with iron girders surrounding the pipe. The whole subject is so new that we have to feel our way in this investigation. Here in Ottawa, three hundred miles from the nearest sea-coast, we have in a general way correlated microseisms recorded by the seismograph with the storms along the Atlantic coast from Cape Hatteras to St. John's, Newfoundland, a distance of 1500 miles, so that for an exhaustive study there should be quite a number of undagraphs installed. However, a beginning has been made at Chebucto, distant in an air-line about 620 miles from Ottawa, and the results will be published as soon as available.

OTTO KLOTZ.

Dominion Astronomical Observatory,
Ottawa, September 5.

Geographical Distribution of Phreatoicus.

THE occurrence of the isopod Phreatoicus in a fresh-water stream near Cape Town, in South Africa, as recorded in your issue of June 12 by Mr. Keppel H. Barnard, is of very considerable interest from the point of view of the geographical distribution of the group. Since I described the first species of the genus in 1884 our knowledge of this group has grown very rapidly, and there are now known three species of Phreatoicus in New Zealand, two subterranean and one from surface waters, and several species grouped under allied genera from Australia and Tasmania. The genus is shown both by its generalised character and by its distribution to be an ancient one. I have long considered that it is probably a fresh-water form that has developed in subantarctic lands, and its discovery in South Africa seems to confirm this. In New Zealand it appears to be confined to the more southerly portion, but it was not found in the subantarctic islands to the south of New Zealand when these were visited in 1907. It should, however, be looked for in other subantarctic islands, particularly St. Paul and Amsterdam Islands in the Indian Ocean, and the Falkland Islands and adjoining parts of South America.

CHAS. CHILTON.

Biological Laboratory, Canterbury College, N.Z.,
August 7.

The Characters of Hybrid Larvæ obtained by Crossing Different Species of the Genus Echinus.

I HAVE carried out this summer hybridisation experiments on certain species of echinoids, and, in view of the interesting condition in which this inquiry was left last year by other workers, I venture to think that my results may be worth recording.

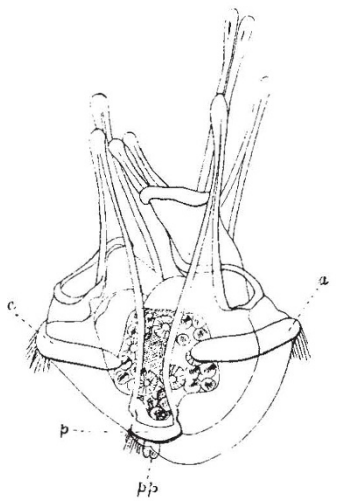
In 1911, Shearer, De Morgan, and Fuchs, as the result of three seasons' crossing experiments at Plymouth, stated (Journal M.B.A., ix., 2) that the hybrids between *Echinus miliaris*, on the one hand, and *E. esculentus* or *E. acutus*, on the other, showed, in respect of certain larval characters, a purely maternal inheritance. In 1912 the same workers, in a letter to NATURE, and later in *The Quarterly Journal of Microscopical Science*, published the result of their latest experiments, which was, briefly, that when *E. miliaris* was mother the inheritance was *paternal*. They found one culture which was exceptional. Debaisieux, working at the same time, and independently, first in London upon Plymouth material, and afterwards at Millport, obtained substantially identical results. These results he expressed in terms of dominant and recessive characters in the larvæ.

This disparity between the results of 1912 and those of former years raised a number of interesting questions, and made urgent a repetition of the experiments—a work that at the suggestion of Prof. E. W. MacBride (whose encouragement and advice I gratefully acknowledge) I undertook to perform.

The species used by me were those mentioned above, and the symbols, **M** and **m**, **E** and **e**, **A** and **a**, may be used to represent the ♀ and ♂ gametes respectively of each of them, the zygotes being then written **Mm**, **me**, **Em**, **Ee**, &c. The larval characters, the inheritance of which was studied, were the green pigment masses of **Mm** plutei, on one hand, and, on the other, the posterior pair of ciliated epaulettes and the posterior pedicellaria of **Ee** and **Aa** plutei. Debaisieux found the first of these "recessive," the other two "dominant."

In London I succeeded in raising cultures of **Mm**, **Em**, and **Am** plutei only, the reciprocal crosses failing for want of ripe males. Plymouth sea-urchins were used, and sea-water from Lowestoft. The hybrids, without exception, showed maternal characters. But in these crosses the dominant characters of Debaisieux were also maternal characters. I accordingly made further experiments at the Millport Marine Biological Station during July and August, using *E. miliaris* and *E. esculentus* only for my crosses.

After many failures, four healthy cultures of the **Me** cross were reared, one culture to a stage at which the anterior epaulettes were formed, the other three to the stage of metamorphosis. In the first culture green pigment was absent from all the larvæ examined; in the other three cultures all the individuals (132) had posterior epaulettes, eighty-one had the posterior pedicellaria, none had green pigment. The reciprocal cross agreed in its characters with the one made in London.



There was a very notable difficulty in making the **Me** cross—a difficulty which would seem to be intrinsic, and unconnected with any defect in the egg, because it has occurred again and again in experiments in which the **Mm** and **Ee** controls have both yielded good cultures of plutei. The *E. miliaris* used as parents were small, and the ovaries contained a large proportion of unripe eggs; but a majority of the apparently ripe eggs developed, when fertilised with sperm of their own species, while only a small proportion developed when *E. esculentus* sperm was used.

The mortality in the **Me** cultures finally examined was unusually low after the blastula stage, and could be assessed with considerable accuracy on account of the small number of individuals in a culture. Differential mortality would seem then to be improbable as accounting for the final character of a culture.

The sketch shows a hybrid pluteus (**Em**) as seen from the left side: *a*, anterior epaulettes; *p* posterior epaulette; *pp*, posterior pedicellaria.

H. G. NEWTH.

Zoological Department, Imperial College of
Science and Technology.