footnotes, where they do not break the continuity of the descriptive text, and of adding further geological information in an appendix is useful in drawing attention to the geological value of an interpretation of the physiography in a paper written primarily to explain and describe the land forms. This method I adopted in "The Physiography of the Middle Clarence Valley, New Zealand."[1]

In the case of my paper "Block Mountains in New Zealand," to which Professor Rich refers, the age of the covering strata in Central Otago is uncertain within fairly wide limits. The statement that they are probably Oamaruian but possibly Wanganuian would not convey much definite information to American readers. When I was preparing the paper for publication the temptation to discuss the age question was strong, and I yielded to it. Realizing that the discussion would be out of place in the body of the paper I placed it in an appendix, which, however, the editor wisely omitted.

This article was not written with a dual purpose. The geological significance of the land forms of Central Otago, as well as the closely related forms throughout New Zealand had already received full attention in a paper entitled "The Structure and Later Geological History of New Zealand," published in the *Geological Magazine*.[2] This and "Block Mountains in New Zealand" were in preparation at the same time, the one frankly geological, the other geographical. As such the latter was intended for publication in a geographical periodical and was offered to the Royal Geographical Society, which was unable, however, to find space for it in its *Journal*.

C. A. Cotton
Victoria University College,
Wellington, N. Z.

"A WAVE OF LIFE"

An interrelation of organisms somewhat suggestive of Hudson's "wave of life" was observable about the University of Montana Biological Station on Flathead Lake the past season.

During the summer of 1917 flowers bloomed luxuriantly about the station grounds, and humming-birds and butterflies visited the flowers very commonly. Rodents were present in normal numbers, but attracted no particular attention.

Conditions were markedly changed during the summer of 1918. For unknown reasons the rodents became very abundant. Pine squirrels and chipmunks were everywhere present. Spermophiles appeared on the station grounds for the first time in the history of the institution. The chipmunks quickly cleared the ground of flowers and ascended to the tops of trees to strip the honeysuckle vines of their blossoms. Deprived of their natural food in this vicinity humming-birds were rarely seen and butterflies were very uncommon. Pine squirrels kept the ground under the pine trees well strewn with pine cones, but the effect of this inroad upon the pine cones was not so apparent upon other forms of life.

Weasels, which were not observed about the station the preceding summer, were seen several times during 1918. Great horned owls hooted at night in the nearby tree tops. These birds had not been reported for 1917.

G. B. Claycomb
University of Illinois

QUOTATIONS

THE PHYSIOLOGY OF A WORKING DAY

Gradual reduction of the hours of labor from ten or nine to eight, and now to seven or six, must have made many people wonder whether some scientific basis might not be found for the hours which should be worked in various trades. Major A. C. Farquharson raised the matter in the discussion on the second reading of the Ministry of Health Bill. Speaking as one who had spent the greater part of his professional life in the service of the miner, he expressed his astonishment that members of the House of Commons should be so ready to put forward the idea that the number of hours a man should work day by day was to be settled by the arbitrary

[1] Geog. Jour., vol. 42, 1913, pp. 225–46.
[2] December 6, vol. 3, 1916, pp. 243–249, 314–320.

capricious decision of the mass. He contended that it was a scientific problem, and suggested that if science could establish that a normal man could work up to a given standard without detriment to his physical condition and without injury to his health or chance of longevity, the number of hours of a working day could be standardized. In the discussion on the bill in committee he contended that there ought to be a scientific department, working in relation with the Ministry of Health, to decide various matters of a physiological nature in relation to capital and labor, including suitable hours of work. We may point out that a large amount of scientific work had been done in this direction, some of which is summarized in the reports of the Health of Munition Workers Committee, but the subject is complex and physiology is far from having found a complete solution. It is comparatively easy to estimate the amount of energy given out in various kinds of work at various paces, but muscle fatigue is only one and probably the least important element in fatigue. There is in addition the mental element, which can not be measured, and the nervous element, which it will be possible to measure with difficulty if at all. Nervous fatigue occurs in the initiating and distributing nervous mechanisms of the brain and spinal cord, which are more quickly fatigued than the contracting muscles; consequently in the animal body the impulses to activity, springing from the brain, can not bring the muscles far towards complete fatigue before their sources are themselves fatigued and impotent. Though a tired man may refer his tiredness to the muscles, in reality the most severe bodily activity does not produce any close approach to complete fatigue of the muscles. The fatigue is of the nervous system, though its effects may be referred to the muscles. The conclusion of the committee was that the problems of industrial fatigue were primarily, and probably almost wholly, problems of fatigue in the nervous system and of its direct and indirect effects. Another complicating matter is that the human body seems to be adapted to withstand short spells of severe labor, broken by longer spells of rest; the point is illustrated by the story of a wager between two officers at the front as to the time to be taken in making equal lengths of a trench, each with an equal squad of men. One officer let his men work as they pleased, but as hard as possible. The other divided his men into three sets, to work in rotation, each set digging their hardest for five minutes and then resting for ten. The second team won easily. Another conclusion—this time in a report by Dr. H. M. Vernon to the same committee—was that the hours of labor ought to be varied between wide limits according to the character of the work performed. This seems the most promising line of inquiry.—*British Medical Journal.*

SCIENTIFIC BOOKS

Injurious Insects and Useful Birds. By F. L. WASHBURN, M.A. Philadelphia, J. B. Lippincott Co. Pp. xviii + 453. Price $1.75.

This little book is one of a series called "Lippincott's Farm Manuals" edited by Dr. K. C. Davis, and now containing about a dozen hand-books on as many phases of agricultural practise. The author of this volume, Professor Washburn, has for many years held the positions of state entomologist of Minnesota, professor of entomology, University of Minnesota and entomologist of the Agricultural Experiment Station, consequently as an investigator and teacher he is in possession of some first-hand knowledge and is posted regarding the work of others. A list of questions at the end of each chapter shows the custom of the teacher.

The book is divided into twenty-one chapters, with headings as follows: Loss to Agriculture Due to Insects and Rodents; Farm Practises to Lessen Insect and Rodent Injuries; External Structure of Insects, Orders, Metamorphosis; Collecting and Preserving Insects; Insectides and Spraying; Fumigation; Insects Injurious to the Apple; Insects Affecting the Pear and Quince; Plum, Peach and Cherry Insects; Insect Pests of Berries and Grapes; Principal Insects affecting Citrus