If this distinction be admissible, the case here described belongs to the latter category, being very excitable, blonde in complexion (though sub-brachycephalic) and, up to the time of onset of the fits, intelligent to the point of precocity. There was no epileptic history on either side. There seems, therefore, reason to hope that, if the fits do not eventually return, the child may grow up to fill a useful place in society instead of falling a victim to the progressive mental degeneration which at one time threatened to be his lot.

P.S.—About a year after the apparent arrest of the fits the mother reported that epileptiform attacks had re-appeared, occurring at bedtime and on awaking. On inquiry I learnt that the child had, in contravention of strict orders to the contrary, been having porridge for breakfast. Unfortunately, stopping this forbidden luxury has produced no amelioration of the fits up to the present, but the child continues to progress otherwise bodily and mentally. Just before receiving the proof of this paper the mother reported to me that she had noticed "something like a piece of tapeworm, about 4 in. long," in the child's stool. Unfortunately she did not save it for inspection, but thought it was segmented. It may, of course, have been mucus, but it should be noted that the child was fed with raw meat for a time. It would be interesting if a tapeworm were at the bottom of the trouble, and should this prove to be the case I will report it.

ON RADIUM EMANATIONS IN MINERAL WATERS.*

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THE year 1903 was an important one in the history of balneology, for then it was that Ramsay and Soddy demonstrated that helium was one of the products of the disintegration of radium; in the same year Professor the Hon. J. R. Strutt discovered radium in the deposit of the Bath waters. In the same year, again, the late Lord Blythwood published in *Nature* the fact of the radio-activity of the gases from the springs of Bath.

In his presidential address to the Section of Balneology of the Royal Society of Medicine in October, 1909, my friend Dr. Leonard Williams attempted to redress the balance between science and empiricism, which, in matters balneological and climatological, had, in his judgement, too long shown a bias in favour of the latter. The burden of his argument, as it seems to me on re-reading that address, was that the methods which we employ exercise an influence upon the internal secretory glands, and he brought a considerable mass of evidence in support of his theory. He did not, however, offer any explanation as to how and by what means these internal secretory glands were influenced by such methods. I think the time has come when we can venture a step further by suggesting that the means by which our results are produced are, in some cases at any rate, brought about by radio-activity.

[Mr. Pagan Lowe then gave an outline of Sir William Ramsay's observations, recently reported,¹ and continued as follows:]

The radio-activity of all mineral waters exists only at the source, and such waters rapidly lose this quality. Nevertheless it is possible by artificial means to render them permanently radio-active. Does the therapeutic potency of natural mineral water depend upon niton alone, or is the credit to be divided between it and the other, the chemical constituents—that is with those constituents which we have till now endowed with the entire beneficence? We are told that radio-active waters can be prepared by adding one milligram of radium sulphate to one litre of distilled water, which can then be used as a subcutaneous injection without harm. Is this artificial water as potent as natural radio-active water, or does it more quickly lose its acquired qualities? Can the radio-active water, as we find it at our springs, be used as a subcutaneous injection with advantage? These as well as other questions present themselves for our consideration.

Such, for instance, as those connected with the statement that niton, although it has the power of rendering all substances radio-active, cannot itself, according to some

authorities, be absorbed by the skin. If this were true it would seem that bathing, as far as any special benefit from the radio-activity is to be obtained, was at a great disadvantage. But a little more consideration modifies this view. In addition to the immediate relief which experience tells us occurs from mineral water baths, such, for instance, as increased mobility and lessened pain, the patient is in the best position for taking the full advantage from niton. The orifices of the body are soaked in it, and the surrounding air is more or less saturated, and thus when the patient is in the bath, with his nose and mouth just above the surface of the water, he must be most favourably situated to reap the benefits of the induced radio-activity. Moreover, contrary to the belief of those who say that niton cannot be absorbed by the skin, Professor Lazarus is of opinion that it can, and in this he is supported by Ramsay and others.

In the administration of baths much longer periods of immersion seem to be called for, and I have no doubt that the custom of spending many hours in the bath, as is the custom at Leukerbad and other resorts, has a good deal to recommend it. The large public baths, as used there, however, seem to be inadvisable, and I cannot but think that the small bath-room, due regard being of course given to ventilation, is preferable. The probability is that niton is not too strong, and we want to concentrate, perhaps to augment, it as much as possible.

Some authorities are of opinion that natural waters are not sufficiently radio-active to be of much service therapeutically, but on this question of their potency there are very conflicting views, and Professor Farr, of New Zealand, in an interesting discussion on the effect of radio-active spring water on trout, refers to radium emanation (niton) as a gas which physically is a hundred thousand times more active than radium.

Hitherto details of the effects of niton given off at the fountain head are not very numerous, notwithstanding the immense amount of research which has been made with regard to radium and artificially prepared radio-activity. It is urgent that those of us who have access to natural radio-active waters should fill up the deficiencies. Fortunately, at Bath the waters are sufficiently charged with niton for all purposes, and may be considered saturated, and we have 500,000 gallons coming up daily at a temperature of 118° F. There is also available more than 5,000 litres of gas.

Has the presence of niton any subtle action on the salts of magnesium, sodium, lime, and so on, which are found in indifferent waters rendering them more absorbable or potent when brought into contact with mucous membrane? The free absorption of radio-activity by mucous membranes and by the lungs will probably alter our treatment by those routes, and we shall in the future rely upon them much more. Inhalations will be more frequent and drinking more resorted to, for longer time and in greater quantity. The same, too, will apply to vaginal and rectal douching. This latter—the so-called Plombières method—is very popular at the present time at certain spas. Certainly its effect in suitable cases is very striking. It is also almost certain that the future will see a great increase in the combined use of electricity and radio-active waters.

Sir William Ramsay, referring to the ingenious spraying machine invented by Mr. Jones, the engineer to the bathing establishment of Bath, for use in throat and eye affections, suggests that the natural gas should be used instead of the mineral water. If this were adopted—and I have no doubt it will be—Ramsay is of opinion that "an agent nearly twenty times as potent would be available." He also thinks that in a similar way niton might be applied directly in the treatment of local rheumatism, especially if the patient were insulated and connected with the negative pole of a battery. He further outlines a method by which the intake of niton could be very much increased by giving electric baths with a continuous current; he says:

If the patient in the electric bath were connected with the negative pole of a battery giving, say, 100 volts potential, or even more, and the other electrode were placed in the water, of course not in contact with the bather, the niton would rapidly reach the skin. It is, indeed, not unlikely that it would enter the system by so-called "ionization," and in this way a considerable dose might be given.

In the estimation of the value of natural waters it is

* Introduction to a discussion at the Royal Society of Medicine.

necessary to estimate the degree of its radio-activity, the contained volume of gas, and the amount of helium. Although helium is therapeutically useless, nevertheless its presence is an indication that we are dealing with a radio-active water. At the King's Well at Bath Lord Rayleigh found that there were 12 volumes of helium in 10,000 of the water, and some of the foreign mineral waters have been examined by Ramsay and others.

No introduction to a discussion on the subject we are joining in to-night would be complete without some reference to the valuable work of Professor His. He administers niton by means of a portable apparatus, and supplements its effects in certain cases of rheumatism by an injection of an insoluble, or repeated injections of a soluble, salt of radium, in the immediate neighbourhood of the affected joints. His article on the treatment of gout and rheumatism, in the *BRITISH MEDICAL JOURNAL*,² unfortunately lacks full details of the exact method of the administration of niton. He tells us that under its influence the blood loses its uric acid within a few weeks, but the way, the time, and the dose are somewhat vague. What we require as practical balneologists is to learn how we can best utilize the niton for the benefit of our patients. It seems probable that radium emanations have a specific action on gout, and it is in cases of this disease that we may expect some of our greatest successes.

In an article by W. H. B. Aikins and F. C. Harrison, published in the *Canadian Practitioner and Review* last August, on the present status of radium therapy, the results in general are summarized as follows:

1. Greatly increased diuresis and excretion of uric acid.
2. Largely increased carbonic acid exhalation from 20 to 60 per cent.
3. Lowered blood pressure, especially in arterio-sclerosis.
4. Decreased blood viscosity.
5. Great improvement of gastric and duodenal digestion.
6. Marked solvent action on gouty deposits.
7. The dislocation of uric acid and its salts into carbon dioxide and ammonia.
8. Inhibition of inflammation and relief of pains in rheumatism.
9. Increase of sexual vitality.
10. Considerable influence over sympathetic nerve affections.
11. Marked results in diabetes, albuminuria, and glycosuria.

All of these results I am able to confirm from personal observation in Bath, and I would add the rapid disappearance of indican from the urine.

A good deal of further work on the subject comes from Germany. It seems that the Kreuznach waters are highly radio-active, and the local physicians have been studying the results of their application in various conditions. Substantially their conclusions coincide with those just quoted, but some further information in the matter of contraindications and best form of administering the emanations is now available.

So far as contraindications are concerned, they do not at present appear to be very definite; but there are observations enough to warn us that they certainly exist, and that, to say the least, some cases demand very great caution in the application of the remedy. Thus, Meternitzky of Kreuznach says he has found the application of radium emanation to cause not only subjective symptoms such as dizziness, fullness of the head, faintness, pains in the joints, but also objective phenomena such as emaciation, albuminuria, and even haematuria. This, as coming from a physician practising at Kreuznach, would be a very valuable testimony even if it stood alone. But it does not. Several others have studied the question, notably Davidsohn; working with an artificial radium producer, and not with mineral waters, he found that rheumatic and gouty patients after radium treatment experience violent pains in the joints and aggravation of other symptoms. This is particularly interesting to balneologists as affording an explanation of what we are all so familiar with—namely, an acute exacerbation of gout soon after treatment has commenced. Other observers have described considerable rises of temperature, haemorrhages from the mucous surfaces, and the like. It would be interesting to me personally to find any confirmation from other radio-active spas of the experience of everyone who has ever practised at Bath, to the effect that both baths and waters are definitely contraindicated in a case in which there is any suspicion of tuberculosis. Löwenthal considers that chronic nephritis, particularly of the contracting kind, affords a definite contraindication for treatment. It is probable that at

least some of the accidents and inconveniences which have been described as resulting from treatment by radium have been due to the ignorance under which we still labour on the subject of doses. I may say here that a serious disadvantage to radium research and the application of radium is the absence of a general uniform standard of measurement. Neither the counting by Volt unit nor that by Maché unit is uniform in itself, as these units differ according to the different apparatus used. At the suggestion of Löwenthal, the Radiological Congress at Brussels last year appointed a committee, which accepted as unit the action of one gram of radium. It is hoped that this proposed Curie unit will bring order into the present confusion.

Concerning the method of administering radium, the German authorities do not agree with the views of those who attach subsidiary importance to the balnear treatment. Thus Kemen says:

In the bathing method a certain part of the emanation passes through the skin into the blood, as was conclusively proved by Engelmann. It is also well known that during the bath the emanations readily find their way into the pulmonary circulation. Yet the bath appears to have a third mode of action in addition to these two; for, on the one hand, the fact of a very marked improvement, subjective and objective, is well known, yet, on the other, the quantities of radium available by the pulmonary and cutaneous routes are much too small to account for the results.

What this third mode of action may be it is impossible to say at present, but we should do well to bear this view in mind lest in our enthusiasm for drinking and inhalation, whose action we happen now to understand, we be led into neglect of the time-honoured method of bathing, the detail of whose action is still insusceptible of explanation. We should not reject it merely because we are unable to understand it.

For we must remember that there is still a great deal about radio-activity and its therapeutic action which we are unable to explain. We cannot explain, for example, by what processes it produces its therapeutic effect. If we may rely upon the work of German authorities, its action is in no sense bactericidal. We know, further, that it stimulates metabolism, but by what process it achieves this is not clear. It may be, it is indeed probable, that the suggestion of Dr. Leonard Williams may yet prove to be correct, and that the stimulation is effected by way of the internal secretory glands. The statement that radio-activity is not bactericidal is not universally accepted. Later investigations by Lazarus Barlow seem to show definitely that it is decidedly bactericidal. But whether this action is sufficiently intense in mineral waters, or even in the gas from such waters, to be of service has as yet not been proved. After all, this would seem to be a minor point, for as far as present knowledge goes it is improbable that bactericidal qualities, as we understand them, are the explanation of the benefit that is derived from mineral water treatment in such diseases as gout and fibrositis.

From my own personal experience I have little to add that is of value. It seems that we balneologists are like the man in Molière's play, who was delighted to find that he had been talking prose all his life. We in Bath and elsewhere have been using radium all our medical lives, and we are proportionately uplifted. But we cannot say which of our results have been due to the radio-activity of the waters, and which may be accounted for by the douching, massage, and other measures upon which we have so long relied.

Nevertheless, I should like to confirm, from my own observation, some of the clinical results that have been reported by certain observers. The experiments by Wickham and others show that radium is destructive to the gonococcus, whilst the literature of gonorrhoeal arthritis shows that the cure of this disease is usually tedious and tiresome by medical means. Nevertheless, some of our greatest successes in Bath have been with patients suffering from it. I have always, in addition to the mineral water, given them potassium iodide, and it is a significant fact that the salts of potassium are radio-active, giving off beta rays—that is, the valuable ones in the medical uses of radium. It may be that the action of potassium in gout and fibrositis is due to radio-activity, and that metabolism under its influence is stimulated.

In connexion with gonorrhoeal arthritis it is interesting

to note how remarkably well cases of iritis do under mineral water treatment. We have patients sent to us with recurrent iritis, who rapidly improve, and, what is still more important, do not usually relapse. Mr. Beaumont, who has seen a considerable number of these cases, doubts the very existence of rheumatic iritis at all, and believes the cases we see in Bath are almost entirely gonorrhoeal, and that those which are not are due to some other form of toxæmia. Experiments by Wickham and Degrais show that radium is not, strictly speaking, bactericidal, but that it so modifies the culture medium as to make it inimical to the growth of the gonococcus. They are of opinion that one millionth part of pure radium in water will act on the cultures. If these views are corroborated, it is probable that in the near future the whole treatment of gonorrhoea and its sequelae will be revolutionized. Gonorrhoeal ophthalmia at once strikes one as a disease in which some confirmation of these hopes should be sought for.

During the last few weeks I have been treating an old lady of 75, suffering from a long-standing atrophic scirrhus of the left breast, by exposing it to the gas from the Bath springs. The ulcerated surfaces were exposed for ten minutes daily, and after twelve applications all the ulcers had healed and some of the surrounding induration had disappeared. This is the first case, I believe, of malignant disease in which the gas has been used in this way. A single case is, of course, of no very great value; nevertheless it encourages us to repeat the experiment, let us hope with equal success.

One final word more with regard to radium. Many of us believe that in this element we have found the explanation of the therapeutical effects of mineral water, but beyond a declaration of our faith we dare not at present go. It is a postulation that would explain the accumulated evidences of the ages. Every biochemical fact concerning it dovetails with the clinical effects of its application. Is it, then, any wonder that we balneologists regard radio-activity as the unknown god, and the blind worship of ages and the empirical faith of centuries as justified? To us the unknown god and his shrine are alike worthy of our homage.

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THE EFFECT OF UNSUITABLE NECK CLOTHING ON HEALTH.

By WALTER G. WALFORD, M.D.,
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I WISH to bring before the profession the important bearing of collars and other forms of neck wear upon health, and to show, by experience gained in three years' study of this subject, that it has not received the attention it deserves.

Any pressure on the neck acts most insidiously; the neck is cone-shaped, and a collar or band that may be perfectly loose at the middle of the neck, say over the cricoid, may be tight enough to exert some pressure when it drops into its working position, more especially in a slope-shouldered person. Again, a collar may seem roomy, but may, when a person is reading, get pressed by the chin on to important organs. Next, the habitual wearing of neck clothing not sufficiently large arrests the full development of the neck, with its numerous organs for communication between brain and body. This is of great importance during the period of growth. Also, in advancing life when the neck muscles are wasting and losing their tone, the vessels and nerves beneath become more exposed and sensitive to pressure.

I had often, when young, suffered from headaches, but my attention was not drawn to this subject till at the age of 69, when, after having had many years of gouty and rheumatic troubles, I got a clot in a small cerebral artery, attended with pain in the head, unsteady gait, vertigo, sickness, and double vision. Though I improved in some ways, yet at the end of four months the pain was increasing, and I was certainly going downhill. After some experiments, I decided to have all my neckwear made an inch larger. This sudden change rather affected me just at first; however, I improved so rapidly that in a fortnight

I could cycle. My blood pressure, which in consequence of hypertrophied heart had previously been very high, rapidly fell. But I found, in order to retain the splendid health to which I was restored, that it was necessary, as my neck, now that it was free, was enlarging, to continue to enlarge my neck wear. I had to continue doing this for three years, at the end of which time (the present date) my neck was actually 3 in. greater in girth. Almost from the first I lost all my gout, rheumatism, headaches, and indigestion as well. Strange to say, during this period, probably through freedom of the thyroid, I got thinner, and lost nearly a stone in weight.

Thus my neck had not previously been allowed to attain its proper size; and it is reasonable to think that this increase of neck material, while I was getting thinner as well as healthier, could not be mere fat or muscle. I then proceeded to try the same remedy upon others, and, being almoner of a charity in East London, I had a good field for it amongst the poor. I found, in all ranks of life, that most people were in the same condition as I had been, and that few had quite the full means of communication between brain and body that Nature would have supplied. For in all experiments the neck enlarged. It would appear that my own symptoms had been mainly caused by pressure on the jugulars, producing congestion of brain, and that this impediment to the blood current had in turn affected my heart.

One of the first cases in which I tried the loose collar was that of a clergyman who suffered much from attacks of aphasia. He would sometimes, too, get dazed, and almost "lose himself." He at once took my hints, and from that time, two years ago, to this has had no return.

A man of about 55 had frequent attacks of aphasia with vertigo. He wore no collar, but had a tight muffler. I got him to loosen this, and in a few minutes he was all right. I soon satisfied him as to the cause of his symptoms, of which at first he seemed doubtful, by getting him to again tighten his muffler, when he reproduced them. I subsequently found I could always produce aphasia in him for experiment by doing this.

I have met with many other cases of vertigo, generally with sickness, but all yielded immediately to the same remedy. Some had previously been under the usual treatment, but without success.

Dr. Phillips, of Coventry, told me he had noticed that neck pressure over the pneumogastrics was often the cause of indigestion, and I have found very slight pressure will do this. Just as a person sitting cross-legged may suddenly find his foot numb, so it would seem that one may insensibly get the whole of the viscera supplied by these nerves numbed and handicapped in their work.

In July, 1911, a lady asked me to see her parlourmaid, who had been ailing for some days with sickness, discomfort in the stomach, and pain in the back and legs. I said the cause was tight neck wear. Whereupon the mistress and a lady friend attacked me vigorously for the absurdity of my views. Both said any one could see the young woman's things were not tight, and that she wanted "a proper course of medicine," etc. I told her that medicine would be useless, and then asked the young woman if she would prefer "the proper course of medicine," or to get well at once straight away. She chose the latter, and retired to alter her things amid murmurs from the two ladies. The same afternoon the maid, feeling better, went to Hendon to see the flying, walked miles, returned quite well, and continued so in spite of the intense heat prevailing at the time.

Is not the undersized neck particularly noticeable in phthisis? In every case that I have met with of late this has clearly been produced by tight neck wear in fast growing young people.

In July, 1910, I found two consumptive children, a girl and boy, aged about 13. The latter had just been refused admission on account of tubercle to the Shaftesbury Home. Both had tight neck wear. The parents in each case readily took my hints. Nothing else was done for these children but to give them a fortnight in the country. Both most rapidly improved and very soon recovered, even after their return to the balmy air of Shoreditch, and were still quite well a year later.

A lady who a year ago had been sent to recruit in Devonshire for incipient phthisis was most tightly constricted in the neck and short of breath. She gladly took my advice and at once expressed relief, and I learn that she has recovered.

I found a girl of 19, nearly 5 ft. 10 in. in height, in advanced phthisis, with a neck only 9½ in. in girth at the cricoid. What room was there here for sufficient windpipe and nerve communication for a girl of this size? Her neck enlarged 1½ in. in three months, but the disease was too advanced for her to have a chance. Though she improved much the next fog killed her.