

another thirty years it would then have entirely disappeared. The first great drop in its rate took place in the decade 1840-50, about the time that serious attention began to be given to sanitary reforms and especially to land drainage. It then remained scarcely reduced for about seventeen years; but from 1857 to 1894 it has been steadily on the decline. It is in this period that most of the great sanitary works have been carried out in this country. Can we doubt that it is to them that we owe so substantial a diminution of the disease? And need we despair of carrying it on to its fitting close? Let it be remembered that this improvement has taken place in spite of the increasing aggregation of the population in towns and without any special measures of repression having been attempted. It is, indeed, only recently that tubercle has been reckoned amongst preventable diseases, and although some slight efforts at the disinfection of sputum and the cleansing of rooms occupied by phthisical patients have been made we certainly cannot ascribe any part of the improvement that has taken place to these causes.<sup>10</sup> What may we not hope for when these measures come to be recognised as a part of the duty of every sanitary authority throughout the kingdom?<sup>11</sup> It is interesting to note that the other tuberculous diseases—such as scrofula, mesenteric disease, and tuberculous meningitis—have not diminished in like proportion.

Dr. Tatham has kindly sent me the following table from his decennial supplement, not yet published, from which it will be seen how slight a change has taken place in the rates of these diseases in the last thirty years. I have marked on the chart the annual rates per 10,000 for the last twenty years, as given in the Registrar-General's report for 1894. The difference between the first and last decennial periods per million is only 69, or rather less than 9 per cent. The rates under the heading of scrofula have, in fact, considerably increased—a fact difficult to account for if the causes of phthisis and scrofula are the same.

*Annual Mortality per Million Living from Tuberculous Diseases, other than Phthisis.*

Decennia.	Rates per million.
1861-70	765
1871-80	747
1881-90	696

The only possible sources of fallacy that can be discovered in these figures are (1) the uncertainty of diagnosis in the earlier periods of the registration of the causes of death, and (2) the acknowledged longer duration of phthisis in the later years. If in former days more cases of bronchitis or broncho-pneumonia were mistaken for phthisis, then these mistaken cases might have raised the apparent rates of mortality of this disease. Again, in more recent years the extension of the average duration of its progress before it ended in death would for a time postpone the appearance of these deaths in the register and would by so much lessen the phthisis rate without necessarily diminishing the real prevalence of the disease throughout the country. It is probable, however, that neither of these intrusive faults would account for the remarkably steady fall in the rate. Phthisis is a disease so easily recognised in its later stages that it has probably been reported with a fair degree of accuracy all through the period in question, and sooner or later most of the chronic cases of phthisis would have found their way into the death-roll. There is thus no important bar to our hope of a speedy extinction of phthisis if not of other tuberculous diseases, and the prophecy drawn from the analogy of leprosy is already in process of being fulfilled.

Bournemouth.

<sup>10</sup> A talented writer, Mr. G. Archdall Reid, in a recent work on *The Present Evolution of Man* (Chapman and Hall, 1896, pp. 279-286) ascribes the lower rate of mortality from tuberculosis amongst the British races to an increased resistance to the microbe, a power due to "the accumulation of inborn variations"; but this explanation will surely not apply to so rapid a decline as the diminution of from 60 to 70 per cent. in the course of sixty years. It is far more likely to be due to the causes to which we have assigned it: to the sanitary measures, including improved diet, which have at once and directly diminished the infecting power of the bacillus and increased the bodily powers of resistance in the mass of the population.

<sup>11</sup> We may, perhaps, find an additional feature of likeness between leprosy and tubercle in the fact that they have both given way, not to intentional measures of repression, but to general reforms in sanitation, by which the whole physical welfare of the nation has been raised.

**SUPERANNUATION ALLOWANCE.**—Mr. Thomas Francis, L.R.C.P. Edin., M.R.C.S. Eng., late medical officer for the first district of the Bradford Union, has been granted a superannuation allowance of £107 13s. 4d. per annum.

**ON THE TREATMENT OF INOPERABLE CASES OF CARCINOMA OF THE MAMMA: SUGGESTIONS FOR A NEW METHOD OF TREATMENT, WITH ILLUSTRATIVE CASES.<sup>1</sup>**

By GEORGE THOMAS BEATSON, M.D. EDIN.,

SURGEON TO THE GLASGOW CANCER HOSPITAL; ASSISTANT SURGEON, GLASGOW WESTERN INFIRMARY; AND EXAMINER IN SURGERY TO THE UNIVERSITY OF EDINBURGH.

I HAVE no doubt it has fallen to the lot of nearly every medical man to have been consulted from time to time by patients suffering from carcinoma so widely spread or so situated that it has been quite apparent that nothing in the way of operative measures could be recommended. Such cases naturally excite our sympathy, but they also bring home to us the fact that once a case of cancer has passed beyond the reach of the surgeon's knife our curative measures are practically *nil*, and "that whether the case advance with giant strides or with slow and measured steps the result is equally sure and fatal." Of late, owing to my taking up the work of surgeon to the Glasgow Cancer Hospital, I have seen a considerable number of such cases, and an opportunity has been furnished me of working out a line of treatment which I am not aware has been as yet tried by others and which is founded on a view of the etiology and nature of cancer which is entirely opposed to the local parasitic theory of the disease and which seems to me to offer a more reasonable explanation of it. As these inoperable cases of cancer may be arranged into two groups—first, those which have been operated on, but in which, sooner or later, there has been a recurrence, or, as it should perhaps be better expressed, a re-appearance of the disease; and, secondly, those in which no operation has been attempted, but in which, when they first present themselves, the disease has progressed so far that no local removal could be attempted—I shall bring forward three cases, one of which is illustrative of the first group and the other two of the second.

The first case, then, that I wish to bring under notice is that of a woman who consulted me on May 11th, 1895, at the Glasgow Cancer Hospital, bringing me the following letter:—

"Apsley-place, May 6th, 1895.

"DEAR DR. BEATSON.—The bearer is, and has been, suffering, I fear, from a malignant breast. She has been in the Royal Infirmary before she came to me. My own opinion is that nothing can be done for her, but as she is a woman of great courage you might have a look at it for my sake, and perhaps you can order her something in the way of dressing. Even this little will be accepted by her as a great deal.

"With kindest regards, yours very truly,

"JAMES W. WALLACE."

The history she gave me was that she was thirty-three years of age, married, and the mother of two children, the oldest three years of age and the youngest fifteen months. She nursed both her children for from ten to twelve months, chiefly on the left breast, the first child entirely so, as the right breast suppurated for two or three weeks. While nursing her first baby she observed a small, hard lump at the outside of her left breast, and as it was painless and did not increase in size she took no further notice of it. It was only when her second baby was born twenty months later that she became aware it was increasing. She nursed the child on both breasts notwithstanding, and it was not for ten months, by which time the tumour had grown a good deal, that she weaned the child and sought advice at the Glasgow Royal Infirmary. In January of 1895 she was admitted to that institution, and the journal report states that an examination showed the left mammary gland to be a little more swollen than the right one and to present a hard and nodular appearance. In its centre was felt a large mass, measuring 5 in. across and 3½ in. in vertical diameter, while small nodules from this infiltrated the skin around. About 2 in. upwards and to the left of the nipple was seen an ulcer 1 in. in size, two nodules about the size of beans bordering on the extreme left of this ulcer. The patient

<sup>1</sup> A paper read before the Edinburgh Medico-Chirurgical Society on May 20th, 1896. Microscopic sections, kindly prepared by Dr. R. M. Buchanan, were shown of the growths in the cases described in the paper.

appeared to be strong, healthy, active, and robust. On Jan. 25th, 1895, she was operated upon. The hospital journal says that the left breast was excised, a large area of skin free of tumour being taken away. The axillary glands were removed, also a considerable part of the pectoral muscle which appeared to be implicated. A plastic incision was made parallel to the trunk to allow of the edges of the wound being approximated. The patient seemed to have made a good recovery and to have left the Infirmary towards the beginning of March with the wound almost healed. About a month after she had gone home—that is, within three months of the operation—she noticed that the wound had opened, that a little discharge was coming away, and that pain of a shooting character had developed. She observed also that some hardness was developing at the side of the scar, and so she returned to the Infirmary for advice. She was there told that she should come into the hospital again. She was readmitted for a few days and then discharged, as it was thought that an operation would be useless. The journal report is as follows: "April 28th, 1895: Dismissed. General involvement of whole scar by large tumours, cancerous in nature, to remove which entirely was thought impossible. Adherent axilla and chest walls. One of the wounds from the recurring secondary tumours has given way and there is now an ulcerated surface." Such, briefly, was the outline of her personal history as detailed to me. On questioning her nothing could be elicited in her family history that showed any hereditary tendency to cancerous disease. On May 11th, at the time she presented herself to me, the local condition for which she sought advice was as follows. On the left side of the thorax there was seen a very extensive cicatrix in the situation of the left mamma, which had apparently been entirely removed. The scar extended from the middle of the axilla to within 1½ in. of the xiphi-sternum. It was irregularly curved in aspect. Above the centre of the scar was a cicatrizing area, which had broken out after the operation in January last. This was now granulating and seemed healthy, but immediately below and arching over the centre of the long scar was a mass of recurrent tumour, hard and nodular, with much thinning and discolouration of skin. This mass was curved in shape, about 2½ in. broad at its broadest part, and about 3½ in. in length. There were other nodules in the cicatrix as far back as the axilla. Four inches lower down there was the linear cicatrix of a plastic operation, made apparently to allow of the sliding together of the edges of the operation wound. No enlarged glands could be felt in the axilla or above the clavicle, but there was a distinct tumour of the left lobe of the thyroid gland, with some enlargement of the isthmus. This, however, she said had been present as long as she could remember. The right breast and axilla were free from any disease. The patient's weight was 9st. 9lb. She looked pale and careworn, and when questioned admitted she felt ill and was quite unable to perform her household duties. From the clinical history she had given me and from the local condition present I had no doubt that the case was one of carcinoma—a diagnosis that was subsequently confirmed by our pathologist, Dr. R. M. Buchanan, who reported as follows on a portion of tissue taken from the ulcerated surface above the line of the cicatrix: "The portion of tissue ..... is typically cancerous. The cellular elements predominate over the stroma very largely."

The question that had to be decided was whether anything further could be done for the case. As regards local removal I was quite at one with the opinion already expressed at the Royal Infirmary that it was unjustifiable, because the prospects of complete eradication of the cancerous material were not good, and previous experience had shown me that in young patients such as the present the attempt is seldom successful and, indeed, sometimes seems to hasten the progress of the disease, which assumes an acute and fulminating form, most disappointing and disastrous. Failing, then, local measures, could the disease be attacked in any other way and by any other channels? To answer this it is necessary that I should put before you views that I have for some time held as to the etiology or cause of cancer generally, but more particularly of that of the female mamma. Before, however, doing so I think it will be advantageous that I should very briefly lay down what I consider is the present state of our knowledge of carcinoma or cancer, so that I may make it quite clear what I mean by that term and that there may be no difference of opinion as to what it is we are discussing. Well, I think I put the case fairly when I say

that there are certain points in carcinoma on which we are all agreed and others on which there is great diversity of opinion. I think we are all at one on the following: 1. That carcinoma is a tumour taking origin in epithelium and having an epithelial structure. 2. That the essential feature of the disease is the continuous and excessive growth of this epithelium, which invades the surrounding tissues, spreads along the lymphatic vessels, passes from one set of glands to another, and eventually forms deposits in distant organs and parts of the body. 3. That once this proliferation of epithelium has begun nothing that we know of has the power of arresting it. 4. That if a microscopic section of a carcinoma is made sufficiently thin and stained certain special cells are observed, which cells, although not fulfilling the rôle of Lebert's specific cancer-cell, are yet sufficiently characteristic of the disease and are now known as "cancer-bodies." 5. That clinically it is a matter of common observation that the younger the patient the more rapid the cell proliferation and the more quickly fatal the disease; while in many old persons cancer assumes the atrophic or withering form from fatty degeneration and absorption of the epithelial cells, little more being left than a mass of fibrous tissue with here and there a few cells surrounded by granular debris. 6. That cancer kills either by septicæmia from absorption of unhealthy products, or by hæmorrhage, or by interference with the function of some important organ. 7. That in our present state of knowledge of the nature and etiology of cancer the best treatment we can offer our patients is the complete removal of the disease by the surgeon's knife, and that the aseptic surgery of the present day allows this to be done more freely than heretofore, so that very extensive operations are performed nowadays.

There is, however, not the same unanimity of opinion on the two following points in connexion with cancer: (1) as to the purely local origin of the disease; and (2) as to the interpretation to be put upon the structures known as cancer-bodies.

Taking the first point, we find that some hold that the carcinomatous growth has a purely local origin—starts, in fact, from an irritation developed locally, and that if that irritation and its effects are freely removed the patient is cured. Others, again, teach that carcinoma, though an affection of the solid tissues, as shown in the local cell proliferation it causes, is really a blood disease and that the tumour is only a local manifestation of a blood affection. Lastly, there is what I may term a third school, who hold that there is a certain state of the system or of the tissues in which a local injury, such as a blow, will start a carcinoma of the part, and without this local irritation a cancer will not develop. Coming next to the interpretation to be put upon the cancer-bodies, a large number of observers, and amongst them men of the highest standing, look upon them as intra-cellular organisms of the nature of coccidia, or psorosperms, as French writers call them, and they regard them as the cause of the cell activity and proliferation characteristic of cancer. One distinguished member of the Edinburgh Medico-Chirurgical Society, Dr. Russell, has brought out the fact that these cancer-bodies can be particularly well displayed by fuchsin staining, but, if I remember correctly, he looks on them as closely related to the yeasts. Others, however, are not satisfied as to the parasitic nature of these cancer-bodies. They explain them as arising from the embedding of leucocytes within certain of the cells, or, as Klebs puts it, from the fructifying influence of the leucocytes upon them; while others, again, think that they are simply epithelial cells undergoing vacuolation in the course of what is evidently a mucoid degeneration. I confess that of late this latter has been my own feeling.

I must now be allowed briefly to mention what has led me to modify still further my views about these cancer-bodies, and also to lean to an explanation of the exciting cause of cancer that is quite opposed to the parasitic theory of the disease. I shall do so as shortly as I can. It is just twenty years ago that I was asked to take medical charge of a man whose mind was affected, and I went to reside with him at one of his estates in the west of Scotland. My duties were at times exciting, but never onerous, and I had a good deal of leisure to myself. I thought it would be a good opportunity of writing my M.D. thesis, and after consideration I decided I would take up the subject of lactation. What suggested it to me was the weaning of the lambs on a large adjoining sheep farm soon after I went down to my patient. Accordingly I commenced to work at it, getting all

the practical information I could about it from the farmers and shepherds round. At that time, however (1876), cerebral localisation was being much talked about, and I took up the disease study in sheep instead, as there were a good many cases of it just then. I yet, however, elicited the following points in connexion with lactation that struck me as of great interest. 1. I found that the secretion of milk, though undoubtedly affected by the general nervous system, had no special nerve-supply of its own to control it. Neither section of the sympathetic nor of the spinal nerves seems to influence it. The erectility of the nipple is affected by cutting the latter, but nothing more. 2. It was clear to me that the changes that take place in the mammary gland in the process of lactation are almost identical, up to a certain point, with what takes place in a cancerous mamma. We have, under both these conditions, the same proliferation of generations of epithelial cells which block the ducts and fill the acini of the gland; but in the case of lactation they rapidly vacuolate, undergo fatty degeneration, and form milk, while in the carcinoma they stop short of that process, and, to make room for themselves, they penetrate the walls of the ducts and the acini and invade the surrounding tissues. In short, lactation is at one point perilously near becoming a cancerous process if it is at all arrested. 3. I learnt this very remarkable fact, that it is the custom in certain countries to remove the ovaries of the cow after calving if it is wished to keep up the supply of milk, and that if this is done the cow will go on giving milk indefinitely. This fact seemed to me of great interest, for it pointed to one organ holding the control over the secretion of another and separate organ, and thus explained the absence of that distinct nervous control that I pointed out as characteristic of the mamma. Of course, the close intimacy between the ovary and the mamma is well known to all of us, as seen in the absence, as a rule, of the menstrual function during lactation, but I certainly was not aware until then that it was of the nature that it would seem to be and almost of a distinct control. In our country farmers have not gone the length of spaying cows as in Australia, but they attain the same end of having a continuous supply of milk by getting rid of all ovarian influence in another way. We know that during pregnancy the ovary is, as a rule, functionless—that is to say, we have not the indications of its activity in the shape of the menses, and it would seem to be in its turn brought under the control of the pregnant uterus. Farmers knew that their cows after calving usually begin to menstruate every three weeks and that with the establishment of this function the mammary secretion gradually lessened. They also knew that during the nine months the cow carried her calf she did not menstruate, so to prevent menstruation and lessened milk they put the bull to the cow usually two or three months after the calf is born and when the milk secretion is becoming lessened, the result being that with pregnancy the secretion ceases to lessen and remains copious. I need hardly say that though I temporarily abandoned the subject of lactation for my thesis I did not lose sight of the facts above mentioned, for they seemed to me to point to influences at work in the human system that had not as yet been generally reckoned with or recognised. Above all, I was struck with the local proliferation of epithelium seen in lactation. Here was the very thing characteristic of carcinoma of the breast, and, indeed, of the cancerous process everywhere, but differing from it in that it was held in control by another organ, and could either be arrested by that organ altogether or continued to a further stage, where the cells became fatty and passed out of the system not only in an innocuous but nourishing fluid—milk.

Now I think I am correct in saying that the spirit of modern pathology is this—that all pathological changes are merely modified physiological ones, that there is no essential difference between the two, and that a knowledge of the forces controlling the one may sometimes give us a clue to the other. I often asked myself, is cancer of the mamma due to some ovarian irritation, as from some defective steps in the cycle of ovarian changes; and, if so, would the cell proliferation be brought to a standstill, or would the cells go on to the fatty degeneration seen in lactation were the ovaries to be removed? For an answer to these questions I felt I must wait; but on settling in practice in Glasgow in 1878 I determined to look further into this point of the control the ovaries seemed to have over the function of lactation. Accordingly I obtained at the end of 1878 a licence for performing the experiment of removing the ovaries from

suckling rabbits. Through the kindness of Professor M'Kendrick I was able to carry my experiments out at the University laboratory. Space will not allow me to go into them in detail, but I may say that the three cases I tried all confirmed the fact. As long as the young ones were at the breast the milk-supply continued, and when eventually they were taken away the milk-supply ceased; but the creatures increased very much in size, and post-mortem examination revealed that this was due to large deposits of fat around the various organs, and, above all, in the lumbar region, where there were masses of pure adipose tissue, showing that the secretion of milk was still going on, but, not being discharged by the usual channels, was deposited in the various tissues of the body as fat.

In the year 1882 a case of uterine cancer, unsuitable for local removal, came under my care, and I thought I would try on it the effect of removal of the tubes and ovaries, as the patient was willing to submit to any operation. I found, however, on performing abdominal section that the disease had extended so much into the broad ligaments that a satisfactory removal of the appendages could not be accomplished and I abandoned the operation. She made a good recovery from the laparotomy, but died some months later from her disease. With this single attempt to put my views to the test I was for a time content, as I was very unwilling to do anything of the nature of experiments on my fellow creatures. Further, with the rise and progress of bacteriology I began to share in the hope that in this quarter a solution of the true nature of cancer would be found, and, with the announcement of the so-called cancer bodies, now generally recognised, I began to think less and less of my ovarian theory of the origin of cancer.

On taking up my work at the Glasgow Cancer Hospital, which I may say has been established not only for the treatment of cancer in all its stages but also for the pathological study of the disease, I felt that the position of matters was that our present state of knowledge has nothing better to offer than the surgeon's knife for the cases where the tumour was limited and could be thoroughly removed; but that in inoperable cases, if the so-called cancer-bodies were not parasites at all but merely cells undergoing mucoid degeneration, it was possible a free administration of thyroid extract might influence the growth and work through time a cure. Failing this, I thought I might follow up my old line of reasoning, and in cases of advanced carcinoma of the breast in young patients see what effects the removal of the tubes and ovaries would have on the progress of the cancerous growth in the way of arresting the cell proliferation and converting the cells into fatty matter. Although the breast had been removed, this was the line of procedure I decided to adopt with the case under notice, and accordingly on May 11th she was put upon the thyroid tabloids. They were pushed until their physiological action was made apparent; but as no appreciable change was seen in the diseased condition at the end of a month I put it to her husband and herself as to whether she should have performed the operation of removal of the tubes and ovaries. Its nature was fully explained to them both, and also that it was a purely experimental one, but that it could be done without risk to life; and that, if it should have no effect on the cancerous process, it would cause her no increase of suffering. She readily consented that I should do anything that held out any prospect of cure, as she knew and felt her case was hopeless. On June 15th I operated and removed the tubes and ovaries on both sides. The right ovary seemed healthy; the left one was somewhat cystic. Subsequently there was some little trouble with the action of her bowels; but she made a good recovery and on June 28th was sitting up. No local application was made to the diseased areas on the thorax. They were simply kept clean with boric lotion and dressed with protective and boric lint. On July 12th the administration of the thyroid tabloids, three daily, was resumed, as I felt that though I hoped by my oophorectomy to arrest the cell proliferation and favour, perhaps, fatty degeneration of the cells, there was present such a large amount of cancerous material that a powerful lymphatic stimulant such as thyroid extract might be useful. On July 19th, about five weeks after operation, an examination of the diseased areas on the left side of the thorax showed, as the hospital report states, undoubtedly a marked change compared with their condition some weeks ago. The larger mass of disease was much less vascular. It was also smaller, flatter, and altogether less prominent, and the same may be said of all the other secondary foci of disease. The

tissues around were also softer and more pliable. On Aug. 1st it was noted that the local improvement continued and that the measurements of the largest area of disease were—length, 2½ in.; breadth, 1½ in.; while the depth was hardly appreciable. The colour was a dull yellowish-white and the vascularity slight. There were five small nodules in the axillary region, which were also diminishing in size and vascularity, though perhaps not so much as the larger growth. The patient's general health and nourishment were satisfactory; and as she was an intelligent and reliable woman, and interested in her own case, I allowed her to go to Bridge of Allan for a change, and asked her to report herself from time to time. This she did, and without going into a detailed account of her condition on each visit that she made I may say that the local improvement continued, and my note on Oct. 12th, just four months after the operation of oophorectomy, was as follows: "On examination of the left breast the condition of the tissues is favourable. The most remarkable feature of the case is the yellow fatty look that the former thick bar of cancerous tissue above the scar of the incision for removal of the breast presents. It is to my mind the most striking feature of the case. The cancerous tissue has been reduced to a very thin layer and is in no way raised above the surrounding skin. In fact, the whole surface is smooth and level, and to the naked eye it seems as if the skin at this part had a yellow look. So distinct is this that one could easily trace out the outline of this yellow-coloured tissue. At places the surrounding skin seems pushing its way into the yellow mass and the processes of bluish cicatricial tissue are to be noted. The yellowish nodules at the axillary end of the incision are still apparent from their colour, but they seem thinning out. The whole of the tissues on the chest wall are more movable and the surrounding skin has a clear and healthy look. The scar of the former ulcer above the mammary excision cicatrix is sound and no new nodules are at present observable. The patient expresses herself as feeling very well and looks so. She is taking four 5-gr. tabloids of thyroid extract daily." I need not trouble with any further detailed account of this patient than to say that eight months after my operation all vestiges of her previous cancerous disease had disappeared, and that I am able to show her with a sound cicatrix and healthy thoracic tissues, and that she is apparently in excellent health.

(To be concluded.)

## NOTE ON EUCAINE AS A LOCAL ANÆSTHETIC.

By ROBERT BRUDENELL CARTER, F.R.C.S. ENG.,  
CONSULTING OPHTHALMIC SURGEON TO ST. GEORGE'S HOSPITAL.

THE *Medizinische Novitäten* for June quotes from the *Ärztlicher Central-Anzeiger* a condensed account of a paper read before the Hufeland Society of Berlin by Dr. Gaetano, of Vinci, Messina, on the properties of "eucaine" as a local anæsthetic, and this account induced me to make further inquiry into the subject. I have since seen an English

THE *Medizinische Novitäten* for June quotes from the *Ärztlicher Central-Anzeiger* a condensed account of a paper read before the Hufeland Society of Berlin by Dr. Gaetano, and informed that eucaine is not derived from the vegetable kingdom, but that it is a laboratory product which can be prepared in any quantity at moderate cost. I am also informed that its proper designation is "methyl-benzoyl-tetramethyl-oxypiperidine-carboxylic-acid-methyl-ester," a combination which seems to open a door, either in speech or writing, for infinite possibilities of error. The trivial name "eucaine" is comparatively free from this objection; but I neither know by whom it was invented nor what idea, if any, it is intended to convey. It is apparently compounded of the prefix "eu" and of the last syllable of "cocaine," and if so may perhaps be regarded as a first cousin of "chlorodyne." But "eucaine" seems to have no meaning, while "green pain" has, at least, the semblance of one.

Dr. Gaetano, or "Dr. G. Vinci," whichever it may be, described eucaine as possessing the properties of cocaine as a local anæsthetic, but as being less toxic and as having no effect upon the pupil. The last statement seemed to me to be of practical importance, because a dilated pupil is an

impediment to the performance of many operations upon the eye. It has long been my practice to neutralise the dilating effect of cocaine by a preliminary application of eserine, but this course is not entirely satisfactory. It is difficult to secure the precise degree of effect which is desired, while the eserine dilates the vessels of the iris and occasions free bleeding when they are incised. It also renders the iris tissue comparatively rigid, so that it is less easily drawn out of the anterior chamber.

I obtained a supply of a 5 per cent. watery solution of eucaine hydrochloride from Mr. Rogers, of 327, Oxford-street, and used it last week for a cataract extraction, the patient being a woman. Before my arrival the nurse had applied a drop of the solution within the lower lid every five minutes for six times, and I found the eye perfectly insensitive. The pupil was unaffected and acted readily to light. There was scarcely any bleeding from the cut iris; there was perfect quiescence of the muscles and there was no pain. I asked the patient whether she had felt anything and she replied, "I felt something moving about my eye but it did not hurt me." There was no pain afterwards and healing was uninterrupted. I have since successfully used a single application of the same solution as a preliminary to the removal of a foreign body embedded in the cornea.

In the original paper it is said that eucaine has been successfully used in dentistry and laryngology, and that solutions may be injected hypodermically without injury. My first experiments will certainly induce me to use it again, and for tenotomies as well as for iridectomy or extraction. It is said that the solution above mentioned may be sterilised by boiling, again and again if necessary, without undergoing decomposition or suffering any deterioration of quality.

Harley-street, W.

## ON THE ORGANIC MEMBRANES AS INSULATORS.

By SIR BENJAMIN WARD RICHARDSON, M.D., F.R.S.

Up to the present time we have been content to look upon a membrane of the body, the pericardium, the periosteum, the capsule of the kidneys, and any structure of the kind, as a covering of the organ wrapped up in it, that holds the organ, as it were, in a mould, supports it in its place, allows it to glide, and by virtue of the fluid secreted keeps it distinct and separate. There can be no question that these grand functions belong to the membranes, which have ever been to us structures of the utmost moment. I have watched the influence of many substances upon them; have noted their conditions during the various stages of life, and have examined their degenerations during disease and after death. But I have recently made observations on these structures—membranes—which, if I am right, give them a new value, or rather a value that has not before been appreciated. It seems to me they are *electrical insulators*, and by their presence confine and render useful the vital force that is developed in the organs they various stages of life, and have examined their degenerations during disease and after death. But I have recently made observations on these structures—membranes—which, if I find that they all have a common quality.

I obtained an electrical battery consisting of twenty-four small cells, so arranged that one cell could be put on at a time, or the whole or part of the whole as might be required. I commissioned Messrs. Faraday of Berners-street to construct for me a delicate galvanometer, the needle of which moved in a millimetre circle and certified, with accuracy, the force of the current transmitted. I fixed to one pole of the battery a conductor which was connected to the galvanometer, and from the opposite pole of the battery attached a platinum conductor of the same length and carried it also to the galvanometer. This last conductor I divided in the centre and joined the end of the portion from the galvanometer to a platinum disc that was secured by its under surface to a porcelain slab. The other half of the conductor (from the battery) was allowed to remain free with a probe-like end which could be used at any moment to touch the platinum disc and complete the circuit or to touch any substance laid