one all over the country. A system of that kind was very likely to run into abuse, and he could not, as a teacher of medicine, countenance it without considerable reservations. He thought it would be admitted that the doubt in his mind was a just one. It might have led him to appear a little too conservative, but his mind did not always remain in that condition. His mind was open. He thought there was a good deal which might be said in favour of the use of the cold bath, but he had not even attempted to employ it on the large scale indicated by its strongest advocates, because he did not think that the British statistics of fever required to be amended so much; and, in the second place, he had imbibed distrust of strong routine-measures, which required to be kept under strict control. At the same time, he thought that a tolerably good case had been made out for the use of the cold bath early in the disease; and having read the results of the treatment in Germany, and more recently in Lyons, in London, and elsewhere, he confessed that his mind inclined to believe that a great deal of good might be done by the cold bath employed early in the fever, but he thought disappointment would accrue in the end if the cold bath were employed with any idea at all that it would make an entire revolution in their practice. It might be a good thing to use along with other things; but if medical men thought they were going to amend typhoid fever out of existence as a fatal disease, they would be disappointed. It was the best of the antipyretics, and the least subject to abuse. He thought the same principles applied still more to the rest of the antipyretics; quinine, when given with due regard to preserving the enfeebled digestive power, being the next best. Kairin he had only tried once. In considering such extremely disturbing remedies as digitalis and veratrin, his hesitation went on increasing; and he confessed he had no experience of any fever in which, merely in order to keep down temperature, it was advisable to run the risk of poisoning the patient; or even to say, as was affirmed, that it was of no consequence at all, if the patient became sick and vomited as the immediate result of the remedies given. His principle had been throughout to save up every atom of power and life; to save up everything as regards the enfeebled digestion and assimilation, thereby sustaining the strength of the patient. Any success he had had was due to a religious carrying out of that idea; and was he to be told it was of no consequence if the patient were put in a state of collapse, such that he must be revived again by stimulants, and so on? His mind revolted against that view, and was by no means to be entirely converted by such statistics as had been brought from Germany.

Dr. T. J. MACLAGAN (the President) had been a pupil of Professor Gairdner twenty-five years ago, and he could remember the extreme caution and care which Dr. Gairdner impressed upon his pupils. The subsequent long years of experience made the last speaker's words even more valuable.

Dr. ORD (London) was extremely glad to find himself in harmony with Dr. Collie. He had tried the use of the baths in hyperpyrexia in the treatment of fever, and in other cases where the temperature exceeded the limits of probable safety. The kind of bath which he had been in the habit of using was not quite the kind of bath to which reference had been made. It had been a less violent form. He used a bath into which the patient was immersed at a temperature of 90°, and, during the space of half an hour, the bath was cooled to 75°. That was a much milder medication; and he had to chronicle no obvious disadvantages from such treatment. As a beneficial result of the treatment, he had noticed that the temperature had been reduced in a remarkable way, but a number of symptoms had been produced in a more marked degree even than that recorded by Dr. Collie. He had noticed a diminution of delirium, headache, and the procuring of very long sleeps. In using this treatment in enteric fever, he had used it not as a routine remedy; he had considered himself by no means restricted from applying it to other diseases. He had used it in some cases of severe bronchitis, and in that he had found its beneficial influence illustrated more trenchantly. He would give an instance. It was that of a child suffering from bronchitis with a very high temperature. It was delirious, and apparently near death, from high temperature and difficulty of breathing. The father was a medical man; and, with his consent, he (Dr. Ord) put the child into a bath at a temperature of ninety-five degrees. When it had been immersed ten minutes, it fell asleep; its temperature fell, respiration was reduced to one-half, and the temperature, reduced eight degrees while the child was still asleep, when it was lifted out of the bath, remained in that state for three hours. After that it improved very much, and ultimately recovered. He had used the bath in a similar way in pneumonia and acute rheumatism, and Dr. Quinlan would forgive him for stating that it had succeeded in two cases in saving the patients where the salicylate had failed. He

used thirty grains of salicylate of soda every ten hours, and went on with half-hour doses. The patients had several hundred grains. The temperature was rising, and at the time of the bath there was a temperature of 106.7°, accompanied by delirium, timidity, etc., and he was inclined to suspect he had to deal with the evil effects of the salicylates. There was no subsequent rise of temperature with the use of the bath; however, in some way or other, by the combined action, the patients got well. Conditions of this kind had, for a long time, been making him think what was the meaning of fever. Dr. Collie had spoken of the futility of merely regarding the temperature in these cases. Dr. Collie was very right; but he did not say all he might. Dr. Ord then proceeded to comment on the cause of the rise of temperature, and to describe some investigations which he had made.

Dr. CURRIE (Lydney) spoke a few words on the subject of the action of kairin.

Dr. MACLAGAN also addressed the meeting.

Dr. QUINLAN, in reply, said that he would feel the greatest hesitation in differing with Professor Gairdner. He could not, however, avoid expressing his surprise that he should put cold baths at the head of the list of antipyretics and quinine next; and that he should not even mention salicin, which was, Dr. Quinlan thought, the most powerful antipyretic, as the one most free from risk. The case mentioned by Dr. Ord was in complete accordance with the views that he (Dr. Quinlan) had put forward. Dr. Ord administered the sodium-salicylate in legitimate doses, and it produced the effects which had caused Dr. Quinlan to give it up altogether, and that even in a more aggravated degree than usual. Under these circumstances, Dr. Ord most judiciously discontinued its use; but he did not use salicine in this case; had he done so, these serious effects would not have occurred. He believed that it would yet be shewn that rheumatic fever was a germ-disease like intermittent fever; and that, like rheumatic fever, it was best combated by germicide remedies.

Professor GAIRDNER intimated that none of his remarks could refer to Dr. Quinlan directly, as he (Professor Gairdner) had not heard his paper.

Dr. COLLIE also replied briefly.

THE MICROCOCCUS OF PNEUMONIA.

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

By ROBERT MAGUIRE, M.D. LOND., M.R.C.P.,

Physician to the Manchester Southern Hospital; Pathologist to the Manchester Royal Infirmary; Assistant-Lecturer on Pathology in the Owens College.

I HAVE the honour of exhibiting to the members of the Section three preparations which illustrate the micrococcus of pneumonia, as recently described by Friedländer. One is a section of pneumonic lung; another a section of the kidney from a case of pneumonia; and the third is a preparation of the sputum from a similar case.

I may first say a few words as to the method which has been adopted in preparing these organisms. If a section of tissue be stained with methyl-blue, or with any of the reagents ordinarily used for detecting micrococci, it will be found that not only the micrococci, but also the nuclei of the cells, which are present, are stained by the colouring agent. In pneumonic lung, however, the exudation-cells are so numerous, that it is an exceedingly difficult task to discover amongst them, when stained in this way, any small and similarly stained micrococci.

The method used in preparing the specimens before you disposes of this difficulty in a most beautiful manner. It was introduced by Dr. Gram of Copenhagen, and a detailed account of it is found in the *Fortschritte der Medicin* of March 15th in this year. In the process, two prepared solutions are required: one is the gentian-violet-anilin-water solution used for staining tubercle-bacilli, and best prepared by Weigert's formula: anilin-water, 100 parts; concentrated alcoholic solution of gentian-violet, 11 parts; absolute alcohol, 10 parts. The other is a solution of iodine and iodide of potassium in water, in the proportion of iodine, 1 part; iodide of potassium, 2 parts; water, 300 parts. The section of tissue is placed in the gentian-violet solution for from one to three minutes, then in the iodine-solution for a similar time, and here a brown precipitate will be seen to occur. The section is then placed in absolute alcohol, until nearly all the violet colour is removed, and is afterwards transferred to oil of cloves, where a little more violet may be dissolved out. The section is finally mounted in Canada-balsam in the ordinary way. You then find, as is shown by the section before the meeting, that whatever micro-organisms are present are stained violet, but all the other parts are simply stained

yellow by the iodine. The organisms can thus be made out with the greatest nicety, while the tissue itself is quite sufficiently stained to recognise its different parts; but, if desired, these may be rendered still clearer by a short immersion in a solution of Bismarck brown before the final clearing in oil of cloves. This method is applicable to all micro-organisms. For tubercle-bacilli, however, although strongly recommended by Friedländer, it is not so convenient; for, according to the directions given, as in all methods for staining this bacillus, the section must remain in the staining fluid for at least twenty-four hours, after which time it becomes somewhat difficult to remove the violet from the tissue-elements. For other organisms, however, the method is exceedingly convenient and rapidly carried out.

The clinical resemblance of croupous pneumonia to the various specific fevers—such, for instance, as the sudden onset, the presence of pyrexia before local signs, the disproportion often seen between the severity of the general symptoms and the amount of local mischief, and the sudden crisis—have long been noted by clinicians. More recently again, attention has been paid to the occasional epidemic, and sometimes endemic, outbreaks of the disease. From these signs alone, many physicians are now agreed that, in croupous pneumonia, we have to deal not with a mere local inflammation, but with a general condition, of which the inflammation of the lung is merely a local manifestation.

The lung-lesion may, indeed, be regarded as corresponding to the intestinal lesion in enteric fever. Dr. Flint of New York has even ventured to introduce an analogous term, pneumonic fever. One more link in the chain of connection between pneumonia and the fevers has now been found. Klebs (*Arch. für Exper. Pathology*, Band iv), in 1875, found micrococci in connection with pneumonia; but Eberth (*Deutsch. Arch. für Klinisch. Med.*, Band xxviii) apparently was the first to recognise that these had any specific characters. In the inflamed pleura covering the lung, and in the exudation resulting from a meningitis complicating the pneumonia, he found ellipsoid micrococci, for the greater part in groups of two.

Koch (*Mittheil. aus der Kais. Gesundheitsamt*, Band i) again found micrococci in the exudation into the alveoli, in the lung-capillaries, and in the capillaries of the kidneys, in a case of pneumonia after recurrent fever. These observations, however, only referred to individual cases. Friedländer (*Virchow's Archiv*, Band 87, xxxvii) first showed that micrococci were constantly found in the alveolar exudation of croupous pneumonia. His first researches were conducted on eight successive cases, but further researches have enabled him to extend his series to fifty cases in which he found micrococci. He examined not only the tissue of the lungs in fatal cases, but also fluid drawn from the lung during life, by means of a hypodermic syringe.

The latter procedure one naturally, although, perhaps, needlessly, hesitates to adopt for mere experimental purposes; and my own experience refers only to the examination of the lung in fatal cases. Since the appearance of Gram's papers, with the description of his method for detecting micro-organisms, I have made *post mortem* examinations on ten cases of pneumonia, which have died in the Manchester Royal Infirmary. The lungs of all these cases were examined in the pathological laboratory of Owens College, and in every case the micrococcus was found.

The first specimen I exhibit is a section of lung from one of these cases, and in it some of the characteristics of the pneumonococcus are well seen. The germ is a somewhat oval body, sometimes found singly, but usually in groups of two, as a diplococcus. Often, too, chains of diplococci can be seen, but no true formation of a zoogloea. In all the specimens I have examined, the organisms were most numerous at the growing border of the pneumonia, that is, at the junction between the red hepatisation and the congestion; while, in the grey hepatisation, none were to be seen. Large numbers of diplococci were also found in the lymph-spaces beneath the inflamed pleura. On closer examination, the diplococci were found in the blood-vessels covering the walls of the alveoli, and in the alveolar exudation. Here they were seen in greatest number, in the parts nearest to the alveolar wall, and not only lying between the exudation-cells, but inside the cells themselves. The position of the organisms, with reference to the stage of the pneumonia, makes it evident that, in far advanced cases, the germ might not be discovered. In one case of the pleuro-pneumonia of cattle which I have examined, I was unable to find any micrococci; but I should be inclined to attribute this to the far advanced state of the pneumonia, since other observers have found the germ in such cases.

Another peculiarity of the pneumonococcus, which was at first thought to be quite characteristic, is the possession of a capsule. This is somewhat difficult to demonstrate. In the first place, it is only in the early stages of the pneumonia that the diplococci show any capsule. Hence, in the lungs I have examined, only a trace of the cap-

sule could be seen, since death in each case had occurred when the disease had reached a somewhat advanced stage. The capsule, too, is soluble in alcohol, and hence sections of the lung to be examined must be prepared in the fresh condition. Although I am unable to show the capsule round micrococci from the lung, the preparation of sputum now before the meeting demonstrates its appearance clearly. If a preparation of the pneumonococcus be stained with methyl-blue, the capsule, as well as the coccus, will be stained, and will be undistinguishable from it. The specimen before the meeting has, however, been stained with gentian-violet-anilin-water, and then treated for only a short time with absolute alcohol. In this way, the micrococcus and the ground-substance remain coloured, while the stain is entirely removed from the capsule. An appearance is thus seen of a bright uncoloured zone, surrounding the coloured micrococcus. The capsule appears, from its reactions, to be of a mucoid nature, and to be distinctly connected with the life of the germ. Unfortunately, however, more recent observations have shown that other micrococci may possess such a capsule, while the pneumonococcus may, as I have already stated, occasionally show no trace of it.

In a recent communication to the Medical Congress at Berlin (see *Deutsche Medic. Zeitung*, April 28th, 1884), Friedländer maintained that the pneumonococcus cannot be distinguished by any one peculiarity, and that not only its form, and the possible presence of a capsule, must be considered, but also its characteristic cultivation, and the results of its injection into animals, as first described by Friedländer and Frobenius (*Fortschritte der Medicin*, November 15th, 1883). If the pneumonococcus be grown on blood-serum, the cultivation assumes a nail-like shape, with a rounded head. This, apparently, is very characteristic.

The results of the injection of the germ into animals are very peculiar. Thus, while mice invariably were affected by croupous pneumonia after injection, and dogs very frequently, the disease was in no one case communicated to rabbits. (Attention may be directed to the coincidence—and it may be no more than a coincidence—that, while rabbits are so easily inoculated with tuberculosis, they cannot be so infected by pneumonia. It will be remembered also that tuberculosis frequently ensues on catarrhal pneumonia in the human subject, but it is an extremely rare sequel of croupous pneumonia.)

To summarise, then, the peculiarities of the pneumonococcus are—its grouping into diplococci, the presence of a capsule, the nail-shaped cultivation on blood-serum, and the inability to reproduce the disease in rabbits, while mice and dogs are affected.

I have examined the kidneys in three cases, and in each have found the diplococci. They are seen in the capillaries round the tubules, in the glomeruli, and, as in the specimen before the meeting, in the cells of the tubules. We may have here a possible explanation of the albuminuria which occurs in pneumonia, and one more example is added of the infective nephritis described by Bouchard. The presence of the organism in the kidneys may be taken as evidence of the generalisation of the germs. They are here, however, usually found in only small quantities, but this is accounted for by the small number present in the blood. The blood of a pneumonic patient does not show diplococci when examined directly. The blood of animals, however, in whom the pneumonia has been produced by injection of the germ, swarms with micrococci. Friedländer recently has succeeded in demonstrating the presence of the germ in the blood of the human subject by cultivating the blood on sterilised blood-serum, when the organisms, of course, multiplied, and were then easily detected.

I have examined some other forms of pneumonia without finding any micrococci in the lungs. The observations, however, were few. One case at first appeared to be croupous pneumonia, and yet no micrococci were seen. Careful microscopic examination, however, showed that it was an example of the pseudo-lobe form of catarrhal pneumonia.

During the last few years, considerable attention has been paid to the occasional recurrence of croupous pneumonia in epidemics. Considerable light is thrown on this mode of occurrence by the discovery of the pneumonococcus, since pneumonia is thus linked to other infective diseases whose epidemic occurrence is well known. Not unfrequently, in these epidemics, the pneumonia assumes some peculiar type. Thus, quite recently, an epidemic of pneumonia has occurred in Manchester, of which a series of cases has been described by Dr. Dreschfeld, in a paper which will shortly appear, as creeping pneumonia. Three of the *post mortem* examinations which I have mentioned above were on such cases of creeping pneumonia, and two of them are included in Dr. Dreschfeld's series. In all the *post mortem* examinations on creeping pneumonia in which the lung was examined for pneumonococci, these organisms were found. For a description of the clinical features of these cases, reference may be made to Dr. Dreschfeld's papers. *Stiff*

it, here, to say, that the pneumonia appeared to advance in successive attacks. This peculiar progress may account for my finding micrococci, in one of these cases, at a somewhat advanced period (twenty days) of the disease.

Occasionally, too, pneumonia assumes an endemic character, and most of the cases of this kind have occurred in hospitals, or prisons. A most important observation has recently been made by Emmerich of Munich (*Fortschritte der Medicin*, March 1st, 1884). A prison in Amberg was noted for the occurrence of epidemics of pneumonia, and after excluding all other possible sources of contagion, Emmerich examined the material filling up the space between the floor of one room and the ceiling of that below. Here he found numerous diplococci, which showed the same round of life-history as those described by Friedländer. Several of the ten fatal cases, the necropsies of which I have recorded, occurred in an endemic fashion, in the Manchester Royal Infirmary, during the months of April and May of the present year. It is unnecessary to give any details of these cases. Two only, which presented certain peculiarities, I may describe shortly, and the same description will serve for both. Two patients were in the hospital, one under Dr. Simpson, the other under Dr. Dreschfeld, suffering from lymphadenoma of the mediastinum, pressing mainly on the parts to the right of the middle line. In each case the trunk of the sympathetic on the right side was pressed upon, giving rise to the usual pupillary signs. Both patients, while in the hospital, were attacked by pneumonia of the right apex, and died within a short period of each other.¹

At the necropsy the whole of the upper lobe of the right lung was found to be in a state of grey hepatisation. At first sight it was thought that the pneumonia might be due to a trophic lesion, from pressure on the pneumogastric, just as, in some cases of aneurysm of the aorta, gangrene of the lung is supposed to follow from nerve-lesion. The microscopic examination of the lung showed, however, that the pneumonia was croupous in character, whereas the so-called vagus-pneumonia is catarrhal; and, finally, the micrococcus was found in large numbers at the border of the pneumonia. In fact, the section of the lung now before the meeting was taken from one of these cases. In each case, too, the pneumonococcus was found in the kidney.

Time will not permit me to discuss the various questions regarding the finding of the pneumonococcus in the sputum. The sputum, as is well known, may contain large numbers of micro-organisms, even in the normal condition. Fraenkel (Medical Congress at Berlin, 1884) has shown that one species of these organisms may, in very many respects, including the possession of a capsule, resemble the pneumonococcus; differing from it, however, in its power of infecting rabbits after injection. This organism, Fraenkel proposes to call the organism of sputum-septicæmia. It seems probable that this is the same germ found by Dr. Giles in pneumonia. (*BRITISH MEDICAL JOURNAL*, vol. ii, 1883.) Friedländer's warning must, therefore, be repeated, that one or two peculiarities cannot be depended upon for the recognition of the germ; but the whole cycle of its history must be proved for each case. It need hardly be said, then, that at present, however important in pathology, the clinical standing of the pneumonococcus is in abeyance.

Professor GAIRDNER (Glasgow) said that Dr. Maguire's communication was a very valuable one, and went far to establish its point—namely, that pneumonia was related to the infective diseases. Of course, a certain amount of reserve was appropriate, at present, in receiving the statement that such important powers belonged to the micro-organisms met with in the disease. It might be that atmospheric influences played a part; some places more exposed than others to the north-east wind, for example, being oftener visited by pneumonia.

Dr. HADDON (Hawick) thought that pneumonia could not be very infectious. In some cases, it appeared to him that the house was to blame for its propagation.

¹ I may here interpose that, in many others of the cases of pneumonia occurring about this time in the hospital, the apex of the lung was attacked, and more often on the right than the left side. About last November, a similar position of the pneumonia was noticed amongst several cases arising in the hospital.

BEQUESTS AND DONATIONS.—Mr. Chadwick has given £500 (additional) to the Charing Cross Hospital, and £100 (additional) to the Middlesex Hospital.—The Sheffield General Infirmary has received £100 under the will of Mr. Tobias Child, of Hathersage.—The Stratford-upon-Avon Infirmary has received £100 under the will of Mr. F. Cobb.—Messrs. Barclay, Bevan, and Co., have given £50, and Mr. Leatham Barclay £20, to the North-Eastern Hospital for Children.

A CASE OF CHYLURIA CAUSED BY BACILLI, WITH CULTIVATION-EXPERIMENTS.

By ALBERT WILSON, M.D., LEYTONSTONE.

WONDERFUL discoveries having been made within the last two or three years of bacilli in tubercle, phthisis, leprosy, and other diseases, and speculation being rife as to these organisms causing other disorders, I am anxious to support the germ-theory by relating some experiments I made five years ago with a case of chyluria. I especially wish to call attention to the mode of experimenting by which I discovered bacilli and micrococci, which were the cause of the chyluria.

Chyluria is really a symptom, like albuminuria, and exists, apparently, under various conditions. The urine is chylous permanently, or paroxysmally, or only after meals. The urine varies from a mere milkiness to a thick firm white, or pinkish, coagulum. It contains albumen, oil-globules, sometimes blood-corpuscles, and often sugar. Tube-casts do not occur. The first case was described by Dr. Prout; several cases have been described since.

A patient, passing urine of the character described, sent for me on January 29th, 1879, whilst I was resident at the Medical Mission Dispensary in Edinburgh. The patient, W. W., a male, aged 40, went to sea at the age of 14 for seven years, visiting the Mediterranean. The last nineteen years he has been on land. Seven years ago he received a kick on the external genitals, for which he had to undergo hospital treatment, and have catheters passed. Since then, he had enjoyed very good health until two months ago, when he noticed a difficulty in micturition, and that the urine was white and thick. At this time he was very poor and starved. He never had a stricture. The urine continued milky. He became weaker, and had to remain in bed. He had, at different times, four rigors.

I found the urine milky, especially after sitting up. Sometimes there was incontinence. He passed five to eight pints a day. There was great thirst, and marked anæmia.

The urine was neutral when passed. In a few days it became ammoniacal, and the clot broke up. The specimens varied, some milky, with a white clot at the bottom. In others, the whole urine formed a thick white coagulum. On adding nitric acid, a large quantity of albumen was precipitated. It contained a trace of sugar. Microscopically, I found oil-globules, degenerated white corpuscles, entangled in fibrin and *débris*. No bacteria or organisms could be detected. Staining-methods were then undeveloped.

The line of investigation which I pursued was to inoculate sterilised vegetable-infusions with the most minute particles of the coagulum. The urine was procured under the spray, with the most careful antiseptic precautions. The result of these inoculations was a rich growth of micrococci and bacilli. Large active bacilli, in every way larger than the tubercle-bacillus, were easily seen without staining. These organisms were examined by one of the greatest authorities on the germ-theory, who declared them to be not unlike the bacillus anthracis.

It is essential to describe the method of experimenting, but I will do so briefly. On November 13th, 1879, I made a sterilised infusion of carrot, obtaining a clear straw-coloured fluid. I adopted Professor Lister's method. I procured a flask after his pattern. It is an ordinary fifteen-ounce flask, with a spout fixed on the neck, the end of the spout being drawn out to a fine capillary point. The wide mouth has a cotton-wool cap to filter the air that enters. After pouring out of the spout, a minute drop remains, which closes the capillary end, preventing air from regurgitating until its cotton-wool cap can be reapplied.

I purified such a flask with solution of carbolic acid, 1 to 20, and refilled it with boiling water, and boiled it for an hour. Having emptied the flask, I quickly refilled it with well boiled and filtered carrot-infusion, and again boiled for an hour. I thus purified both flask and infusion, and, whilst still boiling, plugged both orifices with caps of cotton-wool, purified with a 1 in 20 ethereal solution of carbolic acid. Filtered air could enter the flask freely. Having made several experiments before with sterilised infusions, I knew that, so long as the infusion remained clear as crystal, it was pure; but, as soon as organisms entered, the infusion became turbid. In this flask, I had kept sterilised infusions eight months.

I next purified a large number of small test-tubes. They were first cleansed in soap and water; then soaked for hours in 1 in 20 carbolic acid solution; and then dried at a temperature of 340° Fahr.; and, whilst still hot, were plugged with carbolised wool. In many cases, the wool was charred. After the fluid had remained clear for a fortnight, I rapidly filled fifty tubes under the carbolic steam-spray. For