knowledge of the main epochs of medical history, which cannot fail to be of the greatest service to him should he desire to pursue his studies further.

In our opinion, the book is one of the best attempts that has yet been made in the English language to present the reader with a concise epitome of the history of medicine, and as such we very cordially commend it.

On the Blood-Serum Treatment of Diphtheria: a Lecture given to Military Surgeons on the 11th October, 1894, in the Institute for Infectious Diseases in Berlin. By Dr. H. KOSSEL, Assistant at the Institute. (From the Deutsche Medicinische Wochenschrift, 24th October, 1894, No. 43.)

As the subject of serum therapeutics is being brought prominently before the public from both Paris and Berlin at the present time, we think it well to give a short account of this interesting lecture.

Dr. Kossel gave this lecture at the request of Geheimerath Robert Koch. He first gave a short account of the method of obtaining the serum recommended by Behring and Ehrlich.

If one injects a small quantity of the blood of an animal which has been rendered insusceptible to the poison of tetanus or diphtheria into another animal, the latter will for a certain time be rendered insusceptible to inoculation with the bacillus of that disease. The diphtheria bacillus is one of those bacteria which in the most pronounced manner give rise to poisonous products, which have a pathogenic action. If one wish to render an animal insusceptible to the action of diphtheria bacilli, he must, in the first place, make it insusceptible to the diphtheria poison. He can do this by injecting the poison in gradually increasing doses, which are each time sufficient to make the animal ill, but not to kill it. As the insusceptibility of the animal to the poison rises, so does the power of the blood-serum to confer on other animals immunity from the disease.

In order to render animals immune to diphtheria, one injects at first very small and then gradually increasing doses of the diphtheria poison under the skin. The poison is obtained, according to Roux and Yersin, by introducing cultivations of diphtheria bacilli into large flasks containing nutrient bouillon, and after about four weeks killing the bacilli by the addition of 0.5 per cent carbolic acid, or 0.3 per cent trikresol. The dead bacilli then fall to the bottom of the bouillon, and the clear
fluid contains the poison in solution. On injecting a small quantity of this poison into an animal it reacts with fever, oedematous swelling at the point of injection, and, what is most important, with the production of the specific anti-toxine. After each such reaction this substance appears in the blood, and as the doses of poison increase in number and strength, the quantity of anti-toxine present in the blood is also increased. The treatment of the animal with the poison is continued till the blood contains a sufficient quantity of anti-toxine. This is controlled from time to time in the following way:—A small quantity of blood is drawn from the animal and mixed in a test-tube with the poison, and this mixture is injected into guinea-pigs, a poison whose power to kill guinea-pigs is already known, is taken in ten times the minimal fatal dose; for example, 1 cubic centimetre is mixed with 0·3, 0·25, 0·2, 0·15, 0·1 ccm. of the blood to be tested, and these five mixtures are injected into five guinea-pigs; then, perhaps the first, which has received 0·3 ccm. blood with 1·0 ccm. of the poison, will remain without any sign of disease, the second (0·25 ccm. blood + 1·0 ccm. poison), have an infiltration about the size of a pea at the point of injection, the third a much larger infiltration which sloughs, the fourth perhaps dies in fourteen days, the fifth dies of acute diphtheria-intoxication. Then we know that 0·3 ccm. of the blood examined is necessary to paralyse ten times the minimal fatal dose.

Behring and Ehrlich, for simplicity, give the name normal serum to a serum of which 0·1 ccm. is sufficient to render harmless 10 times the fatal dose, and they say 1 ccm. of normal serum contains 1 unit of power to produce immunity. A serum of which 0·01 ccm. is sufficient to neutralise the fatal dose is called a 10 times normal serum, or is said to have 10 units of power to produce immunity. According to the experiments of Ehrlich and Kossel, it is necessary, in order to cure diphtheria in children, to inject at least 500 units of power—that is, 10 ccm. of a 50 times normal serum or 5 ccm. of a 100 times normal serum. When the blood of an animal is found by experiment to have this strength, a large quantity is drawn into sterilised vessels and allowed to coagulate at a low temperature, the clear serum is drawn off, and half per cent carbolic acid added to it to preserve it; the material is then ready for use. It is best to use large animals, such as horses, for the purpose, as more blood can be obtained from them.

Dr. Kossel recommends that even the most hopeless cases should be treated with the serum, as it can do no possible harm and may do some good. Accordingly, all the cases
of diphtheria admitted for the last two years have been so treated, and the mortality over all has fallen to 16 per cent, while, of children admitted in the first and second days of the disease, not one has died. Dr. Kossel is convinced that it is possible to cure every fresh case of true diphtheria by the use of a sufficient quantity of anti-toxine. Similar good results have been obtained in the Kaiser and Kaiserin Friedrich Hospital, and by Roux in Paris.

The treatment gives rise to no hurtful symptoms, it does not raise the temperature, and does not injure heart or kidneys. Albuminuria has never been observed by Kossel as a result of the injections. Sometimes there is a little pain on the following day at the point of injection, and sometimes a quite harmless urticaria occurs.

At first, after using the injection, the local disease in the throat may for a short time seem to extend, but this is only over parts that have been already infected before the injection; in twenty-four hours the process is seen to be stopped, the temperature and pulse rapidly fall, and this reduction of the fever usually continues, unless there be some complication, as ear disease or abscess formation. In scarlatinal diphtheria and other diphtheria-like diseases, without the presence of the bacillus such a fall in temperature and pulse is not observed.

The serum can be obtained from the Farbwerke vorm. Meister Lucius & Brunig, Hochst. a. M., and is supplied in bottles, in three strengths, the entire quantity in the bottle to be injected at one time. No. 1 contains 600 units of immunisation, and is sufficient for fresh cases in the first and second days of the disease; No. 2 contains about 1,000 units, and is to be used in cases older than two days, or where the disease is specially severe, or involves the larynx; No. 3 contains 1,500 to 1,600 units, and should be used for adults or for children in severe prolonged cases. In fresh cases no accompanying treatment is necessary, but to see that the cavity of the mouth is kept clean. Painting the throat is quite unnecessary.

To protect children in an infected family who have not been infected, it is only necessary to inject one-fourth of No. 1. Dr. Kossel considers that the protection will not last more than two or three weeks.

Post-diphtheritic paralysis need not be feared in cases that have come under the treatment early, but in older cases it may occur.

Dr. Kossel injects, with a Koch's 10 ccm. syringe, into the side of the thorax below the axilla. In children with difficulty of breathing he injects into the upper arm.
The lecture is a very interesting one, and gives a fair idea of the process and of the theory which underlies it; but we think the author glides over the dangers of the process and the difficulties in the theory too lightly.

Micro-Organisms in Water. By Percy Frankland, Ph.D., B.Sc. Lond., F.R.S., and Mrs. Percy Frankland. London: Longmans, Green & Co. 1894.

The subject considered in the book before us has become of the very greatest importance on account of the evidence which has been accumulating in favour of the view that some infectious diseases are often disseminated by impure water distributed in the places where such epidemics occur—as, for instance, in the cholera epidemic in Hamburg two years ago, in which case it was shown that the presence of certain microorganisms had a close relation to the amount of disease in certain districts, and their absence from the water supply to the immunity enjoyed by other districts.

We would, at the same time, point out that though bacteria may cause some diseases which are spread by impure water, it is hardly likely that all such diseases are caused in that way; and, therefore, due attention should still be paid to the chemical examination of water supplies, as there is danger that in the hunt after pathogenic bacteria, other larger and equally important matters may be overlooked.

This book is well got up and arranged, and very fairly illustrated with woodcuts and a few plates. It starts with a good description of the methods of bacteriological research in reference to water, and of the apparatus required in such investigations. Then the bacterial contents of various waters are discussed, and in this chapter a series of tables is given, derived from various sources, of the number of bacteria found in the water of rivers, lakes, and the sea, but without referring to whether the bacteria are pathogenic or not.

We should like here to call attention to the difference which may be observed in any pond, in the vegetable and animal life in various parts, according to the supply of sunlight and also to other and perhaps very slight local differences. For instance, the other day, in a pond near Glasgow, we noticed, on examining the water with a lens, that at one place there were numerous specimens of volvox globator, and but few daphniæ present, while in another part, only a few yards off, there were great numbers of daphniæ and no volvocinæ to be found.