Strong testimony to the indifference of the Marine Mollusca to extremes of temperature is given by the deep-sea dredgings which have been made during the past few years. These dredgings have proved that marine molluscs of high organisation live at enormous depths, where the temperature of the water is close on freezing point.

We find, then, the Marine Mollusca, whether of high or of low organisation, exhibit a remarkable indifference to heat and cold, the same genus flourishing both where exposed to intense heat and where subjected to intense cold. The prime cause of their present geographical distribution cannot, therefore, be variation in temperature.

The more or less abundant supply of food is probably the most potent of the influences which regulate the present distribution of these animals, and to the same cause may be ascribed the great size attained by certain molluscs, such as the *Tridæna gigas*.

Scientific Instruction in New Zealand. By Professor Bickerton.

[*Read before the Philosophical Institute of Canterbury, 6th September,* 1876.]

It is with regret I have to call the attention of the members of the Institute to the very small progress that scientific education is making in New Zealand. This is not only the case with the instruction now being given in our schools, but also in the training of the future teachers.

Colleges have been established in Otago and Canterbury with the necessary appliances for teaching the higher branches of science, but there is no systematic elementary training to produce a supply of students. In the elementary schools it is absolutely neglected; I have attempted to show further on the cause of this. The High School at Dunedin, and Christ College School, both have able science teachers; but instead of their whole time being devoted to the preparation and delivery of lectures, and to tutorial work in science, they have the general class-work of a division entrusted to them, the science work being taken when they are liberated by their class being taken by other special masters. Position in the school being in no way dependent on their scientific knowledge, the boys think it is of no value, and look upon its study as a bore.

It may fairly be assumed that the valuable prizes offered by the University as Junior Scholarships, which are worth £135, would be competed for by the best informed among the students in the colony, and would be a fair criterion of what is being done. What do we get? One student recommended for a scholarship, and only one other obtaining the necessary minimum to compete; and this result with a set of questions,

that, were it not for the circumstances of the colony, must be (for such a prize) considered ridiculously easy. This examination is the only one in which science is one of the subjects for which junior students compete, science being absolutely ignored in all others. The Canterbury Provincial Scholarships are divided into four grades, with about six subjects in each grade, in none of which is science of any value to the competitor. For pupil teachers there are four progressive examinations, with no science; there is an examination for assistant teachers with no science; and the examinations for masters have science as a voluntary subject only in the first and second classes; and, since the establishment of these examinations, none have passed in Chemistry, and only about 20 papers in science have been worked, and these mostly only of a popular character. It is not a subject examined by the Inspectors of Schools, nor is it among the subjects mentioned in the Sixth Standard, or in the new scheme of the General Government. There is, consequently, no inducement for its teaching in elementary schools, neither to scholars, pupil-teachers, or assistant masters, and, therefore, scientific attainments in a teacher are of no value in obtaining an appointment. In point of fact, it seems to be the reverse. A teacher, who had some scientific attainments, remarked that the Committees appeared to think that as he had wasted so much time in science, he could scarcely be a good scholar in other ways. I am often told by masters that both the bent of their minds and their inclinations were for science, but that it did not pay, and they were therefore working at those studies which were better appreciated. This fact lessens considerably the usefulness of the Science Classes of the College. I will take one case as an instance. I established a class in Chemistry expressly for schoolmasters. Some fourteen joined, and attended a few times. I wished them to bring notes of the lectures. This was not done. I again expressed more forcibly the uselessness of merely looking at the experiments and not supplementing that by private study. The result was that only four came next time, and so on till the end of the course. In all my classes it is the same; I can only administer the smallest modicum of science at a time, or it is not assimilated. As with the masters, so with the pupils. All the more intelligent are working with a view to passing some of the examinations mentioned above, so that they dare not go aside from their regular course to take science—it is so much waste of time to the object for which they are working. In the University examinations there are the same influences at work. The degree of B.A. may be obtained, and, unless there are some alterations, will generally be obtained, without the competitors knowing anything of the forces at work controlling the universe in which they live, or of the materials of which it is composed, and yet the holder of the degree

will be considered a man of liberal education and culture while ignorant of the wondrous speculations contained under the terms Matter, Energy, and Biology. We will examine how the present arrangements of the University work. To matriculate, the candidate has to pass in six out of twelve subjects; to take a degree, he has to pass in five out of eleven; of these latter, two are compulsory, namely, Latin and Mathematics. The student who thinks how the degree may be obtained with least work, knows Latin and Mathematics must be taken; therefore, to matriculate, he of course takes Arithmetic, Algebra, Euclid, and Latin; his school training, and the association with compulsory subjects, will probably lead him to select two of the following: Greek, English, Modern Language, Geography, or History; and small is the chance that he will choose Chemistry or a branch of Natural or Physical Science, these subjects in his previous training having been wholly neglected, or at least he has attended, in a desultory manner, a few lectures, success in the matter of which was of no value in giving him a position in the school. With this foundation, what hope is there that, in working for the degree, the student will leave the beaten track and take to science, when he has Greek, English, Modern Language, and History from which to select his optional subjects? In passing the general examination previous to studying for the Law, no science is taken, although its study has an eminently powerful effect in training the juridical faculties, consisting as it does almost wholly of induction and deduction, based on evidence in which prejudice must be allowed no play, and conscientiousness is the only possible means of ordinary progress. The mere facts of science alone, leaving out its value as a high-class mental training, are of enormous value in a large proportion of legal cases.

Science troubles not the sleep of the embryo clergyman, although a little accurate knowledge of the wondrous harmony of the universe would give power to his discourses, and would enable him to show the absurdity of many of the pseudo-scientific arguments of those who neglect the duties which true science and religion alike enforce in the most unmistakable language.

The chemist and druggist may still sell his poisons and antidotes without its being essential that he has ever looked into a book of pure chemistry, or that he should know whether there is any difference between elements and compounds. It seems inconceivable, seeing the improvements effected in this particular in England, that this state of things should be allowed to continue.

New Zealand has nothing resembling the classes in science controlled by the Science and Art Department of the Council of Education, under whose auspices 40,000 papers were worked last year, principally by working-men.

The fact that the material and intellectual progress of a nation is largely dependent upon the scientific culture of its inhabitants, has been so often brought before the notice of the members of the Society, that to say anything further on the subject would be so like "killing the slain," that I do not attempt it. But should any of the new members be still in doubt, I would refer him to the unexampled progress of great intellectual activity of the nations which have made its study a matter of general every-day instruction; and if he trusts not his own judgment, or that of any scientific writers who may assume to be prejudiced, I would direct his attention to the writings of Flint, Bain, Max Muller, Mill, and Spencer, as to the influence inductive science has had in founding the science of language, the philosophy of history, and in establishing the modern school of mental philosophy. The question of immediate importance is, how may this present state of scientific instruction be altered? I submit the following as the most reasonable:—

Let science be an optional subject in the second standard and upwards, and after due notice let one branch be compulsory in the sixth standard. Make the sciences voluntary subjects in the Provincial Scholarships examination. It may be thought by many that this would be beginning science too early. I believe science should be begun to be taught as soon as the pupils are fairly conversant with the "three R's." At Winchester College with me, the junior boys invariably produced the best answers. I believe this, however, to be a special case largely due to the different habit of mind needed in real scientific study to that cultivated by the ordinary method of classical work. I am strengthened in my belief by the fact, that those who shine in classics, when the examination consists of set work, seldom do well in science, if the questions rise above ordinary cram. A large number of eminent scientific men have given testimony to the ability of very young children to learn the elements of science.

I would suggest the following amendments of the University and Teachers' examination:—Let the pupil-teacher and matriculation examinations be sound "all-round" examinations; let the papers be the same all over the colony, and of a real character, that having passed them may be a guarantee against gross ignorance of any branch of learning. After having passed this examination, let the student specialize his studies according to the bent of his mind; the degree examination depending on the success in subjects selected by the candidate himself; the honours being for a high-class knowledge in any primary and subordinate subject; and let a somewhat similar rule hold for the examination of schoolmasters.

But, above all things, to give a speedy impulse to scientific study, a simplified copy of the English Science and Art Department of the Committee of Council on Education (without the social distinction made in

England) should be initiated as early as possible. The perfectly wonderful results achieved in England at a comparatively small cost is a sufficient guarantee of the usefulness of these classes. The Science Directory issued by the Council gives every particular of the work of their organization.

Observations on Captain Hutton's paper "On the Maori Cooking-places at the Mouth of the Shag River" (Trans. N.Z. Inst., VIII., p. 103). By JULIUS VON HAAST, Ph.D., F.R.S.

[*Read before the Philosophical Institute of Canterbury, 15th December*, 1876.]

IT was not my intention to enter at present any further into the controversy concerning the age and time of extinction of the different *Dinornis* species, but on a perusal of Captain Hutton's paper "On the Kitchen-middens at Shag River Point," I feel obliged to say a few words in reply, as my silence might otherwise be taken for my agreeing with all his statements and deductions, of which several, as I shall show, are utterly at variance with the observations I made in that locality. Although my own excavations were on a more limited scale than those made by and for Captain Hutton, all the principal facts were nevertheless ascertained by me, and no further excavations, even had they all been made under his eyes, could alter them in the least.

And as Captain Hutton bases his deductions principally upon the excavations made by other persons, it is very probable that the position and sequence of the beds were imperfectly understood by them, and that therefore these deductions, based upon partly erroneous interpretations, can in many instances also not be accepted.

In order to show that I do not speak at random, I wish only to give one instance, which is conclusive. In my paper I stated that—

"In their vicinity (shell-beds), and below high-water mark, a small flat stretches towards the river channel, which is in many localities literally paved with Moa bones. The excavation which we undertook on this piece of ground proved that the lowest bed of human origin, consisting of boulders, once forming the cooking-ovens, had been arranged at least two feet below the surface of the flat. Here and there a chipped stone implement, embedded amongst the bones and of exactly the same character, proved that the same people who feasted on and near the summit of the sand-hills, camped here on the flat, which must then have been high and dry, and, as before observed, situated about theee feet above high-water mark, as the fires with which the Moa-hunters heated their boulders at the bottom of these ovens could not otherwise have burnt."