when the experiments were made over places where various substances had been concealed under the ground. It was found that whether the trials were made in this manner or over masses of coal, subterraneous currents of water, or metallic veins, the divining rod indicated a determined sphere of electric activity, and was in fact an electrometrical rod. "Of all the phenomena relating to the distinctions of fossil bodies," says Thouvenel, "acting by their electric emanations, doubtless the most surprising is this; upon the mines of iron, of whatever kind they may be, the rods supported by the fingers of Bléton turned constantly upon their axis, from behind forward, as upon the mines of coal; while upon other metallic mines, as upon other metals extracted from their mines, the rotary movement took place in the contrary direction, that is to say, from before backwards. This circular movement, which never varies while Bléton is in a perpendicular position over mines or upon metals, presents revolutions as rapid and as regular as the revolutions in the contrary direction upon the mines of iron and of coal."

The constitutional effects of spasms and convulsive twitchings took place more or less in all the veins, but copper emanations excited very

h. Matter has a power of conducting it, in different degrees, in proportion to the continuity of bodies.

strong and disagreeable spasmodic symptoms, accompanied by pains about the heart, by flatulent movements in the bowels, and by abundant eructations of air. On lead, there seemed to be less unpleasant consequences, but stronger again on the mines of antimony. Having previously determined that for Bléton, on all the metals, except iron, there existed a sphere of electric activity, which propagated itself towards the west, a great number of experiments were made which always had the same results. At the depth of two, three, or four feet under ground were buried gold, silver, copper, tin, lead, and iron. The weight of each was only from five to eight pounds. In other similar pits pyrites of all kinds, sulphur, coal, resin, wax, and lard, were buried. All these different deposits were made at distances from each other, in gardens or in open country, and they were so well covered over and concealed that nothing could be perceived except private marks to be known only to certain assistants. Over the resin, wax, and lard, Bléton experienced nothing; over the coal there was a decided effect; the convulsive tremor of muscle was manifest, and the rod rotated from behind forwards. Over the iron, the same indications, but more energetic. A feeble impression from the sulphur, but sufficient to establish a difference between it and the two preceding, and the rod over the sulphur turned from before backward. Pyrites produced the same rotation as the sulphur, and a slight tendency of the electric sphere towards the west. Gold and copper especially exhibited strongly this singular tendency of the active electric emanations. Over silver, tin, and lead also, it was more remarkable. It extends itself more or less from the focus of the metals, according to their depth and their mass. For example, in describing a circle having a radius of three or four feet from this focus, Bléton felt absolutely no action except on the line of the west. It was the same when, in proceeding from the vertical point of the focus, he successively traversed all the radii of the circle; or even if he went from all the points of the circumference to proceed to the centre. In these two inverse proceedings it was always only on the radii going westward that his person and the rods were affected by movements more or less intense, according to the kinds of metal.

It must, however, be admitted that the action of these metals presenting only the differences of greater or less in degree, either in the nervous and muscular impressions of the body, or in the circular revolutions of the rods, constantly moved from before backward, these differences do not yield a certain means of distinguishing the five metals one from the other. The object Thouvenel had in view was nevertheless fulfilled, for he had

i. The capacity of bodies to receive a charge is in direct relation to the strength of the crystallic force.

established the extent and the determination of a sphere of electric activity towards the west, in certain metals and on sulphur, which does not exist in the same manner on iron, on coal, or on streams of water.

To give a summary, then, of the relations of these phenomena to those established by Professor Faraday, it may be said that over iron mines the divining rod assumes a movement of rotation diametrically opposite to that which it exhibits over all other mines. When iron and other metals are extracted from their ores and deposited under ground, the phenomenon occurs with the same distinction; that is to say, with iron it rotates towards the north. With all the other metals submitted to trial, its action is from east to west. The influence of the red metals appears to be more energetic than that of the white. But with regard to this divining rod let one condition be remarked—the relation of the organic substance to another organic and living power of matter; to a human being in a certain susceptible state of nervous system. Thouvenel describes the symptoms which affected Blêton when he was in the sphere of metallic action, and the rod becomes the secondary part of the philosophical instrument, composed of an impressionable human being and a piece of stick. Some of the Baron von Reichenbach's subjects would have been just the persons to illustrate the facts of Blêtonism.

A highly susceptible girl, the lady's maid of a very clever and intelligent friend of mine, residing in Hertfordshire, offers, when she is mesmerised, a great many deeply interesting phenomena. I have repeatedly mentioned her as Harriet P——. She is as guileless and as good a being as can be met with, and is much beloved by her excellent and amiable mistress, who has repeatedly addressed me on her case. If a piece of hazel stick or whitethorn be presented to Harriet, she grasps it and sleeps mesmerically in less than a minute. The sleep is at first very intense and deep, and then the stick is held so firmly that the spasmodic state of the muscles renders it very difficult for even a powerful bystander to turn it in her hand. Mary Anne Douglas and several others of my patients have exhibited the same phenomena. In two of the cases a very curious point has been remarked. If the hazel or whitethorn stick be held with the pointed end upwards, that end which is upwards when it grows from the ground, a force of attraction is so energetic that these individuals cannot resist their inclination to grasp it with both hands. One of them will rush towards it from a considerable distance, and will with extreme eagerness run from the bottom to the top of the house in order to have the pleasure of grasping it. If she succeed in getting hold of it

k. It expresses itself quantitatively different at the two poles; so that, like the magnet, it produces, as a rule, sen-

before its direction is reversed, her delight is unbounded; she becomes intoxicated, and soon passes into a state of deep unconscious sleep. If, however, the stick be turned rapidly with its pointed end downwards, a repulsive force operates, and each patient feels a repugnance to it. If the stick be allowed to be held in both hands, and a piece of gold, or of platinum, or of cobalt, or of nickel, or the pointed end of a rock crystal be held to it, in each experiment there is a burning sensation complained of, and an endeavour is made to loosen the hold on the stick, with ludicrous haste. A gentleman who had been often put into mesmeric sleep, remarked, on holding successively several pieces of these sticks, that a sensation of heat was communicated to his hand in each instance, and he felt a strong tendency to sleep. Susan L., a highly susceptible person, exclaimed, while in a sleep-waking state, "that a shower of fine small sparks of fire" came from a piece of hazel which happened to be in my hand. She did not see this from ash or from fir, but invariably saw it from every piece of hazel or from whitethorn that was brought near her. On numerous occasions experiments were made to test the accuracy of her repetitions on observing these things, and she invariably gave the same answers to the questions on the same objects. Subsequently, eight other individuals were separately examined as to their susceptibilities to different kinds of wood. Each gave the same results and saw the sparks of fire. In many other cases, the impressionability being different, the hazel and whitethorn had no perceptible effects; the patients handling the bits of stick without observing heat or sparks, and failing to grasp them spasmodically. But Harriet P——r's impressionability was put to a very useful purpose. Her mistress had heard of the practice of dowsing for water, and in a letter to a correspondent, now before me, writes thus under date of July 1845:—"We made a curious experiment here some days since with Harriet P——. We have very bad water here, and have long been unable to find a good spring. Mr. G. has in vain dug and dug and dug for one. I proposed the divining rod; for, said I, Dr. Ashburner would not think it a foolish experiment. Harriet P—— was willing, so we went forth to a field the most likely one for a spring; Mr. and Mrs. G., myself, and two friends staying here. We put Harriet to sleep by the hazel stick; she grasped it so tightly we were obliged to use the gold chain;—she then held it only in one hand, and immediately began to walk, taking her own way. She went very carefully for about twenty yards; then suddenly stopped as if she had been shot. Not a word was uttered by any one. We all looked on, and were not a

sations of cold at the pole corresponding to — M, at the pole corresponding to +M of gentle heat. In regard to quantity the northward pole is stronger, the southward pole weaker.

little surprised to see the rod slowly turn round until her hand was almost twisted backwards. It looked as if it must pain her. Still no one spoke. Suddenly she exclaimed, 'There! there! don't you see the stick turn? the water is here—under my hand. I see, oh I see—let me look—don't speak to me—I like to look.' 'How deep is the water?' said Mrs. G., speaking to Harriet's fingers. 'Oh, about three feet; I can't quite tell, but it is here.' In a moment, to our astonishment, she sunk down on the grass, took the stick again in both her hands, and seemed to like it as if it could feel. We made a strange group round her, as we were all much astonished to see what we had come there to see, but still it astonished us: she seemed so like a little witch. We marked the place, and after a few minutes we awoke her. In the evening she was again mesmerized to sleep, and we asked her what she saw at the spring. 'Why I saw water—water everywhere.' 'Then,' said I, 'how do you know where the spring is?' 'Oh, because it goes trinkle, trinkle—I know it is there.' 'Why did you sit down?' 'Why, because I was so giddy; it seemed as if all was water but the little piece of ground I stood upon; —oh I saw so much water, all fresh, but no sea; I tried to see the sea, but I could not—I could not at all.' Mr. G. caused a large hole to be dug at the place; and just at the depth of three feet the water was found. A brick well has been constructed, and there is a good supply of excellent water. No one could doubt of the action of the rod, it turned so evidently *of itself* in her hand. Of course when awake Harriet knew nothing of the circumstance." So many and so various are the testimonies and the facts relating to the divining rod, that it would be tedious to recite the hundreds of respectable documents offered by those authors who have written on this subject. Lately, a work by Tardy de Montravel, printed in 1781, entitled "Mémoire Physique et Medicinale sur la Baguette Divinatoire," has fallen into my hands, and it abounds in testimonies as to the truth of the same class of facts. One of the most curious works I have seen on the subject is a little book with the title of "La Physique occulte, ou Traité de la Bagnette Divinatoire, et de son Utilité pour la découverte des sources d'eaux, des minieres, des trésors cachez, des voleurs, et des meurtriers fugitifs, avec des principes qui expliquent les phenomènes les plus obscurs de la Nature," par M. L. L. de Vallemont, Ph. D. et Ph., &c. This work, embellished with plates illustrating the different kinds of divining rods, with the various modes of holding them for use, appeared at the latter part of the seventeenth cen-

l. Warming the crystal has hitherto produced no essential modification.

tury, and passed through several editions in France as well as in Holland. It is remarkable for much curious literary and historical learning, and for able statements of the arguments which were used in the controversies, rife at that period, on the realities of the facts under consideration. It contains a curious catalogue of a great number of mines discovered, in France, by means of the divining rod, made out by a German mineralogist employed for the purpose by the Cardinal de Richelieu. But the most singular part of the book is the powerfully authenticated history of Jacques Aymar, a peasant, who, constitutionally impressionable, guided by the divining rod, followed a murderer for more than forty-five leagues on land, and more than thirty leagues by sea : —

On the 5th of July, 1692, a dealer in wine and his wife residing at Lyons were murdered in a cellar, for the sake of robbing them of a sum of money kept in a shop hard by, which was at the same time their chamber. All this was executed with such promptitude and secresy that no one had witnessed the crime, and the assassins escaped.

A neighbour, struck with horror at the enormity of the crime, having remembered that he knew a man named Jacques Aymar, a wealthy peasant who could follow the track of thieves and murderers, induced him to come to Lyons, and introduced him to the king's attorney-general. This peasant assured the functionary that if they would lead him to the place where the murder was committed, in order that he might receive from it a certain influence, he would assuredly trace the steps of the guilty parties, and would point them out wherever they were. He added, that for his purpose he should make use of a rod of wood such as he was in the habit of using to find springs of water, metals, and hidden treasure. The man was conducted to the cellar where the murders were committed. There he was seized with emotion ; his pulse rose as if he were suffering from a violent fever, and the forked rod which he held in his hands turned rapidly over the two places where the murdered bodies had lain.

Having received the impression, Aymar, guided by his rod, passed through the streets through which the assassins had fled. He entered the court yard of the archbishop's palace. Arriving at the gate of the Rône, which was shut, it being night, he could then proceed no further. The next day he went out of the town by the bridge of the Rône, and always guided by the rod, he went to the right along the bank of the river. Three persons, who accompanied him, were witnesses that he sometimes recognised the tracks of three accomplices, and that sometimes he found only two. In this uncertainty he was led by the rod to the

m. This force of crystals is contained in those exhibited by the magnet; it constitutes therefore a separable part of them, capable of being isolated.

house of a gardener, where he was enlightened as to the number of the criminals. For on his arrival he maintained that they had touched a table, and that of three bottles which were in the room they had touched one, over which the rod visibly rotated. In short, two boys of nine and ten years of age, who, fearing their father's anger, had at first denied the fact, at last acknowledged that three men, whom they described, had entered the house, and had drunk the wine which was contained in the bottles indicated by the peasant. As they were assured by the declaration of the children, they did not hesitate to go forward with Aymar, half a league lower than the bridge on the bank of the Rhone. All along the bank for this distance the footsteps of the criminals were traced. Then they must have entered a boat. Aymar followed in another on their track as clearly by water as by land; and his boat was made to go through an arch of the bridge of Vienna which is never used, upon which it was concluded that these wretches had no boatman, since they wandered out of their way.

On the voyage, Aymar went ashore at all the places where the fugitives had landed, went straight to their coverts, and recognised, to the grea surprise of the hosts and spectators, the beds on which they had slept, the tables on which they had eaten, and the pots and glasses they had touched.

He arrived at the camp of Sablon, where he was considerably agitated. He believed that in the crowd of soldiers he should find the murderers. Lest the soldiers should ill-treat him, he feared to operate with his rod. He returned to Lyons, whence they made him go back to the camp of Sablon by water, having furnished him with letters of recommendation. The criminals were no longer to be found there. He followed them to the fair of Beaucaire in Languedoc, and always remarked in his course the beds, the tables, the seats where they had been.

At Beaucaire the rod conducted him to the gate of a prison, where he was positive one of the wretches would be found. Fourteen of the prisoners were paraded before him, and the rod turned on a man with a humped back, who had been sent to the prison about one hour before for a petty larceny. The peasant did not hesitate to declare his conviction that the hump-backed man was one of the assassins; but he continued to search for the others, and found that they had gone towards Nismes. No more was done at that time. They transferred the hump-backed man to Lyons. On the journey he asseverated his innocence; but finding that

THIRD TREATISE.

EXPERIMENTS TO ESTABLISH SOME FIXED PHYSICAL LAWS IN THE VARYING PHENOMENA WHICH HAVE HITHERTO BEEN CALLED ANIMAL MAGNETISM.

58. In the first place I shall endeavour to apply the laws obtained in the two preceding treatises to another series of

all the hosts at whose inns he had lodged recognised him, he avowed that he had been the servant of two men of Provence who had engaged him to join them in this foul deed: that these men had committed the murder and had taken the money, giving him but six crowns and a half from their booty of one hundred and thirty crowns. He corroborated the accuracy of the indications of the peasant as to the gardener's house, the camp of the Sablon, the fair of Beaucaire, and the other places through which the three had passed, extending over forty-five French leagues. All these things of course excited immense interest. At Lyons many repetitions of the observations respecting the turning of the rod in the cellar were made in presence of many persons. Monsieur l'Abbé Bignon gives his testimony to the truth of the statement of facts, in a letter, inserted by Vallemont in his work. There can be no doubt that such statements require very strong corroboration, and here they apparently obtain it. Vallemont, quoting the authority of the Royal Society of London, in the second part of the history, seventeenth section, one hundred and twenty-fifth page, says, that in all countries where men are governed by laws, the testimony in a matter of life and death, of only two or three witnesses, is required; but is it, then, treating an affair of physics equitably, when the concurrence of sixty or a hundred persons is insufficient? It is difficult to define the just boundaries of credulity; but in all these recitals of histories of events, there is this general consent, that in those who can make use of the rod, there is always an agitation, a fever, or some sensation which indicates a nervous commotion; and the best evidence of the closest investigation goes to the point that most frequently the rod is of hazel wood. How far these stories tend to the conclusion that organic tests appear to require the reagencies of organic force is at present a matter of speculation; but it is to be

investigations which have reference here, and to give them a wider extension and better foundation. Beyond the memory of man, have been known certain enigmatical phenomena, produced by the magnet, in its effect on many sick persons, especially on somnambulists. In the last century, and indeed earlier, it was found that similar phenomena might be brought about by bare hands, and without a magnet. In the condition, up to this time, of our physical knowledge, it was impossible to discover any certain connexion between that force of the magnet, and this of the human hands, feet, &c., and equally in vain was it attempted to detect any regularity and subjection to law. The consequence of this was, that all those who were occupied with natural science passed by these subjects, and gave them no place in the school of physics. Isolated physicians and dilettante kept alive the tradition, or increased the heap of unconnected observations. For want of a better word, they called it *animal magnetism*—an expression which is the more unsuitable, the less the phenomena signified by it agree with that which constitutes magnetism in the proper sense of the word. In the meantime, books have been written; few are good, many appear altogether one-sided, many are actually unreadable.

At first I avoided entering upon this literature; I wished to retain my powers of observation and judgment free and unbiassed, and to build my work from the beginning solely on the foundation of my own experience. It seemed to me

hoped that the effort to attract serious attention to this class of facts is not uninteresting or unimportant.

There are many facts connected with the Baron's new force which may be used to illustrate the influence of water and of shining surfaces in producing the clonic spasms of hydrophobia. The phenomena offered by certain somnambules are highly illustrative of the effects of water in certain diseased or susceptible states of the human system. Running water, a constantly changing series of crystalline molecules, perpetually discharges positive or negative odic force.

better to select my own path in the direction in which natural science usually advances, and which is never that of medicine. The medical man is chiefly concerned for a remedial agent, but the physicist looks solely for natural truths; one seeks the concrete, the other the abstract, and it is from this primary divergence that the two have hitherto been able to combine so little in their researches.

59. After I had demonstrated a force in crystals, which, with all its difference, at the same time bears an unmistakeable analogy to magetism; while the so-called animal magnetism, appearing in a shape similar to the former, on the other hand, allows us to perceive in certain resemblances an astonishing parallelism with magnetism, in spite of particular essential differences; this affinity of the conditions led me to the inquiries—whether and how much might be found to be common to all the phenomena, and whether at last some laws might not be discovered, upon which animal magnetism might rest, in the same way as the crystallic force. Since we imagine crystallization to be the connecting link between the inorganic and organic, the dead and the living, I believed I might encourage some hope finally to obtain, by way of experiment, a point of connection between animal magnetism and physics—perhaps even to procure it a resting-place for which it has hitherto striven in vain.

60. To open a path to this, it seemed to me above all things necessary to make out, as clearly as possible, the part which the terrestrial magnetism plays in these matters. Since the magnet, since the crystallic force, exercises so decided an influence on sensitive persons, the power of the terrestrial magnetism, which directs the magnetic needle, cannot be without influence on the animal nerves. And I thus saw clearly that it was impossible to draw any scientific conclusion from any experiments, so long as this powerful factor, which must always interfere in the

phenomena, was not considered, measured, and brought into the account.

With this view I now tested both healthy and sick, in particular Mr. Schuh, Mr. Schmidt the surgeon, and Misses Nowotny, Sturmann, Maix, Reichel, Atzmannsdorfer, and others, under different circumstances and at different times.

61. Mr. Schuh, in his present dwelling, had the strange custom of regularly turning round in bed, when he woke early in the morning; that is, he then placed his head where his feet had been during the night, after which he always went to sleep again. This sleep was always more refreshing than all the preceding night's sleep, contrary to the general rule, according to which, the earlier sleep, especially that before midnight, is the most strengthening. When he had not this after-sleep, he felt weaker all day; and thus this strange custom had for a long time been a necessity to him. I inquired about the position of the bed, and learned that the head was turned toward the south, and the foot toward the north. By my advice he assumed the opposite position when he went to bed at night; that is, with the head to the north and the feet to the south. From this day forward he never found the morning after-sleep necessary; the sleep was good, and strengthening; and he thenceforward gave up that custom.

62. Mr. Schmidt, the surgeon, of Vienna, had received a chill of the right arm on a railway journey, and for some time had suffered from acute rheumatism, with the most painful cramps running from the shoulder to the fingers. His physician treated him with the magnet, which rapidly quieted the cramps, but they always returned. I found him lying with his head directed toward the south. On my remarking this, they turned him round and brought him into the direction of the magnetic meridian, with his head to the north. Directly he came into this position he uttered expressions of pleasure; he declared that he felt refreshed

and strengthened. A pleasant uniform warmth diffused itself forthwith in the chilled part,—he felt the pass of the magnet incomparably more cooling and agreeable than before, and before I went away the stiffened arm and the fingers became moveable, and the pain had wholly disappeared.

63. When I tried the position of Miss Nowotny with the magnetic needle, I found her almost exactly in the magnetic meridian—the head lying to the north. She had herself instinctively sought and wished for this direction, and it had been necessary to break down a stove to satisfy her desire. I asked her to lie with her head to the south, by way of experiment, to ascertain the result. It required some pains to induce her to do it, for I was obliged to repeat my wish three or four days running, and to make her appreciate the weight I laid upon this change, before I brought her to it. At length I found her one morning in this reversed position; she had assumed it a short time before my arrival. A very little time elapsed before the patient began to complain. She was uncomfortable; she turned over restlessly; her face became flushed; her pulse rose, became fuller; flow of blood to the head increased the headache; and discomfort of the stomach soon ensued. The bedstead, with the patient, was quickly turned round again, but stopped when moved a quarter of a circle. She now lay in the magnetic parallel, with her head to the west. This direction was completely unbearable to her, and still more adverse than the south-north position she had just left. This was at half-past ten A. M. She feared from her sensations, that if she remained she would soon faint, and begged to be quickly removed from this situation. She was then brought back into her original north and south direction. Immediately after this all the adverse conditions decreased, and in a few minutes had disappeared so perfectly that the patient became cheerful again. But not

merely an extreme discomfort seized the patient in the altered direction toward the heavens,—her reactionary sensations to all external things were transformed in the most striking manner. The usual passes of the magnet, performed by her physician, which she always found agreeable, then became unpleasant,—stronger ones intolerable; substances at other times disagreeable, like sulphur, were then almost indifferent; others, such as lead, even agreeable; in short, all diseased conditions assumed an altered form.

These observations were too full of import, and held out too great a prospect of immediate value for medical purposes, to be passed over without farther and more careful investigation. I concerted, therefore, with her physician for a farther inquiry on a future day. This took place on the 4th of April, 1844. When we came to the patient in the morning, we found that she had already been lying half an hour in the south-north position. She anxiously longed for our coming, and earnestly begged to be speedily released from her painful situation. All the above-mentioned phenomena were repeated in the same order of succession; her hand no longer followed the magnet, but was only weakly attracted by it—even the strongest did not produce any spasmodic clenching of the hand, and the reactions to different substances were disturbed just in the same way as before. In order to enable us to trace all these things conveniently by experiments, we had the patient dressed, and taken out of bed. I now placed her alternately on four chairs, which I had arranged in a square in the N.S., S.N., E.W., and W.E. positions, the feet being extended, the head thrown back, so that her position was half reclining. The *north-south* position was, as before, comfortable and pleasant; the *south-north* furnished, step by step, the same results as in the two preceding trials; they followed gradually, one after another, in the course of about half an hour. But

when the patient was brought into the *west-east* position, the phenomena presented themselves most distinctly, and so rapidly, that this position could scarcely be endured for a minute. The effect of the magnet on the senses ceased almost wholly at once; at the moment of entrance into the position, disagreeable heat came over her; then quickly followed, in order, an universal external and internal shivering, disquiet, flushing, acceleration of the pulse, determination of blood to the head, headache; finally, pain in the stomach, hummings in the ears, loss of sense, and approaching syncope. It was necessary to hasten to bring her back into the north-south position, unless we would run the risk of seeing her fall from the chair. The rapid disappearance of all these adverse symptoms after her return to the latter position was astonishing; in a few minutes her face became cheerful again, although it had just before expressed the most distressing sensations. After some interval of rest, we tried the *east-west*. I held my watch in my hand, and found that not more than a minute had elapsed before all the phenomena appeared in the same way and in the same order as they had in the west-east position, only somewhat milder. For the greater confirmation and more accurate observation of all these occurrences, the experiments were finally repeated, as we induced the patient to place herself once more in each of the different directions; the result was just the same.

Since Miss Nowotny's sickness had been protracted, slowly increasing, for eight years, I asked whether she had not observed, while the disease was in its milder stages, that she had felt more or less comfortable in different places. Inquiry was made, and it was remembered that in some of the houses in which she had resided during that interval, her condition had been either more quiet or more strikingly insupportable. I gave her brother a compass, and bade him see in what positions her bedstead, sofas, or working-

seats had been placed in the various former residences. He actually found that in the Wohl-leben Street, her bedstead and sofa had accidentally been placed almost exactly in the magnetic meridian, and she herself had lain in the north-south position; while in the Marokaner Street her direction had been north-eastward and south-westward. In the Wohl-leben Street she had been comparatively easy, while in the Marokaner Street she had never been well, but had constantly struggled with the most painful illness. Even now, she knew not why, she could never bear to sit either across the bed, nor on her couch, nor yet to lie down on the latter: she could only remain lying in bed. The first brought her into the west-east position, the second into the east-west, the third into the south-north, and the fourth alone insured to her the indispensable north-south direction.

As between north and south, so also between east and west, a not inconsiderable distinction was subsequently discovered. In June, namely when she was already so much improved that she could sit up the greater part of the day, I tried her once more in the four positions. She could now remain for a good while in the south-north position; in the east-west also she was tolerably well for a little time; but in the west-east position she could not remain more than a minute without feeling the attacks, even to the irritation of the stomach. A few minutes' rest in the north-south direction wholly removed the evil effects of the few minutes in the west-east position. *The west-east position was therefore by far the worst and most exciting of all.* I add the remark, in reference to the position of the sun and terrestrial thermo-magnetism, that this last experiment was made about five o'clock in the afternoon.

64. Furnished with these experiences, I visited the sick Miss Sturmann at the hospital of the Vienna University. She was suffering from tubercle of the lungs, and they called

her condition *eklampsia.** According to her account, her illness had commenced about three years previously, when she was in her sixteenth year, after dancing very violently at several balls. I found her lying in a bed, in the west-east position. I tried a very strong magnet upon her, one which would support 50 lbs.; I passed it over her, laid it upon her head, and under her feet. It produced some weak reactions, but of little importance. I then asked her physician, Professor Lippich, to allow her bed to be moved into the north-south position of the magnetic meridian, which he was kind enough to order. In a moment everything changed. The patient immediately evinced pleasure; her former disquiet left her; a painful burning of the eyes, which she had suffered unceasingly, disappeared; instead of the previous insufferable heat, she felt only a comfortable coolness, and a general relief was visible. A night of unusually peaceful sleep followed, such as she had not experienced for a long time. Her bed was now kept permanently in this position, as she herself also earnestly requested. Another time I induced her to turn round in bed, and thus brought her into the south-north position; just as quickly as everything had turned to good before, all now returned again to evil; general disquiet and heat ensued, flushing of the face, determination to the head, followed, and the peculiar *burning in the eyes* at once reappeared. All this was removed again as soon as I allowed her to return to her north-south position. Now, when she was in the normal direction, I again took up the magnet. But what a difference! She, who could scarcely feel it before, could not bear it now, when I removed the armature at a considerable distance from her. I placed myself with it at a distance

* Convulsive movements of the eyes, of the muscles of the abdomen, and of the extremities, now and then with pain, and sometimes with tendency to a deep unhealthy sleep; a description of case easily and completely curable by continued mesmerism.

of four paces from her head; the patient gave me no answer, and when I examined her I found her in a state of unconsciousness, in tonic spasms. After her recovery from this, I took my place seven paces from the foot of her bed, and removed the armature: and here also she had scarcely spoken a word, before she became senseless, and fell into the same condition. A third time I removed, in the prolonged direction of the magnetic meridian, the whole length of the ward, which amounted to more than thirty feet from her bedstead and her feet. Not quite so quickly as before, she felt the magnet in some degree after I had removed the armature; but after I had remained about a minute in this position, she stopped speaking in the middle of a word that was upon her tongue. She had half said it, the rest died away on her lips. She had been suddenly attacked, and I found her lying rigid with spasms, and with clenched hands, her eyes open and cast upward, so unconscious that I could place my finger on her eyeballs without the lids moving. What an unexpected difference in the effect! The same magnet which I had placed above her head and under her feet without any remarkable effect, so long as she lay in the magnetic parallel, now, when she was in the meridian, threw her into a state of unconsciousness at a distance of ten yards! at a distance of thirty feet attacked her in a deadly manner.*

* If the Baron had accustomed himself to mesmeric experiments, he would have discovered that the magnet, in this case, had induced that kind of tonic spasm which constituted a true mesmeric deep sleep, from which the application of unmagnetised iron to the nape of the neck, the magnet being removed to a suitable distance, would have roused her up. Instead of any fear of the "deadly manner" of the magnet's action, the probabilities are that the frequent and prolonged exercise of the magnetic or mesmeric practice, the rigid spasms being repeatedly produced, the eclampsia would speedily have vanished, and health would have been restored. The worthy and talented Baron has operated with mesmeric patients, while he has deprecated the use of these in his researches.

65. Miss Maix, unable to walk, was kind enough to grant my request of allowing herself to be moved in a chair into the four directions. She is neither cataleptic nor somnambulist; never was so, but suffers from paralysis of the lower part of her body. In spite, therefore, of the cases being of totally different kinds in these sensitive patients, I nevertheless obtained exactly similar results here; the patient could only bear the north south direction, and the west-east was the most insupportable. This experiment was not performed in the morning, as with Miss Nowotny, but about 4 o'clock in the afternoon.

66. In Miss Reichel's case, the physician took no notice of the position in regard to the heavens, and when I remarked about this to him, he said he thought the patient strong enough to be indifferent to its effects. I was not of the same opinion, and when I tested the patient, and made her occupy the four chairs, one after another, as great a difference presented itself as in most of the other sensitive patients. Finding her bed in the south-north position, I counselled her to have it moved into the north-south. She followed my advice, and found her night's rest much improved; now she could sleep, which had been extremely difficult before.

67. With Miss Atzmannsdorfer I tried the experiment at two different hours; once in the morning, when her illness was on the increase, the other time in the evening, in her recovery. In both cases the north-south position was the easiest, the west-east the most insupportable,

68. All these patients now recalled to mind how uncomfortable they always were in church, although they knew not the reason why. Catholic churches are all built from west to east, so that the congregation before the altar are in the west-east position; therefore in that direction which is the most insupportable to the sensitive. In this situation, therefore, they all often fainted, and were obliged to be

carried out of the church. Miss Nowotny subsequently could not bear to walk in the garden or in the streets from west to east, for any length of time.

69. These eight completely different cases all agreed in this point,—that for sensitive persons of the most varied kind, any other position but that with the head to the north and the feet to the south is in the highest degree uncomfortable, but the position in the parallel, with the head to the west in our northern hemisphere, is almost insufferable: perhaps the conditions are different in the southern hemisphere. The causes of these phenomena, as is seen at a glance, can only lie in the effect of that magnet, which is constituted by the terrestrial globe and its atmosphere; in other words, of the terrestrial magnetism. It here affects just like any other magnet, and from the present investigation we arrive at a law, which I will comprise in the following terms:—*The terrestrial magnetism exercises in sensitive persons, healthy and sick, a peculiar exciting action, strong enough to interfere with their rest; in the healthy, to modify their sleep; in the sick, to disturb the circulation of the blood, the functions of the nerves, and the equilibrium of the vital force.*

70. And since the magnetic conditions of the earth are subject to variations, and these variations are connected with the *phases of the moon,* among other things, in such a way that, as is well known, the intensity of the terrestrial magnetism in relation to that, attains its minimum when the moon is full; here evidently emerges from obscurity one of the causes to which the phenomena of *somnambulism* (*mondsucht*) *are to be attributed.* I cannot express myself on this until I have advanced to some more special developments.

71. If, then, terrestrial magnetism thus displays itself as a wonderfully powerful reagent upon our bodily condition, and more or less upon our health in general, its action in

the eight investigated cases being so great, that it to a great extent determined the healthy and sick condition, we are certainly justified—nay, compelled—to reason from these to other cases of sensitive disease, and must recognize that in many, perhaps all these cases, it will be impossible to effect cure by means of magnetism, when the patient is not first of all placed in the proper position towards the terrestrial magnetism: that this must, before all things, be sought out and borne in mind in all kinds of curative treatment, and that all magnetic phenomena in nervous patients—nay, perhaps in many other diseases—are greatly influenced by it. It furnishes the key to a vast number of errors and contradictions, which have presented themselves throughout the field of animal magnetism, from the time of Paracelsus and Mesmer to our own days, which were a stumbling-block to the best thinkers, and have everywhere brought contradiction into the facts and discord into opinions. For, when one and the same disease was treated in Vienna in the north-south position, in Berlin in the east-west, and at Stuttgart in the south-north, different results were obtained in each case: no agreement could be arrived at in the experiments. Nay, even when the same physician treats exactly the same complaint at different times, or simultaneously, but in different places, with the same magnetic means, if the beds of his patients happen accidentally to be placed in different directions, he necessarily will find effects produced differing as widely as possible from each other: he must be led away, and be wholly mistaken about magnetism: he must consider it full of caprice, and from the impossibility of foreseeing and regulating the results, at length throw it aside as an intractable and unmanageable instrument. This, therefore, has been the melancholy history of magnetism. During ages, repeatedly taken up and laid aside again, now lies, almost unused, so remarkable, so profoundly efficient—nay, one may say, an incomparable

means of allaying suffering, where the human hand is so seldom capable of affording help. Physicians themselves call nervous diseases the *scandala medicorum*. At a not far distant time I confidently hope this will not be. Henceforth the all-powerful influence of terrestrial magnetism will be estimated and taken into account, and the whole question of magnetism will be subjected to regular study in its relation to medicine; progress will be made, and a clear understanding arrived at. The world will at length be able to hope for healing powers to be drawn from these extraordinary things, whence it has so long justly expected them. If any physician have here and there remarked, that his patients generally found themselves better in a position where the head was directed to any particular point of the compass, the matter, so far as I know, has never been reasoned upon to any extent; least of all, has its peculiar and mighty import been educed, or been traced back to its physical basis. Here, however, where I have merely to do with the relations of the subject to physics, beyond the limits of which it would be beside my purpose to stray, I have merely to remark, in reference to § 60, that after I had established by the foregoing experiments, the powerful co-operation of terrestrial magnetism in the magnetic influences upon sensitive persons, *I made all the succeeding investigations with them solely in the magnetic north-south position, and that I regard this as the normal direction for all re-actions on living, sensitive, nervously diseased human bodies.*

72. Now that by the researches from § 60 to this point, we have arrived at the theoretically and practically important fact, that terrestrial magnetism exercises uninterruptedly and universally a powerful influence on all sensitive bodies, and have been fortunate enough to bring these new deductions respecting the inward powers of dead and living nature under rule and law, we may return to § 59, and take

up the thread to extend it further in another direction. This will be effected by tracing the effects of the magnet and crystals on sensitive organisms.

It is well known that a piece of pure iron, free from carbon, however often it may be rubbed with a magnet, will not acquire an independent power of attracting iron, will not even lift up iron-filings. It therefore does not receive any enduring magnetic power from the magnet, and physicists agree that the iron returns unchanged into its former condition, so soon as the magnet is removed. But this is not absolutely the case. Hitherto, it is true, we have possessed no reagent that would indicate any alteration in the condition of iron which had been in contact with a magnet; but the sensitive human nerves furnish one. For when I allowed Miss Nowotny to take in her hand a rod of pure iron before it was touched with a magnet, I myself not interfering, it was perfectly indifferent to her; but when I brought it into contact with a magnet, and then keeping my hands away removed this from the iron and again allowed her to take it, she found it very different from what it had been before; for now it was no longer indifferent, but gave her the same sensation as a weak magnet, some heat and curling of the fingers, and this persisted decreasingly for some time, till after eight or ten minutes it lost its newly gained strength, and again became indifferent. Miss Reichel felt a magnetic rod twenty inches long when removed to several rooms off. This was connected by cross pieces with an iron armature of exactly the same shape and size. When I removed the latter from the magnet and tried its unaided effect on Miss Reichel's sensations, I was not a little astonished to see that when just removed from the magnet it was perceived almost at the same distance, reacting magnetically upon the sensitive patient even as the large magnetic rod itself. I made similar experiments with other

sensitive persons at various times. The curling of the fingers did not occur in all, but the other reactions of the magnet were met with universally, the patients finding the force of the latter conveyed to the iron in a weaker degree, yet still of considerable strength when the magnet was powerful. *Therefore something must be left behind in the iron by the magnet; but this is not magnetism, and at present we are ignorant of its real nature.*

73. When, as may be read in all books on animal magnetism, a glass of water is placed between the poles of a horse-shoe magnet, consequently in the magnetic current, and is, as it is called, magnetized, every sensitive patient can not only at once distinguish it from common water, but the glass brought immediately after the magnetization to the hand of a cataleptic patient, attracts this like a magnet, and solicits it to follow, just as I have described in my treatise on the peculiar fundamental force of crystals, §§ 27 and 28. *Something must therefore have passed from the magnet into the water and remained bound there, something which is not a magnet, which we cannot detect by any known chemical means, and cannot be recognised by any of the common senses.*

74. Our celebrated botanist, Prof. Endlicher, visited the patient Miss Nowotny, and witnessed a curious experiment performed by her physician. Prof. Endlicher advised the latter to pass the magnet over himself, and then to react upon the patient. To his surprise, he now, as had never happened before, could attract the hand of the patient with his hand, cause it to attach itself, and follow everywhere, just as the magnetised glass of water had done. He retained this power for almost a quarter of an hour; by that time it had by degrees disappeared. *The same unknown something,* which had been left in the iron rod by the magnet, and had likewise passed into the glass of water,

must therefore have been conveyed into the whole person of the physician; it manifested itself here, from the same cause to the same effect, in his fingers.

75. This experiment was subsequently repeated in a variety of forms; in particular cases the physician let his hand lie in Miss Nowotny's, while he rubbed the back of it with a strong magnet. The patient here said that she felt force increase in the hand of the physician, by starts, with each pass of the magnet. I have repeated the experiment with Miss Maix, and while I rubbed the back of my hand with the magnet as it lay in hers, I received the same account from her. I here recal to notice that this patient is *not by any means* a somnambulist, nor ever was.

76. In an earlier treatise (§ 29) I was obliged to mention, for the sake of historical consistency in my memoir, that *a number of objects of all kinds,* when rubbed with a magnet, subsequently exercised a reaction upon the patient, which was indeed weaker, but wholly of the same kind, as that which the magnet itself produced upon them. I spoke there merely of one patient; since then, I have had opportunities of testing many nervous patients in different conditions, among them many who considered themselves healthy and followed their occupations; they are easily detected, for all feel the magnet directly a single pass is made over them with the horse-shoe. *All these persons,* however, who may be found in hundreds in a large city by merely seeking, *felt themselves affected exactly in the same way by all the objects which had been once rubbed over with the magnet, only in a weaker degree than by the magnet itself.* Any one who chooses may confirm this in any place, for there can scarcely be a country village so small as not to contain a nervously irritable person.

77. Since, then, it appears certain, and warranted by experiments and trials of very various kinds, that all persons who possess a certain degree of irritability of the nerves distinctly

feel the magnet like a cool or gently warm wind, without touching or seeing it, but on mere approximation, and by passes made in their vicinity; further, that all these feel in like manner, only weaker, all material objects, of whatsoever kind, when they have been previously placed for some time in the line of the magnetic current,—that is to say, have been magnetised; from these two inductions a third immediately follows, which hitherto there has been an objection to drawing,—nay, which some have, in anticipation, resisted with all their might, and which seems to be especially an abomination to chemists,—namely, that *all magnetised objects suffer some unknown temporary alteration through the magnet, be this what it may. Therefore, magnetised water even, however strange it may sound at first, is altered water.*

78. If we now compare the effects of crystallic force, as I have explained them in my preceding treatise, with the above of the magnet upon other bodies, we see that the *influence of both upon a third body is exactly the same, and so identical, that no character exists for any kind of distinction.* I have there shown that the magnetic force and the crystallic force—each taken in its totality—are essentially different, and deport themselves, in reference to their similarity, like a part to the whole; for example, like the heating ray to the sunbeam, like sulphuric acid to alum; but the modification which they leave behind in other bodies, when these are withdrawn from their sphere of action, is exactly the same in both cases; and since these are perfectly exercised by the part, that is, by the crystallic force alone, we are compelled to conclude that this is *wholly effected in the magnet by the crystallic force residing in it: therefore by this part of its force. We find, consequently, the magnetic poles and the crystal poles agree wholly, and are perfectly alike in reference to their reaction on the animal nerves.*

79. And now our investigations have brought us to the portal of the so-called animal magnetism, this *noli-me-tangere* may now be seized. When I passed *a magnet* down twice from head to foot, over the patient, Miss Sturmann, she lost consciousness, and fell into convulsions, mostly with rigid spasms. When I did the same with my *large rock-crystal*, the same result followed. *But I could produce the same effect, when, instead of either of these, I used merely my empty hand. Therefore the crystallic force of the magnet and the crystal must reside in my hand.*

80. To test this further, I undertook a series of researches which I will now recount. If this were the case, the force of my hand must produce all the same effects which the crystallic force can bring to pass, as I have recounted them in my last treatise; from the similarity of the properties must be concluded the difference or identity. Before all, it must be inquired whether and what agreement exists between the effect of crystals upon healthy and sick human bodies, and that of the human hand on the same. The results of passing my magnetic rod or my large rock-crystal over a sensitive person, have already been many times detailed; I may here confine myself to a comparison of the two effects upon the hand. When, on those persons who were sensitive enough to feel distinctly the passage of a large crystal along the inside of the hand, I slowly carried my right hand, with the fingers' points turned sideways, down through their left hands, in such a manner that one finger followed another, and thus so swept over them that all passed over in one and the same line, which was drawn from the wrist to the point of the middle finger, I found none who did not feel this in the same way, usually as a cool, more rarely as a warm wind, and not only as strongly, but usually even evidently more so than they had felt the passage of a crystal. I shall not speak

of the sick patients, for all whom I have named in my researches felt this as remarkably strongly as they usually did every magnetic pass of the hand. Miss Maix and Miss Nowotny felt each single finger. But even among the healthy there were not a few who displayed a very considerable sensibility to this reaction; nay, I even found some who, while they could not detect the passage of crystals with certainty, were so clearly aware of the successive passage of the fingers, that they could always accurately state it, with the face turned away. I am empowered to refer by name to my friend, M. Carl Schuh, here. He is a healthy and strong man, and felt the pass of the crystals very distinctly. When I, unnecessarily, and against my own rule, bound his eyes, and carried the *row of fingers* of my right hand slowly down over his left, he felt this so strongly and so distinctly, like a crystal, that he could accurately mark each single pass, and each time spoke precisely when my fingers had passed over a third part of the distance. Mr. Studer, whom I have already mentioned, perceived this just as distinctly; and many other persons, among whom I have permission to name one of the most vigorous, well-inured, and finest men, who has traversed Persia and Kurdistan, and twice penetrated from Egypt into the heart of Asia, therefore is a rare example of an iron constitution, namely, Mr. Kotschy, sometime fellow-traveller with Mr. Russeger. The effect showed itself more strongly upon him; the more agreeable temperature of the air was increased as soon as it became cold. *The fingers, therefore, act upon the nerves exactly like a moderately strong crystal.*

81. I next wished to undertake the comparative examination of the sources of the two forces as to the capability of being conducted through other bodies. I made Miss Sturmann grasp one end of a German silver conductor in her right hand, without having previously touched it myself. I first allowed her a little time to accustom herself to the

feel of the conductor; then I placed upon the other end the slightly moistened tips of the fingers of my right hand. Instantaneously she experienced a warm sensation in the part in contact with her hand, which passed upwards through this and ascended to her elbow. I placed the five fingers of my other hand upon it; the sensation was strikingly strengthened, and now propagated to the shoulder. I took my fingers away; the sensation rapidly decreased, not, however, disappearing suddenly; I put my fingers on and off alternately; the increase and decrease of the sensations produced kept pace. Another day I induced Dr. Lippich to do the same; his fingers produced the same effect. I made the same experiment with Miss Maix. I made her grasp the same conductor, without my interference, and, after some pause to accustom her to the metal, placed first my five, then ten, fingers upon it. The warm sensation appeared and disappeared as I put my fingers on and took them off; with all ten it was so strong that it ascended through the whole arm to the head. I bade her physician make the same experiment; he did so, with the same results; however, although he was ten years younger than myself, the effect of his fingers was evidently weaker than that of mine. By accident, Father Lambert, of the Franciscans, her confessor, was present; I bade him try his power. She found his power equal to mine. I also desired the matron, Miss Barbara Pschierl, to try. Her fingers produced the same effect, but much weaker, than those of men. I repeated this experiment another time, with the modification of taking an iron wire, five feet long, instead of the German silver conductor. One end was grasped by the patient, accustomed to it for a few minutes; then the other end was touched with my five fingers, and the patient immediately said she felt a sensation of a flow of strong heat: when I placed ten fingers on it the sensation increased, while every time I let the wire

out of my hand it disappeared again. This was tested by numerous repetitions. After that, I had the ten fingers of a young lady, her sister, who was also weak and nervous, placed, instead of mine, upon the end of the wire; the effect was remarkably weak. The ten fingers of another girl were added: the effect was observably stronger, but all the twenty together did not act nearly so strongly as five of my fingers, although I have long been grey and bald. I also tested these conditions with a copper wire. It was ten feet long, and also conducted the force, but more slowly and rather more weakly than the iron wire. The same experiments, varied in many ways, were repeated by me, with the same results, on Miss Reichel. The effect was very strongly exhibited in Miss Atzmannsdorfer. But even the healthy Mr. Studer possessed so much sensibility, that he clearly felt the effect of my hands upon metal wires. It follows from all these experiments, *that the force of the human hand may be conducted through other bodies, exactly like the crystallic force, and that these bodies are capable of conducting the two forces in the same way.*

82. I now wished to investigate the capability of accumulation. First, in Miss Sturmann, I placed the German silver conductor near her, and let it remain a quarter of an hour. Then I told her to grasp it, and to accustom her full hand to it. She laid it down near, and left it. I now held it for some seconds in my hand, and again laid it down. When she grasped it again, she felt it warm, and so strongly charged, that the well-known sensation which the crystals had produced under other circumstances, ascended along the whole hand up to the elbow-joint. This was of course repeated, for confirmation, under different modifications. Her physician, Dr. Lippich, made a similar experiment. At my request, two exactly similar porcelain saucers were placed on a distant table; one he left untouched, the other he held for a short time in his fingers, and then laid it down, where

it remained a few minutes. They were now brought to the patient. She named the saucer which had been subjected to the effect of contact of the fingers, with the greatest ease and certainty. After about ten minutes the effect had disappeared, and the two saucers felt exactly the same. I repeated the experiment with the conductor, in the same way, on Miss Maix. It afforded perfectly similar results; it was charged by my fingers, and the charge which had been found to endure five minutes by Miss Sturmann, was detected, gradually decreasing, for twenty minutes, by the more sensitive Miss Maix. The effect was perfectly similar in both, a sensation of warmth ascending from the hand to the arm, and agreeing completely with that which the rock crystal had produced under similar circumstances. I found just the same in Miss Reichel and Miss Atzmannsdorfer some months later. But a glass of water ever remained the most remarkable. When this was taken in the hand, enclosed below in the fingers, the other hand placed above, and the inside also closed by the fingers, and thus held for some ten minutes, it acquired for sensitive nervous patients the smell, the taste, and all the remarkable properties of the so-called magnetised water, which those may make a foolish outcry against who have never investigated the matter, to which number I myself once belonged, but of which all who have examined it and seen its effect can only speak with astonishment. This water wholly agreed in its essential properties with that which had been treated with the magnet or with crystals; therefore received an abundant charge from the fingers and hands, of that peculiar force residing in them, and retained it for some little time. Finally, I could, without selection, take any possible object in my hand, keep it there for some time, and give it to the patients: they then affirmed, of all which they had previously had in their hands, that they had undergone the same change as when they had been rubbed with magnet or crystal poles; and

this whether they knew of my interference, or it had been kept secret. From all these things it undoubtedly follows, that *the force of the hands possesses the same capability of accumulation as the crystallic force.*

83. That this charge *gradually disappears again,* appears from what has been stated already, and requires no especial proof. From these two things it further follows, that in the bodies which acquire a charge, and lose it gradually, *must reside the same power of coercion for the force of the hands which they have shown for the crystallic force.* The *magnitude of the charge* of other bodies increased with the strength of the hand, and the *capacity for charge* displayed no limits but the proportionate strength of the charging body.

84. The question whether there exists a dualism of this force in animal bodies, as in the crystals, required to be subjected to comparative tests. Crystals are known to possess, in crystallographical respects, several axes, main and secondary, and in the compound systems several main axes. When I tried the sensitiveness of the patients on them, they all, as I have already stated in the preceding treatise, after a short investigation found me the main axes and its poles,—those two points, namely, at which the action of the crystallic force on the tips of their fingers was most strongly and strikingly concentrated. But in many, especially in sulphuret of iron, selenite, fluor spar, heavy spar, sphene, granite, &c., they would also discover other axes, the poles of which were much less strongly opposed, but still gave evidence of a marked dualism. All the patients agreed in these perceptions; and a selenite, which I took from one to the other in succession, and allowed them to feel between the fingers of both hands as it lay upon a table, afforded me the same results in all: each described a strong main axis, with its stronger and weaker pole, and far weaker secondary axes, and all at exactly the same points and lines: very frequently the main axis was not the longest, but a shorter,

particularly in selenite; and this agreement among all these mutually unknown observers was here the best possible warrant of the reality and correctness of their statements. Moreover, they may readily be tested elsewhere, for no populous town can be without suitable nervous patients. But even healthy sensitive persons, Mr. Sluder in particular, could, without much trouble, discover the poles of crystals with his fingers. The axes and poles always coincided with the axes and poles of crystallography, and thus it became more than probable that the crystallic force takes part in (if it does not wholly effect) the construction of crystals. Perhaps it is to crystals what the vital force is to organic structures. Yet I will not venture into conjectures here, but hold to that which displays itself as fact: the crystallic force exists in a polar condition in crystals, and contemporaneously in several axes of a crystal, only in unequal degrees of strength.

85. I next met with similar conditions in animal life itself. It has been assumed that in man there is a main axis, from above downwards, and the brain and the genitals have been regarded as the opposite poles. If I ventured to draw a conclusion from observations of the so-called animal magnetism, I should say that it is not the main axis, but a secondary. In the first place, it has been shown above that patients on whom the magnet acts, bear that position worst of all which gives a longitudinal direction in the magnetic parallel; the body becomes thus magnetically differenced according to the latitude, which it appears unable to bear. We know of something similar in exposure to cold; when it comes laterally, it is at once much more injurious and powerful than when it comes in front or behind. This has become more evident to me, through other circumstances, which I may here notice. When I gave the very sensitive Miss Maix my right hand, and placed it in her left, she felt it in the same manner as when I placed upright on her hand a little magnetic rod, or selenite four inches long, both with the northward pole.

But when I gave her my left hand, she found it very much more agreeable. If I laid my right hand in her left, and, at the same time, my left in her right, as is usual when one extends both hands at once to a friend, she said it seemed to her to run as in the "ring-game," (the name given in Vienna to tilting) up the right arm, through the heart and shoulders, down the left arm again, and through me till it reached her again, and thus incessantly around in a circle most painfully to her, and making her giddy. When I now crossed my hands, so that my right was in her right, and my left in her left, she would not bear it, and said that it produced such a painful sensation of a strange kind of contest and strife in her arms and through the heart, a sort of wave up the arms and down again, that it was altogether insupportable. And after she had snatched her hands from mine, she so decidedly refused to give them a second time, that I was obliged to give up the critical repetition which I always made in all other experiments.*

* The Baron has been very fortunate in some of his cases. The phenomenon here noticed is a very rare one, and many cases of sick sensitive, and many others well mesmerised, might be most closely examined without yielding the facts stated in this paragraph. Nature is ready to indulge her votaries with abundance of truths, but they are not poured out at once to even the most industrious, the most ingenious, and the most closely logical investigators. Man must wait his opportunity, and garner patiently. By these hints, can it be supposed that a doubt is entertained as to the facts detailed? By no means. But while, on the one hand, there is a desire to show that there must, in the present state of our knowledge, be a vagueness, inseparable from the very conditions of inquiries into organic laws, in arriving at a conclusion on such a matter as that of the polarities of the two sides of the body; on the other, there is abundant reason to believe that, although a hundred inquirers may not find, may not be able to corroborate the accuracy of the Baron's statements, there are facts enough to prove the existence of the class of phenomena which must in time prove all his positions. Herein lies the value of his logic; of his patient, unwearying powers of investigation. Storms may arise, clouds may darken the horizon, the common ken may not see the progress of the vessel he is steering—but she is guided by a genius, and must emerge from amid the dark doubts

86. Since, then, it clearly results from all these experiments that it is by no means indifferent which of the hands is offered to a nervous patient in the various contacts, it follows with certainty that the two hands are not in the same condition in reference to the hidden power that resides in them; and, if I do not altogether misunderstand the last experiment, there existed a kind of course, like that of the galvanic current, from my left hand to her right, and onward from her left to my right—a motion which could not force its way, or, meeting with considerable obstacles, tried to break through in spite of them, when I placed the left hand in her left, and the right in her right. This difference of the two hands can be nothing else but the well-known polarization,

of ignorance into the light of truth. There are persons who may exhibit transiently the decided symptoms of Miss Maix's case—perhaps some for a few weeks, some for months, and there the peculiarities may vanish. The facts are not, however, the less valuable. They are to be stored for useful purposes. I have examined many impressionable subjects, in order to witness the phenomena determining the fact of the opposite polarities of the two sides of the body. I am convinced of its existence, as I know there are yes and no, positive and negative, plus and minus, attraction and repulsion, &c. But though I have seen the phenomena slightly but clearly defined occasionally, and but rarely, among those I have had under my own treatment, I have never had the Baron's good fortune to witness the striking facts he describes. In one of Dr. Elliotson's cases, however, I saw an example even more remarkable than that of Miss Maix. It occurred in a young man subject to epilepsy, and I refer the reader to some details of it which may be found in the second volume of the *Zoist*, at pp. 53, 215, 216; and in the third volume at p. 53. The young man could not suffer his feet, ankles, knees, hands, or elbows, to touch each other. He could not endure the application of a finger of his right hand lightly to the left side of his face, or any part of that side of his body; nor could he allow any finger of his left hand to be ever so lightly applied to any part right of the mesial line of his body. If Dr. Elliotson touched with his left hand young A.'s right hand, he instantly showed signs of uneasiness; and the same if his right hand were placed in contact with any part of the left side of the young man's body. Many of Dr. Elliotson's observations and details of facts given in the volumes of the *Zoist* are curiously, because unintentionally, corroborative of the Baron's facts.

such as we are acquainted with in the magnet, and has been long known to us in crystals. In this point of view, the main axis passes transversely through man, and indeed through all animals; the longitudinal axis is to be regarded only as a secondary axis. In reality, we are transverse, and composed of two symmetrical halves. All cerebral organs, organs of sense, masticating apparatus, arms and hands, testicles, and feet, stand transversely opposed, and in this direction principally are we universally polar.

87. I subsequently investigated these interesting conditions in the same manner in Miss Atzmannsdorfer. The same results were presented in the same way as those just detailed; when I took her two opposite hands, she felt the current up the right arm and down the left still more strongly than Miss Maix. When I gave her my crossed hands, scarcely a minute elapsed before she was so affected that she became quite ill. When I gave into her hand one of the German silver conductors on a long brass wire, and touched this with my right hand, she had the peculiar secondary sensation, which I had also met with in Miss Sturmann, that this body seemed to her to become light, almost like down; on the other hand, when I touched it with the left, it became heavy, and seemingly much heavier than it naturally was. Without wishing to enter more minutely into this at this moment, I nevertheless must mention it, insomuch that it furnishes another character to the opposition of the hands, in a kind of attraction and repulsion. Yet, different as she found my hands in their effect upon her, she perceived no less difference in her own. When I placed in one of her hands things like iron pyrites, selenite, reguline metals, charcoal, &c., they produced sensations very unlike those which they caused when I bade her transfer them into the other, although no kind of weakening of one or other half of the body in any way existed in her.

88. I have very recently gone through an investigation of this particular with Miss Reichel, and traced it to further de-

velopment than in any of the former sensitive persons. She found not only her right hand, but the whole right side, from head to foot, opposed in all its properties to the left; nay, the mere approximation towards her of my right or left hand affected her in an essentially different manner. I shall detail this more fully in a subsequent treatise; here, where we are concerned merely with the proof by facts of a magnetic polar difference in the transverse direction in the human body, I must be content to state that the observations on Miss Maix were repeated, found the same, and confirmed anew.

89. It appears from all these investigations, that all the symmetrically placed organs of the animal body, so far as they were here investigated, but especially *the hands, exhibited a difference which is caused by a magnetic polar opposition, and that consequently a dualism of the fundamental force now under consideration exists between them, wholly in the way that we have found it to occur in crystals.*

90. I have shown above, § 41 and § 53, that the terrestrial magnetism has no observable influence upon crystals, and not the slightest directing power. The same holds good in relation to the force of the hands. The force which I exert actively with my hands is always equally effective in all places and positions that I assume. Neither can I perceive any influence upon me passively: I have tried lying down to sleep in various directions, but to whatever quarter of the heavens I turned, I slept equally well: and the perfectly healthy man, who perhaps never is sensitive, undoubtedly never feels the least influence of the terrestrial magnetism, however actively and variously this re-acts upon the sick. Neither can I detect in animals anything which indicates the least dependence upon terrestrial magnetism. If a free sense were devoted to this influence, we might expect to find it in larvæ, which are blind. As silk is cultivated on my estates, I had many opportunities of observing the deportment of these so low organisms in all stages and con-

ditions. Yet, even in spinning and changing into the chrysalis, the animal never selected any definite direction, but placed its cocoon irregularly in all possible directions; not even a majority exhibited a preference for any particular direction during their dormant state. Therefore, the crystallic force and the force of the hands agree perfectly in this insensibility to the universal magnetic force of the earth.

91. In reference to the remarkable direct attraction of the patients' hands, exerted so strangely by the magnet and crystals, it has already been stated, § 74, that a man's hand actually effects this, but only when it has previously been rubbed for some time with a strong magnet: he could not do it by his own force. But it has also appeared that he was not very strong in magnetic force. At least, Miss Maix had found his appreciably weaker than those of Father Lambert and mine. I neglected, myself, to make a proper trial upon the cataleptic Miss Nowotny at the right time, because I was not then sufficiently aware of the value of it. On the other hand, I have seen this phenomenon in Miss Reichel and Miss Atzmannsdorfer many times, in the higher stages of their diseases, and in particular in the former, in the presence of many other persons. In the catalepsy which usually preceded her convulsive fits, her hand followed pretty readily the fingers of my vigorous young man, as also my own. I have often made her rise from the seat in a state of unconsciousness, and follow my fingers a considerable distance along the room. Even when I held before her, in this condition, things which possessed no polar distribution of their own, such as a piece of chalk cut to a point, I could lift up her hand with it, and if she, by chance, stood up in the cataleptic state, in her room, I could lead her some paces on. In this case it was the force of my fingers conducted through the chalk, and concentrated at its point, (according to the laws developed above, § 81) where the chalk represented the sum of my fingers, and so perfectly took on their force and action, that it

attracted and drew on the hand of the patient, when I walked backward with it, just as my fingers had themselves done. I observed this attraction by my fingers in the same way during Miss Atzmannsdorfer's attacks. Miss Sturmann's attraction I did not witness myself, but it occurred in exactly the same degree in her, and I can trust the statements of her physician, Professor Lippich, as fully as my own experience. From all these different discoveries, it is certain that *a mechanically attractive force, acting upon the hands of cataleptic patients, resides in the hands and fingers of healthy men, just as in the poles of crystals.*

92. But the luminous phenomena, which I have still to enter into, form a brilliant point in this comparative examination. As I saw Miss Reichel for the first time after violent spasms, with closed eyes, playing in a sort of half sleep with the magnet flame, which always gave her great pleasure, I interposed my outstretched hand, in the darkness, between the magnet and the patient. She immediately began to play in the same manner with the tips of my fingers, and to talk to the bystanders of five little flames, which leaped up and down in the air. She did not perceive my hand itself, and took the movement of my fingers, on the points of which she saw the flames, for an independent movement of the latter. All present, one after another, raised their hands, and each desired to know whether fire issued from his fingers. The patient saw it on all men's fingers, more or less strongly; but not one single girl's fingers emitted sufficient light, or at most but a feeble luminosity, and her own none. As long as Miss Reichel remained ill, these experiments were often repeated, frequently for the alleviation of her spasms, or even for the mere amusement of many spectators. But when she had got well, it appeared, as had not been reported at all before, that not only during sickness, but in health, she saw the magnet flames, the crystallic light, and the flames on the hand, whenever it was dark enough. In fact, she had pos-

sessed this power from her earliest age; even as a child her mother had often lifted her up, to let her convince herself that the imaginary fire which she often cried out about, did not really exist on the nails and hooks sticking in the walls. She even had two sisters who in like manner saw luminous appearances, in all places, of which other people could perceive nothing. Now, while I am writing, she serves me daily for investigations which I am making in this subject, on the connexion with electricity and magnetism, and of which we shall see after a time, from my reports, to what conclusions this has led, and will further lead. I was thus placed in a position to examine the luminous phenomena on the hands in the coolest and most comprehensive manner during a long period, and I am still daily continuing this examination.

93. The investigation on Miss Atzmannsdorfer gave essentially the same results, only she saw all the flame-like appearances larger: while the former patient, according to the degree of her diseased excitement, saw the finger flames from a little less to a little more than an inch long, the latter saw them, in the dark, two inches and more in length; thus almost the whole length of a finger. I shall give, with one of the succeeding essays, drawings of these beautiful appearances, as I obtained them from Miss Reichel. Here the purpose is fulfilled by the facts, warranted by several observers, that *fiery brushes of light issue from the points of the fingers of healthy men, in the same manner as from the poles of crystals.*

94. I have now compared the properties of the crystallic force, without exception, as enumerated in my earliest treatise, with the force that the human hand is capable of exercising: the parallel between the two is, as is evident, complete, and the agreement of the two forces, in their general expression, so perfect, that they evidently become identified. For the sake of clearness I here give the principal results *seriatim*, in a compressed form:—

Hands, passed over the sensitive, act upon them like crystal poles, § 79.

The force that here rules is conductible through all bodies, like the force of the crystal, § 80.

It may be accumulated on other matters, like the others, § 81.

It disappears from the charged substance in a short time, like the other, § 82.

Matter has a coercive power over it, as over the other, § 83.

The capacity of bodies to receive a charge is, for this, like that for the other, § 83.

It has a polar arrangement in the human body, as the other has in crystals, § 89.

It is as little influenced by terrestrial magnetism as the other, § 90.

It exerts mechanical attraction on the hands of the sensitive, like the other, § 91. It displays luminosity of the same nature and power as the other, § 93.

And thus we come back to the starting point of this section, § 79, namely, that the same force really resides in the human hands as manifests itself in crystals; that thus *the crystallic force and the so-called animal magnetism are thoroughly identical, and therefore that the same laws which rule the former are also fully applicable to the latter.*

RETROSPECT.

a. Not only crystals exert a peculiar kind of exciting power upon healthy and diseased sensitive persons, but the like occurs with the terrestrial magnetism. This is so strong, that highly sensitive patients can only sustain it in a certain direction, namely, when placed with the head to the north and the feet to the south, and that every other direction is painful; in many cases, that from west to east wholly insupportable, and even dangerous.

b. All magnetic, crystallic, and similar re-actions on such nervously excitable persons, are essentially modified by alteration of their direction in regard to the terrestrial magnetism.

c. Pure iron, devoid of carbon, and which contains no intermixture of particles of steel, rubbed with a magnet and then removed from it, does not, as is well known, acquire any permanent magnetism; but it nevertheless acquires a peculiar force, by means of which it becomes capable of exerting a distinct and powerful action on very sensitive persons.

d. The magnet imparts this unknown something, not merely to iron, but to all other metals, stones, salts, water, plants, and animals, even to living men; in short, to all solid material objects, without exception.

e. This something acts in all objects either immediately charged with it, or rendered active by the so-called distribution, on the sensitive nervous persons, exactly in the same manner as the magnet itself and as crystals, and must therefore be identical with the peculiar agent of these.

f. Living men are able to affect sensitive, healthy, and diseased persons, exactly in the same way, especially with their hands and fingers.

g. This force, which physicians have called animal magnetism, possesses the following properties:—It is conductible through all other bodies; it is capable of being either directly accumulated on, or transferred by distribution to other bodies; it disappears from them in a short time; it is fixable on them for some time by their capacity for accumulation and by their coercive power; it is arranged in a polar manner in animal bodies through its dualism; it is without appreciable relation to the terrestrial magnetism; it is capable of mechanically attracting the hands of cataleptic patients, and is combined with luminous phenomena; all exactly as the crystallic force is, with which it thus coincides, and in all particulars obeys the same physical laws.

h. The part of the force residing in the magnet, the crystallic force, and the force which is the basis of the so-called animal magnetism: these three forces, therefore, coincide in their essential nature, under one common point of view.

FOURTH TREATISE.

FURTHER SOURCES OF THE FORCE WHICH RESIDES IN CRYSTALS, THE MAGNET, AND THE HUMAN HANDS.

95. WHAT I have already brought forward here has by no means exhausted the sources from which the enigmatical force now under examination flows; in fact, I have not yet mentioned the principal of them. Following up the subject, I met with new and important facts. Physicists have, as is well known, for many years debated the question whether or no the sun's rays are capable of magnetizing a steel needle. Since Morichini, who published the first observations, Mrs. Somerville, Baumgarten, Configliaghi, and others, have taken the principal share in the discussion of this subject. Recollection of the treatises on this point led me to reflect on the part the *sun* might possibly play in the subjects of my present researches, and which acquired some probability from the undeniable and well-known influence exercised by the moon in certain nervous diseases.

97. I availed myself of the first cloudless sky to experiment in this direction on Miss Maix. I placed the end of a copper wire eleven yards long in her hand, and as usual allowed her a little time to become accustomed to it. I then put the other longer end out of the window into the sun-shine. The effects of the crystallic force became immediately perceptible, in a weak degree, but distinctly. I next connected with the wire a plate of copper, sixteen square inches in extent, in the shade, allowed the patient to get used to the end of the wire, and put the plate in front of the window in the sun's rays. Scarcely was this

done when an unexpected cry of pleasure greeted me from the sick-bed. Immediately the rays fell upon the plate, a strong manifestation of the crystallic force made itself felt in the hand, by the known peculiar sensation of warmth, which then ascended through the arm to the head. But this well-known and not unexpected result was accompanied by a simultaneous sensation of cooling, and this so strong and predominant, and with an experience of strengthening refreshment through all the limbs, that the patient declared herself greatly revived and cheered by it. Heat and cold were felt together.

98. In a modified experiment, with the view to attain the results less complicated with the effect of heat, I substituted a white cloth for the copper-plate. I first attended to the accustoming in the shade, and then carried the stiff wire with the linen cloth attached to it into the sunshine. The chamber was warm, the outer air was cool. Nevertheless, effects presented themselves to the sensations of the patient as quickly, though more weakly, as from the copper plate; a dull feeling of increasing crystallic force in the wire, then the striking cooling and reviving sensation: the latter, however, tolerably vivid.

99. I varied this experiment by placing a wet cloth, instead of a dry one, upon the copper wire, which was held in the hand of the patient till she was used to it, and then placed in the sun. The effect was accompanied by a disagreeable accessory sensation, like damp air would have produced upon her; but the principal sensation, which is peculiar to the sun—increasing heat in the wire, and the refreshing cold which presented itself and spread over her whole body—was manifested in the most vivid manner.

100. I now sought for confirmation and warranty of these observations. Some days later I undertook the same experiments with Miss Nowotny. She had now so far recovered that she had quite left her bed for some weeks;

but I nevertheless wished to test the influence upon her. One end of a wire was placed in her hand, the other in the sunshine before a window. She immediately felt alterations in that part which she held in her hand: it became cooler to her. I brought it back into the shade,—the coolness disappeared; I again placed it in the sunshine,—the coolness returned. I now attached about a square foot of tinned iron plate to the wire, and placed it in the sun. The cooling not only quickly manifested itself, but increased for two or three minutes to such a degree that I received the assurance that the wire had become icy cold and begun to make the hand stiff. The plate was brought back into the shade, and the experiment repeated; but the sensation of cold immediately began to decrease, and in a few minutes disappeared; while, when the plate was brought back into the sun, it returned forthwith, and increased till it had attained the same intensity. I have already remarked upon the point that the peculiar sensation which the crystallic force produces in the hands of the sensitive sometimes expresses itself like heat, sometimes like cold; the particular differences of both will be specially elucidated hereafter. Here, where the cold depends on the sun, which otherwise is the source of warmth to all nature, it is pre-eminently characteristic of a specific activity. This was expressed so powerfully and clearly that the distinction was found to be remarkable, according as I let the sun's rays fall obliquely on the metal plates, when the effect was weaker, or as they struck vertically upon them, in which case it was much more strongly perceived;—whether I made the experiment, in this way, morning or evening, or at noon; whether I performed them in July, or repeated them under the same conditions in November.

101. I had no opportunity to institute very circumstantial experiments on this point, on Miss Atzmannsdorfer; but I heard from her, in conversation, that in general the

sun exercised a very agreeable yet not warming but pleasantly cooling influence over her whole body.

102. In like manner formerly, before I had become acquainted with this peculiarity of the sun's rays, I had often heard from Miss Sturmann the then enigmatical statement that the sun made her cold.

103. But I was enabled to investigate this subject most minutely by means of Miss Reichel. The sun's rays not only produced the peculiar sensation of cold when a wire was connected with iron, copper, or zinc plate, tin-foil, lead-foil, strips of silver, gold leaf, German silver, brass plate, &c., but also when linen, woollen cloth, cotton or silk stuff connected with it, were brought into the direct light of the sun. Nay, every other substance, porcelain, glass, stone, wood, water, lamp-oil, alcohol, sulphur; in short, everything I chose to select, when connected with the wire which the girl took into her hand, in the shade, and moved into the sun's rays, produced in her that striking sensation of increasing cold, to which the sensitive all unanimously and uniformly testified, as much surprised at the apparent contradiction which lay therein, as I was myself: which, however, the sequel will very clearly solve.

104. If it were actually the force of crystals, of the magnet, of the human hand, as I have identified them in the preceding treatises, which I now again met with in the sun's rays, this could only be proved by the same methods I had pursued in similar cases with the crystals, &c., by comparison of the effects. It was necessary, therefore, to raise and discuss the questions: Are the sun's rays capable of producing the same conditions in matter as the poles of crystals, the magnet, and the human hand are? Will mere sunshine impart to a piece of iron the force which is conveyed into it by the magnet? Has it the capacity to imbue all substances with the power of reacting upon sensitive sick persons? Can it produce a magnetised glass of water? Can

the sun's rays, so often investigated, possess a new and mighty force, which has hitherto wholly escaped the glance of physical science? I scarcely ventured to admit such thoughts, but my desire for an explanation acquired strength daily.

The first thing curiosity led me to try was a glass of water. I let it stand five minutes in the sun, and then directed the waiting-woman, who possessed very little magnetic force, to give it to Miss Maix, without informing her for what purpose it was: without having been asked, she said that it was magnetised water directly she had put it to her lips. It produced the peculiar pepper-like burning, well known to the sensitive, on her tongue, palate, throat, down the œsophagus to the stomach, at every point arousing spasmodic symptoms. I allowed another glass of water to stand twenty minutes in the sun's rays before it was given to the patient; this time also by the weak hands of a girl, to avoid the stronger effect of mine. This was found as strongly magnetised as ever one could be by the large nine-layered magnet.

106. It was possible that a more considerable portion of the force might adhere to the glass than was contained in the water. To test this, and at the same time to obtain information of the internal condition of the water, whether or not it might be somewhat in the same relation as a tube full of steel-filings stands to the magnet, I had the solarized water poured into another glass, which was then given to the patient. The result was similar to what had often been experienced with magnetized water by Miss Sturmann and Miss Nowotny—that the transferred water was just as magnetic (as it is called) in the second glass as in the first, and that consequently the complete revolution of all its molecules had little or not at all modified the internal condition which constitutes what is called its magnetization. Even an hour after, when the remainder was drank, the so-called mag-

netism had not wholly disappeared, and though weaker than at first, it was still perceptibly charged. In this, as in all other characters, the solarized water agreed most perfectly with that which had been impregnated by the magnet, crystals, or the human hand.

For security, I subsequently followed out these experiments with Miss Sturmann and Miss Reichel. I shall take the liberty to omit an account of the accessory circumstances, which would only cause tiresome repetitions.

107. To follow out the parallel, I took the often-mentioned German silver conductor, and first placed it in the patient's hands to accustom her to it, then allowed the sun's rays to fall upon it for a few seconds, and immediately gave it back to Miss Maix. She found it rendered active just as when it had been placed in contact with a magnet, crystals, or the human hand; but at the same time she at once perceived the pleasant sunny feeling with which the conductor also had been charged, and which it retained. According to repeated experiments, this persisted to her senses for five or six minutes, after which it became imperceptible; while, on the other hand, the crystallic force, with which the sun had imbued it, was felt much longer, and in fact for the same period of twenty minutes that the same conductor had retained the force of my two hands, § 82. The rays of the sun, therefore, exactly equalled here the force of my ten fingers, and acted just as permanently by accumulation as the latter.

108. I allowed Miss Reichel to become used to the feeling of my hand, and then went out into the sunshine. After ten minutes had elapsed, during which I had exposed myself on all sides to the sun's rays, I went back and gave her the same hand. She was much astonished at the rapid alteration in the great increase of force which she experienced in it, the cause of which was unknown to her. The sunshine had evidently impregnated me in exactly the same way as

the magnet had charged (§ 74) the body of a man, and in other experiments my own person. Miss Maix had already previously informed me that she could not bear any one coming out of strong sunshine to approach her bed. Some time before, a party of friends had entered her room after a walk in powerful sunshine; this had produced so much pain and uneasiness, that she could not sustain it, and had been obliged to beg her friends to leave her; and this had been merely the action of the sun, not the cooling, but that warming the hand-wire, § 97.

109. After I had given up the experiments with the sun's rays on Miss Maix, the girls of her neighbourhood amused themselves with them. When I revisited her, they told me that the patient had found an iron key which they had laid in the sunshine, after a short interval, magnetic, and as strongly as a magnetic rod which they possessed. It did not attract iron, but Miss Maix declared that it acted upon her exactly like a magnet. The key had therefore acquired a magnet-like charge from the sun. It had not endured, but disappeared from the key after some time, as the crystallic force does from bodies.

110. This observation led the girls at once to further experiments, with astonishing results. They took a horse-shoe magnet which had become weak, and instead of rubbing it to strengthen it, laid it in the sunshine, and they had the pleasure to see their expectation fully confirmed. The horse-shoe became so much strengthened and newly magnetically active upon the patient, that thereafter, whenever a magnet became weak, it was only necessary to lay it in the sun to make it good again. This is a kind of confirmation of Zantedeschi's observations.

111. I now sought to complete these experiments, by a trial, with Miss Reichel, of the behaviour of crystals in the sunshine. The fact appeared that a rock crystal and a selenite had scarcely been exposed to the rays of the sun five

minutes before the girl felt the peculiar nervous excitement from it greatly strengthened.

112. All these facts at once combine to afford the law: *The force of the sun*, corresponding to the crystallic force, &c., *is capable of being accumulated in other bodies.* And since they acquire this, charge and retain it for some time, *they possess a certain degree of coercive power over it.*

113. Its conductibility through other bodies has already been demonstrated by the conduction to the patient's hands by copper and iron wires; I will only subjoin a few more facts. When I placed the end of a linen cloth in Miss Reichel's hand, gave her the usual interval to get used to it, and exposed the other end to the sun's rays, while the hand remained in the shade, the sensation of the crystallic force soon advanced gradually from the linen to the hand, and produced cold in it. The same occurred when I gave her a woollen cloth, a piece of cotton or silk stuff, and let her handle it in the same way. When I drew the cloth back out of the sunshine, it lost its coolness in a few minutes, and recovered it again as often as I brought it back into the sun's rays. The conduction was most rapid through silk, next through linen, slower through wool, and slowest of all through cotton. A wooden rod, twenty inches long, conducted the solar force pretty rapidly; a measuring rod, six feet eight inches long, required more than half a minute for the effect to penetrate from one end to the other. But a glass tube conveyed the sensation to the other end, directly one end was placed in the rays of the sun. *Therefore, substances of every kind*, whether good, imperfect, or non-conductors of electricity, *manifest, without exception, the power of conducting that force of the sun's rays;* those which are continuous, easily and rapidly; others, which are composed of distinct parts, like woollen and cotton stuffs, with more difficulty, and more slowly.

114. I pass over the confirmatory experiments, and, in

order not to dwell longer on these comparisons, hasten to the luminous phenomena. It was here an especial concern, and a very necessary trial, to examine whether the force of the sun was in the same way capable of endowing the objects with the power of emitting luminous flame in the dark. The laws of phosphorescence are known, and, according to these, it was impossible to bring one of the bodies upon which the sun had shined, at once into darkness: we know from Heinrich that in such a case a great proportion of solid bodies are luminous. The contrivance which I arranged for carrying on experiments, in perfect darkness, while the sun was shining, was as follows. In my laboratory, a covered staircase leads down to a lower story, where my collections and instruments are kept: I had the windows of this closed up: when I closed both doors, I had perfect darkness upon the staircase. Communication was easy with this, and everything could be understood that was spoken both in it and in the adjacent rooms on the two floors. Miss Reichel expressed her willingness to allow herself to be shut up here; and I mention these accidental circumstances especially, because a great number of experiments on light were performed on this staircase: these will all be mentioned in their place, and bear reference to the locality just described. At the same time, this arrangement gave the best control to ensure the accuracy of the sensitive observer, who, shut up here far above or below the room where the operations were carried on, could never know what modifications the experiments underwent there; she could only be aware of their effects, and simply state how and where she perceived them. Up stairs, in the room, I had prepared several large sheets, half a square yard in extent, of copper, iron, and zinc, plates covered with gold leaf, large pieces of lead foil, linen dipped in melted sulphur, &c. I connected these, one after another, with an iron wire, about one-twelfth of an inch thick, thirteen yards long, carried this through the key-

hole of the door, which was stopped closely all around it, and down the stairs, where the observer grasped it in her hand, keeping the end of the wire turned upwards. After she had remained quiet in the dark long enough for her eyes to become accustomed to it, I placed the objects above named, one after another, in the rays of the sun. Before quite a minute had elapsed, a slender column of flame, from ten to twelve inches high, and only two-thirds of an inch thick, ascended before her eyes from the end of the wire. It was gradually attenuated upwards, almost like a knitting needle at the end, and spread an agreeable coolness all around. When the air was disturbed by speaking, it flickered backwards and forwards with it, as I have described of the flame of the magnetic needle. As the metal plates above were moved into the sunshine or into the shade, the flame in the darkness below rose and fell upon the wire, an interval of half a minute or more always elapsing before the manifestation of the change. I substituted a human being for the metal plates, and placed the end of the wire in her left hand. It was my daughter. By her own force, while still standing in the shade, she produced a little flame on the wire, which diffused warmth around, in accordance with facts already detailed. When she placed herself in the sunshine, the flame on the end of the wire shortly rose to a height of nearly nine inches, and now diffused a pleasant solar cooling. As often as she removed out of the sunshine, the flame sank to its previous inconsiderable size, and again emitted heat. I next brought some metal plates and other objects, by way of experiment, as rapidly as possible out of the sun's rays into the darkness, before the eyes of the observer. Without wishing to take account of the luminous flame which spread over them, since this, though not produced, might be more or less influenced by phosphorescence, it is still to the purpose to mention here that from the sharp angles of the plates, especially those turned upward, issued

tufts of flame in the manner of the magnet and crystals; green and blue from copper, clear white from gold and silver, dull white from tin, dirty blue from lead, reddish white from zinc, white from a quicksilvered mirror, and blue with white points from a mass of crystals of sulphate of potass. Lastly, I brought a glass tube forty inches long and two inches wide out of the sunshine into the darkness; it was enveloped on the upper half, as held vertically, by fine white lambent flame, which passed at the upper end into a tube about three inches long, playing around the top.

I applied alternately polarized light, which fell at an angle of about 35° into the room through the window, and the direct rays of the sun, for which purpose was used a roomy balcony, to which there was ready access from the work-room; however, no distinction in the results could be perceived. All these experiments prove that *the force flowing on to matter, with the sun's rays, produces the same beautiful luminous phenomena as the crystallic and other forces do.*

115. Therefore, in every respect related here, *the action of the sun agrees with those of crystals, the magnet, and the human hand; and this, our fixed star, must be received as the fourth source of crystallic force.*

These observations, as is evident at the first glance, lead far in their more distant ramifications. I avoid, however, in the outset, entering into the infinite multiplicity of their relations in universal nature, because I wish in the first place to trace out and establish successively all the sources I have become acquainted with of the force now under consideration, and then afterwards to elucidate each singly, so far as I have been able hitherto to detect its peculiarity. Nevertheless, I cannot help casting a few glances at one of these many sides, because it is this very one which more directly establishes the mode of action of the sun. This is *the spectrum.* Since the sun's rays manifest the force in question, the question at once presents itself—whether this

force resides in all the rays of the coloured spectrum, only in one, or more or less in particular of them? I made a preliminary experiment in this direction on Miss Maix. I threw the spectrum upon a wall with a glass prism, placed a copper wire in the patient's hand, allowed her to become accustomed to it, and then, holding it near the other end in my hand, moved it slowly from colour to colour across the spectrum. She could not see me, for we were separated by a folding screen. Many and repeated experiments, both with her, and afterwards with several other sensitive persons, led to the uniform results; violet-blue and blue were the principal seat of the solar agreeable influence, and of that reviving coolness which diffused itself throughout the body of the patient; consequently, that part of the spectrum in which exists the least intensity of light. On the other hand, the crystallic force, apparent warmth—nay, sensation of heating of the wire, although it was some six yards long, increased continually from the middle, from yellow to orange, so that it was most distinct and deep in the red. Here we find the maximum of the heating rays; the true warmth of which, however, was far from being able to reach the patient. These observations support the statements of Morichini and Mrs. Somerville, and place new weight in the scale of the probability of their assertions, which are as yet by no means universally received.

117. *Each end of the spectrum, therefore, had its specific strongly expressed influence upon the excitability of the sensitive persons;* the more minute and detailed examination of which will afford interesting further conclusions, and the elucidation of which will form the subject of one of the succeeding treatises.

118. From this point it was but a step to the moon, the trial of which necessarily pressed the more urgently upon me, from the well-known fact that countless terrestrial phenomena among the healthy and diseased show them-

selves to depend more or less upon our satellite, the causes of which we as yet know not. I made the first experiment on Miss Maix. It was not carried out without some difficulty. Her window looked toward the north, and the moon could not be got at on any side. In this difficulty I resolved to carry an iron wire one-twelfth of an inch thick through two rooms, then over an area, and from these, again, through three rooms, in all about 100 feet; thus alone could I obtain some of the moon's rays. I placed one end of the wire in the patient's hand, the other was connected with a large copper plate, which, with the usual precautions, was moved into the moonlight. After a short pause the sensation in the hand began to alter very much. Iron wire and copper plate had alone produced a warm sensation, as they always did. The effect of the moon, which became associated with this, was described by the patient as of a very violent and mixed kind, so that her accounts of it did not evince her usual clearness. Without delaying with the particulars of the present merely preliminary experiment, the fact will suffice here, that active influence of the moon, conducted to the patient through a long wire, did really present itself. The sensation on her right hand was much more pleasant than on the left. But a point which did not occur in the sunshine, and manifested itself as peculiar to the moon, was a distinct kind of attraction toward the wire through the whole arm, so that she felt induced to follow along the wire with her hand. She ran her finger slowly along the wire, when she felt the attraction, and would have been inclined, if not in bed, to trace it out along its whole length. We meet here with something similar to that strange attraction which we have observed in the magnet for cataleptic persons, and from which little doubt remains that it is the irresistible attraction which so powerfully seizes somnambulists, and which, therefore, being conductible, may be conveyed by metals.

The patient regarded it as really magnetic, only she said that this attraction was much stronger than that of the magnet. Yet I must repeat what I have already mentioned, that Miss Maix's hand never was perceptibly solicited by the magnet to motion or adhesion. The special local difficulties which prevailed here of continuing nocturnal observations of this kind, rendered it impossible to investigate these interesting phenomena more minutely; I therefore was compelled to turn to other sensitive persons to collect confirmations.

119. This I did in the first place with Miss Reichel, who afforded me abundance of help in variously-modified experiments. Whatever object I placed in her hand, and, after she had become accustomed to it, desired her to hold in the moonlight, she always immediately assured me of the access of exactly the same sensation as was caused in her when I placed the points of the crystals, poles of magnets, or my fingers upon it, or when the sun had shone upon it. *All substances made use of exhibited this susceptibility and conducting power.* Her sensation, however, was not cooling, but of gentle warmth; and the sequel will show that this girl, of all those with whom I experimented, distinguished most definitely and most uniformly, with objective reasons, between cool and warm, between which the sensations of the sensitive constantly fluctuated. When I put the German silver conductor into her hand, laid it down, and then moved it into the moonlight, immediately covered it with a shade, and, after some pause, let her grasp it again, *she found it filled with the force with which the moon endowed it, i. e. warm;* passive and active *capacity for accumulation* were thus proved. When I allowed copper plates, lead and tin foil, zinc plate, silver and gilded surfaces, to remain some time in the moon's rays, and then conveyed them to her on the darkened staircase, she found their pointed angles flaming with tufts of white, red, green, and blue light.

When I arranged a metallic plate, half a square yard in extent, so that I could at pleasure bring it into the moonshine and the shade, connected a long wire with it, and carried this through the keyhole down the darkened stairs into the hands of Miss Reichel, who remained there, *she saw in every instance, as often as I let the moon's rays fall upon it, a slender flame arise, scarcely as thick as one's finger, perfectly straight, to a height of ten inches,* and disappear after a short space as often as I removed the plate from the moonlight. She always felt this flame warm: I repeated the experiments through three different full moons, and always with the same results.

120. From the foregoing, it follows that the moonlight is not mere moonshine; that, even though it brings no warmth to us, it brings together with its light *another powerful, hidden force, which exhibits exactly the same characters as that which resides in crystals, &c. Therefore the moon is the fifth source of this force.*

121. Since the heating rays of the spectrum had so strikingly strengthened the peculiar effect of the force now under investigation, I made it my care to follow out this phenomenon. Formerly I had observed that force in a kind of equilibrium, so in crystals, on the magnet and in the human body. Now, however, in the sun and moon, I no longer found it at rest, but in motion; it appeared to flow from the heavenly bodies, in the same way as—putting the undulatory things out of sight—we may imagine rays of light and heat to flow. I could not but be led by this to an examination of analogous facts in nature,—in the first place *to heat.* To this end I laid a large copper plate upon a broad piece of earthenware, arranged the usual connection by a long copper wire with Miss Maix's hand, put a cold brass tailor's goose upon it, with the heater in, and placed my right hand upon it. I allowed her to become accustomed to it in this condition. Then the iron heater was

taken out, a similar one, heated so as to glow weakly, substituted for it, and the case again closed. I now held it a little distance above the copper plate, without letting it touch. At first, therefore, it only acted by radiant heat upon the metal plate. An increase of the known warm sensation, which is caused by the crystals, &c., at once came to the observer's hand from the wire. When I then placed the heated iron firmly upon the copper plate, and slid it slowly over the surface to diffuse the heat over a greater space, the sensation increased rapidly and strongly in proportion as the heat spread. The patient complained at the same time of a striking sense of weight in the hand. With the removal of the hot instrument, therefore with the cooling, the sensation decreased and increased again alternately as I renewed the heating or cooling.

122. In another experiment of the same kind I placed one end of a strong iron wire in the patient's hand, and grasped it not far from the other end with mine, letting her get accustomed to this. Then I brought the flame of a candle to the extremity, and heated it gradually till the blue shades were produced. The heating by conduction did not reach my hand, and there was a length of forty inches between this and the patient's at the other end; therefore communication of common heat was out of the question. The sense of the force appeared immediately, grew with the increase of the heat, and soon attained such a degree that it penetrated through the patient's arm up to her head. It slowly disappeared on the removal of the flame, and was reproduced every time the flame was again applied in the same manner to the wire. I repeated the experiment with copper wire, in this way: I rolled it up closely ten times, and placed two burning wax candles under the coil of wire. The results were quantitatively greater, but qualitatively exactly similar to the preceding; and this in every repetition. I had a wooden vessel filled with cold

water, the wire sunk in it, and then accustomed the observer to this. The cold water was poured out, and boiling water poured in. She immediately felt the impression of warm crystallic force flowing into her hand.

123. I now gave the experiments the reverse direction. I placed a piece of ice in the hot water, from which the wire led to the patient's hand. The form of the phenomena was immediately changed. The sensation of heat and the other symptoms rapidly decreased, a long drawing occurred through the arm and hand, the disagreeable warm sensation gave place to the entrance of that cooling which the sun's rays produced, and which diffused itself gradually over the breast, back, and whole person. Ice placed in the patient's hand at once produced cramps, and allowed no minute observations.

124. I went through controlling experiments with Miss Reichel. I heated with the flame of a candle one end of an iron wire above six feet long, to the other end of which her hand had been accustomed. Common heat could not reach her at this distance, least of all from such a weak flame and in the space of but a few minutes. Nevertheless, the wire immediately appeared to become *warm, and then so hot*, that she wondered that I, who was so near the flame, could hold it in my hand; but with my healthy senses I did not feel the slightest rise of temperature; she at the same time felt *cool wind* flow *from the end* of the wire—the well-known characteristic of excited crystallic force, &c. I repeated the same with an iron wire of equal thickness, but more than sixteen yards long; I obtained the same effects, but observably more slowly.

125. The question of luminous appearances was now examined. I placed Miss Reichel on the dark little staircase, conveyed a thick copper wire to her, and heated the further end of it with an argand lamp. A reddish-green flame four inches high rose from the end of the wire with

the greatest heating, and fell and rose as I moved the lamp from and back to the wire. I performed a similar experiment with thick iron wire five feet long, one end of which was heated to redness in the lamp. At the other end a flame six inches long arose in the dark, and slowly sank with the cooling. A longer iron wire, over sixteen yards, with one end heated to redness and the other carried into the darkened staircase, gave a flame of a finger's length. *Luminous phenomena produced by heat are here placed beyond doubt.*

126. With these evidences I was for the time content. They proved, by the feeling and sight of different observers, *effects of both radiant and conducted heat, which agree in all respects with those that demonstrate the existence of the peculiar force of crystals, &c. Heat, therefore, is the sixth source of the same.*

127. *Friction* is of complex character in its effect; heat, electricity, galvanism, &c., take part in producing it. At the same time I thought it right to investigate its participation in the circumstances now under consideration. At the residence of Miss Maix I placed a copper-plate upon the deal floor, connected it with her hand by a copper long wire, and rubbed it gently with a piece of wood. A sensation of increasing warmth was immediately developed in the wire, and rose to apparent heat when I rubbed on the wood with greater pressure and rapidity. This sensation increased and diminished as I rubbed more or less. When I substituted my woollen coat for the wood, the same effect was obtained, but strengthened. With a silk handkerchief it was stronger still.

128. I connected Miss Reichel, by means of a brass wire, with a copper-plate which lay upon a wax-polished oaken floor. I placed a piece of wood on the copper, and rubbed it. She at once felt the effect of the excited force through the wire which she held in her hand. Tin-plate

acted in the same way under like circumstances, but more weakly than copper. The end of the wire emitted flame visible in the dark in both. I sawed a piece of wood in the dark with a thin-bladed hand-saw. The observer beheld nothing unusual in the sawdust which flew about, but the blade of the saw, to the extent in which it was in action, soon emitted a reddish light, as if glowing with heat, and a little flame sprouted from every tooth of it. Copper and zinc plates rubbed together with the hands only exhibited sparks here and there. Zinc upon zinc and copper upon copper in like manner emitted little visible light. Gypsum rubbed upon gypsum emitted no light at all. Pieces of charcoal rubbed together appeared as if glowing red, from their points of contact down into their substance to the extent of a finger's breadth. Pieces of sugar rubbed together afforded the usual commonly visible luminosity, but the sensitive saw in addition to this a flaming light one inch and a half in extent surrounding the former. I saw two glass flasks rubbed against each other become fiery at the points of contact; but she saw these parts surrounded by flames as large as one's fist. Unglazed, therefore rough porcelain capsules, gave bright emissions of light visible to me, but only immediately on the flat parts strongly rubbing upon each other; the patient saw flames the size of an expanded hand on them. At this period she was so well that she daily, without hesitation, went about her employment through the crowded streets of Vienna.

129. I rubbed two glass tubes, forty inches long, across one another. I saw a long luminous streak on the line of friction in the dark. Miss Reichel saw besides this, around those parts of the tubes where they had been rubbed, delicate flame-like lights of a finger's breadth, which were so expanded laterally that they had the appearance of a fiery band. As long as the rubbing was continued, she felt the end of the glass tubes, more than twenty inches distant from

the rubbed parts, become apparently very hot, which effect vanished immediately I ceased rubbing. She saw little flames as large as a finger issue from the borders, from which flowed out to some distance a gently warm wind. A similar result was obtained by rubbing two iron rods together: light on the line of friction, which however I did not, though she did see; sensation of apparent warming during the rubbing, and immediate rapid cooling when I ceased to rub; flaming emissions from the ends of the rods, and warm wind flowing therefrom.

130. In none of these experiments were the rubbed objects isolated, but lay sometimes on the floor, sometimes in my hands or in those of an assistant; there was therefore free passage for the escape of any electricity that might have been excited. It was impossible, again, that the heat produced by the friction of the objects could disappear so rapidly, as the appearances of flame vanished every time the rubbing was arrested; the contact electricity excited, produced in almost all the cases enumerated by the rubbing together of bodies of wholly identical substance, must have been so slight that it may be passed over; and in the very case when zinc and copper were rubbed together, and it therefore must have been excited, scarcely a trace of luminosity was manifested, so that galvanism can have had just as little influential share in this action as frictional electricity: from similar reasons I hold that the influence of thermo-electricity could not have been strong enough here, to allow of the observed phenomena of such magnitude being attributed to it, but I am of opinion that in addition to the partial influence which these agents may have had, to the friction itself is to be assigned the greater part of the peculiar luminous appearances which the sensitive persons here perceived. And so I believe, though perhaps with less certainty, *that friction must be regarded as the seventh source of the force dwelling in crystals, &c.*

131. In the researches on the sun's rays and moonlight, we have already seen that *light* assumes an important position when we enter upon the question of the origin of the peculiar force with which we are now dealing. Whether this inheres by and for itself in light, or is only associated with it, or whether it depends on other radiations occurring simultaneously with light, are questions certainly of essential moment, but which, however, I do not regard as in place here, where the business is in the first place to determine the sources generally, the analysis of the inner nature of these sources necessarily remaining as the object of future inquiry. I will therefore merely investigate whether light in general is to be counted among them. The examination of artificial light still remained to be done. When in broad daylight I brought a lighted wax candle near Miss Maix, she felt that it produced a peculiar coldness in her. Several such candles increased this cold, which then attacked her whole body. I removed the candles from her, going a step at a time, to a distance of the length of two rooms, amounting altogether to nearly eight yards. The cold produced by them was diminished very much at this distance, but did not entirely disappear. She remarked that this cold perceptibly resembled that which was diffused from the wire carried to her from the sunshine. This, to her unexpected observation, reminded her that she had never been able to remain at certain ceremonies customary at times among catholics, consisting of strong illuminations at night with hundreds of burning candles; for instance, illuminations of the representation of the holy sepulchre, &c.; the burning lights had always so thoroughly chilled her, that she had been compelled to leave. But Miss Maix had suffered in a slighter degree from her at present greatly heightened complaint, during her whole life, and is to be regarded as one born sensitive, who at every age has been subject to the sensations dependent on it, even when she appeared healthy

and went about. The peculiar influence of light upon her, from distances at which even radiant heat could be but extremely weak, and producing a sensation on the nerves diametrically opposed to that of heat, had therefore been always clearly manifested, even at a time when no one imagined that there was anything abnormal in it.

132. Counter-experiments on Miss Reichel led to the same results. She felt a burning candle to give out cold at a considerable distance; two candles acted at almost twice as far; an argand lamp still farther off; at the greatest distance when a ground glass globe was placed over the flame.

133. I tested by the often-adopted methods, whether the causes of these direct sensations were transferable to third bodies, conductible through them, &c. In front of a copper plate, which was connected with Miss Maix by a wire conductor, I placed two burning wax candles in such a manner that she could not see them, and consequently could not receive rays from them. She experienced simultaneously-increased warmth in the wire, and the pleasant cooling sensation which the sun's rays gave her, only much weaker here than from the sun. This was repeated at different times with the same results. The same was performed with Miss Reichel. I placed eight burning stearine candles near a large copper plate; the observer was in the next room, her hand connected with the copper plate by a copper wire conductor. She perceived the effect very strongly, in the known way, and felt the coolness flowing from the end of the wire at a considerable distance. In a second experiment, in order to moderate the action of the heat I interposed a glass plate between the candles and the copper plate; the effect was very little diminished.

134. These results, according to which rays of fire-light on the one hand directly affect the sensitive, and, on the other, imbue other bodies with the peculiar force acting on them, producing thereby apparent alterations of temperature,

moreover showed themselves to be conductible, and afforded flame-like appearances in the dark, led me to the conviction that not only the sun with the moon, but *light generally, is a source of the force detected in crystals, &c., and is the eighth of these sources.*

RETROSPECT.

a. The sun's rays carry with them a power to affect sensitive patients, which agrees perfectly with the force residing in crystals, the magnet, and the human hands.

b. The greatest influence in reference to a force corresponding to that of crystals is manifested in the outer borders of the red and violet-blue rays of the solar spectrum.

c. The light of the moon possesses the force now under consideration in a strong degree.

d. Heat is a source of it.

e. It occurs with friction, and

f. It appears as a result of the light of flame.

FIFTH TREATISE.

CHEMICAL FORCE—ELECTRICITY.

135. If we take a glance at the condition of chemistry in the times of Agricola, Kunkel, and Brand, we acquire some conception of the relations in which this science at present stands to the subjects of the present researches. Scattered isolated fragments of observations lie around, but in what a condition! To give an idea of this, I will select merely one example. For more than seventy years an instrument has been used in medicine, which bears the name of a magnetic tub (*baquet*); I scarcely dare describe it, for it will be an abomination to every one accustomed to a scientific treatment of natural knowledge. A small wooden tub is filled with a medley of the most absurd and senseless kind, stirred up with magnetized water, an iron rod inserted in it, and from this woollen threads are carried out to sick persons of various sorts, to whom is to flow healing vital magnetism. And this mixture consists of iron slag, broken glass, hammerings of iron from a forge, steel filings, roots, iron ore, grains of corn, sulphur, sawdust, glass plates, wool, pieces of old iron, aromatic vegetables, quicksilver, all magnetized and mystically stratified one above another. What that is pure and healing can come out of such a devil's kitchen? is the reasonable question. How any real magnetizing effect can be produced from a mess of this kind, will certainly be as incomprehensible to every physicist as it is to me. And yet all who have occupied themselves with magnetic cures agree that it is a constantly persisting fountain of magnetism which may be made to flow to the patients through the conductors, &c.

136. Every one who is acquainted merely with the rudiments of such matters, sees that this cannot be a galvanic, electrical, still less a magnetic apparatus; and yet it has an effect which, recognised now for seventy years, has some analogy to these reagents, and must be based upon a hidden something, whatever this may be; otherwise it could not have spun out its obscure existence to the present day. Asking myself what really might operate in it, only one thing seemed to have any clear relation, namely, *chemical action;* room was blindly given for a planless play of affinities, and decompositions and combinations must go on slowly in the tub. In my previous researches I had discovered eight very different sources of one and the same force; the said force here flowed, according to the statements of the physicians, from a mixture of substances attacking and decomposing one another in most opposite ways: might not the chemical disturbance alone excite the same imponderable agent? Might not chemical force also be a source of that associated with crystals, the magnet, living organisms, the sun, heat, &c.?*

137. To investigate this, I took a glass of water, dissolved bicarbonate of soda in it, inserted the end of a wire five feet long, gave Miss Maix the other end into her hand, and placed a pinch of powdered tartaric acid upon the edge of the glass; then gave the patient the usual interval to accustom herself to the arrangement, and scattered the acid in the solution. As soon as the decomposition commenced, the same sensation of heat, then of cooling, came to the observer's hand, as when I had touched the end of the wire with my ten fingers, with a large crystal, or with a magnetic rod.

* I must protest against the imputation of a medical veneration for the devil's kitchen on the part of the investigators into mesmeric phenomena in England. I never saw a baquet, nor ever thought of making one, but I rejoice that the ideas connected with such an absurdity have occasioned the Baron to produce this treatise.

This result displayed itself so quickly and powerfully, that it made the girl grow quite red. It uniformly persisted as long as the chemical disturbance continued in the glass, and subsided when this ceased.

138. I had thus seized the clue to crystallic force, &c., in chemical action; my next business was to acquire assurance of its certainty. I might, in the first place, be met by the objection that the electricity developed in the process of decomposition had acted on the sensitive patient. Lavoisier and Laplace, and more recently L. Gmelin, believed that they observed evolution of free negative electricity in the decomposition of carbonate of lime by sulphuric acid; Pfaff and others contest this. Without delaying with the discussion of authorities, I thought it safest for the concrete case, to apply myself to direct experiment. I connected a conducting wire with a Bohnenberger's electroscope, and carried it into the isolated fluid contained in a long-stemmed glass, in which I prepared a mixture of tartaric acid with carbonate of soda. The gold-leaf did not move. I applied the condensing plates, and added new portions of the salt and acid to the water in the glass; but not even now, after the separation of the plates, could any trace of movement of the gold leaf be detected. If free electricity did present itself in such a tumultuary action as this, it is not very probable in itself that it would appear in insensible amount, certainly least of all such as arose from the purely chemical share in it. I am, therefore, obliged to conclude that electricity here, where no current of it can be set up, is not set free; while that which might take part in the process, is, by known laws, again confined by the products in the moment of origin, through the chemical act itself. The effect upon the hand of the patient, therefore, cannot be produced by a current of electricity, and consequently it belongs entirely to those results which constitute the object of the present researches.

139. I return to the detail of the collected observations. I placed in Miss Maix's hands a glass of diluted sulphuric acid and an iron wire. After a pause, the wire was introduced into the acid, and the solution proceeded with an evolution of hydrogen gas. She immediately found the wire grow warmer until apparently very hot; while cool air was diffused all round the glass.

140. I placed in her hands a glass of water, upon which lay a paper containing some common salt, and after a short pause the salt was thrown into the water, which she gently agitated. She felt the glass acquire crystallic force for some time during the solution, then remain at rest; the sensation flowed upward to the arm.

141. Controlling experiments were made on Miss Reichel. First, the trial with the bicarbonate of soda and tartaric acid, then the dilute sulphuric acid with an iron rod inserted in it; lastly, also with the water and common salt: they all succeeded in the same way. I made further experiments with the following mixtures:—sulphuric acid with caustic soda; acetic, tartaric, fumaric, citric and hippuric acid, successively, in excess upon iron filings; sulphuric acid in excess upon carbonate of soda, &c. We had, at that time, freshly pressed wine-must in full fermentation, and I tried this; all these chemical actions gave abundant evolution of crystallic force.

142. I then took some weak solutions: sugar, alcohol, crystallized borax, crystallized carbonate of soda and potass, in water; then borax and sub-carbonate of potash which had been exposed to the air; sulphuret of calcium and of potassium; lastly, freshly-burnt lime. All these, when passed into water, produced either coolness or warmth in the wire, continuing until the solutions were complete, when the peculiar effects immediately vanished. *In every case, therefore, even when only fixation of water of crystallization or*

mere solution in water occurred, the chemical action devoloped a free manifestation of crystallic force, &c.

143. I was curious to see whether a glass of water could be magnetized, as it is called, by means of chemical action. Here mere conduction through a wire could scarcely convey sufficient force; I required the chemical action in the undivided expression of its power. To obtain this, I placed one glass within another. Into the inner I poured spring water, into the outer a solution of bicarbonate of soda. I threw some tartaric acid into the latter, and had it slowly stirred by a female hand, until the effervescence subsided. The inner glass was then taken out, and handed to Miss Maix, to drink. The water was found as strongly magnetized as if it had been exposed five minutes to the sun's rays, but not so strongly as in the earlier experiments with twenty minutes of sunshine. After she had tasted it, I subjected the same glass of water to the same process a second time; when she drank of it again, she found it almost twice as strongly magnetic. I afterwards repeated a similar trial with Miss Reichel, in which I used carbonate of potass and sulphuric acid with the same results. *Consequently, we can render water magnetic by chemical force, as well as by the magnet itself.*

144. During the above experiments, I made both Miss Maix and Miss Reichel hold separate copper conducting wires, the ends of which were dipped in dilute sulphuric acid. One of these was nearly 100 yards long. But the effect was manifested even at this great distance, and Miss Reichel perceived at the end of the wire which she held in her hand every insertion and removal of the opposite end, which were evident to the hand, not instantaneously, but after a little interval of from fifteen to twenty seconds.

145. There still remain the investigations on the luminous phenomena, abundance of which I went through care-

fully with Miss Reichel. On the one hand, I tried a series of chemical and mechanical solutions alone; on the other hand, according to their effect upon the opposite end of the conducting wire dipped in them, in the dark. Sugar, carbonate of soda, borax, &c. were dissolved separately in glasses of water. A glass rod was used to stir them. Even before this was applied, the contents of the glass emitted a red light in the dark. A fine luminosity began to sweep over the fluid, flowing upwards. A largish tuft of light ascended from the further end of the glass rod. As I dropped the pieces of sugar into the water, and they became wetted, they emitted a red light, according to the observer, and sank in the water like red fragments. Therefore, the evolution of light produced by the process of solution commenced instantly the sugar came in contact with the water. As I stirred it slowly in the dark, I myself saw very strongly luminous flashes from the sugar, at each gentle friction with the glass rod, and here, in water where the whole outer surface of the sugar was half dissolved, it could scarcely, or only by a great stretch, be assumed to be electrical, as the flashes produced by rubbing loaf sugar, chalk, &c. in the air, are commonly imagined to be, although there is not the slightest evidence for it. I placed some freshly-burnt lime in a porcelain capsule, and dropped some water on to it. As soon as the internal disturbance connected with solution began, and steam appeared, the entire mass of lime appeared to the observer to glow with a white light, and a dull blue flame rose above it to the height of a hand. She imagined the dull appearance to be caused by the aqueous vapour. These flames endured of the same size for about a quarter of an hour after the chemical action had ceased; they then began to sink, and ceased in half an hour. Sulphuric acid poured into water at once formed red flames in the glass, waving on the water. When I stirred, these increased so much, that they rose to the height of a full span above the

glass. The effect of heat was here evidently associated with that of chemical action. The glass stirring rod also acquired a tuft of flame on its upper end. Fermenting wine-must emitted a continuous yellowish, dull flame.

146. An iron wire 30 yards long was led in the day-time to the observer, placed on the darkened staircase, and the outer end dipped into dilute sulphuric acid. After the lapse of half a minute, she saw a slender column of fire, a span and a half long, ascend from the extremity, and this rose and sank as the wire was moved in and out of the acid. The same recurred with a solution of sugar in water; the flame at the end of the long wire was even somewhat larger than from the action of sulphuric acid upon iron wire. In another experiment, a brass wire 4 yards long was employed; it gave the same result, with the slight difference that, where the iron wire flame had appeared white and reddish-blue, the brass wire emitted a white and green light. Dried lime stirred up in excess of water gave a flame a span high on iron wire. Thus in every case, *when chemical action occurred, light and flame also appeared to the sensitive in the dark.*

147. In an examination of the chemical causes of the potential essence here investigated, I would not omit the flame of burning bodies, which is in the highest degree a chemical process. But since it is associated with heat and the development of light, there did not at first appear any prospect of obtaining simple results. I might have included the experiments made in this respect just as well under the treatment of heat or light. I brought a pan full of glowing charcoal near Miss Reichel. At a distance of a yard she found it cold; she felt it cool at the whole length of the room. I have already detailed the effects of the flame of candles on the sensitive. I lighted a shallow capsule of spirits of wine, then of pure alcohol, and allowed them to burn away; she felt cold from both flames at a slight distance. I burned various substances, both positive and

negative, in her presence, such as resin, sulphur, and globules of potassium; all of these, especially the last two, were found cold. But it cannot be simply determined here what emanation it was that produced coolness to the sensitive, and was the ultimate cause of this crystallic force. Light appears to take proportionally little part in it, for the effects of alcohol and of sulphur, from which there is little evolution of light, were not found weaker than that of stearine candles. Real heat almost always afforded sensations of apparent heat, as we see by the last treatise. Since, therefore, the flame here always emitted predominant cold, the reason of this must be either in the products, or, as is most probable, in the chemical action itself, as this does so in all decompositions without flame.

148. From the present investigation of chemical force, we will pass immediately to one on the voltaic pile. Since the hydro-electric chain is one of the most important foci of chemical force, I shall take the liberty to anticipate the final result of this, namely, that there, also, a great spring of crystalline force flows from the interchange of matter, with all the attributes which we have observed in it elsewhere. This invasion of the system of the present work must be excused, on the ground that it is necessary to collect all kinds of chemical processes in the subjoined deduction.

149. The parallelism of the properties of the so-called magnetic phenomena associated with chemical force, with those which we have found in crystals, the magnet, human hands, heat, light, &c., is complete, and *chemism declares itself as the ninth in the series of sources of this force.*

150. The field of these researches here opens out to an immeasurable extent; but this can scarcely surprise; such a result must have shown itself in the distance with the earliest discoveries in crystals. Chemical action, solution, decomposition, combination, interchange in the groupings

of the elements, stand in such close connection with the destruction and reconstruction of crystalline forms, that as soon as a force like this declares its presence in crystals, it must be placed almost in necessary connection with the forces and actions which bring about the separation and reunion of the molecules. It was therefore to be anticipated that chemical force would and must be reactive here. I hope that it will furnish us with the means of concentrating the force in question, and facilitating further investigations to a greater extent than has yet been accomplished, where I have been almost wholly restricted to the irritability of sensitive persons, and, above all, that it will afford what I have hitherto wanted—a more convenient reagent, and a more certain measure for its relative amount.

151. And now let us turn our eyes back to the magnetic tub; the strange affair loses its mystery: truly at the pain of still greater ridicule. It is merely an accidentally aroused, slowly proceeding, *chemical action*, which gives out the desired force, exactly as a slowly burning fire gives out gradual and continued heat. It is a current of the force of the magnet, crystals, and human hands, flowing slowly from the chemical action, which is thus very improperly called animal magnetism. It is now comprehensible why the "*baquet*," as it gradually becomes inert, acquires new force when stirred up again months after, since new surfaces are exposed to fresh solution; conceivable, moreover, why every new practitioner can make a new medley, and yet always attain the same effect, because it does not matter at all what things they are that act upon one another, if they will only ferment and decompose each other. Finally, we can understand why one who fills a tub with water and glass alone can produce little, another who succeeds him no magnetic effect at all, since glass and water, let any amount of magnetic conjurations be said over them, will not enter into chemical action, &c. All the wonderful superstructure of

the magnetic tub, which, from the time of Mesmer, has not a little contributed to render animal magnetism ridiculous, and to expose it to shame, will consequently be cleared away for the future, and any simple, slowly proceeding chemical operation, perhaps best of all an open voltaic circuit, will take its place, by which means the power will be acquired of arranging it stronger or weaker as may be most desirable, with a choice of very varied modifications in the smallest possible space.

152. But the examination of chemical forces leads us into another still more interesting path. It leads us to the source from which, to all appearance, organic life itself derives its so-called magnetic force, to the focus at which the flaming forces are lighted, which emerge from our finger-ends, and, as we shall hereafter see, from still more noble parts of our curious corporeal structure. This is *digestion*. It being proved that a main source of that magnet-like force lies in chemism, in the play of interchanging affinities, while digestion is nothing else but an exchange, a constant separation and recomposition of matters, enduring uninterruptedly so long as we live, under the influence of vitality—it follows necessarily that, like as we have seen in every, even such weak chemical action as the simple solution of sugar, common salt, alcohol or sulphuric acid in mere water, magnet-like force will be uninterruptedly evolved along our intestinal canal, and must be placed by this great organ at the service of the whole organism. But this is not all. The nutriment digested in the stomach, and then elaborated in the intestines, becomes absorbed, chylified, in its further course, carried to the lymph and blood by countless large and small vessels, here again chemically changed, carried further and further, more and more altered chemically, and thus onward, ever further turned to account in innumerable decompositions as an

inexhaustible reservoir of crystallic force, till at last it leaves the body.

153. All that I have just said of digestion holds good, in altered terms, but to the same value, of *respiration*. It impregnates us with oxygen, carries on the blood to every corner of our body, sustains on every hand the universal interchange of substances, and secures to us, as one of its chief products, the animal heat. The so-called animal magnetism stands beside this, comes, goes, flows, and vanishes with it. That which affords heat, the chemical action in the body, affords, also, as we have seen, crystallic force, magnetism, or whatever we please to call this potential essence. The dynamics, which constitute the inmost life, be they material or immaterial, condition one another, are perhaps one and the same in the ultimate analysis; and when they here appear to us going hand in hand, this is but one more warranty that we are on the right track of their pursuit.

We thus obtain explanation whence the force comes which issues in a polar condition from our hands and fingers as from a magnet, whence it is continually renewed, and why it unceasingly flames forth from us. Chemical action, which is infinitely busied in our whole structure, produces, sets free, and delivers it; and when we meet with it, we see it already subject to the laws of its indwelling dualism.

154. By one of the most ingenious combinations of profoundly grasped thoughts the present century has produced, Liebig has led us to the conception that all motive force of which we partake is afforded through digestion, all the heat which we possess through respiration; that is, force and heat are the results of chemical action. Though this cannot yet be laid down either in an algebraic formula, or in chemical symbols, although the form of the expression of such a vast

idea may be criticised on many hands, yet its profound conception strikes so forcibly on our understanding, finds such a mighty echo in the totality of all that we at present know of nature, that its final triumph stands in tolerably certain prospect. And since nature affords for our maintenance nothing but air and nutriment, we can scarcely imagine otherwise than that she has directly appointed us to draw from air and food all that is necessary to this our maintenance. If, then, for example, it happens, and calculation shews it, that we daily, on the one hand, appropriate fourteen ounces of carbon from the food, and, on the other hand, give it off again by respiration; when we further find that we daily inspire forty-seven ounces of oxygen, and expire just as many ounces; finally, when we find that the carbon and oxygen emerge combined, and this combination corresponds to exactly as great an evolution of heat as we require daily: so much striking testimony is furnished for such deduction, that all scruples must soon prudently submit to be overcome.

155. I regard it a no small warrant of the profound natural truth of my researches, that, as is seen, I have, by a totally different series of observations and deductions, arrived at the same new field on which I now meet Liebig. Chemical action abundantly furnishes the active principle of crystallic force; the human body overflows with this circulating potential essence,—man digests, breathes, decomposes, combines, and interchanges matter, therefore performs chemical action every moment: thus is it not only clear, it is necessary, it is logically inevitable, that man derives that still mysterious force, the existence of which is made known by these researches, from the play of affinities; in a word, from chemism. It is possible to doubt whether the sun lights us, since it is often day while yet no sun is to be seen; I know this well enough, and do not fight against it.

156. As a conclusion to this section, one more practical

application, indeed the more welcome to me that it tears up one of the deepest roots of superstition, the most hateful foe of the development of human enlightment and freedom. An occurrence which took place in Pfeffel's Garden at Colmar is tolerably well known, and has been spread about by many published accounts. I will mention the most important points briefly. He had appointed a young evangelical clergyman, Billing, as his amanuensis. The blind German poet was led by the arm by this person when he walked out. This occurring in his garden, which lay at some distance from the town, Pfeffel remarked that every time they came to a particular place, Billing's arm trembled, and he manifested uneasiness. Some conversation about this ensued, and the young man at length unwillingly stated that as often as he came over that spot certain sensations attacked him, which he could not overcome, and which he always experienced at places where human bodies were buried. When he came to such places at night he usually saw strange sights. With a view to cure the man of his delusion, Pfeffel returned with him to the garden the same night. When they approached this place in the dark, Billing at once perceived a weak light, and when near enough the appearance of a form of immaterial flame waving in the air above the spot. He described it as resembling a woman's form, one arm laid across the body, the other hanging down; wavering, erect, or at rest; the feet elevated about two hands' breadth above the surface of the ground. Pfeffel walked up to it alone, as the young man would not follow him, struck about at random with his stick, and ran across the place, but the spectre did not move or alter; it was as when one passes a stick through flame, the fiery shape always recovered the same form. Many things were done, during several months; parties taken thither, but the matter remained always the same, and the ghost-seer always held to his earnest assertion, consequently to the supposition

that some one must lie buried there. At last Pfeffel had the place dug up. At some depth a solid layer of white lime was met with, about as long and as broad as a grave, tolerably thick, and when this was broken through they discovered the skeleton of a human body. It was found, therefore, that a human being had been buried there, and had been covered with a layer of quicklime, as is the custom at the time of pestilence, earthquakes, or similar occurrences. The bones were taken out, the hole filled up again, and the surface levelled. When Billing was again taken there the appearance was gone, and the nocturnal spirit had vanished for ever.

157. I need scarcely indicate to the reader what I now thought of this history, which has given rise to much discussion in Germany, since it came from the most trustworthy man living, and theologists and psychologists have given it a thousand dreadful interpretations. In my opinion it belongs entirely to the domain of chemistry, and finds a simple and clear explanation in natural science. A human body affords fruitful material for chemical decomposition, for fermentation, putrescence, vaporizations, and play of affinities of all kinds. A layer of dry quicklime pressed into a deep hole, unites its own active affinities with those of organic substances, and gives rise to a long-continued operation of them. Rain water joins from above; the lime first falls into a pulverulent mass, and afterwards, through the rain-water oozing into it, becomes a pasty mass, to which the external air has only very slow access. Pits of slacked lime have been found in the ruins of castles, decayed for centuries, still so well preserved that it could be used for mortar of new buildings. The carbonic acid, therefore, penetrates constantly, but so slowly, that in such spots a chemical process goes on through many years. This event, therefore, had its usual natural course in Pfeffel's garden; and since we know that a constant emanation of the flame

of crystallic force accompanies it, this was a fiery appearance, which must necessarily endure until the affinities of the corpse and the lime for carbonic acid, &c. were brought into a state of rest. Whenever a living man, who was sensitive to a certain degree, but might appear to be otherwise healthy, came there and entered into the sphere of these physical forces, he necessarily would feel, by day, like Miss Maix, and by night, see like Miss Reichel. Ignorance, fear, and superstition, then shaped the luminous appearance into the spectral figure of a human being, and furnished it with arms, head, feet, &c., as, when we like, we may shape every cloud passing over a bright sky into a man, or a goblin.

158. The desire to deal a mortal blow to the monster superstition—which a few centuries since poured from such sources so inexpressible a number of miseries over European society, when, in unhappy trials for witchcraft, not hundreds, nor thousands, but hundreds of thousands of innocent persons breathed out their lives miserably on the rack or at the stake—led me to the experiment of bringing a highly sensitive person, by night, into a cemetery. I thought it might be possible, where mouldering corpses thus lay, to see something of the kind that Billing had observed. Miss Reichel had the courage, unusual in her sex, to promise the fulfilment of my wish. She consented to be taken, on two different very dark nights, from Reisenberg Castle, where she was residing with me, to the cemetery of the neighbouring village of Grünzing. The result actually fulfilled my expectation most perfectly. She soon saw a brightness, and perceived along one of the mounds a fine exhalation of flame; she found the same in a slighter degree on a second grave. However, she did not suppose them to be either witches or ghosts, but recognised the fiery appearance from one to two spans high, as a luminous vapour, waving over the graves and extending over the ground, the length of the latter. Some time after she was taken to two large grave-yards, near

Vienna, where several burials occurred daily, and the mounds lay around in thousands. She saw many graves furnished with such luminosities. Wherever she looked, she found herself surrounded by fiery masses. But these showed themselves more particularly over all new graves; while on very old ones they were extinguished. She described the appearance as less like clear flame than a dense vapour-like mass of fire, intermediate between flame and mist. On many graves this fiery light was as much as four feet high, so that when she walked into it, it reached up to her neck. When she placed her hand in it, it was as though she had brought it into a dense fiery cloud. She did not manifest the least uneasiness at it, since she had been accustomed to such emanations all her life, and had seen them produced in countless forms, in a natural way, in my house. I am convinced that all persons to a certain degree sensitive will see these in grave-yards, and in those very much used always in great numbers, and that this observation may readily be repeated and confirmed. (Postscript, 1847.—Since these experiments, which were made in the year 1844, I have taken five other sensitive persons to grave-yards, in the dark, of whom two were invalids, three perfectly healthy. All these confirmed, word for word, the statements of Miss Reichel, and saw the lights more or less distinctly over all new graves; so that the fact can no longer be open to the slightest doubt, and may be tested anywhere.) Thousands of ghost stories will now meet with their natural explanation, and thus with their end. It will be now seen, too, that our old women were not so far wrong when they asserted, as is well known, that it is not granted to every one to see the spirits of the departed wander over the graves; for in fact it is only the sensitive who can see in the dark the luminosity of the imponderable effluvia from chemical decomposition of corpses. And thus I hope I have succeeded in

tearing down one of the thickest veils of dark ignorance and human delusion.*

* Again, through mesmerism, we obtain a strong corroboration of a fact, which, until the recent importance given to the poisonous influences of grave-yards, would hardly in this country have been credited. Jane M., whose case has offered many striking peculiarities, is a person of a very impressionable nervous constitution. Among other curious phenomena developed in her case, was that of a very powerful agitation and sense of attraction to running water; and this was occasionally so strong, that, in riding in an omnibus along the Bayswater road for a couple of miles, she was, always, for some months, strongly inclined to get out of the carriage and rush towards the water. It has, now and then, required considerable force to remove her from the sphere of the influence of a cistern, where the water was rushing into it through the supply pipes. This tendency to strong attraction by springs, or by water in moving currents, gradually became less; but was succeeded by an alarming sense of sickness whenever she passed the St. George's burying ground in the Bayswater Road. She assured the ladies with whom she lived that she saw blue lights or blue hazy clouds of light over the graves in that ground;—that these were of various heights, some of them high enough to envelope a person who should stand upright on the graves. On the fresh graves the light was more vivid, higher and more voluminous, than on those not so recent. These lights were very attractive, and notwithstanding the sickness they caused, which amounted to vomiting, the young woman had a great desire to go and lie down on the graves. All this I had learned, before I thought of undertaking to supply notes to this work, and I ascertained that no one of the parties had read Gregory's Abstract of Reichenbach's researches, or was cognizant of the facts therein noticed on this subject. My servant George Thacker, now the husband of the young woman, had been in the habit of walking home to Bayswater, from my house, with her. Having heard that he had repeatedly witnessed the phenomena connected with the grave grounds, I requested him to make notes of what he had seen. He has complied with the request, and I subjoin extracts from his statement:—

"One evening last autumn, I accompanied Jane when she had to pass Paddington Church-yard. She appeared at the time well and cheerful, but as we approached the burial-ground, and were yet half a street's length from it, she was uncomfortable and fell into a mesmeric sleep. Not suspecting the cause, I went on, having her on my left arm, my right being towards the cemetery. I could not prevent her

159. We now come to the domain *of Electricity*. By a superficial consideration of the foregoing researches,

from going round behind me and taking my other arm, and then trying to disengage herself from me altogether. I stared, with astonishment, to see her so attracted towards the burial-ground: I could compare it to nothing but the power of a strong magnet over a needle. I recollected that a stream of water had the same power of attraction over her a short time before. We walked on, or rather I dragged her from the ground, and when I thought she was sufficiently recovered, I asked her what had so strangely affected her. She said the dead attracted her; one in particular, lately buried, who had died of a malignant fever; and if I had not been with her, the influence of that body would have drawn her to the grave, and she should have laid down upon it and died, and no one would have been able to remove her till she was dead. As it was, she had taken much of the disorder inwardly, and felt that she should be very ill. I took her home, and was much grieved to hear, the next day, that she had had a miserable night. She continued ill for some days. Nothing remained on her stomach. With her food she brought up what appeared to be the skin of her throat and stomach; and her mouth and tongue, which were parched, and of a white colour, peeled off their skin in the same manner. Some time after this she accompanied me into the country, on a short visit to my family, and she was similarly affected on walking with me at the distance of a field's length from the church-yard. Whenever we walked in London, if we came near a body ready for interment, or if we passed the corrupting mass of a burial-ground, it mattered not, the same attacks seized her. At length, determined, if possible, to find a remedy for the evil, I one day put her to sleep and excited her organ of ideality, begging her to endeavour, by the use of her clairvoyance, to point out some means of overcoming the evil. After thinking some time, she told me a small bottle of mesmerized water carried in her pocket, or in her hand, would have the required effect, and would draw all the injurious influence into itself, and she should, for the time, remain unhurt. On trying the experiment, I was overjoyed to find it fully successful; and ever since have been careful to keep her constantly supplied with fresh phials of mesmerized water. Some other person has always to empty these phials, into the earth, at a distance from Jane; otherwise the bad influence escaping from the water would attack her: and if at any time another person should have touched these bottles, Jane can perceive it by the contents looking black instead of blue; and in this

it may here and there seem as if electricity alone, excited sometimes in one way sometimes in another, bore the greatest share, if it were not the whole basis, of the phenomena which are here detailed. The following results will show what is to be thought of this.

160. The first experiment was for the purpose of seeing what amount of sensibility for galvanism existed in the patients who are highly excitable by steel magnetism. It was undertaken with Miss Nowotny, in the presence of M. Baumgartner, the physicist. I brought in a zinc and copper element of about twelve square inches, between the members of which was placed a piece of linen, moistened with salt and water. The patient took in her hands two German-silver conductors, which were connected with the two electrodes by short copper wires. She did not experience the slightest sensation from the current thus conducted, although it gave a shock with the multiplier. She did

case their virtue, for her, is lost. She describes the appearance of this pernicious influence rising from the graves, more particularly of those recently buried, as looking like beautiful blue vapoury flames, rising to a great height; or like the mist of a waterfall, mixed with thousands of bright sparkling drops, but all blue. When this bad influence comes over her, she is seized with a violent cough, which lasts until she nearly or quite sinks with the exhaustion produced by it."

Here are materials for reflection on the force yielded by the chemism of dead organic matter. When will man be wise enough to dispose of the dead so that they may be extensively useful to the living! We must hope for good by the progress of intelligence among the masses. I can remember the time when gentlemen, students of anatomy, were obliged to risk their lives in exhumating bodies for dissection. Thirty-five years ago, I had the honour of putting my name, near that of the celebrated Lady Morgan, on a list proposed to be published by Professor Macartney, for the good of mankind, of those willing to cede their bodies for dissection, in order to oppose the ignorant superstition of the age. The glorious Reichenbach has, in this treatise, done good service against the vile demon of superstition.

not feel the sourish taste of the positive conductor on her tongue more strongly or differently from us who were healthy. I tried Miss Sturmann with a soldered zinc and copper element of nearly four square inches. She found little difference between this element when I placed it between her moistened fingers, and separate pieces of copper or zinc; at most the metals seemed a little stronger then, but hardly decidedly so. Miss Atzmannsdorfer did not feel a similar element, taken in her moistened fingers, any more strongly. Miss Maix could just distinguish the zinc of the element when she held it in her fingers, moistened with salt and water, from free zinc, but this little with no certainty. A large square element of twelve inches on a side she found little stronger, even when her fingers were wetted with a saline solution. Miss Reichel found this reaction just the same as her predecessors; she experienced no observable influence from the union of the zinc and copper into one element, whether this were large or small, her fingers wetted with water, or a saline solution. The current produced in a single element, after the subtraction of the obstacles to the passage, and with the little tension it has, is indeed very weak; but if the reagent in which it has to act be in a high degree sensible, it is fully sufficient to produce effects. It makes the nerves of frogs contract, diverts the needle, decomposes weak iodide of potassium, &c., and therefore we were led to expect that it would act perceptibly to the feelings upon the nerves of the sensitive.

161. Yet it follows from these experiments, carried out with every care, in every case frequently repeated, all instituted on highly sensitive persons, and all responded to in the same way,—*that a weak hydro-electric current in itself does not act observably more powerfully on sick persons, even when they possess a very high degree of excitability by the slightest magnetism, than upon the healthy.* This, therefore, proves conversely that it cannot be galvanism, for

which exists in them the exalted sensitiveness which we have become acquainted with.

162. Compound circuits, of course, acted more strongly upon them. I brought a little pile of soldered zinc and copper elements, almost four inches square, to Miss Nowotny. The intermediate layers were of felted cloth, moistened with solution of common salt. The zinc surfaces were not very clean, and I let this be so on purpose, so as to retain power over slighter modifications of the strength of the current. I piled up ten pairs before she and others perceived anything at all from it. At fifteen elements she began to trace a little effect, but some of the most excitable of the healthy spectators also already found it. With twenty pairs the tremulous motion from the discharge reached from both hands to the elbows, while I could now feel it myself the length of my finger. Other girls present felt the shock beyond the wrist. Miss Nowotny was, indeed, the most sensitive among us, but did not exceed the usual greater excitability of other healthy persons. With Miss Maix I arranged a pile of nine of the same elements. The result was about the same as the last. The zinc plates were made somewhat cleaner this time; she therefore felt the nine pairs about as strongly as her predecessor had felt the twenty; but healthy persons felt them almost as strongly. A certain degree of increased irritability must be attributed to the general diseased condition, dependent, not upon the sensitiveness, but upon sensibility. With Miss Reichel I tried from two to fifteen elements, in different stages of her disease, on occasions several months apart, in July, September, and November. She did not feel a few elements at all; with from fifteen to twenty she perceived the effect so little, that she never mentioned it when discharges passed through her accidentally, in the course of the operations on the pile; forty to fifty pairs she felt vividly, but she regarded it as sport to take shocks from them when others hesitated to venture. And

subsequently, neither on the days mentioned nor on any others, were any results to be observed. Miss Atzmannsdorfer felt no difference between a zinc-copper element, held in her fingers, wetted with a saline solution, and a piece of one of these metals taken by itself; she found the reaction of the copper warmish, that of the zinc rather cooling, but without other notable effect. I applied to her feet three, then sixteen elements, in a circuit. She perceived the electric current just like healthy persons; at length she detected that with the increase of the number of elements the zinc began to act more coolingly, the copper with more heat, upon her fingers. This was the first trace of the excitement of crystallic forces by the voltaic element.

163. When Miss Reichel allowed the current from fifty elements to pass continuously through her for some time, holding the polar wires in her two hands, the sensations from it increased gradually in strength, becoming felt on the one hand in the head, and on the other extending to the knees; but this was the first character of galvanic action upon her, which necessarily presented itself after a certain time, since a persistent current brings with it as a consequence direct magnetic motion. It was therefore not galvanism alone acting directly here, but because by its entrance it according to known laws converted the conductor more or less into a magnet, which was here the tranverse axis of the patient herself; namely, the path from one hand, through the arms and breast, to the other.

164. When I had recourse to the electrical machine, and let frictional electricity strike upon her from the conductor, it amused her; she drew dozens of sparks from it for mere pleasure; no special sensation presented itself distinguishable from those of healthy persons. Subsequently, electric shocks were ordered her by her physician, to be delivered at the nape of the neck, and carried along the spine. I undertook to provide this rough medicament. In accordance

with the prescription, I charged to saturation a Leyden jar having about a square foot of coating, and gave her daily eight such shocks, which were not pleasant to sustain. But she did not find anything different in them from what we others should have experienced.

165. The conclusion which I believe these experiments to warrant is, that *an electric discharge, carried through the body, either from the voltaic pile, the conductor, or the Leyden jar, passes over too quickly to allow it to set in perceptible motion the force which prevails in human beings, as in crystals; agreeing perfectly with well-known analogous electrical effects.*

166. However, it will immediately appear that we may by no means deduce from this the conclusion that all other kinds of electrical operations are as ineffectual as the shock or the discharge from a weak pile. When I placed in the patient's hands a thick copper wire connected with a weak pile, and allowed her to become accustomed to it, then completed the circuit with this wire, so that the whole current was made to pass through her, without by any means penetrating into the substance of the hand, she at once felt apparent heat—*i. e.*, crystallic force—increase in the wire. The hand was in this case in immediate contact with conducting wire, and the latter was so thick, one-twelfth of an inch, that real heating of it was out of the question.

Since, however, the hydro-electric circuit is a complication of chemical, magnetic, and electrical activity, and thus no instructive conclusions could be expected from it here, I directed the observations to frictional electricity, and made the patient enclose a discharging wire from the conductor with her hand, in such a manner that she did not actually touch the metal, but that this passed freely through her half-closed hand. As soon as I set the glass plate in motion, she had the sensation of a warm atmosphere around the wire, which she clearly distinguished from the well-known *aura*.

167. I pass over the experiments on conduction, accumulation, polarization, &c., which are all involved in the following, and hasten to the phenomena of light. I placed Miss Reichel on the darkened staircase, gave a brass wire six yards long into her hand, the point being held free. The rest of it lay on the ground, passing through the door, and ending at the conductor. The machine worked so weakly, that only sparks about half a finger's breadth long could be drawn from the conductor. Soon after the first revolutions of the plate, a slender column of flame ascended from the end of the wire, such as we have already met with in other similar circumstances, ten inches high, about the thickness of one's thumb below, and running up to a very fine point. When I turned the plate rapidly, of which the patient on the staircase could not be aware, the flame rose higher, and sank again as often as I ceased. The point of wire had no visible trace whatever of an electric brush to healthy eyes, which of course was rendered impossible by the many points of delivery that occurred along the wire. As often as I ceased to move the machine, the flame on the wire endured of the same form for more than a minute, and then first began to diminish slowly. An action therefore took place here which did not agree in any way with the known phenomena of an electrified wire. Every repetition, at different times and with change of the wires, always reproduced the same phenomenon.

168. Instead of fastening the wire on to the conductor, I detached it, and applied to the same end of it a hollow polished ball two inches in diameter. I took hold of this by the wire, and approached it to within two inches, sideways, of the electrified conductor, the sparks of which only equalled a tenth part of this distance in length. The ball was therefore placed in the electrical atmosphere of the conductor as soon as the machine was turned, but remained unisolated in my hand. A full minute elapsed before the

observer shut up in the dark perceived an alteration at the end of the wire which she held in her hand; then, however, the flame began slowly to rise before her, above a span in height, and I turned the plate of the machine for four minutes before it, by degrees, reached its maximum, at which it there uniformly maintained itself. When the machine was now stopped and the ball removed out of the sphere of its action, the flame again remained for more than a minute of unaltered size, and then began to disappear, which it did completely within several minutes.

169. I modified this experiment by removing the brass ball to a greater distance from the conductor. I now held it eight inches above the conductor. The observer described the phenomena in the same order and intervals of time; the flame in her hand was now even somewhat larger. I then held the brass ball at a distance of forty inches from the conductor, laterally. The phenomena actually recurred in the same space of time, and only changed in that the flame was now about one-fourth shorter. Finally, I removed the ball eighty inches (more than a fathom) from the conductor, but again, after a pause of two minutes, the flame at the end of the wire on the staircase rose up, increased for five minutes, and when the machine was stopped slowly sunk away in the course of several minutes. This time, however, it only attained half the size.

170. I placed the ball firmly upon the conductor, so that it was no longer in the electrical atmosphere, but directly received positive electricity: under these conditions the same phenomena presented themselves, but now in less than half a minute, instead of not for two minutes. The duration of its increase, however, and the slowness of its subsequent dying away, remained the same as before. When any one touched the conductor with the finger, or took hold of the brass ball itself, during this, the size of the flame was not obviously altered; it came, went, and vanished in the

same times, and with no perceptible difference of size. But when, instead of this, I placed the ball so near to the conductor that a rapid succession of sparks passed over to it, the effect was not produced; the observer felt the successive shocks in her hand at the passage of the sparks, but perceived no flame at the end of the wire. The rapidity of the electrical action was so great that the flaming principle, more sluggish than it, was not set in motion. Finally, I repeated all these experiments with negative electricity, the apparatus being in connection with the isolated cushion, which, however, was connected with the earth. There was, however, little, or rather no distinction in the results, on the darkened staircase. In all these experiments not a word was spoken; the observer, who sat in darkness, was separated from me by a wall, and knew nothing of all the various modifications and repetitions, did nothing but call out, from time to time, like a clock, so loud that it could be heard through the closed door, the changes as she saw them originate, endure, and pass away, on the wire. So that there could be no question of any kind of deception here,—on the contrary, this exact coincidence of the phenomena with the experiments and the theory, was an expressive evidence of the correctness of all the operations.

171. These experiments speak so clearly that I shall pass over the enumeration of a number of others. I have only to add, that all those slender flames which presented themselves in the darkness diffused coolness. When the sensitive girl was near the electrical machine, the positive charge of the brass conductor gave her a feeling of heat; but when she stood some paces distant from it she always experienced coolness. I shall be able to clear up the cause of this distinction in the succeeding treatises.

172. I afterwards brought over the conductor a tin electrophorus plate of about a foot in diameter, on a wooden handle, in such a manner that it was placed, at a distance,

in the atmosphere of the conductor for about a minute. When, having first touched it freely with a wet finger, I brought it near the face of Miss Reichel, she felt coolness issue from it strongly and for several minutes, which seems to confirm, in a different way, the experiments of the preceding article. I did the same also with an isolated body; I suspended the often-mentioned German-silver conductor over the conductor of the machine, by a silk band; its effect, when brought near the face of the patient, was, as might have been foreseen, exactly the same as that of the unisolated tin plate: as yet no isolator has been found for the crystallic force. Similar experiments were also made, with the same results, on Miss Atzmannsdorfer. The same unisolated tin plate was first brought near her face before having been placed in the electrical atmosphere. She felt it, as she did most metals, to emit heat. It was now held a hand's length above a weakly-charged conductor, and then touched for a moment with my wetted hand, so that if it should possibly have abstracted any trace of electricity this might thus be fully removed. When I now held it again before her face, I found that it had become remarkably cool, spreading cold around it.

173. In every case, therefore, in which electricity is excited to any permanent extent, that peculiar force appears which I am endeavouring to clear up in these essays, and *accordingly electricity presents the tenth source of it.*

RETROSPECT.

a. Chemism is a widely-comprehensive source of magnetic-like force, both when simple and when produced by combustion and the voltaic pile.

b. The slightest chemical action suffices to produce it abundantly, to charge the vicinity with it, to form polarities, produce light, &c.

c. The magnetic tub is nothing but a chemical operation.

d. Digestion and respiration, and the interchange of matters generally, as chemical processes, are the sources of the magnetic force which exists and acts in the human body.

e. The spectral luminous phenomena which have been observed over graves, but denied to exist by all healthy persons, are really of a purely chemical, physical nature, but can only be seen by highly sensitive eyes.

f. Electricity also is a source of the force which dwells in crystals, &c., both frictional electricity, positive and negative, and contact electricity.

g. Even the electrical atmosphere is capable of setting it in full motion at considerable distances.

SIXTH TREATISE.

THE MATERIAL WORLD IN GENERAL.

147. We have now seen the force we are investigating produced from ten different but always *particular* sources; we will now seek a more *universal* occurrence of it,—we will look for it in the whole material world, and seek to make out something of the great part which it plays in the wide totality of things.

175. Every one is aware that many persons exist on whom particular substances exert a peculiar, usually disagreeable effect, which often seems to border on the ridiculous. I will not speak here of the strange things to which instinct urges pregnant woman. But when we find people who cannot bear to touch skins, others who cannot bear to see feathers,—nay, such as cannot endure the sight of butter, &c., this *may* be regarded simply as a result of defective education; but experience shows that definite antipathies of this kind recur in exactly the same form, and against the same objects, in different persons, and in the most distant countries. This proves that they are by no means always outbreaks of a want of good breeding, but that some equally definite cause, be it of objective or subjective nature, must often lie at the bottom, and that when it occurs it must not be chidingly reproved, but frequently deserves that its origin should be investigated and taken into account.

More accurate observation shows that these strange antipathies, often expressed in a very active manner, present themselves most frequently in those persons who, to outward appearance healthy, are more or less sensitive, and that the

degree of their strength and variety increases in proportion as the persons are more diseased, and subject to nervous complaints, spasms, and similar affections. This is so much the case in Miss Sturmann, for example, that sometimes she cannot take hold of a key or bolt of a door, without her fingers being seized with cramps; while, at the same time, she nevertheless walks about the house, garden, or even in the streets, like a healthy person.

In the course of my numerous investigations on highly sensitive persons, I soon became aware that these antipathies had some points in common, that some agreement was to be found, the further tracing and comparison of which could not but afford hope of discovering some relation of cause and effect in the phenomena, and thus possibly supplying the means of penetrating the common, deeper-lying natural cause. I found that certain definite sensations always returned, and that when the feelings of the patients were clearly made out and distinguished by similar names, their apparent multiplicity might be traced back to a few which were continually recurring. And these few I soon found to obey settled rules. They consisted of feelings of apparent heat or cold received from various substances of exactly equal temperature; of more or less decidedly pleasant or disagreeable character, increasing so far as to the production of convulsions, of sensations of pricking, throbbing, or drawing, affecting the skin and extremities, and of painless tonic spasms. In the second of these treatises, where I have explained the character of the force of crystals, I have already pointed out that in the case of Miss Nowotny, the last phenomena, the painless tonic spasms, were produced by the emanations of the poles of the axes of crystallized bodies, and that the capacity for producing this effect was imparted in different degrees of strength to different bodies, but was never wanting in those which are capable of forming free crystals, whether they consist of a simple or any ever so