not in a position to say, but one cannot help feeling that there is some connexion between the lesion in the bowel and the condition of the kidneys. With a powerful heart and diseased arteries we expect cerebral and retinal haemorrhages and epistaxis as a matter of course. Why, then, should the vessels of the stomach and intestine remain intact?

I beg to thank Dr. Douglas Stanley and Dr. Foxwell, of Queen's Hospital, for permission to publish this note concerning their cases.

ROENTGEN CINEMATOGRAPHY AND ITS IMPORTANCE IN MEDICINE.

By DR. FRANZ M. GROEDEL,
BAD-NAUHEIM.

SCIENTIFIC cinematography has two chief aims—first, to represent a series of movements on the screen; and, secondly, to analyse movements.

Roentgen cinematography has the same two aims in view. As yet, however, no positive result has been achieved. A few investigators (I may mention Macintyre, Levy-Dorn, Eykman, and Alban Köhler) have indeed succeeded, by a skilful combination of views taken at different times, in projecting certain movements of the body on the screen. Apart from the great didactic value of this combination of views no real scientific importance can be claimed for them.

The analysis of a movement is of far more importance than its pictorial reproduction. We can watch the process of the movement on the screen with tolerable distinctness, though not demonstrate it so well as by a cinematographic projection, by which everything is reproduced on an enlarged scale. In many cases, however, it is almost impossible to distinguish the various phases of the movement, owing to the well-known slowness of the human eye, or, rather, of the retina. It will not be until we come to study heart, stomach, and breathing movements by means of cinematographic views that this question will be finally cleared up.

For the production of real Roentgen cinematograms the shortest possible exposure is requisite. The way pointed out by me¹ to attain this has since been followed by several investigators, and experience has confirmed my statements. With every good inductor it is possible, by employing a primary current of sufficient strength, to produce views of the thorax with film intensifiers in $\frac{1}{10}$ to $\frac{1}{20}$ second.

Having thus, a year ago, succeeded in fulfilling this first necessary condition, I immediately proceeded to construct an apparatus for taking a series of Roentgenograms. It soon appeared that there were very considerable difficulties to be overcome, a detailed account of which in this place would lead me too far.* It will suffice here to describe in brief the main principles of my Roentgen cinematograph. A number—for example, 24—of strong drying boxes, each containing a film between two intensifiers, are gradually moved forwards by means of a slide. Immediately in front of a leaden screen supplied with a corresponding opening, against which the patient leans, the drying boxes fall through a slit into a case, which is proof against Roentgen rays. The tube is attached behind the patient. In front of the tube moves a large leaden disc, 1 cm. thick, which contains two openings diametrically opposite each other. When one of the openings is in front of the tube, the foremost plate is exposed, and when the opening is just covered the drying boxes are pushed forward and the foremost plate is then thrown off. The whole apparatus, which weighs more than $1\frac{1}{2}$ centner, is moved by means of an electric motor. It can take at least four views in a second.

If the apparatus is fixed for an exposure of $\frac{1}{10}$ to $\frac{1}{20}$ second, views of the heart in pulsation, or the diaphragm in motion, can be obtained with extremely sharp outlines. If it is fixed to $\frac{1}{10}$ second, the movements of the stomach can be distinctly reproduced. For joint movements the time of exposure varies according to whether the Roentgenogram is taken with plates or film-

intensifiers. The primary conditions will be found in the work above mentioned.

Thus we are now in a position to reproduce all the movements in the human body by means of Roentgen cinematography, to study the different phases and to analyse the movements, which the human eye itself is mostly unable to do. Much preparatory technical work has still to be done, it is true, but the way has now been cleared.

The question as to what practical use Roentgen cinematography will be to scientific research must at present remain unanswered. Certain motions, such as pulsation of the heart and the involuntary movements of the stomach, can now be examined with scientific exactitude for the first time. As regards other movements, such as breathing, we have yet to ascertain whether the views we have hitherto held were right or not. As has been repeatedly stated, the eye is not properly adapted for analysing a movement. Therefore we are perfectly justified in expecting revelations in quarters which have hitherto seemed perfectly cleared up. It is only necessary to call to mind what a revolution instantaneous photography and cinematography have produced in regard to the pictorial and plastic representation of moving objects.

We shall only be able duly to appreciate Roentgen cinematography from a practical point of view when we have studied cinematographically the changes of the movements in the interior of the body in a pathological condition. In this respect, to quote but a few examples, the study of the pathological state of breathing, the various abnormal forms of heart pulsation, the pathological changes in the movements of the stomach, etc., all afford an ample field for scientific research.

From the tests I have as yet made with this apparatus, I will here only mention that I have already succeeded in reproducing not only the movements of the joints, the stomach, and the breathing, which are comparatively easy, but also the pulsation of the heart, as I fully demonstrated before the Verein für innere Medizin in Berlin on March 1st, 1909.

REFERENCE.

¹ Groedel and Horn: Ueber Röntgenmomentaufnahmen mit den bisher gebräuchlichen Apparaten. *Muench. med. Woch.*, 1908. No. 11.

NOTES ON A CASE OF TETANIC SPASM

WITH REFERENCE TO THE DIFFERENTIAL DIAGNOSIS BETWEEN TETANUS AND STRYCHNINE POISONING.

By W. SINCLAIR STEVENSON, M.B., CH.B. EDIN.,
HOUSE PHYSICIAN, ROYAL BERKSHIRE HOSPITAL.

THE following case illustrates very well the difficulty which is occasionally met with in the differential diagnosis of tetanus and poisoning by strychnine:

L. H., a young woman of 24, unmarried, was admitted to the Royal Berkshire Hospital on a Wednesday suffering from intermittent spasm of the face and trunk. It appeared that she was a domestic servant, though she had left her last place a fortnight before, and had since been living at home. She said that she had twice recently fallen downstairs. There was no history of any other accident. Three days previously she noticed that the muscles of her face and lower jaw began to contract spasmodically. By the following day the muscles of the face were less affected, but the jaws were firmly closed, and could not be separated. On Tuesday her back became affected, and she assumed a position of mild opisthotonos.

Condition on Admission.

When seen on Wednesday evening she was in a very weak state. The pulse was rapid and compressible. Temperature 102°. Respirations 30. The muscles of the lower jaw, neck, and back were in a state of tonic contraction, the lower jaws about $\frac{1}{2}$ in. apart, and it was impossible to separate them any wider without using undue force. The muscles of the face were unaffected, but the head was retracted in a moderate degree, and the trunk was arched backwards and was quite rigid. The abdomen remained soft and could be palpated without difficulty during the severest spasms. Her arms were affected to some extent, the elbows being firmly pressed in to the sides and the forearms flexed and supinated; the hands were flexed on the forearms. Her lower limbs were stiff and the toes inclined to point downwards; but the legs, though kept flexed as a rule, could easily be straightened. The rigidity of the legs was sufficiently marked to prevent the successful testing of the reflexes. Respiration was shallow and rapid, but regular. The spasms, as a whole, showed periods of exacerbation, but even during these the respiration, though more rapid, remained

* I gave a full description of the apparatus constructed for me by Messrs. Reiniger, Gebbert, and Schall, in Erlangen, in the *Deutsche med. Wochenschrift*, 1909, No. 10.

perfectly regular, and there were no signs of dyspnoea. The urine was of high specific gravity and contained a slight trace of albumen. Unfortunately, no attempt was made to ascertain the presence or absence of strychnine in the urine.

After she had been kept quiet in bed the tonic contractions passed off to some extent. She remained in the position of opisthotonos and her head was retracted throughout, but all the other muscles relaxed considerably.

From this time onward she suffered from periodic tonic contractions of the muscles mentioned before at varying intervals; sometimes the attacks would come on every other minute, and then again she would have no attacks for a couple of hours. As the end approached they became increasingly frequent, and at last almost continuous, but in spite of this her breathing was scarcely affected.

She was able to take her fluid food well and could speak intelligibly, but scarcely moved her jaws in doing so. Discomfort was complained of during the attacks, but apparently she never had any actual pain. There was no vaginal discharge, and till an hour before her death she was in possession of all her faculties.

She was given three injections of tetanus antitoxin—chloral and bromides in large doses had been tried previously without effect—but her temperature rose to 104° F., and she died within forty-eight hours.

A few hours before she died I was informed that facts had just come to light showing that she had recently given birth to a full-time child which had just been discovered in an advanced state of decomposition in her trunk.

Such a state of things had not been suspected in any way, as she was afterwards proved to have given birth to the child without disturbing any one in the house, and to have performed her usual duties on the following day. She was also known to have bicycled about the country three days later.

Necropsy.

At the subsequent *post-mortem* examination very little positive evidence as to the nature of her disease was forthcoming. Rigor mortis was present in both lower limbs, but the back, upper limbs, and the head and neck were not affected.

The breasts were not noticeably enlarged, but milk could be expressed from the nipples. The nipples themselves afforded evidence of pregnancy, and the uterus was soft, enlarged, and typical of the third to fourth week after parturition. Internally, on the posterior wall of the fundus, was a small amount of soft, friable, purulent material, which, when examined bacteriologically for the presence of tetanus bacilli, proved negative. Both lungs were congested. The heart was in the state of systole, and contained a little fluid blood. The blood throughout the body was quite fluid. The bladder was contracted and empty. The brain and spinal cord showed no lesions, and beyond a few petechial haemorrhages in the membranes of the cerebro-spinal system, and a curious "crimson lake" colour of the muscles generally, nothing further could be discovered.

Dr. Kratter's experiments have demonstrated that strychnine is eliminated from the body by the kidneys within forty-eight hours, and as she had been under close observation for three days it was not thought advisable to have the viscera examined chemically.

The diagnosis in this case seems to lie between the poisons of strychnine and tetanus. Other conditions giving rise to similar spasms are tetany, lesions of the spinal cord or brain, hydrophobia and hysteria. Of these the last may, I think, be dismissed at once, as there was no evidence of hysteria in the girl's previous history, and her conduct at the time of her confinement was so cool and collected as to render the presence of such a condition extremely unlikely. Hydrophobia is disposed of by the history, by the presence of trismus and opisthotonos and by the absence of respiratory involvement.

Cerebro-spinal affections are put out of court by the presence of trismus, and the absence *post-mortem* of any pathological lesions in the nervous system.

Further, there were no other symptoms pointing to a cerebral lesion.

Tetany is more difficult to exclude, but the fact that her hands were not seriously involved, and that there were no complete intermissions of the spasms, are decidedly against it.

We are left, then, to decide between tetanus and strychnine, and I have tabulated the main symptoms, with reference to the way in which they favour one or the other.

Taking these in order:

Absence of a Wound.

There was no history of any wound, nor was any abrasion of the skin discoverable at the *post-mortem* examination.

On the other hand there was the purulent condition of the involuting uterus. Parturition must have taken place under conditions the reverse of aseptic. The fact that no

Patient's Symptoms.	In favour of Tetanus.	In favour of Strychnine Poisoning.
1. No history of any wound, absence of tetanus bacilli	No	—
2. No history of any poison having been taken	—	No.
3. Slow onset; prolonged course of disease (ten days)	Yes	No.
4. Early trismus	Yes	No.
5. Facial expression; risus sardonicus absent	No	Yes.
6. Opisthotonos	Yes	Yes.
7. Muscles of abdomen unaffected...	No	No.
8. Arms and hands unaffected	No	Yes.
9. Legs unaffected	No	No.
10. Persistent rigidity	Yes	No.
11. Lack of pain	No	No.
12. High temperature	Yes	Doubtful.
13. Absence of complete rigor mortis, especially of back	—	No.

tetanic organisms were found is not a matter of much importance, as it is comparatively common for those organisms to be absent from the seat of infection forty-eight hours after the onset of the disease.

Ingestion of Strychnine.

There was certainly no evidence that strychnine had been administered, but the circumstances of the case were such as to lead one to imagine that this state of affairs was extremely probable.

The first two points are therefore rather against tetanus

The Slow Onset.

The slow onset would fit in very well with the diagnosis of tetanus, and would be correspondingly against that of strychnine. I believe that the longest recorded incubation period between the ingestion of strychnine and the onset of the symptoms was in Dr. Macredy's case, where the time which elapsed was eight hours, and in this case laudanum had been taken at the same time as the strychnine. In these cases, however, there was a definite attempt to commit murder or suicide, or else the poison was taken accidentally, and in every instance fairly large quantities of the poison were taken. Is it not within the bounds of possibility that this girl had been taking strychnine in minute quantities for some time, perhaps with a view to the induction of abortion, and that some form of cumulative action took place, giving rise to quite atypical and prolonged symptoms?

Against this, however, is the fact of the rapid excretion of strychnine in the urine, and the impossibility of her having obtained further supplies of the drug while in hospital. Also, presuming that the drug was taken to induce abortion, she could not have taken any further doses for a fortnight before her symptoms appeared.

Trismus and Risus Sardonicus.

The jaws were affected from the beginning, in marked contrast to strychnine poisoning, where the masseters are among the last muscles to be affected. The contraction of the jaws was not typical, as they were both actively and passively movable to the extent of a quarter of an inch.

Risus sardonicus, supposed to be one of the most constant symptoms of tetanus, was entirely absent in this case from first to last.

Opisthotonos.

This is equally well marked in both diseases, though perhaps rather more violent in strychnine poisoning. In this case it was present but not to excess.

Contractions of Muscles.

The abdominal muscles were quite lax and unaffected throughout, and the lower limbs were but slightly involved. This condition would seem to be equally rare in both diseases.

The fact that the arms and hands were more or less involved is distinctly in favour of strychnine.

A point which was specially noticeable was that outside influences, noises, jars, movements of the bed, bright light, etc., had no effect whatsoever in causing or increasing the intensity of the spasms.

Persistent Rigidity.

The persistent rigidity and partial relaxation from time to time point strongly to a chronic variety of tetanus.

Pain and Temperature.

The absence of all acute pain, even during the severe exacerbations of the spasms, seems to be quite an unusual feature.

A high temperature used to be thought diagnostic of tetanus, but more recent researches have shown that strychnine poisoning gives rise to high temperatures as well. In both diseases the temperature is apt to rise in a marked degree after death. The presence of this *post-mortem* rise was not ascertained here.

Rigor Mortis.

In strychnine poisoning the back especially is generally rigid for a long time after death, and in a certain famous case it was found to be so two months after. It has, however, been known to pass off after twenty-four hours. It is usually present very shortly after death.

On the whole the balance of evidence seems to be slightly in favour of a chronic form of tetanus. The case was a remarkable one, for the balance between the two conditions, especially when she was first seen, was so evenly adjusted that each slight alteration in her symptoms seemed to incline it first in one direction and then in the other.

As time went on it became increasingly difficult to entertain the idea that the case was one of strychnine poisoning, especially when one considered that the duration of such a case from the onset of the symptoms averages two hours.

But even supposing that the spasms were due to a chronic form of tetanus, many of the symptoms still remain to be accounted for in some other way.

I am indebted to Dr. Francis Hawkins, under whose care the patient was in this hospital, for the permission to publish these notes.

PRELIMINARY NOTE ON THE HISTOLOGY OF EGYPTIAN MUMMIES.

By MARC ARMAND RUFFER, M.D.,
ALEXANDRIA.

SOME time ago my friend Professor Elliot Smith, F.R.S., gave me some fragments of mummies of the XXI dynasty (dating from 1000-1050 B.C.), and I endeavoured to examine these fragments by histological methods. As far as I knew then, this was practically the first attempt to study microscopically the minute structure of tissues mummified for about three thousand years; at any rate, I found nothing bearing on this subject in the literature at my disposal, but I was informed that Professor Looss of Cairo had shown the striation of mummified muscular fibres to his colleagues. I demonstrated some of my sections at the Sheffield meeting of the British Medical Association and at the December meeting (1908) of the Cairo Scientific Club. Quite lately my friend Mr. Shattock has read a paper on a similar subject before the Royal Society of Medicine.

METHOD.

It was found impossible to obtain good microscopical sections without first restoring, to some extent at any rate, their flexibility to the tissues, as their brittleness and hardness broke the edge of the microtome knives; even when a fair section was obtained, this invariably crumbled up when transferred to the slide. I need not describe the various methods tried and rejected, but it will be sufficient to note that, by combining an alkaline salt such as carbonate of soda with a hardening reagent such as alcohol or formol, the mummified tissue placed in the mixture gradually swells up and resumes its former shape.

The solution which has given me the best results is composed of alcohol 100 parts, water 150 parts, 5 per cent. carbonate of soda solution 60 parts. In many cases, however, such a solution softens the tissues too much, and more alcohol must then be added.

After a period of time, the length of which depends on the bulk and nature of the tissue, the solution is replaced by 30 per cent. alcohol, and more alcohol is added day by day. After two or three days the softened tissue is transferred to absolute alcohol, then chloroform, paraffin, and cut *secundum artem*. During these manipulations the tissue remains pliable, though it shrinks a good deal. Very thin sections do not present any particular advantages, and I generally use three divisions of Minot's microtome. Such preparations stain readily with the ordinary dyes, but for tissues such as muscular fibre teased preparations, after maceration in 1 in 10,000 caustic potash, give excellent pictures.

RESULTS.

I have prepared sections of muscle (voluntary, cardiac, and involuntary), blood vessels, skin, intestine, stomach, liver, kidney, bone, mammary glands and testicles, and the main characters of all these organs and tissues can be readily recognized. The striation of muscular fibre, for instance, the muscular coats, the submucous tissue, and occasionally even the glands of the intestines and the convoluted tubules, the straight tubules and glomeruli of the kidneys, the various layers of the skin can be identified with certainty. I have no doubt that coarse pathological changes, such as inflammation, cirrhosis, tubercle, or cancer, could be demonstrated by this method.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

NUTMEG POISONING.

NUTMEG poisoning itself is rare, and this case is especially interesting in that, although the amount taken was so small, it led to very definite symptoms and also to my hearing of two similar cases. I was sent for to see a man, aged 22, who had suddenly been taken ill after a midday meal of cold mutton and milk pudding. The pudding was a small one and he had eaten the whole of it himself. It was flavoured with about a quarter of a moderately-sized nutmeg. Within a few minutes he felt his face flush and he began to itch all over and went up to his bedroom. Here he was immediately sick and vomited his dinner, and at the same time his nose began to bleed. He then lay down on his bed and did not remember anything more till I roused him. I saw him about half an hour later. He was lying face downwards on the bed in a completely collapsed condition. His face was swollen, especially his lips and lower eyelids, and he was cold and markedly cyanosed. The pupils were contracted, but not pin-point. The radial pulse was rapid and scarcely palpable; the heart was thumping and irregular. On speaking to him he appeared dazed, but was able to give me a clear description of what had happened. His tongue was clean, slightly swollen, and he complained of a feeling of fullness in his throat. He also had some slight abdominal pain, but this soon passed off. About an hour later the cyanosis had disappeared and was replaced by a diffuse flush. His face was still swollen, and he still complained of slight itching. The pupils were now normal. There was no further vomiting, and beyond a feeling of drowsiness there were no further symptoms, and he awoke the next morning feeling perfectly well. The vomit obviously consisted of his dinner in an undigested condition. It did not smell of nutmeg. Careful inquiry elicited no other cause for what was evidently a case of acute poisoning. The patient was a healthy, well-developed youth.

The two other cases were described to me by his mother, a publican's wife. Some years ago two barmaids in her employ were awakened at night with abdominal pains, vomiting, and diarrhoea. Their faces were noticed to be swollen and blue. On going to bed they had each taken half a nutmeg in a glass of stout, as they had been assured that this would cure a rash they had. They recovered without further symptoms.

Holmdale, Parkstone.

K. MAYOR GIBBINS.