

able—it was felt that the time of the telescope would be better devoted to these two pieces of direct, useful, and much-needed work than if it were used in miscellaneous researches which, though possibly more interesting, would certainly not be so generally useful in the advancement of the science.

J. S. PLASKETT.

THE USE OF ANIMALS IN MEDICAL RESEARCH.

WHEN a Bill to prohibit experiments on dogs was before the House of Commons in 1914, a memorial signed by more than three hundred eminent physicians, surgeons, and other representatives of medical science, protesting against the measure, was addressed to the Home Secretary. The strong conviction was then expressed that the Bill would inflict very severe injury, not only on medicine and surgery, but also on the study of the diseases of animals; and the memorialists added: "We think that we have some right to ask you to oppose this attack on the advancement of medical science and practice, especially as the Final Report of the Royal Commission on Vivisection does not advise the prohibition of experiments on dogs. We are absolutely certain that such experiments are necessary for the complete study of many problems of physiology, pharmacology, and pathology."

The second reading was carried in the House of Commons before this memorial was presented to the Home Secretary, but the Bill was withdrawn in June, 1914, after a number of amendments to the principal clause had been carried in the Standing Committee appointed to consider it. The subject has, however, been raised again by the introduction of another "Dogs' Protection Bill," which received its second reading in the House of Commons on March 21, and passed through the Grand Committee stage last week. Sir Edward Sharpey Schafer, Dr. T. Lewis, Prof. E. H. Starling, and Prof. Leonard Hill have stated the case against the Bill in letters to the *Times*, and we may be permitted to recall a convincing article by the first-named in *NATURE* of May 7, 1914, where it is shown that the prohibition of the employment of dogs for certain investigations would put a complete stop to the progress of physiology in Great Britain.

The position now is much the same as in 1914, and Sir Edward Sharpey Schafer's forcible statement in our columns of the case against the Bill is as applicable to the new measure as it was to the old. After the brilliant successes achieved during the war by physiological and scientific medicine in the preservation of life and the prevention of suffering in our armies, it might have been thought that the agitation against medical experiments on animals would have received its death-blow. But there are some people who are incapable of learning, and the passage of the

Dogs' Protection Bill through the Grand Committee stage suggests that many of them are congregated in our legislature.

Do the supporters of the Bill really imagine that, since it has been proved possible to slaughter millions of human lives and to subject men and women to slow death by starvation, brutality, and disease, the value of human life has really become lower than that of a dog? For it must be remembered that the prevention and cure of disease are possible only by means of an accurate knowledge of the functions of the body, and that, with regard to these functions, there is scarcely any fundamental truth which has not been established by experiments on dogs. The action of the heart and its nerves, the circulation of the blood, the nature of respiration, the processes of digestion, the chemical changes which the food undergoes in the body, the functions of the kidneys and of the liver, and the action of the internal secretory glands, have all been revealed by such experiments. And, although corroborative experiments have been carried out since on other animals, these would have been in many cases impossible if the principles had not first been established by the use of dogs. If these animals had been excluded from experiment, few of these facts would have been found out, nor would the knowledge and power gained thereby have been applied for the benefit of man.

Why is the use of dogs so essential in medical research? No one will dispute that, to gain a knowledge of living functions, recourse must be had to living animals, and those animals must be such as can be kept in comfort and health within the precincts of a laboratory. The ordinary farm animals are therefore excluded by this fact alone, altogether apart from the difficulties presented, so far as medicine is concerned, by the wide differences, which exist between their digestive processes and those of man.

For a vast number of experiments, viz. the greater part of those necessary in research on infective disease, the smaller animals—mice, rats, guinea-pigs, and rabbits—can be employed. In these experiments it is chiefly necessary to decide whether the injection of a given organism or microbial poison is followed by death or survival. As soon, however, as it becomes necessary to analyse the processes occurring in separate organs, e.g. the heart, the kidney, etc., it is essential to make use of larger animals, and the limitation mentioned above confines these to dogs and cats. Cats are used wherever possible. But the delicacy of their tissues, the small size of their organs, and the marked differences which exist between their food habits and those of man render it necessary to employ dogs for many important lines of research. Thus it comes about that the greater part of our knowledge of the heart's action, of the production of lymph and the causation of dropsy, of the nature of diabetes, and of the fate of different kinds of food in the body, is owing to experiments on dogs, and would

not have been discovered if the use of dogs had been prohibited.

Though the advances in medicine of recent years have been so marked, much remains to be discovered. If this Bill is allowed to become law, all research in this country into such problems as the causes and treatment of diabetes, of Bright's disease, of heart disease, of dropsy, of disorders of the stomach and intestines, and many others, will be hampered to such an extent that progress in our knowledge will come to an end, except in so far as it can be attained by observations and experiments on human patients themselves.

A prohibition of the use of dogs would be equally disastrous for the progress of surgery. The fundamental advances made during the last twenty years, which have proved of such inestimable value not only in civil practice, but also during the war in the treatment of our wounded soldiers, were achieved in the first instance by means of experiments on dogs. By such experiments it was first shown to be possible to excise portions of the alimental canal, to make openings from one part to the other in order to relieve obstruction, to remove part or the whole of the internal organs, to implant bone and tissues so as to restore defects, to deal fearlessly with the cavity of the chest, to sew up wounds in the living and beating heart, to restore continuity of wounded blood-vessels, and to perform many others of the feats which are the triumph of modern surgery.

Much more remains to be achieved in order to abolish or alleviate even a fraction of the pain and suffering which are all around us. But all activity in this direction would be hampered, and much of it brought to a standstill, if the Dogs' Protection Bill is allowed to become law.

Nor would the Bill diminish by one jot any pains at present suffered by dogs. Under the law as it at present stands, the infliction of pain on dogs is already prevented. According to the regulations now in force, the animal has to be under the full influence of an anæsthetic during the whole operation, and to be killed before recovering consciousness. Or, if the object of the experiment requires that the dog should be allowed to survive, it must be at once killed under an anæsthetic should pain supervene at any time after the operation.

These regulations can be justified on purely scientific grounds, since the existence of pain during an experiment is a disturbing factor, which is not only an unnecessary complication, but may also vitiate the whole result of the experiment. The only effect of the Bill, therefore, so far as dogs are concerned, would be that a few more of the stray and homeless dogs that are now used for experiment would be added to the 20,000 or more which are killed by suffocation during each year at the Dogs' Home at Battersea.

We cannot believe the Government is so indifferent to the advancement of medical science and the human suffering which it aims at alleviating that such an act of folly as is contemplated in

the Bill now under consideration will be permitted to be placed on the Statute Book because of the impertunity of certain private members who disregard all that scientific knowledge of disease has to tell them. The Bill is down for the Report stage on May 23, and we look to Ministers to exert themselves sufficiently on that day to protect us from such a pernicious measure.

SIR WILLIAM CROOKES, O.M., F.R.S.

THE few remaining British men of science whose memories extend back to 1862, in reviewing that long period of the past, never lose from the mental vision one remarkable figure. The occasion of the International Exhibition in that year afforded an opportunity by which a young English chemist sprang into sudden fame. The discovery of a new element, however remarkable its properties, would, perhaps, not have proved sufficient to rouse the interest of a mid-Victorian public, but the method of spectrum analysis used in its discovery being then new, coupled with the award of a medal to the exhibit, brought thallium and its discoverer very prominently into notice. The great scientific career thus begun nearly sixty years ago is now closed by the death of Sir William Crookes on Friday, April 4, not only full of years and honours, but also busy in the laboratory to the last.

Crookes was born on June 17, 1832. At an early age he entered as a student at the newly instituted Royal College of Chemistry in Oxford Street, where he remained for some years under Hofmann as demonstrator and assistant. Here he found an atmosphere favourable to the development of his talent for investigation, but it is remarkable that the study of organic chemistry, the chief direction followed by Hofmann and his pupils, never seemed to attract him specially, and many years afterwards he was not ashamed to confess an almost entire ignorance of the work which had occupied so large a number of chemists, especially after Perkin's discovery of the dyes and the general adoption of Kekulé's theory of benzene. His earliest paper records his discovery of the seleniocyanides in 1857, and he was then occupied for a time by the developments then taking place in the processes of photography. The discovery of thallium by the application of the spectroscope gave him occupation for several years, but after completing the study of that element and its compounds it became evident that his preference lay in the direction of phenomena outside the range of ordinary chemical investigation, and that his researches would be pursued along no conventional lines. In passing, it ought to be mentioned that he was instrumental in securing the application of the powerful disinfectant properties of carbolic acid or phenol during the disastrous spread of the cattle plague in 1866.

Meanwhile, Crookes was hard at work on facts