on two factors: 1, the duration of the application of the current; and 2, its intensity. The former of these can be readily recorded. As to the latter, we have no means of accurately measuring the strength of the faradic current; in its employment, therefore, we are guided only by the sensation it produces on ourselves or on the patient, and regulate the amount accordingly. The intensity of the galvanic current can, however, be ascertained and measured with exactitude by means of a galvanometer, which, in all electrical operations, should always be included in the circuit. The instrument should be divided into divisions of definite capacity (milli-amperes), so that, in ordering galvanism, assuming the size and position of the electrodes to be determined, we have simply to prescribe the number of milli-amperes of electrical force that we wish to employ. By this means, the dose of the current can be made as precise as the grains of a powder or the minims of a fluid.

These are some of the debatable points connected with the practice of electro-therapeutics, and the theoretical problems connected with them; all being worthy of discussion, and the solution of any of which would be attended with great practical advantage.

To estimate the precise value of electrical treatment is, to the conscientious investigator, a task of great difficulty; and the opinions of physicians are greatly at variance on the subject. Some look upon it as an universal panacea for all the ills to which human flesh is heir; others regard its alleged properties as hypothetical, and contemptuously refuse to admit any of its virtues. It must be admitted that we are not in possession of a sufficient series of scientifically arranged facts to enable us to speak with confidence on the question. At the same time, the conclusion arrived at by those who, from large experience and extended research, are best qualified to form a judgment, is that electricity is a many-sided remedy, which, in a variety of conditions, relieves distressing symptoms, and occasionally leads to the permanent cure of disease.

In conclusion, I propose to enumerate some of the chief morbid conditions for the treatment of which this agent is believed to be specially suitable. These, for practical purposes, may be considered under three classes: (1) diseases characterised by diminished functional activity; (2) those by increased functional activity; and (3) a large and miscellaneous collection of affections associated with local and general malnutrition. Under the first heading may be placed paralysis, anaesthesia, atrophy, sclerosis, and a variety of other morbid states. The etiology of these conditions is often obscure. The indication for their treatment is to excite and stimulate, to exalt functional activity, to remove anything which inhibits conduction, to overcome obstruction, and to modify abnormal nutrition-changes. The casual as well as the symptomatic manifestations must be brought under the influence of the current; and, in paralysis or anaesthesia, not only must the secondary local effects be treated, but the primary central lesions which caused them must be beneficially modified. Should any obstruction to natural impulses exist at any portion of the nerve-tract, this may often be successfully overcome by an electric stimulus, which thus artificially paves the way for subsequent normal impressions, and the consequent repetition of which ultimately ends in the transmission of the healthy functions. Here, also, attempts are made to stimulate depressed functions into normal activity; and, by utilising the catalytic properties of the current, in modifying nutrition, and influencing the trophic elements of the tissues, to facilitate the absorption of morbid products, and to promote the return of healthy structure. On these principles, there is obviously a large series of symptoms and diseases capable of being rationally submitted to the electric current, and it is probable that many of them receive more benefit from this method of treatment than from any other.

In the class of disorders characterised by excessive functional activity, there are pain, spasm, contracture, and their allied affections. Here, also, we are generally ignorant of the seat and nature of the primary lesion; but we assume the symptoms to be due to some molecular, or, so-called, functional derangement, the objective existence of which, however, we are unable to demonstrate. But, whatever may be the cause, the special property of the electric current, applied in a certain manner, is to relieve motor and sensory superexcitability, not only at the time of application, but often permanently afterwards; and, if this influence be maintained, the nutrition is so modified as to result in the entire removal of the disease itself. These sedative and alterative effects of the electric current obviously suggest its employment in a vast variety of morbid conditions.

Finally, the tonic, modifying, or catalytic actions of electricity, may be employed in many local and general diseases. As has been already stated, the effects are supposed to be due to the influence the current exercises on the nutrition of the tissues, the modification of the trophic functions, the alteration in the circulation, and the

stimulation of the absorptive processes. Of the exact nature of these actions we know nothing, and we are equally ignorant of the precise pathological conditions for which they are applied; and practical experience alone indicates their utility. Hence electricity has, with advantage, been employed in local ailments, as in rheumatism, gout, joint-affections, skin-diseases, chronic inflammations, and so on. So, also, in more general maladies, on the same principles, it has been found beneficial, as in hysteria, neurasthenia, chorea, general debility, and a variety of other miscellaneous constitutional disorders. It is especially among the neuroses, and so-called functional derangements, in other words, in those diseases characterised by much suffering and distress, without demonstrable tissue-change to account for them, that the greatest triumphs of electrical treatment are to be found.

Although these are the general conclusions which have been arrived at as to the utility of electricity as a therapeutic agent, much yet remains to be accomplished in this direction, and a vast field for future research and discovery still lies open for cultivation. For the solution of the complex problems involved, an accumulation of facts, observed and recorded with the most rigid accuracy and impartiality, is demanded. Instead of electro-therapeutic investigations being conducted, as is too frequently the case, by those ignorant of the elements of the science, and registered by them in an imperfect, illogical, and unscientific manner, the question requires for its truthful elucidation an extensive technical knowledge, dexterity and precision in the management and recording of details, and the absence of prejudicial opinions or interested motives. Doubtless, anyone adopting this line of inquiry in such a scientific spirit would be rewarded by novel and important results.

I have now, gentlemen, very briefly endeavoured to give a sketch of the general principles which guide us in the practice of electro-therapeutics. I have also, with the view of suggesting material for the subsequent debate, referred more especially to some of the doubtful or theoretical points connected with it, about which there is room for difference of opinion. I must, however, ask you to believe me when I say that the subject is a most complex and voluminous one, and difficult to compress intelligibly into the limits of a short address. Moreover, as the entire science is still in its infancy, its doctrines cannot be advocated with certainty or precision. I shall, however, have fulfilled my task if, by thus laying its prominent features before you, I initiate a discussion which may be the means of exciting interest, and throwing new light on this important method of treatment.

THE THERAPEUTICAL APPLICATIONS OF ELECTRICITY.

Read in the Section of Pharmacology and Therapeutics at the Fifty-Second Annual Meeting of the British Medical Association.

By W. E. STEAVENSON, M.D. CANTAB., M.R.C.P.,
Casualty-Physician and Electrician to St. Bartholomew's Hospital.

It is not my object to follow or discuss the very valuable remarks of Dr. Bennett upon the therapeutical uses of electricity. I have rather the wish to bring the subject before you from a different point of view; so that, in this discussion, we may consider the very important part which, without doubt, electricity plays in the promotion or maintenance of health and in the production of disease.

Electricity, as one of the physical forces, is constantly exerting its influence on everything around us, and no doubt influences our well-being far more than we have been ready either to admit or suppose. Its nature is still a matter of doubt; but it is most likely only a modification of motion, as is also supposed to be the case with heat and light.

All physicians recognise the effect that light and heat have upon health. We know that the children of our close alleys in large towns are pale and anæmic, chiefly from the deprivation of sunlight; and we also know the blanching effect produced on plants by keeping them in the dark. But we very seldom take into account the effect of electricity upon health; and yet such a powerful agent, that is continually varying and influencing our climate, must have a most potent influence upon such a delicate organism as the human frame. When gross and rapid changes take place, as on the approach of a thunderstorm, we all know that many people are most powerfully influenced. Slight variations in the electrical condition of the atmosphere are continually taking place, and localities in very near proximity vary considerably. This is well known to telegraphists, for the earth-currents produced by this cause are a great source of annoyance; and one of the chief reasons for the perpetuation of overhead

wires. These varying electrical conditions of contiguous localities have perhaps more influence than any other cause in producing the differences of climate, often noticeable within very short distances. Dr. Parkes, in his work on *Hygiene*, says, that electricity and light "are important parts of that complex agency we call climate seems clear, but little can be said on the point. In hot countries, positive electricity is more abundant; but the effect of its amount and variation on health and on the spread and intensity of disease is quite unknown." That electrified masses of air are continually moving at no great distance from the earth's surface has been proved by Sir William Thomson; and that the electrical condition of objects on the earth's surface must be affected by their inductive influence is quite certain, and human beings must participate in these changes. The question of animal electricity was exhaustively discussed by Professor McKendrick at the meeting of the British Association at Southport in September of last year. He denies the existence of a centre for electrical separation in the human body, but allows that such a centre or apparatus for the production of electricity does exist in some animals and fishes. Whether we possess a specific centre for the production of electrical separation, or not, it is quite certain that electrical separation does take place in the human body. All the vital processes, such as respiration, digestion, assimilation, and secretion, are accompanied by chemical changes, and all chemical processes are accompanied by the production of free electricity. Professor McKendrick showed that every muscular contraction produced electrical currents. It has been frequently shown that the electrical condition of individuals is much influenced by their state of health. The relation between nerve-force and electricity is still an undecided question. That they bear some relation to each other is admitted by many physiologists, although it is generally allowed that they are not identical.

When it is known that electricity plays such a prominent part in all vital processes, it is not an unwarrantable assumption to suppose that, if properly applied, it may prove to be, and indeed has proved to be, a most useful therapeutical agent. There is no doubt that electricity is one of the most powerful nerve-tonics that we possess. No agent so quickly restores the depressed condition of the system consequent upon severe and long illnesses. In all states of nervous depression, as from long mental strain or overtaxed bodily powers, general galvanism has proved a most invigorating and refreshing tonic. Dr. Poore proved, by the use of the dynamometer, that, when the muscles of the arm had been exhausted by squeezing the instrument, their strength could be restored by the passage of a galvanic current; and the persons on whom he experimented were, after galvanism, able to use more force, as represented by pounds' weight, than they were at the beginning of the experiment, before the muscles were at all tired.

In the way electricity has been used, up to almost the present time, its good effects have not, as a rule, been demonstrated or made manifest. It has chiefly been used as an aid to diagnosis; and when used as a therapeutical agent, there has been a looseness about the kind of electricity employed, and about the description of the cases reported, which has led to much confusion and distrust in its merits. Not long ago, a case of asthma was reported, in a medical periodical, as cured by galvanism. I wrote for the particulars of the case, and found, as I had supposed, that faradism had been used, and not galvanism at all.

The necessary apparatus for carrying out the different modes of electrical treatment, and the kind of electricity suitable for each individual case, includes a number of different batteries and accessories which are difficult to obtain except in a place set aside expressly for their use. This necessitates the establishment of regular electrical rooms, such as are now being added to all the London hospitals. A description of the one lately started at St. Bartholomew's Hospital will be found in the last volume of the *St. Bartholomew's Hospital Reports*.

In the use of electricity as a mode of general treatment, I see many difficulties. In the first place, it would occupy too much of the time of men in active practice; and, in the second place, batteries are very expensive, and are often getting out of order and requiring repair. This entails much loss of time and a continual additional expense. If treatment by electricity become at all popular, there is, I am afraid, a chance of patients applying for such treatment at the hospitals, if they be admitted to those institutions, as at present, without any questions being asked; and this would cause a great loss and injury to men in general practice. I have asked Messrs. Coxeter, of Grafton Street East, in London, who fitted up the electrical department at St. Bartholomew's Hospital, to exhibit to you the batteries I have found most useful for electrical purposes, and which I have recommended to medical men in practice in different parts of the country when they have asked my advice. The best form of constant-current battery is that made up of the Leclanché cells. Leclanché cells are

composed of a plate of zinc and a plate of carbon, with some bin-oxide of manganese, and excited by a solution of chloride of ammonium. This is the best form of constant-cell for medical purposes and is not in action when the battery is not being used. With due care, a battery composed of these cells ought to last eighteen months or two years without requiring any repair or recharging. I have now a battery of Messrs. Coxeter's in use at St. Bartholomew's which I have had since November 1882; it has not yet been out of order, and it has had more work than I should think any of you are likely to require of a battery. Of interrupted-current batteries, the one shown here by Messrs. Coxeter is a very good and useful one. The bichromate of potash battery, which I believe goes by the name of Morell Mackenzie's battery, and is made in London by Messrs. Mayer and Meltzer, is a very useful form of battery, and gives a most powerful current. The objection to it is, that the zinc is so often left immersed in the exciting fluid that the fluid becomes exhausted, and the zinc almost eaten away. For electrolysis, a battery of Leclanché cells can be used; the larger sized cells are preferable, as the small ones quickly become polarised. For the purposes of galvanocautery, I have found Messrs. Coxeter's zinc-and-carbon battery, excited by the bichromate of potash solution, very useful. The elements are arranged in a different manner from that required for a constant-current battery. The object of a galvanocautery battery is to obtain a large quantity of electricity; therefore, all the zincs are joined together, and all the carbons are joined together. In this battery before you there are only six cells, but a very large surface of the elements is exposed to the exciting fluid in each cell. The electro-motive force is not greater than six smaller cells would produce, but the quantity of electricity is very much increased.

For applying static electricity, an insulated couch and benches are necessary, and a frictional machine. These are much too cumbersome to move about.

The galvanic belts and portable batteries, so extensively advertised, are not of the slightest use, and are great impositions on the public. If it were possible to pass a weak current of electricity through the body, or any part of the body, for an indefinite time, no doubt great tissue-changes would take place. It would be impossible for such a powerful agent—one capable of splitting up all chemical compounds—to be passed through the body without causing great changes. But the skin offers such a resistance to the passage of electricity, that the body may almost be said to be insulated. No weak current, such as is produced by these battery-belts, could pass through the skin. If one pole from the battery-belt be applied to the body, and a galvanometer introduced between the body and the other pole, no deflection of the needle can be detected. If the current from these appliances were strong enough to overcome the resistance of the skin, sloughs would, in a short time, be produced at the points of application of the electrodes, a sore first appearing at the point of application of the negative pole. The same objection holds good with regard to the electric brushes; no battery that they can contain could produce a current strong enough to penetrate the skin of the scalp. That brushing the hair relieves headache I am not going to deny, and possibly it may do so through electrical influence. On all occasions, brushing the hair produces electrical separation; and, in certain people, during dry conditions of the atmosphere, sparks may be seen emitted during the process, that is, if the hair be brushed in the dark.

There is no way of applying electricity for curative purposes except by moving about the electrodes, and by applying it locally and intelligently for the particular affection it is intended to relieve. Its application should not pass out of skilled hands. If, in certain cases, a medical man should, after instructing a nurse, allow her to apply it, as in a case of infantile paralysis, which requires the treatment every day for months, he should still hold himself responsible for the treatment, and, from time to time, see that it is being carried out properly. There are so many points at which electrical treatment may break down, that it is impossible to prescribe it for the public for self-application without bringing the whole method into disrepute. In these cases of infantile paralysis, to which I have alluded, where parents are seldom able to afford the expense of the continual application of electricity by a qualified man, I have found the most absurd mistakes occur, even when a nurse has been duly instructed in the mode of application. Parents have complained that they see little improvement in their child, and, on examining the battery, it is found that there is no current generated, possibly there has been no current passing for weeks, but the nurse has been diligently rubbing the leg daily with the electrodes attached to the battery. At another time, the nurse is asked to go through her usual performance to show how she does it, and it is found that she has been diligently rubbing the

inside of the leg from the time she was first instructed, when the region of the peronei muscles and tibialis anticus had been particularly pointed out. Many of these mistakes occur with adults. They mix up the positive and negative poles, or, when electricity is advised for some abdominal complaint, they buy a magneto-electric machine, hold the two handles, and allow a very unpleasant current to pass from one arm to the other; the rest of the body being left almost completely out of the circuit. As no beneficial result follows, they lose their faith in electricity.

In cases of paralysis, due to cerebral lesions, that is, when rigid arteries are known to exist, or when softening of the brain is expected, the employment of electricity is not unattended with danger. In fact, fatal apoplectic fits have been known to follow quickly on its use (Golding Bird).

In cases of contraction and rigidity following hemiplegia, the result of a descending irritative lesion of the lateral columns arising from the seat of the injury in the brain, the use of electricity, although generally recommended, has not, as a rule, been found to produce much benefit. It very possibly prevents matters from becoming worse, or, at least, retards the progress of the contraction. If let alone, the contraction has been known to be so great that the finger-nails have been pressed into the muscles of the palm of the hand. I have lately had under my care a case sent to me by Sir James Paget, of a young man who was thrown from his horse on to his head, and thereby received some injury to the brain. The accident was followed by right hemiplegia and aphasia. I first saw him six months after the accident, when a great improvement had taken place in his general condition; but there was a progressing contraction, and rigidity of the right forearm and hand. Any attempt to open the hand was accompanied by convulsive trembling; this was also present, to a less extent, on attempting to extend the right leg. Ankle-clonus was most easily induced. I was asked to treat the case with electricity, and have galvanised and faradised the limbs for several months, three times a week. The treatment has been followed by most satisfactory results. I must say that, from previous experience of cases of late rigidity, I undertook this case with some misgivings, hoping only to retard the mischief, or, at best, to arrest it at the point it had already reached; but, at the present time, my patient's hand is often perfectly extended and open without any voluntary effort, and, if closed, can be easily opened with the slightest amount of trembling. The starting and trembling, which have been so troublesome in the leg, now do not occur, and, in every way, the case looks most promising. It is difficult to say how far improvement may continue. It is only fair to state that my patient is only 24 years of age, and in good health in other respects.

I have also under my care at St. Bartholomew's Hospital a man who was supposed to have broken some of his lower dorsal vertebrae, and severely injured the spinal cord. After being in a paraplegic condition for some months, he gradually recovered the power of motion in his lower extremities; but soon symptoms of lateral sclerosis became manifest. He suffered from gradually increasing rigidity of the legs, often suddenly increased in paroxysms. He also suffered from severe tremblings and sudden contractions of his limbs when in bed. The rigidity and contraction of the muscles prevented him from stooping to pick anything off the ground, and from lacing his boots; and he walked with a most marked spastic gait. He was sent to me for electrical treatment about eight months ago, and has been galvanised pretty regularly twice a week since then. For the last two or three months, the rigidity and contraction has been very much less; he walks with great ease and comfort, is not troubled with the sudden jerkings and tremblings at night, and can now easily lace his own boots and pick up anything from the floor. Although cases of late rigidity following disease of the nervous centres may not be very amenable to electrical treatment, I think that these cases will show that, when the injury to the brain or spinal cord is due to accidental violence, very great improvement may be hoped for by a judicious use of galvanism and the interrupted current.

I will now direct your attention to some other affections in which we have employed electricity as a therapeutical agent. It would occupy more time than I have at my disposal, if I were merely to detail a portion of the clinical experience on this subject accumulated at St. Bartholomew's Hospital during the last two years. Time will only permit me to glance at the results of some of the affections in which it has appeared to me to be most serviceable.

Most of the cases of palsy due to pressure on nerves, as from the use of a crutch, or from persons in a state of intoxication going to sleep on their arms when over the back of a chair or some similar object, will usually recover with galvanism more quickly than when left to themselves. In severe cases, the muscles for a time lose their faradic contractility.

In cases of paralysis of the bladder, we have also found galvanism most useful. This condition may be produced by overdistension, due to pressure on the neck of the bladder by an anteverted or a gravid uterus; in some cases, it is due to peritonitis. In cases where there has been overdistension followed by incontinence, electricity has been found to quickly restore the muscular tone of the bladder. I have had cases, in which the urine has been drawn off by the catheter for months, recover after about six or eight applications of electricity. It is also most useful in the nocturnal enuresis of children. The positive electrode is placed under the back about the region of the lumbar enlargement of the spinal cord, and the negative applied either above the pubes or to the perinæum. The results obtained by treatment of the genito-urinary organs by electricity are among the most satisfactory; and I attribute this to the fact that the whole nervous supply of these organs can be easily included in the circuit, the centres which preside over them being situated in the lumbar enlargement of the cord.

Dropped wrist, from lead-palsy, is also most frequently cured by galvanism, even after there is complete loss of faradic contractility; in these cases, of course, the treatment has to be continued for a much longer time. Dr. Golding Bird records cases of lead-palsy cured by static electricity in which sparks were drawn from the spine. This method was found useful when all others had failed.

In all rheumatic affections electricity is particularly useful; rheumatic paralysis yielding readily to its application. I have also had many cases of muscular rheumatism in which the pain and stiffness have been relieved as if by a charm. Several cases of severe lumbago I include under this head.

Facial paralysis is another affection that also, in the great majority of cases, yields more or less speedily to galvanism. I have had one case quite lately, in which paralysis followed some injury to branches of the facial nerve during an operation for the removal of a parotid tumour. There was, at first, almost complete paralysis of that side of the face; it is now difficult to detect the affected side. But there are some cases of facial paralysis which are most obstinate, especially those of long standing.

In those depressed conditions of the system to which I have before alluded, where there is no specific disease, but general prostration and want of energy following severe illness, mental shock, anæmia from over-lactation, flooding or leucorrhœa, general galvanisation has a most exhilarating and revivifying effect; and it does not seem to be followed by any unpleasant or depressing reaction, as is noticeable with the use of other stimulants. Of course, as a rule, hospital-patients with such indefinite maladies are not often referred for electrical treatment, but are given some form of iron or quinine. The patients I have had in this state have chiefly been ladies who have been sent to me to try electricity. They all express the wonderful restorative and refreshing effect they experience; they seem to be much more influenced by electricity than men are. This mode of using electricity can be most easily accomplished by the use of the galvanic bath, in which the whole frame comes under its influence. Male patients, to whom I have given the electric bath, express themselves as feeling most exhilarated by it. They like it immensely, and the light and buoyant feeling it gives lasts the rest of the day. This is a form of nerve-tonic which, I think, has been too much neglected by the profession. If you have a patient flagging and "below par," if you find he is at a stand-still, and will not progress towards convalescence, you send him away to the sea-side for change of air. I think you would find that general galvanisation, in whatever form you may apply it, will often have the same satisfactory effect, without the loss of time and expense entailed by seeking a change.

In hysterical affections of all sorts, electricity seems to be the therapeutic agent which less frequently fails than any other, in whatever form it may be applied. It is part of the treatment successfully carried out by Weir-Mitchell in America, and in this country by Dr. Playfair. I have had many cases of the kind, hysterical joints, hysterical paralysis, hysterical constipation, aphonia, and many of the other numerous diseases which this affection simulates; I may say that almost every case has either been cured or relieved by this mode of treatment. One case of hysterical hemiplegia, under the care of Dr. Gee at St. Bartholomew's Hospital, was cured by four or five applications of static electricity. The patient was placed on an insulated couch, charged with electricity from a frictional machine, and sparks taken from the affected side.

I have had no experience in the treatment of chorea by electricity, but in the *Quay's Hospital Reports* this seems to be one of the diseases most easily cured by its use. The plan adopted and first employed by Dr. Addison, was to take sparks from the spinal cord. Dr. Golding Bird records thirty-seven cases, thirty of which were completely cured. Sir William Gull has also informed me of the great success he had in

the treatment of chorea by electricity when he had the electrical department of Guy's Hospital under his care.

Dr. Golding Bird also says, in his lectures on the Therapeutical Uses of Electricity, delivered before the Royal College of Physicians of London, that, "In electricity we possess the only really direct emmenagogue with which the experience of our profession has furnished us. I do not think that I have ever known it fail to excite menstruation where the uterus was capable of performing this function."

In several cases of hysteria which have been accompanied with amenorrhoea of many months' standing, one of the first effects of electrical treatment has been to restore the menstrual function. I have also noticed the very marked way in which it affects the uterus when I have galvanised patients for affections entirely unconnected with that organ. I have, on several occasions, refused to galvanise patients who have been pregnant; in one case referred to me for treatment for paralysis of the bladder, the galvanising was followed by a miscarriage.

This branch of the subject brings me to another use of electricity, that is, the galvano-cautery, which we have found very useful in gynaecological practice. It is often my duty to assist Dr. Matthews Duncan with the galvano-cautery battery in operations upon his patients at St. Bartholomew's Hospital. Dr. Duncan believes that galvano-cautery is especially suitable for operations about the female genital organs, as it is followed by much less pain than when the knife is used. I may also add that the application itself is antiseptic, the surface of the wound is left charred and protected from infection, and there is very little consequent inflammation. "With no other cautery can we even approach the nicety with which we can graduate the required destruction of tissues, either as to surface or depth" (Dr. Muhlhal). Galvano-cautery is also most useful in other parts which are difficult of access, such as in the removal of nasal polypi.

The electrolytic action of galvanism has also been used as a caustic for parts on which we cannot act chemically without exposing the neighbouring tissues to more or less injury, such as in cases of ulceration of the cervix uteri, obliterations of the nasal duct, and strictures of the urethra. In these cases, it is of importance to get soft and non-retractable cicatrices; and, therefore, M. Tripiet has recommended the use of the negative pole, which acts as the caustic alkalies.

I have found the electrolytic action of the positive pole very useful for the destruction of naevi, according to the method advocated by Dr. Newman, of Stamford.

Sciatica, which is one of the most troublesome affections to treat, yields, as a rule, rapidly to the application of electricity. I published some successful cases, cured by this mode of treatment, in the *Lancet* in January last.

All forms of neuralgia, in whatever part of the body situated, can generally be relieved by galvanism.

I have made my paper so long, that I am afraid I may have tired you; but I hope I have said sufficient to prove that electricity is a most useful therapeutical agent.

Dr. JACOB (Leeds) said the very short experience he had had of electricity was enough to convince him that it would be some time before it would form one of the general therapeutical agents at the service of general practitioners. Some years ago, when in charge of a large hospital, he found a large battery that had hardly ever been used, and he got a standard work on electro-therapeutics and set to work to experiment for himself. First of all, he found that the batteries were frequently out of order; and although, of course, he could put them right again, still there was a great waste of time in this. Next, many of the arrangements were unsatisfactory, though these were improving. Still, the amount of trouble and time lost in putting batteries in order, was such as would probably make medical men relegate this agent either altogether to specialists, or employ electricians who would do exactly what they were told and no more. At the same time, from his experience of its effects, he should, for his own part, feel extremely crippled, if he had not the faradic or other battery to fall back upon in ordinary practice.

Dr. LEECH (Manchester) expressed the view that much of the unsatisfactory opinion on this agent depended on the fact that medical men entered the profession without knowing anything about electricity. They often did not know the difference between the electric and faradic currents. That was one reason why this agent was often ignored. The therapeutical use of electricity would never be thoroughly understood until more was known of the natural history of disease. How many of the cases quoted would have recovered without the treatment? That it was of great utility, however, he made no doubt.

Dr. BARNES (Carlisle) wished to draw attention to the necessity

there was at the present time, when electricity was coming more into use, that there should be some definite meaning attached to the words electricity, galvanism, and faradism. Descriptions were constantly given in the journals of treatment by electricity. What was meant by that, the one kind or the other? In a section of this kind the same indefiniteness of language should be avoided, but Dr. Steavenson wound up his paper by saying that certain cases of sciatica were cured by electricity, and cases of neuralgia very often benefited by galvanism. Did Dr. Steavenson mean that cases of sciatica were cured by static electricity, or by the galvanic current? He himself had found the second of very great service, but not the first; and it was a point of some importance.

Dr. STEAVENSON, in reply, said of course he could not declare that his cases would not have recovered without this agent. Most of the cases mentioned he had chosen because he had happened to have them under his care quite lately. He admitted that there was a great laxity about the use of the word electricity, and he was afraid he had, in his paper, fallen into the same lax way of speaking. In this particular case of sciatica, it was galvanism, or the constant current, that was used. Indeed, he had had only one case that did not get quite well with it. In the neuralgic cases, the word electricity would be quite correctly used, because one form seemed to do in the one, and another in the other.

The PRESIDENT (Dr. MacLagan) observed that the whole subject was still in its infancy. No doubt, a large number of cases did well under the treatment. But it was not always easy to distinguish between the *post* and the *propter hoc*; and he thought the discussion would help that to some extent.

Dr. HUGHES BENNETT said that the prospect of successful treatment in a variety of affections by electricity was so encouraging, that care was to be taken not to cause disappointment by exaggerated statements or a too liberal promise of marvellous cures. The result of ten years' experience as physician to a hospital for nervous diseases had not always permitted him to endorse the confident assertions and universal successes of others, with admittedly more limited opportunities. Premature conclusions might be the means of making a really valuable therapeutical agent unpopular, and bringing it into disrepute. Although our knowledge of the subject was still imperfect, there was sufficient evidence to show that, intelligently employed, electricity might be utilised with advantage for the relief, or even for the cure, of disease. To further develop its resources a more extended inquiry was demanded, which should be conducted in a judicial and logical spirit, free from prejudice or interested motives.

THE INFLUENCE OF ERRORS OF REFRACTION IN AFFECTIONS OF THE CONJUNCTIVA, CORNEA, AND IRIS.

Introduction to a Discussion in the Section of Ophthalmology at the Fifty-Second Annual Meeting of the British Medical Association.

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THE subject upon which I have been asked to open the discussion is, the Influence of Errors of Refraction in Affections of the Conjunctiva, Cornea, and Iris. Attention has lately been directed to this matter by the writings of Keyser and Martin; but it appears to me that the standpoint of these writers is an erroneous one. De Wecker, who has criticised their views, has been equally unsatisfactory in the theory which he has advocated. Keyser and Martin look upon the errors of refraction as a cause, De Wecker as a consequence, of phlyctenular keratitis. For some time past, I have devoted a good deal of attention to this matter, and the conclusion at which I have arrived is, that the errors of refraction are not the direct agents, but that they certainly are important factors, in the production of affections of the conjunctiva, eye-lids, cornea, and iris. When we consider it, there does not seem anything unreasonable in this proposition. Every oculist is familiar with the appearance of the conjunctiva and margins of the lids in an individual who has been exciting his accommodation, and who is at the same time suffering from an uncorrected error of refraction. This increased vascular activity or congestion is probably the very thing which induces him to seek the advice of the specialist. Complete rest, and the application of a cooling or astringent lotion, may quickly remove this condition, but it will recur on any renewed effort of accommodation. No radical cure will be effected without the correction of the anomaly of refraction.

Now let the cause, whatever it may be, local or constitutional, which