Votes of Thanks.—Votes of thanks to the honorary officers for their services during the past year were passed, Dr. J. Allan Thomson specially acknowledging the assistance he had received from Mr. Macdonald in the library.

31st January, 1917. D. PETRIE, Chairman.

PRESIDENTIAL ADDRESS.

The following is the presidential address delivered at the annual meeting of the Board of Governors of the New Zealand Institute, at Wellington, on the 30th January, 1917, by Professor W. B. Benham, F R S :—

GENTLEMEN,—I desire to thank you most sincerely for the honour you did me at the last annual meeting in electing me as your President for the year. I trust that you will overlook the many shortcomings on my part, as they will be counteracted by the good will of the officers of the Board and by the work of the Standing Committee.

In looking through the addresses delivered by the previous occupants of the chair, I feel very diffident of my ability to carry on my duties as efficiently as they have done, and feel rather appalled at my inability to deal adequately in this address with the various matters with which this Institute is concerned.

Although it has been customary to make allusion to those members of the Institute who have died during the year, I find in previous addresses no reference to distinguished men of science of Britain who may have passed away. I propose on this occasion to refer to some of the leaders in the various branches of science whose deaths have had to be recorded during 1916.

Professor Judd, F.R.S., for many years Professor of Geology at the Royal College of Science at South Kensington, was perhaps especially known for his studies of the volcanic districts in Europe.

Elias Metchnikoff, a Russian by birth, was in the earlier part of his life known to zoologists as a student of the structure and embryology of lower invertebrates, in which he made discoveries of great significance. While thus engaged in these microscopic studies, he observed again and again, in animals of widely different character, certain peculiar cells which were highly mobile—moving about in the living tissues in a very active fashion; and in certain of them he discovered that these cells were engaged in feeding upon foreign substances, organic and inorganic, which had obtained access to the tissues. To these cells he gave the name "phagocytes," and he established the fact that they are of universal occurrence. He went further than this: he demonstrated that in the higher animals these phagocytes are of prime importance in the process known as "inflammation," and that they are intimately related to the phenomenon of "immunity" from disease, the proper understanding of which has revolutionized medical theory and practice. This is one instance of a discovery in pure science being of immense value to mankind.

Professor Silvanus P. Thompson, F.R.S., made very important discoveries in electricity, magnetism, and optics.

Sir William Ramsay, F.R.S., the great chemist, passed away at the comparatively early age of sixty-three. He was the discoverer of the peculiar inert gases argon, neon, helium, crypton, and xenon, some of which occur in the atmosphere. Confronted with a type of element entirely devoid of chemical properties, he was forced to rely entirely on their physical properties in order to put them in their proper relation to the other elements, and he solved the problem by aid of molecular and atomic conceptions. He was a pioneer in the work, and exhibited great manipulative skill in designing the apparatus and performing the necessary experiments. A detailed history of these discoveries is one of the romances of modern science. At a later date he pursued the study of radio-active emanations—discovered by Rutherford elsewhere—as exhibited by some of these gases.

Sir Lauder Brunton, F.R.S., gained high distinction by his work on physiological medicine. He was one of the first among practising physicians who used no empirical remedies without first seeking to discover their mode of action—that is, he correlated his clinical knowledge with laboratory work; and by his work pharmacology has become a definite branch of science.

Each of these men has produced vast changes in the science in which he laboured.

Another man, less known, less distinguished perhaps, has an interest for us, since he used his great mathematical knowledge for the benefit of New Zealand Mr. F. W. Frankland, son of Sir Edward Frankland, came to New Zealand in 1875 to recuperate from a breakdown in health. He entered the Government Insurance Department, ultimately becoming Government Actuary and Registrar of Friendly Societies Always alive to the possibility of scientific expansion and improvement in life-insurance methods, Frankland originated and introduced into New Zealand the regulation that in the registration of deaths of males the particulars of the family left should also be recorded, and the data so obtained have been found of great value by actuaries all over the world. He was, too, of a philosophical turn of mind, and a paper by him was published in our *Transactions*, entitled "Mind Stuff."

These men died at a ripe age after a life of active research; but I cannot forbear to refer to the many young scientific men who had already shown promise of brilliant attainment whose lives have been cut short abruptly during this pitiless and horrible war. Mention may be made of Dr. Jennings, Lieutenant Athol Hudson, and other New-Zealanders of promise. Amongst them also was a young Oxford zoologist, Geoffrey Smith, thirty-four years of age, who had done some very original experimental work in the endeavour to ascertain the physiological causes of secondary sexual characters. By a masterly association of ideas he showed the analogy between the physiological regulation in parasitized crabs and the phenomenon of regulation which produce immunity in bacterial disease.

But this war is taking a tremendous toll of the younger scientific men, and when we realize the prime importance of science, in peace as well as in war, and the value of their work in industries, it is extremely saddening to read, week after week, in *Nature*, the records of brilliant young scientific men who have been sacrificed to this war. At first these men were allowed to enlist in any capacity, instead of being retained for work for which their scientific training rendered them valuable. It is deplorable that these young scientific men were permitted at the outbreak of the war to enlist in the combatant forces: it is only one of many indications of the neglect to make use of skilled men in work in which they are experts which characterizes the Governments of British countries, and which one is inclined to attribute to their ignorance of science, and especially of the science of organization.

These young scientific men would have been of immense value behind the fighting-line during the war, as well as in the future peace, as we believe that the need of scientific qualifications in the reconstruction of Empire is of prime importance. But, unfortunate as this is, we have no right to differentiate between this deplorable wastage of trained scientific men and the awful decimation of the young manhood of the Empire, for in their loss the Empire is losing the potential fathers of the race. The most vigorous, most unselfish, most intelligent, and bravest representatives of all classes, from the heir to an earldom to the humblest labourer, are the men of the highest eugenic value to the race, and the loss of these men is extremely serious for the future of the race.

It is time that I turned to the activities of our Institute.—

1. The financial position of the New Zealand Institute is a matter for perennial discussion, and I fear that in this the third year of the present war little can be done to better it. It has been pointed out again and again that the statutory grant still stands at the figure it was forty-eight years ago, when the condition of life in the colony (as it was then) was very different from what it was in 1914. when the cost of printing was less and the scientific activity less. Yet in all these years only on two occasions have we had any definite increase of our annual grants of £250. But we cannot look, I presume, for any immediate assistance from Parliament There will be, when peace is declared, a period of financial stringency, during which, I much fear, all sorts of economy will take place wherever possible. But the half-crown levy on our members will no doubt be of some assistance: it has this year added more than £100 to our income.

It may be that many members of the local branches will prefer to forgo the volume of *Transactions*. It no longer appeals to the general public as it did before it was truly and wholly a scientific publication In those earlier days, you will remember, it was customary to print *in extenso* the annual reports of the various presidents, popular lectures, curious articles on pseudo-scientific subjects, and other matters. These were all intelligible to and of interest to the non-scientific members. But to-day, when we have succeeded in eliminating everything but what is of scientific value—when the papers, or most of them, are couched in technical terms—and the *Transactions* have thereby become a valuable record of scientific research done in the Dominion, it follows that the volume is lacking in interest to our lay members.

What will be the effect of this levy? Will it reduce the number of members who are willing to pay one guinea to the local branches? Will the branches be able to lower the subscriptions payable to them by those who do not desire to take the volume? It seems likely that the number of volumes to be printed will be reduced, and so relieve somewhat our finances.

We shall have reports as to the disposal of grants made from the Hutton and Hector Funds.

2. The most important piece of work that has fallen to the Standing Committee during the past year relates to a scheme for making use of the grant of £250 provided by Cabinet, at the instance of the Hon. the Minister of Internal Affairs, for the purposes of research. The Minister communicated with me, as your President, outlining his idea as to the way in which this sum should be expended; and when he was in Dunedin he was good enough to receive Dr. Marshall, Mr. G. M. Thomson, and myself, and we put before him a general outline of what we considered desirable. Later your Standing Committee arranged for a deputation of Wellington members to wait on him, and a scheme was submitted to him on behalf of the Governors; and a number of grants have been made, as enumerated in the report of the Standing Committee. It will be our duty to confirm their action.

We are much indebted to the Hon. Mr. Russell for the interest he has taken in the work of the Institute, and appreciate his sympathetic attitude towards science, and his evident desire to encourage scientific research, especially in relation to the industries of the Dominion. We trust that he will be able to obtain a continuance of this grant, and even an increase in the amount, as he has led us to understand is his desire. At the same time it must be borne in mind that making important investigations of a class similar to those already being undertaken may require considerable time and the expenditure of considerable sums of money for their proper solution, and may require co-operation between workers along different lines. It must also be remembered that some of these researches may have a negative result that will not necessarily be a waste of money, for if the researches are properly recorded and published it will save waste of time and money in the future in attempting work along the same lines.

Mention may aptly be made here of the uncoördinated researches in Agricultural and other Departments, the absence of good reports of many of these researches, and the difficulties that lie in front of those who try to find out what has been the result of the investigation of particular problems. These matters were brought before the Philosophical Institute of Canterbury, and I trust that something will be done to remedy the defects in the publications of this and other Government Departments. The publication in full of these researches is a necessary complement to the work, for unless this is done the research is wasted and the money is wasted. It will, I suppose, be for the Government to find money for the proper publication of these reports, in such a form and at such a price that if the results are of value to the industries they may be readily brought under the notice of the industrial community.

3. At the beginning of the war the University colleges placed at the disposal of the Minister of Munitions the scientific apparatus in their laboratories, and the professors expressed their willingness to assist in any way that they could; but, so far as I know, little use has been made of the offer Certainly, Professor Scott, of the engineering department at Canterbury College, spent a considerable amount of his time and energy in making the numerous gauges necessary for the manufacture of shells and in making shells, but later it was found that these were not required. The Professors of Chemistry, I understand, have been engaged on various works in connection with the war, and Professor Kirk placed his services at the disposal of the Defence Department, and has done useful work in fighting the flies that invaded the camps.

In the address of one of my predecessors in the chair reference was made to the bequest of the late Mr T. Cawthron, of Nelson, who had intended to leave money to establish an observatory, that, however, now seems unlikely to eventuate. But he left a substantial sum of money to be used in establishing an institute for research. It is the most important bequest of its kind that has been made in New Zealand, and the only one, I believe, with a definite stipulation that research should be carried on. The trustees under the will set up a commission of scientific men to draw up a report as to the best way in which to carry out the wishes of the donor. The report of this commission is not yet completed, so that it is not right that I should say more than this: If the recommendations contained therein are acted upon, an institute will be established in which research into certain agricultural problems will be carried on under a highly trained scientific staff, and I feel sure that the New Zealand Institute will welcome this addition to the opportunities for research in our primary industry.

This leads us naturally to consider the improvement that is in progress in the Home-country and the Dominions towards a closer co-operation between science and

industry. New Zealand lags behind the Commonwealth in this matter As you are aware, the Prime Minister of Australia set aside a quarter of a million sterling for the preliminary work of a conjoint Board on which science and industries are represented, the work of that Board being to investigate various defined and important subjects the solution of which would lead to improvements in manufacture, the utilization of waste products, the destruction of certain weeds which had become a pest, and so forth.

In New Zealand very little progress has been made with the scheme initiated by the Institute. Certain committees have been set up in the four centres, and the Auckland committee have circulated a valuable pamphlet containing their recommendations, which will be seen from the report laid before you. There was formed at Dunedin an "Institute of Science and Industry," which roused a certain amount of enthusiasm amongst the representatives of the local industries, many of whom co-operated with the scientific men

The Minister of Internal Affairs has expressed his intention of calling a conference, which we may hope will result in some practical steps being taken to bring the results of scientific research and method into closer relation with some of the industries. It is not my intention to discuss the matter here, but, as this Institute is the chief body of scientific opinion in the Dominion, and should be able to exercise greater influence than it does at present in all matters involving scientific principles, I cannot pass the movement by altogether.

The valuable report on the relation of science to industry circulated by the committee of the Auckland Institute contains, as you will have seen, recommendations for increased teaching of science, for increased remuneration of research scholars and an extension of the system, and for the application of science to industry. In the case of the last, it seems to me that the committee have scarcely gone as far as they might. Chemical analyses, bacteriology, and agriculture are mentioned, but no reference is made to other industries Moreover, I think that the gap between the student who has done academic research and one employed in an industrial research is not bridged by the recommendation

It has been a complaint, I understand, by manufacturers in England that most of the young graduates, usually chemists, that have come to them from universities are useless, owing to the fact that they have, naturally, no knowledge of doing research on a business scale: they know and generally can know, nothing of the especial needs of the particular works, or such matters as the most economical way of production, utilization of waste material or by-products In other words, they lack a business training in connection with their science It has occurred to me that to get over such a difficulty there should be a central research institute under a competent director with business knowledge—a knowledge of the needs of manufacturers. Here the graduate would be set to work out special problems presented by manufacturers, under the guidance of the director, and thus get some insight into the working of a large concern It would, of course, need money, but I suppose it would not be impossible to interest the large manufacturers in the matter Get grants or endowments from individual firms, from business corporations of various kinds, and I believe that such an institute would justify itself in a few years

It seems to me that this Institute should take a much more active part in urging the importance of a better training in science—or, rather, in scientific methods—in our secondary schools, and in urging, in season and out of season, on the industrial community the need for scientific organization and co-operation It is to this Institute that the Government should be induced to turn for advice and assistance in any matter in which science is involved For instance, I understand that important reports from the British Government were received by our Government and referred to a single individual for a report. Now, these reports, it seems to me, should have been referred to the Institute as a body, which, if necessary, should be called together to discuss and advise It is as true here as in Britain that few of our politicians have any knowledge of science, or what is meant by scientific method, and we ought to see that this is remedied by persistent deputation, if need be, when the present grievous time is passed

For instance, the matter of scientific afforestation is one that demands immediate attention. It is true that a few years ago the Institute approached the Government with the suggestion that a scientifically trained Forester be appointed, but I believe nothing has been done. The members of the Institute are all busy men, and it is difficult, perhaps, to keep track of the varied needs of the Dominion; but if each of the scientific men on the Board were to bring forward from time to time the matters that occur to them as being in need of reform, a special meeting of the Institute might be held at which such matters might be discussed more fully than is possible at our

annual meeting. Committees might be set up to deal with them, and deputations to the Ministers concerned might be arranged, and other steps taken to impress upon the Government the need for taking action.

I must not omit to refer to the first meeting of the Board of Science and Art, a body which has great potentialities in regard to science. The first meeting was called by the Hon. the Minister of Internal Affairs immediately after our last annual meeting. As the President of this Institute is *ex officio* a member, I had to take my place on that Board in the evening, though I was only elected your President in the afternoon. The Board considered at some length a report by the Director of the Museum as to the future of the Museum. It was agreed that the present site is the best one for a museum and art gallery, and a plan of the building was laid before us. It was resolved that a fireproof building should be erected as soon as possible, the building to be part of the completed plan. The Minister was most sympathetic, and gave us reason to hope that the money would be found for its erection, but Cabinet, I presume, was indisposed to make the necessary grant at a time when the Dominion is requiring so much money for other and more pressing purposes. It is a matter for deep regret that former Governments had postponed the erection of so important a structure. It is a standing disgrace to the Dominion that the extremely valuable and irreplaceable collection of Maori objects is housed in the inflammable building in which we sit.

Protection has been accorded to our native birds, to some extent to native plants and insects, by preservation of national reserves, and steps have been taken by Act of Parliament to prevent the removal of Maori antiquities from New Zealand; but there is another set of historical records for which some sort of protection is needed—the early pre-Maori rock paintings of Canterbury and North Otago. These rock paintings, in red and black, occur on the walls of rock shelters, and have received some description at the hands of Mantell, von Haast, and Hamilton — some of whom attempted to give explanations of these extraordinarily varied objects, all of which are totally unlike any of the designs occurring in the carvings of the Maoris. During this last year these rock shelters have been inspected by an American visitor, Mr James Lee Elmore, who has taken a good deal of interest in similar objects in South Africa and Australia. He has made tracings of all these pictographs in the known shelters, adding a very great deal to what had previously been recorded by Hamilton, and discovered new shelters Mr. Elmore allowed photographs of these tracings to be made, and from them we have obtained a plan of each such group of pictographs, arranged in true relative position, in case their juxtaposition may have some meaning. There is now in the Otago Museum a complete set of these reproductions. But the Otago Institute went farther: it commissioned Mr. Elmore to remove some of these designs from shelters which are now exposed to weather and so being destroyed. Needless to say, he got permission to do so from the freeholders. But while some of the shelters are on private property, others are on Crown land, or land owned by a County Council, and it is most desirable that some means of protecting these pictographs should be devised, as some of the shelters are in danger of being destroyed. I think a small committee might, if you think it desirable, be set up to consider what steps, if any, can be taken to protect these extremely interesting records of the earliest inhabitants who have left permanent traces of their existence in these Islands. I hope, too, that a detailed and well-illustrated account of these extensive and varied pictographs will be published