his "review" is a sheer burlesque of what my book contains. He also complains because I have stolen some of his thunder; in other words, he says I have "appropriated" over two dozen *more* illustrations from his text-book than the few which his publishers authorized me to use. In this Dr. Schuchert is quite mistaken. He seems to forget that I and my publishers may possibly have access to the same original sources for illustrations that he himself had.

Possibly it may interest Dr. Edwin Linton and my other critics to know that the latest example of a "transcendent absurdity," issued by me, is entitled "Evolutionary Geology and the New Catastrophism," and that it was published only a few months ago.

GEORGE MCCREADY PRICE

STANBOROUGH PARK,
WATFORD, ENGLAND

LONG RANGE WEATHER FORECASTS

IN a review of "Man and Weather," SCIENCE (Vol. LXV, No. 1681, p. 281), March 18, 1927, some personalities may be passed without remark; but the attitude of the reviewer on the problem of long range forecasting should not pass without comment. He holds that such forecasts are not possible at present and by implication that there is little prospect of accomplishment. "No one," he says, "is in position to forecast for California or any other part of the country the distribution of atmospheric pressure even a week ahead, to say nothing of a month or season." Yet he admits "a fair degree of success in seasonal forecasting" in India; and concedes that "we are on the eve of attaining similar success in parts of California."

Years ago this relationship was pointed out in California; and it is our understanding that forecasters on both sides of the Pacific, Okada in Japan, Eeals, Bowie and Reed on this side, utilize knowledge of the intensity and extent of the Aleutian infrabar and other pressure distributions in long period forecasts. Across the Atlantic similar procedure is followed. The reviewer has overlooked that in Shaw's "Forecasting Weather," 2nd Edition, p. 181, is a pressure chart on which a forecast *for 14 days was issued* by the Meteorological Office.

Weather maps covering a hemisphere are now available with an increasing number of kite and balloon stations. It is not so difficult now to outline and watch the development of major pressure systems as it once was.

The reviewer will doubtless agree that there is room for improvement in forecasting. The present synoptic map remains substantially the same as fifty years ago. It tells what has happened but not what will happen. If we may not scrap it, we at least should modify it—to tell of the advance of cold-dry and warm-moist fronts, and the interpenetration of strata. It is the conflict of air streams that means accurate anticipating of rain areas and their duration. Winds are initiated by pressure differences, hence the significance of major pressure distributions, controlling the paths and constancy of the fronts. It is gratifying to note a growing appreciation of these points by official bureaus abroad and at home.

ALEXANDER MCADIE

SCIENTIFIC BOOKS

The Insects of Australia and New Zealand. By R. J. TILLYARD, F.R.S., etc. Sydney, Angus and Robertson. 1926. 560 pp.

THE insects of the Antipodes claim our attention for numerous reasons. From Australia came the dreaded Cottony-cushion scale (*Icerya purchasi*), which at one time threatened the destruction of the orange industry of California. From Australia also came the lady-beetles, of diverse species, which have proved invaluable in checking the *Icerya* and other coccid pests. From Australia, Froggatt described the extraordinary archaic giant termite *Mastotermes darwiniensis*, close relatives of which have since been found fossil in Europe. The fauna of New Zealand amazes us by its poverty of types, but it is rich in certain groups. These southern lands have not only furnished many entomological surprises, but they will afford new wonders for many years to come. Nowhere else is there such a good chance for the discovery of relicts of an early fauna, now exterminated in other parts of the world.

In 1907, Mr. W. W. Froggatt, entomologist of New South Wales, published an excellent book of 449 pages, entitled "Australian Insects." In it he gave a readable account of the leading or more conspicuous forms, with very good figures. Those of economic importance were discussed quite fully. Now, after twenty years, Dr. Tillyard gives us a new and more comprehensive book, including also the insects of New Zealand. In this interval, the additions to our knowledge have been very numerous, and very much has been done to arrange and systematize what was known before. Among all the discoveries and additions we must place first the revelation of a wealth of fossil insects of great antiquity, which as elaborated by Tillyard, throw new light on the origin and relationships of the various orders.

Tillyard's book is actually much more than its title might seem to indicate. It is a great contribution to the classification of insects in general, and as such will necessarily be at the elbow of the working entomologist everywhere. We note the extraordinary wealth of

detail, the abundance of figures showing structure, the beautiful colored plates by Mrs. Tillyard, the introduction of the evidence from fossils to elucidate phylogeny. Necessarily, a work of this sort has to be largely a compilation, but few have shown so many evidences of originality. The comparison which comes to mind is with that great classic, Westwood's Modern Classification of Insects. As we remember that when engaged in writing his book Tillyard was during a large part of the time seriously ill, we think of Darwin, and wonder whether ill health is a circumstance favorable to scientific production.

An interesting feature is the census of the Australian and New Zealand species under each family. It can of course only represent existing information. Yet as it stands it brings out most strikingly the great difference between the faunae of the two countries. A few examples will make this clearer. Buprestidae, Aus. 766, N. Z. 2; Mutillidae, Aus. 197, N. Z. 0; Thynnidae, Aus. 438, N. Z. 0; Bombyliidae, Aus. 80, N. Z. 1; Dolichopodidae, Aus. 20, N. Z. 45; Empididae, Aus. 50, N. Z. 110; Tipulidae, Aus. 250, N. Z. 500; Syntomidae, Aus. 52, N. Z. 0; Hesperiidae, Aus. 92, N. Z. 0; Picridae, Aus. 30, N. Z. 0; Culicidae, Aus. 100, N. Z. 8.

In these statistics, species known to have been introduced by man are omitted. In view of such facts as these, we look with grave doubt upon records of species of bees or other insects, other than strong flying or migratory forms, said to be common to Australia and New Zealand. All such statements should be critically investigated, and it will probably appear that in most cases the determinations were erroneous, in others that the species have been introduced into one of the countries by human means. Sometimes, perhaps, the locality labels will be found to be wrong. Errors are easily made and too faithfully perpetuated by succeeding generations of writers.

A very extraordinary fact is the lack of plant-lice (Aphididae). There are no native species described from Australia; but a single one, apparently native, has recently been described by Laing from New Zealand. The place of the plant-lice is taken by the Psyllidae (Aus. 80, N. Z. 6).

New Zealand is very poor in bees, but Australia extremely rich. Some of the Australian species are minute; Tillyard remarks that *"Euryglossa"* (should be *Euryglossina*) *chalcosoma,* barely 3 mm long, is the smallest of all Australian bees. However, *Turnerella gilberti* is still smaller, only 2.5 mm.

It is a pity that Tillyard did not know Morrison's important paper (1922) on the Maskell genera of Coccidae. Consequently the subfamily Phenacoleachiinae, from New Zealand, is omitted.

T. D. A. COCKERELL

UNIVERSITY OF COLORADO

SCIENTIFIC APPARATUS AND LABORATORY METHODS

RAPID DETERMINATION OF SOIL MOISTURE BY ALCOHOL

IN the issue of December 31, 1926, of this journal there appeared a brief article proposing alcohol as a very rapid means of determining the moisture content of soils and possibly of some other materials. Since the publication of this paper a great number of letters have been received asking for more detailed information as to the technique, kind of hydrometer used, etc. In view of this large number of inquiries, it has seemed advisable to publish in advance of the main report the directions for executing a moisture determination and other essential information concerning the method.

The alcohol method, as far as it has been investigated, seems to be able to determine the moisture content of soils very rapidly and quite accurately. The rapidity depends somewhat upon the type of soil, which affects the rate of filtering; the time, however, varies from about three to fifteen minutes. In comparison with the oven method the results of the alcohol method run a little lower, not much more than about one per cent. in the heaviest soils. It seems that the alcohol takes out all the water that exists in a physical form. The only kind of water that probably it does not take out is the so-called chemically bound water, and according to the results the magnitude of this form of water is probably not very high. If it is, then it would seem that the alcohol probably extracts some of it, probably the more loosely bound.

For the employment of the alcohol method, as has been worked out thus far, the following apparatus is necessary: (1) alcohol hydrometers made especially for this work. The hydrometers come in a pair. One has a range of from 90 to 100 per cent. alcohol and the other from 80 to 90 per cent. They have a very small volume. They are handled by Eimer and Amend and cost about two dollars apiece. It would be advisable to ask for hydrometers according to the writer's specifications when ordering. (2) An ordinary 25 cc graduated cylinder having an inner diameter of 2 cm. This cylinder is used in measuring the specific gravity of the liquid. (3) An ordinary 100 cc graduated cylinder. (4) A 100 cc funnel. (5) A liter beaker filled with sand. The sand is used to stand in the 25 cc cylinder so that it will be easily adjusted to stand absolutely upright when hydrometer floats. The base of the 25 cc cylinder can be broken off so that the latter can be more easily inserted into the sand. (6) A rod about one half centimeter in diameter. This is used in stirring up soils, such as badly puddled or hardened clays which refuse to slack or crumble easily when coming in contact with