

scope, situated at Arequipa, has also been very extensively used, the chief work being the photography of the spectra of the brighter southern stars with one, two, and three prisms. The report further describes the work done at the meteorological stations, and concludes with a brief summary of the recent publications, and those which are in or nearly ready for press.

THE INTERNATIONAL UNIFICATION OF TIME.—The question of France adopting Greenwich time, or, as they would prefer to call it, Paris time, minus nine minutes twenty-one seconds, seems to be still in the air. Nearly all other countries have come into line on the subject, with the exception of Spain and Portugal. These last-mentioned would, no doubt, soon complete the harmony if only France would take the lead. England, Belgium, Holland, and Luxemburg possess to-day West European time. Central European time is adopted by Italy, Switzerland, Germany, Denmark, Norway and Sweden, while Russia (nearly to one minute), Roumania, Bulgaria, and European Turkey use Eastern European time. In Japan the legal time is nine hours in advance of Greenwich, and in Australia and New Zealand the time zones used are 8, 9, 10, and 11 hours earlier than Greenwich. Canada and the United States have for some years used four zones, namely, 4, 5, 6, 7, and 8 hours behind Greenwich time. An article summing up the information on this question of time is contributed to the *Revue Scientifique* (No. 14, April 3), and the question of the advisability of adopting Greenwich time is strongly advocated by the writer, M. Ch. Lallemand. In his summary he mentions the probable motives that have led M. Boudenoot, deputy of the Pas-de-Calais, to submit to the Chamber the following proposition, which is more simple than that which has been previously suggested, namely: "The legal time in France and in Algeria, is the mean time of Paris retarded by nine minutes twenty-one seconds." The writer's concluding words are: "Reduced to this and stripped of all which could hurt the susceptibilities of the most delicate, one may hope that this projected reform will meet with the reception that it deserves, both by Parliament and the public; that is to say, the unanimous approval of *tous les hommes de progrès*."

KOCH'S RECENT RESEARCHES ON TUBERCULIN.

DURING the last couple of weeks there have appeared in the various lay and medical journals long accounts of an improved method of preparing and using tuberculin. Koch and his assistants, no doubt disappointed at the results of the premature application of the tuberculin treatment, have, for seven years, worked away steadily to try to counteract some of the damage done by irresponsible enthusiasts in 1890. How far they have succeeded will be gathered by those who carefully weigh the work that has now been published. Disregarding Koch's instructions that the cases of tuberculosis to be subjected to the tuberculin treatment should be carefully selected, and that tuberculin should not be tried in any but comparatively early cases, physicians threw aside tuberculin as being not only of no use, but absolutely injurious, and taking into consideration the class of case on which it was tried they were right. The febrile reaction may or may not have been injurious in the majority of cases, but in a certain proportion it was undoubtedly associated with exacerbations of the disease and a general deterioration in the condition of the patient. A few workers, however, have all along maintained that in properly selected cases the exhibition of tuberculin has undoubtedly proved beneficial, whilst as a diagnostic agent, especially in tuberculosis of cattle, it has opened up the possibility of gradually eliminating tuberculosis from our farms and dairies. Tuberculosis, however, has never been brought into line, as regards the production of immunity, with tetanus, anthrax, diphtheria, and certain similar diseases. But a step in advance in this direction has now been made by Koch, as is evidenced by the publication of his most recent work. He points out that in the case of tubercle, unlike many other diseases, an infection, in place of protecting, rather predisposes to new attacks of the disease. On the other hand, there appear to be certain conditions, such as those met with in acute miliary tuberculosis, under which the tubercle bacilli disappear; from this he argues that immunisation only takes place when, as in general tuberculosis, the whole body is invaded by great masses of tubercle bacilli, which thus come in contact with comparatively healthy tissues. Having determined

this, it becomes necessary to find out whether the products of the bacillus failing to give immunity, the substance contained in the bodies of the bacilli are the immunising agents. By means of a decinormal soda solution, he partially broke down, or extracted, the tubercle bacilli; with the fluid thus obtained (T.A., or alkaline tuberculin), he made a series of injections, and found that this substance acts very much as did his original glycerine tuberculin, producing both local and general reactions, but acting more powerfully; and he found that relapses were undoubtedly less frequent when this substance was used than when the original tuberculin was injected. If the remains of the bodies of the tubercle bacilli were left in this fluid, abscesses were formed when large quantities were injected, but such abscess formation was immediately prevented when the fluid was filtered. The tuberculin in this form, however, required to be used in a fresh condition, and, therefore, could not be applied on any very extensive scale. The bodies of tubercle bacilli he found are covered with a layer containing two sebatic (fatty) acids, one of which is soluble in dilute alcohol, and is easily saponified; the other, soluble only in boiling alcohol or ether, is not so readily saponified. These fatty acids form a layer which protects the bacillus, and prevents its being absorbed from the seat of injection, with the result that it remains and sets up a powerful local suppurative reaction. By pounding these organisms in a dry condition, then adding distilled water and centrifugalising, then by drying the sediment and repounding until the whole of it is dissolved, Koch has been able to obtain the substances of the bodies of the bacilli in an absorbable condition. These substances, he says, appear to be divided into two sets: those contained in a whitish, opalescent, transparent supernatant fluid, which contain no bacilli, and a muddy deposit, which contains the solid bacilli. The upper layer contains most of the substance soluble in glycerine. This upper layer is very like the ordinary tuberculin, and acts like that substance, but more powerfully; whilst the lower layer, or the tuberculin remainder (T.R.), has an even more distinct immunising effect. Used in very large doses it produces a general reaction (rise of temperature, loss of appetite, &c.); but used in smaller doses, gradually increasing as quickly as the patient's condition will allow, and avoiding a general reaction, it sets up an immunity against the T.R. substance; indeed, Koch shows that any case which can be rendered proof against T.R. can also be rendered proof against the tubercle bacillus itself. Without going into the question of dosage, it may be insisted that this substance should never be given so as to produce a rise of temperature of more than half a degree. If the disease is advanced the substance appears to exert little or no effect, but as a protective agent and as a curative agent applied at an early stage of infection, a certain proportion of experimentally infected guinea-pigs could be beneficially influenced. So far, as with tuberculin, the best results have been achieved with cases of lupus (or skin tubercle), and here the improvement obtained has been far greater than that produced by the use of tuberculin, though Koch guards his position by saying that though many of the cases may be regarded as cured in the ordinary sense of the word, it is, he thinks, premature to use the word cure before a sufficient time has passed without a relapse. It is, however, important to note that in none of the numerous cases treated were the patients injuriously affected. There was a steady increase in weight, and the variations of temperature, so marked in the tubercular patient, were distinctly diminished, and the general condition of the patient improved.

The interest that attaches to these experiments does not end at this point, for it is evident, if an immunity against the action of the bacilli and their poisons can be obtained, that the treatment of tubercle may ere long be brought into line with the treatment of some of the other specific infective diseases, and that by an extension of Koch's and Maragliano's methods still further advances in the treatment of tubercle may be made. What will strike those who have followed the development of Koch's method of treatment from the time that he discovered the bacillus to the present moment, is the ingenuity, perspicacity, and tenacious adherence to one idea that has characterised the whole of Koch's reasoning and experiments. It is not too much to say that through his early work we have the hope that tuberculosis may gradually be eradicated from cattle, whilst as the result of his later experiments there appears to be some promise that for the human subject protection against the ravages of tuberculosis and even cure may be obtained.

G. SIMS WOODHEAD.