physiological importance, and certainly will furnish therapeutical indications to those who wish to study.

M. Dumontpallier subsequently requested M. Landolt to test, by experiments on the sight, the correctness of what M. Gellé had discovered with regard to hearing, and what he had himself found out in the general sensibility. The results obtained by him were absolutely of the same order; that is to say, M. Landolt discovered that when sight was restored on the affected side, it was lost on the other, and this in fixed proportions. The phenomena of transfer disappeared with sensibility; that is to say, at the end of two or three hours, sometimes at the end of one day, things returned to their original condition; the affected side again became insensible; the phenomena of transfer disappeared.

The transfer which exists in hysteria is not produced in hemianæsthesia from poisoning, nor in hemianæsthesia due to cerebral organic lesions. This is important; because, as soon as transfer has been discovered, we may in general pronounce the case to be hysteria.

By the side of these facts may be placed what may be termed supplementary facts, which one day, it is to be hoped, will have a therapeutic application. These supplementary facts, or at least some of them, have already been foreseen by M. Burq, but they have only been scientifically established by the Commission of the Société de Biologie.

There was in M. Charcot's wards a woman who was attacked with left ovarian pain, with left hemianæsthesia, and who had hystero-epileptic attacks. This patient presented the singular phenomenon that, when the metal (gold) which affected her was applied on the forearm, at the end of a minute sensibility returned; but this return of sensibility lasted only one minute, and during the second minute the skin had again become insensible. This M. Burq has called return-insensibility. It was not easy to make experiments on this patient, in whom the phenomena changed every minute. There was scarcely time in her case to measure the temperature or the muscular force; it was only possible to note sensibility and insensibility. M. Vigouroux has recalled to memory that M. Burq had discovered, under certain circumstances, it was possible to fix the phenomena produced. He had seen that sensibility, once recovered, could be fixed by applying a plate composed of two metals. M. Vigouroux then had the idea of making the following experiment. The woman in question was alternately sensible and insensible from one minute to another. The experimenter took each of these phenomena during the minute it lasted, and fixed it by placing on the active metallic plate a neutral one. He was able to note, by operating in this way, that sensibility lasted during half an hour, and that insensibility could be made to last the same time by proceeding in the same way. M. Burq has lately applied these phenomena to therapeutic purposes on the woman Morissot, the patient who at first was sensitive to gold, and then went on to be acted upon by silver. He fixed these phenomena by applying on the skin during the period of sensibility a plate of German silver. Sensibility, which had returned, lasted, and remained so long as the patient continued to wear the plate.

METALLOSCOPY IN HYSTERICAL HEMI-ANÆSTHESIA.*

By RINGROSE ATKINS, M.A., M.D.,

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THE interest which has been aroused within the last year or so by the researches of M. Charcot and his collaborateurs at the Salpêtrière, on the effect of the application of coins and metallic *plaques* over the phenomena of hysterical hemianæsthesia and hemianalgesia, and the varied results which have been obtained by the British physicians who have had the opportunity of pursuing this investigation, induce me to bring under your notice the particulars of a rather well marked case of this peculiar affection, which afforded an opportunity (rather infrequent in this country) of repeating some of the now well known experiments which have given rise to so much conjecture and speculation. For being enabled to do so I am indebted to the kindness of my colleague Dr. Connolly, in whose wards in the Waterford Union Hospital the case came under observation.

Previous History.—Margaret Walsh, aged 18, is a member of a healthy family; her parents are living, and, together with her brothers and sisters, are in the enjoyment of good health. As far as I can learn, there is no neurotic taint, nor any hereditary tendency to nervous disease. The girl states that she first menstruated when between thirteen and fourteen years of age; and about three years ago the periods became shortened, the menses sometimes appearing every week, and being

followed by a white discharge. She does not appear to have suffered any inconvenience from this condition of things for two years, and never applied for treatment. On June 10th, 1878, she began to suffer from pain in the left hip and knee, which soon so interfered with locomotion that she had to seek aid, and was admitted into the Leper Hospital, Waterford, where she was believed to be suffering from the earlier stage of morbus coxarius. In August 1878, the pain being somewhat relieved, she returned home. In a little time, however, the pain again returned: it used, she says, to start from the inner surface of the left knee, and pass rapidly up the thigh and hip and along the side to the neck, when she would begin to tremble convulsively all over and scream out. These spasmodic attacks became very frequent; and she states that she used to lose consciousness momentarily. During this time, the menstrual irregularity continued. Early in the present year, she became so ill that she sought admission into the Union Hospital, and came under Dr. Connolly's care on his appointment to the hospital, with whom I first saw her on March 22nd.

Condition on March 22nd, 1879.—The patient was a florid-looking girl, with red hair, freckled face, and a rather strumous cast of countenance; square set jaws, and *retroussé* nose: she had, however, no physical indications of struma, and was healthy looking, being by no means anemic or wasted. She was now suffering from the spasmodic seizures above alluded to, which had recently become considerably intensified. The attack commenced with a starting pain on the inner surface of the left knee, which immediately radiated upwards, and caused the entire body to be thrown into a momentary spasm, which was accompanied by a short but sharp cry, and a feeling of exhaustion after the spasm passed away. When the surface of the knee was even lightly touched, it at once determined the occurrence of a seizure; and the same was the case when pressure was made on a point a little above the great trochanter on the left side, and over each ovarian region. Deep pressure was better borne than superficial manipulation. At points over the lower cervical and middle dorsal regions, pressure also caused spasmodic jerking of the body; and the cutaneous surface of the entire left side was decidedly hyperæsthetic to the touch. There was no paralysis of motion, nor of any of the special senses. Mentally, the girl was generally bright and cheerful when not in pain, and was by no means emotional or easily excited. She was quite unsophisticated, and did not betray any of the *bizarre* freaks or eccentricities which so frequently characterise cases of exaggerated hysteria. At this time, the patient was treated with bromide of potassium and liquid extract of ergot: and the continuous galvanic current from ten and fifteen cells of a Leclanché battery was applied on a few occasions. Under this treatment, the cutaneous hyperæsthesia, the ovarian tenderness, and the spasmodic jerkings diminished, and finally ceased altogether; and she left the hospital three months after admission, walking home. The catamenial periods then for a time became less frequent. After a fortnight's residence at home, and feeling herself strong and well, she endeavoured to do some whitewashing in her father's house, mounting a ladder for the purpose; but almost immediately on her doing so, the pain in the knee and hip recurred, with even greater intensity than before, so that she was only able to barely limp about, and was in consequence again admitted to hospital; the physician who saw her outside suspecting hip-disease. Soon after her readmission, she became affected with almost momentarily recurring spasm of the diaphragm, which was very exhausting; and at this time she again came under my observation. Under treatment, the diaphragmatic spasm gradually subsided; but on the 16th June, she began to notice a loss of power of motion and sensation in the left leg, which gradually increased, the anæsthesia extending over the entire of the left side, and being sharply demarcated by the middle line of the body, while the arm still retained a certain degree of motion.

Condition on June 23rd, 1879.—Motion. There was complete hemiparaplegia of the left leg. She could not raise the limb from the bed nor bend the knee, nor bring into voluntary action any of the muscular groups. She could raise the left arm, and bring it to her face slowly and with evident difficulty. Her grasp was feeble in the extreme; the muscular power was not, however, determined by the dynamometer. There was no difficulty in articulation; but the tongue, on protrusion, pointed towards the right side.

Sensation.—Hemianæsthesia on the left side was complete. She was perfectly insensible to touch on any part of the left half of the body, while at less than a quarter of an inch to the right of the middle line she was acutely perceptive. She was similarly insensible to painful impressions, being completely hemianalgesic. Needles pricking the skin were unfelt, and no blood followed on the punctures. She could not distinguish the presence of a highly heated metallic spoon; while on the right side she winced, and cried out from its momentary contact. Ticking the soles of the feet produced no effect.

Special Senses.—There was no diminution in the power of sight, nor

* Read in the Section of Psychology at the Annual Meeting of the British Medical Association in Cork, August 1879.

was there any achromatopsia. She readily distinguished different colours; the latter, however, were of bright and decided tones (reds and browns). She could detect no sound through the left ear, not even a loud-ticking watch on contact; while the functions of taste and smell were similarly obliterated on this side—those on the right being normal. The menstrual irregularity had returned. The girl was generally cheerful, but shy and retiring when questioned, and she evinced no desire to obtrude her symptoms or exaggerate her condition. Such being her state, it was determined to try the effect of the application of metallic discs, after the manner of M. Charcot. Accordingly, I had a number of pieces of copper and zinc cut from rather old and tarnished plates of these metals, each somewhat larger than a shilling; and on June 25th, there being no difference in the symptoms, they were applied as follows: four discs of zinc were fastened round the left forearm, about four inches above the wrist, and at the same time a band of copper was placed round the leg above the ankle-joint. In about fifteen minutes, the girl complained that she had lost all power in the arm, which she could previously move partially, and that she could neither bend nor straighten the limb; on raising it from the bed, the elbow-joint felt quite rigid, as if contracted, and the fingers were similarly circumstanced, though to a lesser degree. After a little time, under pressure and with apparent effort, the patient lifted the arm from the bed and was able to bring it slowly up to the head. She was now left for an hour; at the expiration of which time, I again examined her condition. The anaesthesia was still complete, but under the discs she could distinctly feel the prick of a needle and winced slightly; while the puncture became marked by a bleeding point, and the skin was flushed in the neighbourhood. There was no change in the sensibility of the lower limb. I now removed the copper band and replaced it by an ankle of zinc discs, those on the wrist remaining as before. On visiting her in the evening, I found that there was now sensibility to touch and to pain from the elbow down, the upper arm being still anaesthetic; and the power of motion had not only returned to its condition previous to the application of the metallic plates, but had, the girl averred, increased. She could move the arm much more readily, bring it over her head, and her grasp was distinctly more powerful. She could now feel the leg being pinched and pricked, but could not distinguish a touch. The back, neck, ear, and side were still quite anaesthetic. The next morning (June 26th), the discshaving been worn through the night, the sensibility had considerably increased, and spread over the entire of the affected side, with the exception of the back of the neck and ear, which were still quite anaesthetic; and, further, she could raise the paralysed leg slightly from the bed. Ticking the sole now produced involuntary motion of the foot, and the application of a heated spoon caused her to wince. The metallic discs were now removed, to watch whether the results thus obtained would be permanent. In the evening, the sensibility had further increased; she could pick up a needle readily, and was able to rise from bed and move about a little with assistance; there was no return, however, of taste, hearing, or smell on the left side, and the auricle and back of the neck were still anaesthetic. The next day (27th), there was further improvement in the power of motion, and she was able to walk out a little in the grounds with assistance, the difficulty in walking being now rather of the character of a limp, rather than of a paralytic dragging of the leg. I now fixed one zinc disc on the ear and three on the back of the neck. On the 29th, there was no effect from these. The improvement in the power of locomotion had so far continued that she was able to walk unaided, and with very little noticeable defect. On the 30th, she could feel when the ear and back of neck were pinched, but she could not distinguish when the parts were merely touched. She also stated she could now hear the watch on contact, and that taste and smell had returned on the affected side. The discs had fallen off, and were not reapplied; her power of locomotion was almost normal; and she employed herself knitting, using the previously anaesthetic hand and fingers readily and well. On July 2nd, the condition of the ear and back of neck was unchanged, and she had a tendency to sickness of stomach. On the 5th (when this report was written), the sensibility of the ear and neck to touch was quite normal; she was, however, still deaf in the left ear, but I ascertained she was always a little so in that ear. She had a slight recurrence of the spasmodic hiccough on the 4th. In all other respects she appears to be now convalescent. The last menstrual discharge appeared on June 22nd.

REMARKS.—This case, is clearly one of those instances of so-called hysteria, or in some of its features allied to hysterio-epilepsy, accompanied by those peculiar functional nervous disturbances which have of late aroused such interest and attention. Without entering minutely into the question of the origin or causation of those symptoms, it may, I think, be shortly said that the menstrual irregularity played an important if not the sole part in their production; and it will be noticed that, on each occasion on which amelioration or disappearance of the

nervous troubles ensued, the menstrual periods resumed their normal course and the ovarian tenderness diminished or ceased. It is now, I believe, universally acknowledged, that any error of menstruation, be it defect or excess, is peculiarly active in developing every variety of cerebral and spinal irritation, and sometimes involves psychical life to such a degree as to impair consciousness, perception, and volition. How far the effects, in the present instance, were mental and how far purely physical, and why at one time the symptoms took the form of excess or irritation of nervous function, expressed in the spasms and electric pains, and at another, the form of depression of function, expressed by the motor paralysis and anaesthesia, is most difficult to estimate or judge. But be this as it may, the uncertain character of the symptoms, and the part which the mental bore to the bodily condition, seems to me to be an important element in the result which accrued from the application of the zinc discs as I have described. The particulars of the case are brief, and, from the results which followed the single application of the metal, have afforded but little opportunity for anything like an extensive repetition of the now numerous experiments which have been conducted on cases of this kind. That the hemianæsthesia in this girl was real, and not feigned or dependent on any purely emotional condition, is beyond any uncertainty; the girl was unsophisticated, perfectly unacquainted with any of the eccentricities of the affection, or of the effects which were to be looked for from the application, though of course, from frequent examination and constant prickings and pinching to elicit sensation, she subsequently became aware of what we were striving to bring about. That she was aroused from the condition of paralysis of motion and sensation *during* the application of the metallic *plaques* is equally certain. And then, having come so far, the question at once arises: was this restoration of motor and sensory power, so rapid and so far complete, due to and brought about by the peculiar action of the metal, either through the induction of electric currents of an obscure kind, or through its influence on the circulation? or was it the result of the action of the mind on the body, of the will overcoming the conditions dependent on emotional states of a finer and hidden kind, which are not expressed in outward and purely mental manifestations? It is needless for me to occupy your time by recalling the experiments made by M. Regnard to determine the presence of electric currents produced by metallic applications, or the hypothesis which he has offered as to the different effects of different metals on different individuals being due to the interference of the currents produced on the sensibility. On all hands, the possibility of mental influences playing a part in the results obtained has not been lost sight of, and recently the experiments and investigations of British physicians have strengthened this view. In an interesting article in the *Journal of Mental Science* for January of this year, Dr. Hack Tuke records carefully what he witnessed at the Salpêtrière, and, while unwilling to come to a positive conclusion, suggests that to the influence of expectant attention on the part of the patient may be ascribed the very curious phenomena produced. Dr. Hughes Bennett, who has published interesting papers on the question in the *JOURNAL of the Association*, and in *Brain* (October 1878), is of the same opinion, and others who have since written coincide in this view.

Reviewing the facts of the case under consideration without any preconceived opinions, it is difficult to conceive that the mere application of the zinc discs could have brought about the results which I have recorded, and which, so far as their extent and permanency go, exceed any with which I am at present acquainted; and yet it would seem that the presence, if nothing more, of the discs had some influence, as the condition of anaesthesia persisted in the ear and the back of the neck until the metal was applied and its application continued. In favour, however, of the view of mental influence is the fact that, when the girl's attention was first directed to her condition by the placing of the discs on her wrist and before she was at all aware of the effects they were supposed to produce, the arm on which they were fixed became helpless and rigid; and it was only after being assured that she could use it, and *concentrating* her attention on it, that she began to try, and finally succeeded in doing so; and, from the subsequent and rapid restoration and increase in the power of motion, as well as of sensation, which followed, I cannot but think, while at the same time quite open to conviction, that this concentration of attention on the affected limbs, even while she was ignorant of the exact results looked for, played a considerable part in the subsequent events. It is, I believe, a well established fact, that certain hysterical patients can, under the influence of a powerful effort of the will, control and nullify some of the phenomena of their affection; and may it not be here that the attention which was directed in this girl's mind to the powerless and anaesthetic limb, and the desire which naturally followed to be rid of this condition, induced a volitional impulse sufficiently powerful to release the inhibitory or arresting action which was taking place in the cerebral

centres? As evidence of this volitional effect, I have heard since that the girl, after the recovery of motor power, was on one occasion in the hospital-kitchen, and declared to the cook that she was about to vomit; and, on being informed by the cook that she could not do so there, she so far controlled herself that she made no further allusion to the matter and did not vomit.

This case illustrates the fact that sometimes the chameleon-like symptoms of hysteria will simulate and may be mistaken for diseases of serious import, such as disease of the hip or other joints; and it may be that the very influence on her mind on being told this contributed to increase the symptoms, while the subsequent assurance that nothing of this kind was wrong with her aided in the restoration of the arrested powers. The facts as to the actual effects of the metallic applications in this case are so far very meagre; the rapid recovery from the anæsthesia, and the permanence of this up to the present time, removing the opportunity of making further trials and experiments. Should there, however, be a recurrence of the symptoms, I shall pursue the matter, as the patient is likely to continue or again come under observation.

P.S.—October 21st, 1879, I have seen the girl to-day. She has had no recurrence of the hemianæsthesia since, nor any apparent loss of motor power; she, however, complains that the electric pains in the legs sometimes suddenly seize her, and that for short intervals the left foot becomes numb, she looks well but is stated to be nervous.

DISINFECTION BY ACIDS.

By JOHN DOUGALL, M.D., F.F.P.S. GLASGOW,

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[Concluded from page 728 of last number.]

ACIDS have an action on putrescible fluids which seems to me of much value in a sanitary sense. I have already referred to this in my paper on the Science of Disinfection,* and the numerous experiments by which it was discovered are detailed in my paper on Putrefiers and Antiseptics.† A few remarks on this point may not be out of place. If a clear, fresh, putrescible fluid be set aside for a short time, and then examined by the microscope, it will be found swarming with bacteria and their allies in active motion, fetid, and opaque. Its reaction is neutral; but these changes would ensue though it were made moderately alkaline or *very faintly* acid. If it be now exposed in a cool dark place for from nine to twelve months, and then examined, it will still be found swarming with life, cloudy, fetid, and containing albumen. In a few months later, putrefactive reduction is completed. The solution may be still cloudy, but is now almost free from fætor; a bacterium is only seen here and there; a faint trace of albumen may or may not be detected; and its specific gravity, at first perhaps about 1.6, is now probably about 1.1 or 1.2. Such are the chief physical phenomena of putrefaction. As regards its chemical aspects, the chief elements in animal matter are oxygen, hydrogen, carbon, nitrogen, phosphorus, and sulphur. The hydrogen unites with the oxygen to form water; with the nitrogen to form ammonia; with the sulphur, phosphorus, and carbon, to form sulphuretted, phosphoretted, and carburetted hydrogen gases. The oxygen also unites with the carbon to form carbonic anhydride. In course of time, the ammonia is oxidised into nitrous and nitric acids and water; the sulphuretted hydrogen into sulphurous and sulphuric acids and water; the phosphoretted hydrogen into phosphoric acid and water. These free acids then at once combine with any bases present to form their respective salts. Putrefaction is thus seen to be a process of reduction; and the greater the number of equivalents of elements forming the atoms of a compound, the more easily does such a compound decompose. This instability is increased in animal substances by their containing nitrogen, which has less tenacity in its affinities than any of the elements. The large quantity of water present also forms a most favourable medium for putrefaction, which only takes place at death, as then the chemical forces by which the living tissues act on vital organic compounds cease, and the elements of the original compounds unite to form bodies less complex, but more stable, as described above.

If to another portion of the same clear, fresh, putrescible fluid, a quantity of acid, mineral or vegetable, be added, so as to cause marked acidity, and the mixture be then placed under the same conditions as the former, then in a day or two it shows quite a new set of changes. One or more small tufts of mycelia are present, their silky filaments radiating from a tiny nucleus; also numerous free spores and double torulaceous cells. If the proper quantity of acid have been added, no bacteria are

present, and the fluid, instead of becoming hazy, becomes clearer and sparkling. Its reaction is of course distinctly acid, its odour somewhat mouldy, but not at all unpleasant; while, in about four months, it ceases to respond to albumen tests, indicating that decomposition is completed. This is fermentation. Again, if to a portion of a putrefying fluid a slight excess of acid be added, putrefaction is soon arrested, and the mixture, instead of being then fetid, has an odour like that of oil of spirea. And if to separate portions of a fresh and of a fermenting albuminous fluid, a larger quantity of acid be added than is sufficient to cause fermentation alone, then the fresh fluid neither putrefies nor ferments; fermentation is arrested in the fermenting fluid; and both mixtures remain in this antiseptic state for an indefinite time, and latterly cease to respond to albumen tests.

Now, these results seem to me strong proofs that putrefaction and fermentation, whatever be the chemical changes they produce on solutions of animal fluids, are distinct processes. There is abundant evidence that putrefying matter is very injurious to health, but there is little or none to show the effects of fermenting matter in this respect. It is obvious, however, that fermentation must be harmless as compared with putrescence. Putrid matter evolving noxious effluvia for nearly twelve months* must be more hurtful than the same matter when fermenting, it being always almost odourless and fully decomposed in about four months. Moreover, as already observed, acids added in excess both prevent and arrest putrefaction and fermentation; and this not by antiseptic but by destruction, as is shown by the animal solution ultimately ceasing to respond to the tests for albumen, without the physical signs of either putrefaction or fermentation having been present.

Convinced of the truth of these facts and deductions, I have now for a number of years exclusively practised them in every form of infectious disease, for which there has been ample opportunity both in my capacity as medical officer of health and in private practice. I have watched the effects with scrupulous care and an unprejudiced desire to learn whether, and if so how far, theory and laboratory experiments were confirmed by practice. My experience and observations have further convinced me that disinfection by acids is cheap, quick, easy, and certain: and I have frequently been struck with the summary manner in which an infectious disease has been thus arrested, under circumstances most favourable for its propagation.

About eight months ago, I attended a girl, aged 6, suffering from scarlatina. The family—besides the father, mother, and a servant girl—consisted of eight children, four older and three younger than my patient, none of whom had the disease. The house contained four small rooms and kitchen. The girl was kept in a room by herself; none of the family were allowed to see her; but during her illness, which lasted about a month, they remained in the house. The mother nursed the sick girl, at the same time mixing freely with the other children, four of whom had to stay from school, thus greatly increasing their risk of being infected; but as yet none of them have taken the disease.

About five months ago, I attended a male, aged about 18, son of a sanitary inspector. I found him very prostrate, and covered with a livid scarlatinal rash. Next day, he was greatly worse, and the case looked hopeless. The house consisted of two rooms and kitchen, and contained, besides the father and mother, four children, excluding my patient, whose ages ranged from six to sixteen, none of whom had the disease. Two days afterwards, a brother of the patient turned ill and was fevered. It was assumed that he also was sickening with scarlatina, and hence was put in a bed in the same room with the patient; but recovering in a couple of days, he was removed to a friend's house. Briefly, my patient, after a rather protracted illness, with profuse desquamation of the cuticle, quite recovered. The other children lived in the house, and as usual were kept from school. The mother nursed the patient, mixing freely with the rest of the family; and yet, up to the present, none of them have taken the disease.

About two years ago, I attended a girl, aged 12, ill of typhoid fever. The house consisted of four rooms and kitchen. Besides the father, mother, two servant girls, a sick nurse, and my patient, there were five young children staying in the house. The patient's bowels were very loose for about three weeks. She ultimately recovered; the children were kept at home during her illness; none in the house previously had, nor subsequently took, the disease.

About four years ago, I was hurriedly called to see a boy, about six years old. I found him in a state of collapse, and covered with a petechial scarlatinal rash; he died next day. The house consisted of

* *Transactions of the Social Science Congress.* Glasgow: 1874.

† *Glasgow Medical Journal*, November 1872, and February 1873.

* I have a bottleful of beef-juice prepared about five years ago, which is still quite putrid: its contents have, however, been kept from air and light. From this can be inferred the time which animal solids may lie festering in a choked or improperly flushed drain.