

yet seem possible to formulate. We do not assume because we find rabbits eating belladonna with impunity that other animals can do likewise, or that mercury must act similarly on canine and human livers. And, similarly, we are not justified in inferring that homologous parts of the nervous system, even when they are found (and what of those cases in which no such parts exist?) must perform precisely the same functions. Nor is the case confined by any means either to the higher animals or the lower, to vertebrates or invertebrates. A thorough generalisation ought to be co-extensive with organisation. Are insects to be judged unconscious in all their varied manifestations because they have no cerebrum at all? The mistake of physiologists all through seems to have been that they reasoned from too small an area. Flourens' law of substitution is good for pigeons, but is altogether untrue when applied to animals in general. And in the same way it appears to me that the generalisation that the cerebral cells are the seat of consciousness in animals in general is by no means justified, because it is the case that they are so almost certainly in man.

A. RABAGLIATI.

---

#### METALLOSCOPY AND METALLOTHERAPY.

For the last thirty years Dr. Burq ('Métallothérapie,' Paris, 1853), has been endeavouring to establish a system of therapeutics in certain forms of nervous disease, based on the action of metals applied externally to the human body. His views had been generally received with coldness and even derision by his professional brethren until about two years ago, when he succeeded in attracting Professor Charcot's attention to some of his experiments. On the instance of that influential neurologist the Société de Biologie named a Commission to investigate M. Burq's statements and theories. The members of the Commission were MM. Charcot, Luys, and Dumontpallier, assisted by MM. Gellé, Landolt, and Regnard.

The points to be investigated were two: Do metals applied externally to patients suffering from certain forms of anaesthesia (chiefly of hysterical origin) bring back sensation in the parts affected and are patients severally influenced by one metal and not by others? Does the metal thus found active on external application prove equally beneficial when administered internally?

The first of these questions involves the doctrine of *metalloscopy*, the second that of *metallotherapy*, in the language of Dr. Burq.

The first meeting of the Commission was held on the 4th of November, 1876. The method followed was first to carefully examine the state of the patient to be experimented upon; then, after bandaging the eyes, to apply disks of different metals in succession, and notice the effects produced, if any. Several meetings were held of which the details are given in the first Report of the Commission. The results may be summarised as follows:—

1. *Phenomena of Sensation*.—From ten to twenty minutes after the application of the active metal to the anæsthetic limb symptoms of returning sensation are manifested in the neighbourhood of the disks, and gradually extend to the whole of the anæsthetic region.

The special senses also, if involved, are restored in a similar manner.

It is observed that during the process the patients complain of various constitutional symptoms, chiefly headache, which is apt to persist till the next day.

2. *Phenomena of Motility*.—Patients sensitive to metals are often also amyosthenic. Observation shows that along with the restoration of sensibility there is a restoration of muscular power. When, however, contractures exist in any of the muscles, no change takes place with regard to them.

3. *Phenomena of Circulation*.—*Pari passu* with the former changes, circulation becomes more active in the affected limbs. Transfixion of folds of skin with large needles, which previously drew no blood, is now accompanied by hæmorrhage. The temperature of the limb is also shown by the thermometer to rise with the increased supply of blood.

4. *Phenomena of Transference*.—The members of the Commission, whilst engaged in studying the facts stated above, discovered that all the changes on the side of the body operated upon occurred, so to speak, at the expense of the opposite side. That is to say, while sensation, muscular strength, and circulation were restored on the one side, they vanished in a proportional degree in the corresponding part on the other side of the body.

It was observed that all these phenomena were strictly transient. In no case did the effects produced last more than a few hours, and patients experimented upon day after day never showed any signs of permanent or real amendment. Strange to say, however,

Professor Charcot, having tried the application of metals in two cases of organic hemi-anæsthesia, obtained a permanent return of sensation. In the one case, that of a woman affected with hemi-anæsthesia and hemichorea from cerebral lesion, zinc, copper, and gold proved ineffectual. Iron, however, applied for twenty minutes, caused symptoms of returning sensation, and the patient continued to progress until feeling was restored to the whole side of the body. A local application of iron disks caused the return of gustatory and olfactory sensation on the affected side. The hemichorea was also notably diminished by the treatment.

Having arrived at the facts just described, the Commission proceeded to investigate the possible electrical nature of the action of metals on the organism. When two plates, placed in contact with the patient's skin, were connected with the terminals of a multiplying galvanometer, a deflection of the needle was constantly produced. The amplitude of this deflection varied with the metals used, measuring from 2-10 degrees with gold plates, and from 8-15 degrees with copper plates. It was then found that battery currents equal in strength to those indicated by the plates had the same effects as the plates themselves. Further experiments showed that if the current-strength went beyond that given by the metal to which the patient was sensitive, no effect whatever was produced. (It is to be noted that all these currents were so weak as to be comparable only to the "physiological currents" of nerve and muscle, and demonstrable only on galvanometers with 30,000 turns of fine wire.) Beyond a certain point, however, it was found that increase of the current was followed by the usual phenomena of return of sensibility, &c.; and repeated observations allowed the rule to be laid down that each patient was sensitive to certain current-strengths, but not to intermediate ones. Such ineffective points in the galvanometric scale were called "neutral points." For instance, a patient who proved sensitive to a current of 2° was also sensitive to currents of about 40° and 70°, but insensitive to currents between these several points.

Such were the conclusions reached by the Commission, and embodied in the report presented by them to the Société de Biologie on the 14th of April, 1877. They then proceeded to investigate Dr. Burq's second proposition with regard to the therapeutical application of the metallic sensibility of certain patients, and to ascertain whether the metal, active externally, acted curatively upon internal administration.

Their second report, read on the 18th of August, 1878, begins

with a recapitulation of the facts previously established, and gives the details of the following cases:—

1. M., sensitive to gold. On July the 11th one-third of a grain of chloride of gold was administered daily. In about three weeks the anæsthesia and amyosthenia had disappeared; menstruation had begun to take place normally, and the general state was altogether satisfactory. On August the 26th gold plaques were applied. Sensation, both general and special, gradually vanished. After one hour and a quarter the plaques were removed, and sensation returned within nine minutes to the various parts, in an inverse order of that of its disappearance.

2. A., blind; restored to normal health by chloride of gold in doses of one-third of a grain, gradually pushed to nearly one grain. Gold plaques applied; within half-an-hour anæsthesia and amyosthenia induced, together with phenomena of dysæsthesia, sleepiness, loss of memory of persons and things. On the removal of the disks she seems to awake, and asks to go away. The restoration of sensation proceeds with great rapidity.

3. B., sensitive to copper. Improves greatly under the influence of pills of binocide and albuminate of copper. But the drug ceases to be tolerated by the stomach after three weeks, and the treatment suspended, and anæsthesia returns. A month afterwards patient is made to drink the St. Christan water (which contains copper). Improvement becomes manifest, and two weeks after, the copper plaques are applied: similar phenomena are observed as in the previous cases, anæsthesia, amyosthenia, and sleepiness are induced, which disappear after the removal of the disks. Subsequently her state was found to have gone on improving under the influence of the mineral water.

4. B., sensitive to gold. The patient is a hystero-epileptic, anæsthetic on the right, analgesic on the left. A treatment of aurochloride was instituted; all the hysterical symptoms disappeared, and menstruation became regular, whilst the epileptic fits continued.

5. W., completely anæsthetic; amyosthenic. The gold, exhibited internally, restored sensation and muscular power, and for a month she had no hysterical fit.

Several of the experiments performed in the above cases were witnessed by Professors Claude Bernard, Vulpian, Béclard, and other physicians.

The report draws attention to the fact that the same patient may be sensitive to some extent to more than one metal, but if

metals to which she is not sensitive are substituted without her knowledge, no phenomena are produced. This, it is maintained, excludes the action of expectant attention invoked by some in explanation of the supposed metallic action.

Further experiments were instituted, showing that the weak galvanic currents above described acted here also as the plaques. Platinum disks too, which are inert when applied without preparation, become active when charged by connecting them with the poles of a galvanic battery.

Another curious series of phenomena studied by the Commission was the effect of the combination of metals applied externally. It was found, for instance, that if a gold plaque was applied to the patient, and a silver plaque superposed, when sensation had returned the effect was *fixed*, as it were, and anæsthesia did not return within the usual limits. Next, that if the two metals were applied, already superposed, no effect followed; and that the same happened if a silver disk was applied above the gold one, or even on the other arm. As an illustration of this, mention is made of an experiment on A. (sensitive to gold). A gold plaque fixed to a wooden disk did not produce the accustomed effects. On inspection it was found that copper clamps had been used for fixing the gold to the wood. The substitution of gold coins was immediately followed by anæsthesia. The report also draws attention to the case of Mlle. M., who, among some hysterical symptoms, was affected with achromatopsy. She was cured by the administration of gold chloride. But it was found that the application of the gold plaques to the temple immediately reproduced the achromatopsy; the loss of perception of the various colours following an order opposite to that in which she had regained it previously: thus, violet, red, orange, yellow, blue, were successively lost.

The conclusions reached by the Commission naturally drew a considerable amount of attention to the phenomena of metalloscopy. Numerous illustrative cases appeared in the medical periodicals, of which the following may be quoted:

1. (BURQ, 'Gaz. des Hôp.,' Nos. 102 and 105, 1878.) A young woman, who had during four years been treated in various hospitals for severe hysterical symptoms, was admitted into l'hôpital de la Pitié, under Dr. Dumontpallier. Everything had failed, including electricity, and even surgical interference. She presented left-hand anæsthesia, with paresis, anorexia, constipation, meteorism, and amenorrhœa. The left leg was highly hyperæsthetic, and the seat of a contraction of the flexors.

She was found to be sensitive to gold chiefly, but also to copper. The application of gold plaques relieved the anæsthesia and hyperæsthesia, together with the contracture; their effect seemed, however, to last only so long as they remained applied. On their removal, the patient returned to her previous condition.

She was treated by subcutaneous injections of gold chloroxyde with such success that in two months most of her symptoms had subsided. The application of the plaques, however, still produced troubles of sensation; a fact, in Dr. Burq's opinion, which proves the persistence of the "hysterical diathesis," and forbids, as long as it subsists, to consider the cure as complete.

2. In the same hospital, last summer (see 'Gaz. des Hôp.,' No. 87), there was a married woman who, since 1870, had been subject to hystero-epileptic seizures. These occurred as often as three times daily. Her general health was bad; she suffered from intense vaginism; and it was found on investigation that the cervix was imperforate, and that menstruation had been vicariously carried on by hæmorrhoids, which bled regularly every month. For eighteen months, however, there had been suppression of this flow.

She was found sensitive to silver plaques. Accordingly, silver was administered internally. After a few days the piles began to bleed, and her state gradually amended.

3. A patient was admitted, under Dr. Dumontpallier, for rheumatism of the knees. She was a quiet woman, married, and had had only one hysterical fit, due to mental shock. This appeared a suitable case to test susceptibility to metals; and accordingly gold, silver, iron, and zinc plates were applied successively, but in vain. At last copper was tried, and produced anæsthesia of the limb, transient as is usually the case, but which could be "fixed" by the application of one of the neutral metals, such as iron or zinc. Several experiments were made, giving the same results. It was further noticed that on repetition of the applications severe cephalalgia supervened, of a persistent nature; and that hysterical fits manifested themselves more and more frequently. On discontinuation of the experiments, the patient returned to her previous state. (See 'British Medical Journal,' Oct. 12, 1878.)

4. Dr. Burq showed a patient, at a meeting of the Société de Biologie (May 11th), who, after having been sensitive to gold, was no longer influenced by that metal. Silver produced some effects, but of fleeting character. On the superposition of a plaque of an alloy (zinc, copper, nickel) persistent effects were obtained.

5 to 7. Dr. Vigouroux finds ('Progrès Médical,' No. 30) that a

neutral metal fixes the change produced by other agents than the plaques, such as magnetism or electricity. He describes a case of left hemianæsthesia in which transfer was produced by a charge of statical electricity. A brass plate then attached to the left arm fixed the effect; and next day the right side was anæsthetic and achromatoptic. In a second case brass was found to fix the effect for a whole day. In another, copper preserved æsthesia for a whole week. Here the experiment was repeated several times successfully. The anæsthesia returned immediately upon removal of the metal.

8. Dr. Abadie ('Progres Médical,' No. 28) states that amolyopia is often hysterical, and then accompanied by a low degree of anæsthesia, of which the patient is not conscious. The hysterical kopiopia of Förster ('Hdbch. ges. Augenhkde.' vol. vii. p. 88) is characterised by photophobia, peri-orbital pain, cephalalgia on reading, painful sensations in eyelids and conjunctiva, and is dependent either on actual uterine trouble or pure hysteria. In these ocular disturbances the application of metals is of importance.

Mlle. Z. complains of kopiopic symptoms every morning; the eyelids are puffed. Chalybeates, hydrotherapy, the bromides, quinine have been tried in vain. Gold plaques are applied overnight to the temple, and gold chloride exhibited internally for a month. No result followed this medication. Copper plaques were then substituted: after the first night there was some improvement; the puffiness had not appeared. After eleven days the patient can read for one hour. In one month she thinks herself cured and gives up treatment. All her old troubles soon return, however, and she resumes her copper applications. She is dismayed to find that this time not the slightest result is obtained. She returns to Paris, where copper with zinc superposed is tried. The symptoms give way and have not returned since.

Prof. Westphal, having witnessed some of the experiments performed at the Salpêtrière, made some observations, the results of which he read before the Medical Society of Berlin on the 5th of last June. ('See Berliner klin. Wochenschrift,' No. 30, 1878.) Among some preliminary remarks, we observe that he objects to the term "ovarian hyperæsthesia," so often used in connection with hysterical symptoms. For he had some patients specially examined, and it was found that pressure upon the ovary from the vagina did not produce any pain, whilst external pressure did. The tenderness therefore resides in the abdominal walls and not in the ovary itself. The first case he describes is one of left

anæsthesia in a hysterical patient. Two florin pieces having been applied, the patient discovered "with terror" some time afterwards that sensation had returned. No transference was observed in this instance; but it was so four days afterwards during another application, which was followed by a persistence of sensation, lasting until a fit occurred five days afterwards.

2. Hemianæsthesia, in a non-hysterical patient, after attempted suicide with chloral. Silver plates are fixed to the ulnar side of the hand; subjective sensations are felt, and there is return of feeling in little, and ulnar side of ring, finger. This was not permanent, and further attempts proved unsuccessful.

3. Hemianæsthesia. The patient proved sensitive to gold in two experiments. Later, iron gave similar results.

4. Left, and partial right, anæsthesia. A small galvanic element made of zinc and brass, with a wet piece of lint between, is applied by its zinc-side face to the skin. Sensation returned. A magnet was then tried, with the N. pole centrally: sensation returned in ten minutes at the S. pole, in thirty at the N. pole, and a little later at the neutral point of the magnet. Further experiments showed that the S. pole always acted more energetically.

Prof. Westphal then tried disks of copper, with a layer of varnish or sealing-wax to protect them from any action from the moisture of the skin, and obtained similar results. Even ivory markers were successfully applied to a patient. Finally, several observations showed that mustard-plasters produced a return of sensation at their seat of action.

In the wards of Dr. Wilks, at Guy's Hospital, some observations were made which are recorded in the 'British Medical Journal,' July 10th, 1878.

CASE 1. E. M., school teacher, whose symptoms "fluctuated between sickness, rheumatic pains, analgesia, anæsthesia, &c., the incontinence of urine remaining," was submitted to various metallic applications, but in vain.

2. C. B., analgesic on left side, the special senses being affected on the same side (deafness, achromatopsia).

On the 21st of February two sovereigns were applied to the forearm. In twelve minutes sensation had returned under the loins; this gradually extended upwards to the shoulder. The points at which the skin had been pricked bled copiously subsequently. Some indications of transfer were observed. The night after the experiment, the patient suffered from an intense headache. Two days after, lead and iron were applied with some, but rather



indistinct results. The return of sensation was very limited in area, and occurred after thirty minutes only. Transfer was not observed with the lead plaques. On the 26th gold was again tried with much more marked effects, but not so clearly defined as at first. The patient was put on one-eighth of a grain of chloride of gold and sodium three times a day without her knowledge. Two months after, she had recovered to a great extent, being able to move about freely. The special senses had fully recovered; there was amyosthenia in the left side, however, and anæsthesia in the hands and feet, extending about half way up the legs and forearm.

Dr. A. H. Bennett, who has published views on metallotherapy in the last number of this Journal, gives the details of experiments on a case in the 'British Medical Journal' for Nov. 23, 1878. The patient, aged 44, single, had nine years previously had an attack of transient paralysis of the right arm and leg and twisting of the face to the right side, apparently as if there were paralysis of the left. She soon recovered; but four years afterwards she began to become numb and weak on the right side. She again had an attack similar to the first, which passed off, leaving, as found on examination, impairment of muscular power and anæsthesia, both general and special, on the right side of the usual kind. There was an apparent absence of all nervous or hysterical symptoms. Various metallic disks were applied in succession time after time, but without any result, until one day she was found to have recovered sensation in the right arm, under zinc. The sensation ultimately became restored over the whole body, the left side even being hyperæsthetic. Next day the anæsthesia had returned as before. Similar results followed six or eight subsequent experiments, but the analgesia of the right side gradually became less, while there was a corresponding blunting of sensation on the left, so that eventually both sides were in the same condition.

All kinds of metals now produced the phenomena due first to zinc, but sensation never extended beyond the limbs to which they were applied. Even wooden disks were now found to answer as well as the metallic ones. The state of the patient became one of great instability with regard to the anæsthesia, which was present now here, now there, and the applications were now no longer followed by any constant results.

The patient went for a month to the seaside, and on her return was found much in the same state as on admission, except that the sensibility of her right arm had improved, while that of her left side had diminished.

In a thesis for the M.D. of Paris, just published, entitled '*Comparaison des effets de divers traitements dans l'hystérie*,' &c., Dr. Oscar Jennings gives a historical sketch of the use of metals in ancient times; which is followed by an analysis of three cases of metalloscopy taken from periodicals in which the observations had been published. After a short notice of the electrical theory of metalloscopy, Dr. Jennings proceeds to give his own explanation of the phenomena, which he looks upon as purely the effects of imagination. These are illustrated by the well-known tales of middle-ages delusions. After urging that the effects of metal plaques are not constant, that the sensitiveness of the same patient varies, and that doctors differ among themselves as to the relative value of different metals, the author maintains that in every case the patient *knows* what metal is applied, that this knowledge works upon her imagination, and thus the effects are produced. The initial impression of a particular metal is due to chance, fancy, &c. The patient recognises the metal either by *smell* or a peculiar exaggeration of tactile sense at the point of contact which enables her to diagnose the nature of the plaque.

In offering such an explanation, without a single experimental proof in support of it, Dr. Jennings certainly appears to me to make as severe a demand upon the imagination of his readers as he does upon that of the patients. Under the hypothesis of an electrical action of metallic plates, the inconstancy of the phenomena observed may be explained by the fact of the same metal giving in different individuals, and in the same individual at different times, signs of varying electrical states. That such is the case has been shown by Eulenburg in the '*Deutsche medicinische Wochenschrift*' (Nos. 25 and 26), where he gives the details of some galvanometric measurements of the electrical action of plates of different metals applied to the skin.

Dr. Thermes has published the results of his experiments upon the application of heat and cold, in similar cases to those in which metals produce the effects previously described. (See '*France Médicale*,' No. 69 ff., and '*Gazette des Hôpitaux*,' No. 123.)

Hysterical patient, with left hemianæsthesia, achromatopsia, and amblyopia, which prevented her reading any of the twenty Nos. of Jäger's scale.

*Ice to left temple:* achromatopsia disappears; patient distinguishes first blue, then yellow, red, green, violet; and can read No. 2 of Jäger's scale. Transference occurs. On removal, return of anæsthesia, &c., in opposite order.

*Ics to left arm:* anæsthesia and amyosthenia of arm transferred to right. Prolonged application produces "anesthésie de retour."

*Cold water* produces similar phenomena, but less marked.

*General cold douche:* effects the same, but generalised.

The effects of heat were the same; the methods being the application of warm water to the hand, a hot sponge to the face, and a general hot douche. The temperature used ranged between 40°-50° C.

Statical electricity was also tried successfully: magnets had no effect. Other cases gave similar results.

On the 6th of June, 1878, Professor Charcot introduced before the Société de Biologie the subject of magnetism and the influence of magnets upon the nervous system in certain diseased conditions; prefacing his own remarks with a short historical sketch of the subject. In 1779 the notorious Mesmer appears to have obtained some results from the application of a magnet to a hysterical patient. He repeated his experiments before two friends, one of whom was a physicist, named Ingenhousz. Instead of pursuing his researches in a judicious and scientific spirit, he forthwith launched into wild hypotheses, after proclaiming the existence of an "animal magnetism," and readily obtained a hearing from credulous people. Ingenhousz opposed these extravagances; and Andry and Thouret published forty-eight observations, which, if not sufficiently critical in their spirit, still show that some remarkable results were obtained. Mesmerism, however, was doomed to fall through its own excesses; and little more was heard about magnets till the publication of Becker's work, 'Der mineralische Magnetismus und seine Anwendung in der Heilkunst,' published in Muhlhausen in 1829.

The next writer who appears in the field is Professor Maggiorani, of Rome. His views are contained in a pamphlet, published in Milan, in 1869, 'La Magnete e i Nervosi,' and in two communications to the Reale Accademia dei Lincei (Sessione VI., del 5 Maggio, 1872, and Sessione II., del 5 Gennaio, 1873). His experiments were made with weak magnets, sometimes rotatory, and solenoids, in various forms of nervous disease, organic or functional. He also obtained marked effects from the application of magnets to cats. He found hysterical, ataxic, hemiplegic, diabetic patients, frequently sensitive to the action of magnets; but never speaks of having obtained any prolonged or curative effects.

The main symptoms elicited in successful cases were sensory disturbances, convulsive or spasmodic phenomena, and rise of

temperature. He gives a table of the cases in which the thermometer showed an increase, amounting to sometimes  $\cdot 2$  and even  $\cdot 4$  Centigrade, after the application of magnets.

Professor Charcot's own observations were made with solenoids (that is, coils of insulated wires through which an electrical current circulates), with ordinary magnets, and with Faraday's powerful electro-magnet, fed by fifteen Bunsen's elements. The cases he exhibited to the Société were the following:

1. A., blind, hysterical, hemianæsthetic. When the neutral point of the magnet is applied, no effect is produced; when one of the poles, there follows the usual phenomenon of transfer. If the application is protracted, there occurs a reversion to the usual state of things. Upon removal, there occurs another transfer, soon followed by another reversion to the primitive condition.

2. G1. The patient's arm is placed in the solenoid, and the current made: transfer, and later reversion. The same phenomena occur now on breaking the current.

In some hysterical cases these changes occur with the utmost rapidity.

3. A man affected with organic lesion of the brain, and hemianæsthetic. The electro-magnet was applied to the anæsthetic arm. In twenty minutes sensation had returned to the whole side. No phenomenon of transfer was observed. Apparently the cure is permanent.

Many hundred of times, says Professor Charcot, these experiments have been repeated in private and hospital practice, with similar results.

Dr. Vigouroux reports a case in the 'Progrès Médical' (Nos. 35 ff., translated in the 'London Medical Record' for November), in which Professor Charcot applied magnets in a very original, and so far successful, manner. The patient was hysterical, and suffered from a most severe contracture of the flexors (together with anæsthesia) of the left arm. A pad had to be placed in the patient's clenched hand, to prevent the nails from burying themselves in the palm. The application of metals to the diseased arm, as well as of solenoids, magnets, electrical currents, both induced and constant, had proved utterly useless; but it was found that a solenoid to the right arm had the effect of rendering it analgesic and cold.

On the 12th of June a magnet was applied to the back of the right arm. Analgesia and cold extend into hand; marked flexion of the fingers. After one hour the left hand can be opened with less force. Temperature of right arm,  $27^{\circ} 6'$ ; of left,  $30^{\circ} 4'$ . The

contraction of the right hand and fingers becomes more intense, and is removed by faradisation of the extensors.

15th.—Magnet to flexors of right arm. Similar phenomena occur. The contraction produced cannot be wholly removed by faradisation.

17th.—Right hand still weak. No magnet is applied. Extensors of left arm faradised. It is found that sensation has returned in left thumb.

18th.—Magnet to right arm, which remains analgesic and weak, notwithstanding faradisation. Faradisation of left extensors; return of sensation in little finger. Contraction diminishes.

Further progress on the 19th. On the 21st the left arm has recovered sensation in parts. The magnet no longer produces cold, but hyperæmia in right arm. Treatment continued till the 4th of June, when the magnet was applied to both arms, which remained contracted till the evening. The left then returned to its state before the application; the right remained very weak.

11th and 12th.—Magnet applied to both arms. A brush discharge of statical electricity restored flexibility and sensation to the remaining anæsthetic regions of the left arm. Voluntary motion of left thumb manifests itself. On the 23rd of July slow voluntary movements of left fingers and wrist were possible. The right arm was still weak.

As Mr. Charcot remarked, there was in this case a "predisposition" to contracture. Application of magnets produces such phenomena only in cases where such a predisposition is present. There is a curious correlation between the transfer of anæsthesia and transfer of contracture; the mechanism in both is probably similar. It has been seen that in this case the most varied means directed to the diseased limb did not produce the slightest result; as a rule it will be found better to act upon the sounder side, both for diagnostic and therapeutic purposes. There has been no transfer of sensation here, which shows that it is not a constant phenomenon in hysterical cases. On the other hand, a case of hemianæsthesia from syphilitic cerebral lesion did present the phenomenon as well as the peculiarity of a gradual recovery, instead of the immediate one, observed usually in organic affections. (There was, by the way, an improvement of the concomitant hemiplegia with athetosis.) It is to be observed also that transfer may occur separately as regards (a) sensation, (b) muscular power, (c) vascular tonicity, (d) temperature. Contracture of the flexors was always produced, whatever the position of the magnet was. In the leg,

contracture could be produced in the peronei, or in the flexor (gastrocnemius, &c.) muscles according to that position. *Galvanic currents* were found to produce contracture, as well as magnets. Unipolar action of a battery of 80 Daniell-Trouvé cells produces it also. Charging the patient with static electricity, or acting upon the flexors by means of sparks sufficient to produce single contractions, does not produce contracture. The "brush-discharge" of static electricity directed on the same muscles produces it. (This clearly shows that what is required from electrical applications is not a "current," nor "interruptions," but simply a *steady, local*, difference of potentials.) Ice applied locally produces contracture. Many experiments have shown that vibrating sonorous bodies applied to the arm of hysterical patients act as metals, magnets, &c. In the present case a large diapason was used, contained in a case 1·20 metre broad, ·40 long. When the patient's hand rests on the case, contracture is produced, but not if the patient sits altogether upon it.

Test experiments were also tried: the neutral point of magnets, simple metals, insufflations with an atomizer (imitating the sensation of the brush-discharge), were all fruitless.

The practical outcome of all this is, first, the possibility of producing artificial contracture; second, the beneficial influence of such proceedings upon the original contracture. Apart from all theoretical considerations, these results are valuable, therapeutically, as giving some hope in an otherwise very intractable manifestation of hysteria.

The phenomenon of transfer which the experiments of the French Commission have so strongly brought into light had, it is curious to note, been already observed by Dr. Buzzard ('Practitioner,' October 1868) under the following circumstances. A girl of about fourteen suffered from seizures, apparently epileptic, which were preceded by an aura in the *left* wrist. A blister applied to the forearm arrested the aura, the fits became less frequent, and were then heralded by an aura originating in the *right* wrist. Eventually the aura returned to its former seat, and one or two fits a week continued to occur, uninfluenced by treatment. At twenty years of age the patient died of acute phthisis. The sole lesion discovered in the brain was a small gliomatous tumour, the size of a walnut, situated in the white substance of the left hemisphere above the middle of the lateral ventricle. Dr. Gowers, who relates the results of the post-mortem examination ('British Medical Journal' September 26, 1874) remarks that beside the interest due to the fact

that the aura (and probably, therefore, the convulsion) arose on the same side as the lesion, the migration to the opposite side in an organic brain disease is certainly a rare event. This case has a historical, as well as an intrinsic, importance in connection with the subject now in hand.<sup>1</sup>

Intimately connected with the phenomena of metallio and magnetic sensibility in hysteria, and tending to throw much light upon the difficult problems they raise, are the facts lately described and demonstrated by Professor Charcot. (See '*Gazette des Hôpitaux*' No. 135; and '*British Medical Journal*,' October 12th, and November 30th). By looking fixedly at a hysterical patient it is possible to throw her into a state of lethargy, characterised by unconsciousness, insensibility, and complete muscular resolution. Whilst in this state she manifests a most extraordinary degree of muscular excitability. If the region of the facial nerve, near the ear, is touched lightly with a wooden rod, all the facial muscles on that side are thrown into a state of violent contraction, just as if a strong faradic current were used. If the sterno-mastoid or any other muscle be touched singly in the same manner, it is also made to contract. It is evident that no patient can possibly feign these results unless acquainted with anatomy and physiology. Repeated stimulation with the rod converts the single contraction into a lasting contracture.

Opening the eyelids of the lethargic patient so as to expose the retina to the impression of daylight makes the patient pass from lethargy into catalepsy, with plastic rigidity of the limbs. Blowing in the patient's face or pressing upon the ovarian region at once draws her out of her unconsciousness, and it is then found that the contracture induced persists. To dissipate the latter, it is sufficient to reproduce the lethargic state and stimulate the antagonistic muscles. The cataleptic state can be produced immediately by making the patient look at the electric light. When the light is turned off she passes into the phase of lethargy with its concomitant phenomena. Whenever she is roused from this pathological state she utters a cry and foams at the mouth.

Professor Charcot also pointed out that in hysterical women who have not had any fit for some time there are hyperæsthetic points on the body constituting hysterogenous zones comparable to the epileptogenous zones described by Brown-Séquard in guinea-pigs.

<sup>1</sup> Dr. Dumontpallier ('*Soc. de Biologie*,' No. 30) states that in healthy individuals there often occurs a diminution of sensibility and temperature on the opposite side of the body when a portion of an arm, for instance, is anæsthetised by means of the ether spray. As in cases of hysterical transfer, this diminution occupies a corresponding symmetrical surface.

The most common locality of such points is between the shoulders; they are also observed in the axillary region and about the waist. Light pressure or friction calls forth an attack; more energetic or protracted stimulation arrests it.

In presence of the novel, nay startling, nature of many of the facts related above, one naturally finds some difficulty in framing a hypothesis to explain them; and more difficulty perhaps still in following the wiser course of abstaining from any definitive judgment until more is known about the subject. I trust, however, I may without presumption offer a few remarks of a general character.

1. The attitude assumed by some writers on this subject, and described by them as one of "strict scepticism," is in my opinion one rather of prejudiced dogmatism. The true "Cartesian doubt" is very different from the active disbelief so often mistaken for it. We hear the theory of a metallic or magnetic action upon obscure derangements of the nervous system dismissed summarily as "long exploded." Exploded by whom? When were the phenomena subjected to a searching scientific investigation? A hundred years ago Mesmer by his disreputable practices threw *discredit* upon the whole subject, but there is not one atom of *proof* to show that magnets and the like can never influence the human organism. There is no innate improbability that a physical force like magnetism, closely connected as it is with electricity, may influence it, and the facts before us at least make further inquiries an imperious necessity.

2. Naturally enough "expectant attention," the *Deus ex machina* of the physiologist in trouble, has been made responsible for all the phenomena attributed to metallic and magnetic influence. That it may and does explain much, is a proposition which will not be denied. But that it explains all, is one that requires more conclusive argument from those who hold this view. The character of the observers who vouch for the facts recorded, and the strained meaning put upon the expression "expectant attention," in order to make it account for all the phenomena, make us cautious in accepting too readily a theory that seems to be merely a screen for our ignorance.

3. Such proof is supposed to be furnished in respect to "metallic influence" by the fact that other bodies, such as wood, are productive of the same results as metals. Now it may be admitted by all except perhaps by a thorough-going Burqist, that metals, as such, have no specific influence; that their action may be electrical, not dynamical, but statical. If this is true, it is obvious that nothing is proved by the substitution of wood for metal, since, as everybody knows, a disk of wood applied to the skin will be at a



different potential from the body, and though unable to give rise to a current, will, as well as any metal, exert a statical influence upon the tissues beneath. At the same time it is possible that, in Dr. Bennett's case, expectant attention formed a factor in the later stages, when after a few successful applications of metals the patient had learnt what to expect. The gradual weakening of the effects noticed in the same case may as well be explained by the wearing-off of the therapeutical virtue of the treatment by undue prolongation, as by the tiring-out of the patient's attention. At any rate, many more such observations upon a variety of cases, and with special reference to the electrometric conditions, will be necessary to invalidate the numerous antagonistic cases recorded elsewhere.

4. It is a curious fact, too, that the application of disks, metallic or wooden, should have such a very marked influence upon the imagination of the patient. It would seem that the more striking application of electricity, from an induction coil, for instance, ought to enlist as much interest on her part, and act as powerfully upon her psychical faculties. In the Salpêtrière patients, inured as they were to the most varied experiments, we yet find the simple application of metal plates invariably successful. Again, however imaginative hysterical patients may be, we find that in them the effects are but transient; whilst in old standing organic lesions permanent cures are effected. And how do we explain transfer of insensibility by expectant attention? Warts removed by "charming" are not reproduced on the other side of the body. Entirely *unexpected* results can hardly be put to the credit of expectant attention, especially when they occur in a large number of cases.

5. The objections made to experiments with metals cannot be applied to those performed with electro-magnets and solenoids. For in the latter there is nothing to indicate to the patient that a current circulates in the coil of wire. And yet it is found that the mere application of the apparatus is not followed by any manifestation, but that the effects follow only when the current is sent through the wires, which is easily done, entirely without the patient's knowledge.<sup>1</sup>

<sup>1</sup> Dr. Carpenter ('Brit Med. Journal,' Dec. 14, 1878) "cannot but wonder that Prof. Charcot and his reporters should have so readily accepted the reality" of the phenomena above described "without taking those precautions which experience has shown to be necessary for the elimination of the influence of expectancy," and he mentions the desirability of testing them "by means of electro-magnets made and unmade at a distance." Dr. Carpenter, like many other English critics, appears to be unaware of the methods used, and number of experiments made, by Prof. Charcot. The public demonstrations at the Salpêtrière are intended to *illustrate* his results and not to *prove* them.

6. It is admissible to suppose that, under given circumstances the nervous system may become more sensitive to electrical influences, as it does become more sensitive to other agents, such as light, sound, &c. That the human system is influenced by static electricity is proved by the fact that many people of "nervous" temperament are highly sensitive to changes of atmospheric potential. Dr. Lombard has shown ('*Climatologie Médicale*,' vol. i., p. 410) that mortality and electrical tension rise and fall together. Professor Scoutetten ('*De l'électricité dans les eaux minérales*') has given reasons for assuming that mineral waters owe their efficacy more to their electrical actions than to their actual composition. That terrestrial magnetism may have also an influence upon our bodies is far from improbable, and Dr. Horn ('*Ueber Krankheits-Erzeugung durch erdmagnetische, &c., Einflüsse*') has tried to establish some connection between the appearance of certain diseases and magnetic fluctuations. M. Grandeau has found ('*Acad. des Sciences*,' July 1878), and M. Berthelot confirmed the fact, that plants can be arrested in their growth by disposing about them a few iron wires. Here, at least, as in Dr. Maggiorani's cats, there is no room for the influence of the imagination.

7. Having thus cleared the ground so far from the main obstacles to a calm view of the subject before us, I may sum up the whole question by saying that, under certain disturbed conditions, the nervous system appears to be sensitive to influences, various in their nature and obscure in their mode of action. The facts are too numerous and too well supported to be doubted; the explanations of the facts hitherto given are not sufficiently supported by experiment to be regarded as satisfactory. Whatever the fate of metallic and magnetic therapy may be, there is not the slightest doubt that the researches to which they have given origin will be followed by a rich harvest of pathological discovery in a very important and obscure field of medicine. All honour is due to Professor Charcot, who has had the courage to brave the charge of reviving "played out and flimsy superstitions," and has preserved whilst treading on such dangerous ground a spirit of admirable reserve and penetration. To the sciolistic "esprit fort," which delights in cheap scepticism, I prefer the scientific humility of a Claude Bernard, who, in presence of the strange facts he was witnessing, confessed his ignorance:—"Malo cum Platone errare!"