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Experiments with living human beings

EXPERIMENTS

WITH

LIVING HUMAN BEINGS.

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I.

MR. JOHN STUART MILL, in the preface to his work on "Logic and the Principles of Evidence," observes that while in the search for truth we may be able, in some cases, to avoid errors instinctively and successfully, although unable to formulate the method by which we do so, yet it is an advantage not to be dispensed with to have a rational understanding of the philosophy of reasoning, so that we shall not be forced to depend alone on blind and irregular instinct.

In experimenting with *living* human beings there are *six* sources of errors which instinctively physiologists and physicians sometimes guard against and allow for, but which ought to be and can be, as I contend, and shall here aim to prove, reduced to a positive science. As these elements of error come in the main from the nervous system, their study belongs preëminently to neurology, or the study of the nervous system in health and disease; and it is because of the backwardness of this specialty that the subject has been thus far passed by.

The deficiencies of our knowledge of this subject were forced on

¹ An abstract of a portion of this paper was read before the American Neurological Association at New York, June, 1878. This essay relates to questions suggested in my series of papers on "The Scientific Study of Human Testimony," published in the May, June, and July (1878) numbers of the "Monthly," and may be of service to those who are interested in that subject. This department of science is of especial interest at the present time, when the experiments of Charcot and the criticisms upon them are exciting so much attention.

my attention several years ago, when I was engaged in the study of the physiology of mind-reading, and making experiments in mental therapeutics ; and in essays published on those topics I briefly noted these errors, which I was obliged to study out, and without any theoretical guide or precedent. I found that the whole matter—the importance and interest of which were of the very highest, practically as well as scientifically—was as unexplored as central Africa, and that it was necessary to hew one's way clear of infinite obstructions at every step.

From the elevation of this subject to a positive science these three practical benefits must flow :

1. The world will be spared the reports of such experiments as those of the physician who examined into the condition of the hysterical girls that were the cause of the Salem witchcraft epidemic, and of the committees of the French Academy, of Gregory and of Elliotson and others, with clairvoyance and mesmeric trance ; of Crookes with Home, of Wallace and Zöllner with Slade, and, latest of all, of Parkhurst and others with Mollie Fancher ; of Charcot, Westphal, and their coadjutors with metalloscopy and metal-therapeutics ; and will at the same time be able to reach the solid truth that lies behind all such accredited phenomena. These experiments and these reports are often made by strong and earnest men ; indeed, the abler the experimenter in the present state of the subject, the worse his experiments and his reports of these experiments : instead of arriving at the truth of many questions of physiology, we get farther and farther from it the more we study them.

2. There will be more precision to all our investigations in regard to the action of remedies, and especially of new remedies. At the present time we know not whether to believe or reject any report of the virtues of any new medicine or mode of treatment, however high the authority for the reports, for we feel instinctively the elements of error which those who introduce new remedies and modes of treatment ought to know, and in time will know and rationally provide for.

3. Men of narrow or but limited ability will be able to attain accurate results in experimenting with living human beings where now the strongest scientific geniuses of the world are every day failing abjectly and humiliatingly. Sir William Hamilton, in his work on "Logic," remarks most truly that the proud boast of Bacon that, by the system of inductive philosophy, it would be possible for ordinary men to make discoveries in science, has been strictly fulfilled : every day under the light of the inductive method very commonplace minds are finding new and important facts that go to swell the current of science. Genius of the first order is rare, and in every field of knowledge the details of cultivation must be worked out by the average man ; the bulk of the work is done, always has been done, and probably always will be done, by talent rather than by genius.

The elements of error in experimenting with *inanimate* objects were indicated, in a general way, by Bacon, under the strange headings "Idols of the Tribe," "Of the Den," "Of the Forum," "Of the Theatre"; and later writers on evidence and the principles of science have repeated or assumed the Baconian formulas; but the special elements of error in experimenting with *living* human beings have escaped conscious and exhaustive analysis. To have formulated these elements of error much sooner than the present time would have been quite impossible, for our knowledge of the involuntary life—one of the most important factors—was far too limited.

The science and art of experimenting with living human beings is indeed now in precisely the same state as the general philosophy of induction prior to the time of Bacon. Before the era of the Baconian philosophy, indeed in all eras, men had *instinctively* employed the inductive method, but the principles of that method had never been formulated; consequently, when philosophers reasoned or attempted to reason on the subject, they almost always went wrong. The philosophy of Bacon applies only to *inanimate* nature; of the art of seeking truth through experiments on *living* human beings—of the *six* sources of error in all such experiments and the means of guarding against them—he knew nothing, and evidently suspected nothing; and that branch of philosophy—of such vast import in biological investigations—has remained to this day unstudied and almost unthought of; hence, although some experimenters are saved through their instincts, others—and those the very ablest scientific geniuses of the age—never attempt to reason on the subject without falling into serious error.

In experimenting with living human beings there are, as above stated, just *six* sources of error, all of which are to be recognized and systematically and, if possible, also simultaneously guarded against if our results are to command the confidence and homage of science. To be guilty of overlooking, in any research, even one of these six possibilities of error, is to be guilty of overlooking all, and practically to vitiate all the results of our labors.

These six sources of error are as follows:

FIRST SOURCE OF ERROR: *The phenomena of the involuntary life in both the experimenter and the subject experimented on.*—Under this head are embraced trance, with all its manifold symptoms, and all the interactions of mind and body that are below the plane of volition or of consciousness or of both. Without a knowledge of this side of physiology, scientific experimenting with living human beings is impossible. It is a want of this knowledge that makes most of the experiments of scientific men in this department during the past century so unsatisfactory and so ludicrous.

SECOND SOURCE OF ERROR: *Unconscious deception on the part of the subject experimented on.*—This unconscious deception comes

through the involuntary life—the mind of the subject acting on the body—and producing results which, it is to be noted, are as decided, as uniform, and as permanent as when produced by powerful objective influences. This element of error slips into all the ordinary experiments with new remedies and supposed new forces in the animal body, thus corrupting science at its very sources. The neglect of this element of error would of itself, even though all the other errors were guarded against, destroy entirely the scientific value of all such experiments, for example, as those of the committees of the French Academy with clairvoyants and mesmerism ; it is because physicians of experience instinctively feel this element of error, that reports of cases wrought by novel and strange and especially by imposing methods of treatment are so frequently discredited. Under this head come also all the so-styled miracles of healing, whatever may be the paraphernalia through which they are accomplished.

I know not where can be found a better single illustration of the effect of this element of error, alone of itself, in scientific research, when all the other elements of error seem to be provided for, than in the experiments on animal magnetism of the late Dr. J. K. Mitchell, as recorded in the volume of his miscellaneous writings. Dr. Mitchell was an original thinker, an observer of patience and care, and a clear and logical writer, who suggested more than he told, and his chapter on animal magnetism was incomparably the best essay ever written on that subject down to the date of its publication. This paper—which consisted of a record of independent, careful, and many times repeated experiments on living human beings, with remarks thereon—shows that the author not only had the courage and the power to do his own thinking and experimenting, but that he recognized some of the chances of error in experiments of this kind, and fortified himself against them ; while of the errors that enter through the doors of the involuntary life—the unconscious deception of the subject experimented on—he knew, and apparently suspected, little. His essay is therefore at once a model and a warning : a model for thoroughness and precision up to a certain point, or within a limited area ; a warning as demonstrating the worthlessness of all experiments with human beings when any one or two of the six sources of mistake are overlooked. So accurate and scientific were these experiments, in certain directions, that they have furnished an important contribution to our knowledge of some of the symptoms of mesmerism, in spite of the fact that the author failed, like hundreds of able men in science before him, to solve the problem of the nature of trance. By not understanding and taking into account the phenomena of the involuntary life, of which in his day very little was known, and of trance, of which nothing was known, this acute and philosophic observer allowed the subjects on whom he operated to constantly deceive themselves and deceive him, and to drive him to the logical but absolutely false conclusion that the mesmeric trance was an

objective state induced by a supposed fluid, or force, or influence, then and now known as animal magnetism.

In order to be able always to guard effectively and absolutely against these two sources of error that I have thus far specified, just two things are necessary for the experimenter :

1. A general knowledge of the phenomena of the involuntary life, including both the action of mind on body and of body on mind, in health and in disease, and especially of the real nature and philosophy of trance, the state in which the involuntary life culminates.

2. The subject experimented on must always be *deceived* in the experiments in such a way that this involuntary action of his mind or body can not come in and destroy the experiment. The subject may be successfully deceived in three different ways, which I shall presently specify.

Burq, Charcot, Westphal, and their coadjutors in the now well-known metalloscopy experiments, failed on both of these points. Many of the critics of those experiments, as Althaus, Reynolds, and other physicians in England, also failed to comprehend these points, hence the inconsistency and unsatisfactoriness of the discussions to which these experiments gave rise. The claim of Burq and Charcot and Westphal in regard to the temporary relief of hysterical and sometimes of organic anæsthesia by the local application of metals might be entirely true, but thus far they have failed, in a scientific sense, to prove it to be true. I do not deny their results—indeed, there is a possibility that some of them may be genuine—although in my own experience with the same method I fail to confirm their claims ; it is in the manner in which the experiments were conducted, without regard to the results, that the non-expertness of these experimenters appeared. The criticism I have to make on Charcot is that, in his elaborate lectures on this subject, he nowhere gives evidence of a full appreciation of the power of the involuntary life, particularly in hysterical conditions, or of the true and only method of systematically and successfully guarding against it. The experiments now going on under the same superintendence in the hospital of Salpêtrière with mesmeric trance, and with the effects of magnets and lights on catalepsy and kindred conditions, are all open to the same criticism.

If some savage fresh from the jungles were put on board of an engine, and told how to open the valves, he might very naturally infer that his own feeble strength caused the train to move ; in like manner, scientific experimenters with living human beings attribute the phenomena that follow the application of metals and magnets and passes and flummeries solely to the objective influence of these appliances, whereas in truth these and similar performances but serve to let on the potent forces of the subject's own mind. The mistake of these philosophers is indeed quite analogous to that of the little boy who,

when placed on the front seat of the carriage, pleases himself with the fancy that he is guiding the horse, when all the time his strong father behind him is quietly holding and pulling the reins. In all experiments with living human beings, as in the special branch that we call therapeutics, it is oftentimes not what we do, but *how* we do it, that determines the results.

As regards this first point—the action of mind on body—I may say that, by a series of experiments not yet published, but a brief abstract of which has been twice presented to this Association, it has been proved that, by properly turning the mind of the patient on his body, through excitations of the emotions of wonder and special expectation, it is possible not only to relieve for the time various functional diseases, but in many instances to *perfectly* and *permanently* cure them; and it was also shown that *organic* or *structural* diseases may be relieved in the same way, in some cases, more satisfactorily than by any objective medical treatment whatever. The method by which the emotions are to be acted upon for the purposes of mental therapeutics are now so far organized into a science that any one who will make himself practically familiar with the subject can obtain the same results. The first mistake of Charcot and his coadjutors in France, and his followers in England and in Germany, was in assuming that such effects as the orderly, uniform reappearance of the sense of the different colors in hysterical women, and the symmetrical transference of sensory phenomena from one side of the body to the other, under the local application of metallic disks in hemianæsthesia, could not be produced *subjectively* by the mind of the patient. Such an assumption would never have been made by any one who had performed or witnessed the experiments in mental therapeutics of which I have spoken; for, again and again, not only in hysteria, but in other forms of disease, and in conditions not distinctively nervous, I have obtained results which, in definiteness, in quantity, and in permanence, are far more imposing, proving beyond question that, when all the sources of error were considered and provided for, the results were entirely independent of any objective power in the means employed—were, in short, subjective purely; applications of metals, or wood, or paper, or no applications at all, provided the subject expected them, being equally effective.

Science is not a matter of opinion; its very essence is demonstration; and the question whether, in any given experiments, the results are subjective or objective, can be brought entirely out of all discussion and all opinion, provided the elements of error are understood and avoided. Indeed, all discussion in scientific matters must be, in logical strictness, unscientific: if we know anything, there may be need for statement, of explanation, of illustration, but none for discussion; if we do not know, the course of wisdom is to keep silence until we do. With the formulated six sources of error before them, and the methods of protecting themselves against them, the experiments of Charcot

would never have been discussed, even for a moment, in any scientific body.

The *three* methods of deceiving the subject by which alone the element of error from mind acting on body can be eliminated, and the results of experiments with living human beings transferred from the realm of opinion to science or positive knowledge, are these :

1. By doing something when the subject experimented on believes that we are doing nothing.
2. By doing nothing when the subject believes that we are doing something.
3. By doing something different from what the subject believes is being done.

In experiments of importance, as where radical and overwhelming discoveries in science are claimed to be made, *all* of these methods of deceiving should be used ; and it is because they are not used in the experiments of scientific men that we are constantly compelled to face and listen to the claims of "animal magnetism," of "odic force," of "spiritism," of "cundurango," of "blue glass," and, during the past year, of "Mollie Fancher," of "metalloscopy," and "metal-therapeutics."

A classical example of one method of deception in experiments of this character was afforded by the *exposé* of the performances of mesmerized or professedly mesmerized girls by Mr. Wakley, of the London "Lancet." A good example of neglect of this deception, as well as of ignorance of the relation of mind to body, is found in the experiments of Dr. Vansant with magnets, as published by him a few years ago. This writer gives an immense number of differential symptoms that, as he claims, are produced by the north and south poles of the magnet ; his experiments were in the same line with the famous Perkins tractors, though apparently more scientific ; the same criticism applies to the researches that are now being made in the Salpêtrière Hospital in Paris, where, according to the testimony of experts who have witnessed them, and the statements of the experimenters themselves, no systematic deception is employed or even suggested.

That even the strongest leaders in physiology are not fully armed against the errors that beset experimental research, when living human beings are the subjects, is shown in the not long ago published Lowell Lectures of Professor Brown-Séguard, wherein that master in experimental study through the processes of vivisection declares that the claims of telling of time through the back of the head are authentic. Deductive reasoning for ever disproves this claim, which any inductive research, properly conducted, must always confirm ; but any test to be of value must, at every step, shut out absolutely all the six avenues of error ; and the report of any test, in order to be worth reading, must clearly state and show that all such errors were so excluded.

Experiments in physics are likewise, in some instances, complicated with experiments with living human beings. Thus in the "Keely motor" and "Winter motor" claims, and in other like devices for the overthrow of the law of the conservation of energy, the apparatus for generating power was in the hands of interested non-experts, who might be capable of either willful or self-deception—for the purposes of science it matters not which—and no satisfactory experiment could be made unless these possibilities of error could be eliminated.

The temporary success of cundurango was almost entirely the result of self-deception of those who, under the mingled emotions of hope, despair, and expectation, availed themselves of it. It is impossible to introduce any drug or system of treatment for cancer, or any other grave disorder, amid great pomp and noise, and under the patronage of honored names, without at least relieving, for the time, a certain proportion of cases; and practically it is of little import what the drug or remedy may be, if only the confidence of the sufferers is assured.

Men not only of general but of special experimental ability are constantly going far out of the way in scientific research through want of simple knowledge of the laws and phenomena of the involuntary life—a branch of physiology which, though of extreme interest and overflowing in suggestion, is so young and recent in its development that it is not yet taught in colleges or schools. The published monographs of the late Mr. Braid, of Manchester, show indisputably that their author was not without a certain genius for scientific research; but in all his philosophizing on the effects of fixed attention and straining of the eyes in the production of what has been known as hypnotism he missed utterly the discovery, or even the suspicion, of the great fact that trance, of which hypnotism is but one of numberless phases, was a subjective not an objective condition—existing in the subject's own brain—and that the manœuvres by which he was wont to excite it were but one of infinite devices for acting upon the mind; thus Mr. Braid failed to solve the problem of trance. Similarly Professor Czermak—one of the inventors of the laryngoscope—though he made many experiments in the production of hypnotism in animals, likewise confounded the subjective with the objective, and did not arrive at the true explanation of his own experiments. Indeed, from the time of Mesmer down, all or nearly all the scientific studies and attempted scientific studies of trance, in any of its multiform phases, have been made valueless by this same non-recognition of the involuntary life, of which trance is the extreme expression. Confounding the subjective with the objective vitiates nearly all human philosophy.

Similarly Mr. Edison, in his experiments with those highly interesting phenomena that he supposes to indicate a new force, was so far misled by the muscular contractions of the tongue when applied to a block of iron, through which the suspected force was passing, as to conclude that an objective influence was acting, whereas, after the ele-

ment of error from the expectation of the experimenter was eliminated, it was quickly shown that the contractions were entirely subjective. Mr. Edison, I may say, is not only an inventor of phenomenal genius, but likewise a skilled and practiced experimentalist, and, as I found when making these and similar investigations with him, extraordinarily fertile in resources of method and device for wresting the secrets from nature, and usually alert against subtle sources of error; but, when drawn into the province of the involuntary life, he found himself, like men of science in general, insufficiently equipped with knowledge to even surmise, not to say provide for, the errors that may arise from the unconscious or involuntary action of mind on body.

In some instances the reverse mistake is made, and phenomena of the involuntary life are supposed to be volitional. In the case of the "Maine jumpers" or so-called "jumping Frenchmen" of Canada and the Maine woods—the incredible performances of which I have elsewhere described—it had for years been assumed, both by men of science and by the laity, that the movements were intentional, and within control. This conclusion, though most erroneous, was quite a natural one for those who have no knowledge of the relation of mind to its physical substratum.

An illustration of the second method of deception—doing nothing when the subject supposes we are doing something—is professing to apply electricity, putting the electrodes in position, and going through the motions, when no current is running, or when the connection is broken; in this way I have several times proved that patients were mistaken in inferring that electrical applications injured them; and, conversely, I have been able in one striking case to prove that the patient was right, and that a certain symptom was temporarily aggravated by the application.

THIRD SOURCE OF ERROR: *Intentional deception on the part of the subject.*—This element of error is so obvious that it would seem to be quite needless to refer to it; and yet it is constantly overlooked even in researches conducted by physiologists. To assume, as is often or usually done, that the subject on whom the experiment is made is honest in his relation to that experiment, because he has a general character for honesty, is always unscientific; and all experiments where such assumption is made must be ruled out of science.

Intentional as well as unintentional deception on the part of the subject can only be scientifically met by deception on the part of the experimenter. The methods of deceiving already described suffice to guard against all deception on the part of the subject, whether intentional or unintentional.

It is clear proof of the non-expertness of Zöllner, Wallace, Charcot, and Westphal, that in their published accounts of experiments with living human beings they assumed that, if the subjects were honest, the

results of the experiments must be accepted by science. Scientifically it makes no difference whether the subject on whom any such experiment is performed is honest or dishonest; the experiments are to be made without any reference to the moral character of the subject.

FOURTH SOURCE OF ERROR: *Unintentional collusion of third parties.*—By third parties are meant audiences, witnesses, bystanders, or assistants seen or unseen.

The best illustration of error from this source is the aid which audiences in the mind-reading experiments give to the performer by their silence, when he wanders away from the object looked for, and by their murmurs and applause when he approaches or reaches it. This is quite analogous to the cry of "hot" or "cold" in the game of "blind-man's-buff." So natural is it for errors from this cause to enter these investigations that I found it necessary, in all my researches in that department, to send all witnesses from the room, or to insist on their being absolutely silent, and even motionless, at every stage of the experiments.

FIFTH SOURCE OF ERROR: *Intentional collusion of third parties.*—Under this head comes the aid which assistants, known or unknown, *designedly* give to the subject experimented on. This, in the abstract, is one of the more readily suspected of all the six sources of error, but in the concrete very difficult to guard against, or even to detect, as is so brilliantly illustrated in the conjuring tricks of Houdin and Heller, and, it may be added also, in the operations of so-called "confidence-men."

The best and most mystifying tricks of illusionists, and sleight-of-hand performers of all kinds, are almost always done through some form of collusion, the time and method of which are so artfully arranged that only those of unusual acuteness or expert skill can at once detect them. The astounding success of clairvoyants and mediums in telling people what they already know, but which they suppose can not be known to the witch they are consulting, is oftentimes explained by this fifth source of error.

Intentional, deliberate deception, where no money is to be gained by deception, is much more common among the better classes than those who have not specially studied this subject would be willing to believe: it is an instructive fact in the psychology of lying, that some persons—usually, though not always, women—whose general character is of the highest, are in some special direction absolutely systematically untruthful all their lives long. An old merchant of New York once told me that a clerk in his employ, trustworthy in all business affairs, exact, scrupulous, just, had a habit of telling large stories in regard to what he had seen and done so firmly fixed that it was organically impossible for him to restrict himself to the facts, and that his statements in regard to matters outside of business were worthy of absolutely no credence.

I was once requested by a valued medical friend to aid him in some experiments with a case of alleged sixth sense, or the asserted power of

reading without the use of the eyes. The subject who made the claim was a lady of education, culture, and social position, universally and justly respected. In answer to the request, I stated that by deductive reasoning it was established as firmly as the Copernican theory, or the law of the persistence of force, that no human creature could have any such power, and that therefore it would be unscientific to investigate any such claim ; but as an amusement, and for the sake of determining whether the deception was intentional or unintentional, I would suggest and prepare some tests in which all the six sources of error would be excluded. This was done. The tests were of course not taken, but the result of the investigation was to demonstrate the interesting psychological fact that for years a graceful and agreeable lady had been deceiving not only strangers and friends, but even her own husband, by means of the very old and familiar "ballot-trick," and a not especially adroit method of performing it. The puzzling cases of starving girls, of invalid clairvoyants, of mediumship, that are constantly infesting and astonishing civilized society, are in many instances to be similarly explained. The "mind-readers" were originally self-deceived, since the physiological interpretation of that phenomenon is too complex and profound to be suggested, not to say comprehended, by the mass of those who are accustomed to practice that art. But at the present time the public performers probably understand, in a general way, the philosophy of their success, at least enough to know that their claims of a sixth sense are baseless.

Lying, like stealing, may become a passion, and, in like manner also, may concentrate all its force in some one direction, for folly as well as wisdom has its specialties and hobbies : there is a monomania for deceiving, where naught is gained save its own gratification ; one who is in all other directions honorable and just may become an inebriate of falsifying, and be half his days intoxicated thereby.

II.

IN experimenting with living human beings, deception, whether voluntary or involuntary, can only be scientifically met by deception ; it must be beaten with its own weapons. No experiment of this kind in which the results depend in any way on the honesty of the subjects experimented on can be of any value in science ; and those who assume that, because the subjects of these experiments are members of great churches, and move in high society, they are therefore incapable of untruth, would do well to resign the task of investigations of this sort to those who are better endowed with the scientific sense. *Systematic, orderly, exhaustive deception*, on the part of the experimenter, as here

suggested, will, in all cases, exclude both intended and unintended deception on the part of the subject or bystanders.

SIXTH SOURCE OF ERROR: *Chance and coincidences*.—The subject of chance and coincidences seems never to have received the attention from men of science that its direct and practical bearings on experimental research and the principles of evidence would long ago have demanded. On the mathematical side the philosophy of chance has been investigated and discussed by various writers, and with not a little intelligence and skill; but with the effect also of misleading many amateur experimenters and reasoners, who have thereby been tempted to employ mathematical estimates in departments of science where they are sure to guide into error. No forms of error are so erroneous as those that have the appearance without the reality of mathematical precision. Of this sort are the blunders of those physiologists who, at various times and under various guises, have sought to solve physiological problems by experiments half built up on rigid mathematical calculations, the other half having no foundation at all; for the average non-expert observer is awed and overpowered by the very sight of figures, and assumes that an investigation into which addition, subtraction, and multiplication enter must inevitably lead to precise and unerring results, forgetting that, as quantitative truth is of all forms of truth the most absolute and satisfying, so quantitative error is of all forms of error the most complete and illusory. Figures, to be of any value in science, must go all around the subject and thoroughly embrace it, else they fail to master it and become its possessor: for, while the truth is apparently shut in on one side, it is all the time stealthily escaping at the other. Thus it is that the most acute calculators, most logical reasoners, and most accurate observers as well, are so often cheated out of the truths to the search for which their lives are devoted; the instincts of the plow-boy often outstripping the wisdom of the philosopher.

Among this class of scientific blunders is the custom of applying the calculations of chances to experiments with living human beings. Thus in the now well-known mind-reading performances it was averred that by a mathematical calculation there would be but one chance in several hundred thousand of finding any object in a house or hall or assemblage; hence it was inferred that a new force, or manifestation of force, had been revealed to the world. The fallacies in this philosophy do not require a very long search; of the many objects in any house, or indeed in any public building, but a small minority would be accessible in any mind-reading test, and of these few only a limited number are of a sufficiently positive nature and description to be thought of by the subject of such experiments; then, in addition, are all the errors that come from intentional and unintentional assistance of audiences and bystanders.

Practically the only way to eliminate, in a scientific manner, the error of chance or coincidence in all experiments of that character, is by

making comparative experiments in the same line, with all the sources of error closed except chance, and to repeat these a sufficient number of times to make an absolute demonstration. In this way it was shown that *mind-reading*, so called, was really *muscle-reading*. In these and in all studies of like character it is to be recognized that coincidences of the most extraordinary and astonishing nature are liable to occur at any instant, and that they are as likely to occur on the first trial as on the last of a long series. To determine whether any conjunction of events is simple coincidence, or the result of some new fact or law in science, is possible oftentimes only through a series of comparative experiments. In the researches which I made in muscle-reading it was shown over and over that by pure chance alone—every other element of error being excluded—the blindfold subject would, under certain conditions, find the object looked for in one case and sometimes in two cases out of twelve.

It would seem that the errors from chance and coincidence were the most patent of all the errors that complicate and confound scientific investigation, and so clear even to the unskilled and unthinking mind, that trained investigators would never be deluded by them. But in practice it vitiates the research and the philosophizing of educated men, even more perhaps than any other of the six, excepting the involuntary action of mind on body which, as we have seen, has been the stone of stumbling for physiologists ever since physiology was introduced into science.

Hay-fever, for half a century and more, has supplied an unusual richness of material for false reasoning of a similar type. An English physician, a victim of this disorder, notices that he is worse as he crosses a field of grass, and concludes that at last he has found the one source of the mystery, and so gives the affection a misleading name which it can never lose; Helmholtz, a leader both in physics and physiology, puts the nasal secretions under the microscope, discovers some unexpected infusoria that are killed by quinine, and announces to the world in one breath a theory of the disease and a specific for its cure, without apparently suspecting, what is now known, that the presence of infusoria might be a coincidence or effect and not a cause.

To all this it may be said that practically we do find out the true value of medicines and their objective action on the human body without systematically eliminating any of the six elements of error here pointed out. This is to be allowed; but the admission of the fact requires also an explanation of the way in which these errors are in practice actually eliminated, although unintentionally and unsystematically, and I may say also, most unscientifically.

It is by an immense number of experiments or trials on a large variety of cases, at different times, by different observers, and under varying conditions, that medical science has been able, after centuries of doubt and struggle, to arrive at some few real scientific facts in regard to the action of medicines. If these six elements of error had, from the

first, been everywhere recognized and comprehended and systematically guarded against, the process of finding the truth in this department might have been abridged by hundreds of years. The method by which, in practice, physicians learn the action of any new remedy, is to give it to a number of cases, and then to watch and report the results ; another physician repeats the experiments on a different set of cases ; he also notes the results : and this process goes on perhaps for years, until in lapse of time the profession, without being able to give precise and convincing reasons for their faith, slowly and instinctively settles down to the persuasion that the effects claimed for the remedy are genuine, and act accordingly.

In many instances they are right in this conclusion ; but how awkwardly and in what a roundabout way, and through what useless and wearying toil, have they, in doubt and distrust and suspicion, finally reached that goal ! All the trials with the remedy, from beginning to end, have been impaired in scientific value by some one or all of the six elements of error ; but through the immensity and variety of the experiments, extending through a long period, these errors have been *unconsciously* and *unwittingly* eliminated, so that only the solid fact is left. This unconscious elimination or rather leaving behind of errors, after the analogy of the formation of the universe according to the nebular hypothesis, takes place in this manner : In the first hundred cases treated there will be perhaps one or two, or more, who have no faith in and no expectation from it, good or bad ; these few obtain the real objective effects of the remedy, while all the others deceive, more or less, themselves and their physician. In subsequent experiments by other observers, some of whom perhaps are less hopeful than the original investigator, the same unconscious and irregular elimination takes place, until the objective power of the remedy may for all practical needs be regarded as established. Such is the history and philosophy of medical experimentation in all ages and with all schools of medicine. I claim that by the rigid following out of the principles here taught it will be possible for even the humblest member of the profession to take any new remedy, and, if a sufficient number of cases be provided, to accurately determine some points at least of its therapeutic value, if it really possesses any that are capable of being demonstrated to the senses or reason of man. It is the unconscious or unformulated apprehension of these errors in the working up of remedies that causes so many of the profession to take at certain periods of their lives the extreme and unscientific view that all medication is a mistake—that drugs have no power outside of the mind of the one who takes them—and consequently, and logically, to trust only to the forces of nature and hygiene.

In relation to this branch of our theme, it is worthy of note that there are certain modes of treating disease which from the very nature and manner of their employment can not be experimented with in a truly scientific way ; it is impossible to use them so as to deceive the

patient on whom they are used; of necessity, therefore, they must be developed by the process of successive eliminations already described. Among the medical procedures of this class are hydro-therapeutics or hydropathy, electro-therapeutics, and massage, or systematized rubbing, kneading, and manipulation; none of these remedial operations can be used without the patient's knowledge; none of them can be used in a different way from what the patient supposes they are being used; they are open, in clear sight, and affect the various senses so strikingly that satisfactory deception is impossible; patients know when they are being galvanized or faradized; they know when they are washed or showered; they know when they are rubbed and kneaded; no art or device of the physician can avail to so deceive them as to absolutely eliminate the error that comes from the hope or fear or expectation of what the treatment is to accomplish. The practical value of these methods of treatment—and they are all of undoubted value—could only be ascertained, as it has been ascertained, by the immense variety of the experiments that have been made with them, wherein through the process of time the six sources of error have been little by little eliminated.

In all new remedies and systems of treatment the aim of the scientific physician should be to make the deception so thorough that whatever effects are obtained must be known positively to be the objective action of the treatment or of nature. The criticism which I make on Burq, Charcot, and others, who have recently experimented with the action of metals of different kinds on the anæsthesia of hysterical patients, is that they left the question open when, by a systematic, orderly, and thorough provision against these six sources of error, they had it in their power, with the vast material at their command, to have absolutely closed it; if they could not determine with certainty whether the temporary disappearance of the anæsthesia on the application of plates of copper or silver or gold was the result of feeble electrical currents excited, or of simple mechanical pressure, or of absorption, they could surely have answered, to the satisfaction of scientific men, the question whether it was to be explained subjectively or objectively; but this, through want of appreciation of the sources of error, or from want of a formula to guide them in their elimination, they failed to do. Even though it should be proved, as it may be, that some of these phenomena observed by Burq, and Charcot, and Westphal are objective, and independent of the expectation of the persons operated on, the validity of this criticism is thereby not at all affected. To attempt to build up a practice of metal-therapeutics on the basis of metalloscopy as that claim now stands, is like putting up a house before we are sure of our foundations. The first question to decide is whether metal-therapeutics is or is not really mental-therapeutics.

In the illustrations for this essay I have chosen, by preference, the experiments of scientific men of skill, honor, and distinction, and for

the same reason that Blair, in his work on rhetoric, refers, for examples of incorrectness, inelegance, and carelessness of style, only to the writings of the greatest masters of style in the language: if these things be done in the green trees, what shall be done in those that are utterly dry? The average scientist, the every-day physician, the followers, the gleaners and popularizers of knowledge, are expected to blunder and teach but half truths, if not positive error; but if all those who should be our experts fail us, where can we look for clear ideas? It is no overplus of enthusiasm, no fancy of rhetoric, to say that if these six sources of error and the true methods of providing for them had been mastered half a century ago, the history of scientific experimenting during that time would have been radically different from what it now is.

On this subject no nation can throw stones at another; in all the great centers of modern civilization the strongest leaders of science and scientific thought have been and are constantly demonstrating their non-expertness in the art of experimenting with living human beings; the history of science, or the demonstrably true, and the history of delusions, or the demonstrably false, run in the same channels; but in the minds of the French there appears to be some psychological peculiarity that, while it urges them to undertake, at the same time unfits them to succeed in researches of this character, their very genius for science, as it relates to inanimate nature and the lower forms of life, predisposing them to all error when dealing with living human creatures; hence the paradox of history that France is at once the home of science and the home of delusions. Now, for almost a century, the ablest philosophers and experimenters of France have been wrestling with the problem how to experiment with living human beings; from the first committee of the French Academy on mesmerism, through Perkinism and Burqism, down to the very latest bulletin of Charcot on metalloscopy, it is one uniform, unbroken record of persevering non-expertness and failure: Science constantly baffled, beaten, utterly overthrown, yet as often returning to the hopeless contest, where delusions always compel a drawn battle, if they do not positively win; experiments without number that have the form of precision without its substance; all truth, or even the suggestions of truth, submerged in vast floods of error; the faith that belongs to religion and emotion carried into the realm of science and intellect; all along the line of strong endeavor an obvious want not only of the philosophy but even of the instinct of seeking truth from living human beings—in the whole history of folly one shall not find a more instructive chapter than this; were there no other proof of the limitations of the human brain, sufficient could be found in this fruitless searching after truth on the part of the most intellectual leaders, of the most intellectual of nations, in the most intellectual era of the world. Not only during the past year, in the hospital of Salpêtrière, but, by recurring intervals, during the past century, the best science of France has been on its

knees before hysterical women, and there it must remain until it has mastered the true philosophy of trance and the involuntary life, and learned by heart the sources of error.

The time must come when it shall be well understood that experiments with living human beings, in which the elements of error are unrecognized, are not only unscientific but are a satire on science ; bearing the same relation to the true method of investigation in this special department of physiology that the dreams of the mediæval sages sustained to the general philosophy of induction. The philosophy of the future will be that the laws of nature are not to be put on the market, and can not be bid off at auction, and that the long-standing and unaccepted financial prize of the French Academy for the one who should prove to be endowed with clairvoyant or mind-reading power is as unscientific and as puerile as to attempt the bribery of the law of the conservation of force, or to hire the sun to rise in the west instead of the east.

During the past few years it has been my destiny to have been frequently requested to carry out or to plan for others various experimental researches with living human beings ; these requests have sometimes come from professional and scientific men who, in all dealings with inanimate objects, are amply competent, both by instinct and by reflection, to guard against all illusions and deceptions. It is my hope and belief that this formal attempt—ill perfected as it may be—will so reduce this subject to a science as to bring it within the power of all physiologists to plan and to complete all such experiments for themselves, with ample confidence that the results will invariably be in harmony with the truth. The above analysis, in spite of its necessary condensation, will, it is hoped, make clear even to those who do not follow all its details, that in this, as in every other realm of knowledge and acquirement, success need not be the result of any special acuteness, or cunning, or wisdom, but can be made the possession of any sober and well-trained mind that has a sufficient endowment of the scientific sense to recognize and submit to the inevitableness of law in all mental as in all physical phenomena, and to subordinate, even in scientific research, all feeling and emotion to intellect and reason.

The relation of this subject to delusions is also of much interest, both psychological and practical ; during the present century especially the prevailing follies of civilization have received an unusual and unprecedented dignity and strength from the non-expert experiments of scientific men with living human beings. It is a part of the inconsistency of ignorance, and one of the effects of long breathing the atmosphere of superstition, that the apostles of the demonstrably false, while they uniformly dread and oppose the advance of their natural enemy, organized knowledge, yet pray for and welcome all mistakes of scientific men, either in experiment or philosophy, as so much addition to their capi-

tal ; the weapons with which delusionists of every name prefer to fight their battles are forged in scientific armories ; trace any one of the rank and overrunning superstitions of our day to its utmost radicle, and it will surely lead to sources where we are wont to look for light and truth—to some great discovery which our chemists, our naturalists, our astronomers, of fair and noble fame, have evolved, or are believed to have evolved, out of experiments that they have made, or tried to make, with living human beings ; to the laboratory of some physiologist even, who forgets that the chief fact in human life is the involuntary life ; to some logician and philosopher, who has yet to learn that the habit of trusting the senses, though endorsed and inculcated in all the universities of the world, is the source of half the ignorance and not a little of the suffering of mankind.

