Japan fully four years ago, but most of the copies of it were destroyed in a fire, and reprinting has been delayed through the author's absence and pressure of other work. It is now available to students of archæology in this country, and they will find much in it which affords an opportunity for the comparative study of archæology in Japan and other countries in the East and the West.

It is interesting to note that there are now a considerable number of Japanese workers in the field of archæology, and to them Dr. Munro gives thanks for assistance in his work. The Imperial University of Tokyo and the Imperial Museum have now very interesting collections, and many valuable papers on anthropology appear in the Tokyo *Anthropological Magazine*, the *Archaeological World*, and in the Transactions of the Asiatic Society of Japan. Dr. Munro has taken full advantage of these, but his book is no mere compilation, but owes a great deal to his own investigations. It treats of the Palæolithic phase, the Neolithic sites, habitations, implements and utensils, weapons, ceramic art, diet, dress, and social relations, in each of which a great deal of interesting information is given. The earliest forms of religion in Japan are discussed, and many suggestions occur to students of comparative religion.

The concluding chapter deals with the prehistoric races, and shows that these, as certain remains testify, formerly possessed the west and the south, but were compelled to retreat by the pressure of the alien Yamato, and they are now represented by the Ainu, the sole survivors of the primitive inhabitants. The Japanese people, according to Dr. Munro, are a mixture of several distinct stocks. Negrito, Mongolian, Palasiatic, and Caucasian features more or less blended, sometimes nearly isolated, are met with everywhere. The book may be regarded as a cultural history of the Ainu and of their conquerors, and it forms a very valuable supplement to the many popular books about Japan which have appeared in recent years.

H. D.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* Nature. *No notice is taken of anonymous communications.*]

Forced Vibrations.

When a system capable of natural vibrations is acted upon by forcing influences, it is usually supposed that the amplitudes of forced vibration will be greatest when the forcing influences are in tune with the natural vibrations. If there is no damping or corresponding loss of energy this is correct, but when there is such loss of energy it is incorrect.

I do not know if this has been taken into account in spectrum analysis, or with what care measurements have been made in comparing the bright lines of a gas with the dark absorption lines of the same gas. In wireless telegraphy the tuning of the antennæ ought to be readjusted when the sender becomes the receiver.

Simplest mechanical example. A body of mass M vibrates at the end of a spring of yieldingness h; there is a force of friction b times the velocity. Two methods of forcing vibration may be taken. The other end of the spring may have a varying displacement y from its mean position; or y being 0, the body may be acted on by a varying force F. Let y be $y_0 \sin qt$, or let F be $F_0 \sin qt$. The equation of motion is, using the letter θ for d/dt and x for the displacement of the body,

$$M\theta^2 x + b\theta x + \frac{x}{h} = \frac{y}{h} \text{ or } F.$$

Using $2f$ for b/M and n^2 for $1/hM$, we have

$$\theta^2 x + 2f\theta x + n^2 x = n^2 y_0 \sin qt \text{ or } \frac{F_0}{hM} \sin qt.$$

The frequency of the natural vibration is $q'/2\pi$, where

$$q' = \sqrt{n^2 - f^2} \quad \ldots\ldots\ldots (1)$$

The forced motion is

$$x = \frac{\left(n^2 y_0 \text{ or } \frac{F_0}{gM}\right) \sin qt}{\theta^2 + 2f\theta + n^2}.$$

Using qi or $q\sqrt{-1}$ for θ, we see that the amplitude is greatest when $(n^2 - q^2)^2 + 4f^2q^2$ is least, or

$$q = \sqrt{n^2 - 2f^2} \quad \ldots\ldots\ldots (2)$$

The second case is the electrical analogue of the mechanical one. If L is the inductance, R the resistance of a circuit closed on itself in which there is a condenser of capacity K; if v is the voltage across the condenser and c is the current, and if there is a varying E.M.F. e in the circuit.

$$c = -K\theta v = (v - e)/(R + L\theta), \text{ so that}$$

$$\{(R + L\theta)K\theta + 1\}v = e. \text{ Using } 2f \text{ for } \frac{R}{L} \text{ and } n^2 \text{ for } \frac{1}{KL}$$

$$(\theta^2 + 2f\theta + n^2)v = e/KL.$$

Making $e = 0$, the frequency of the natural vibration is $q'/2\pi$, where

$$q' = \sqrt{n^2 - f^2} \quad \ldots\ldots\ldots (3)$$

If $e = e_0 \sin qt$, the amplitude of v in the forced case is greatest when

$$q = \sqrt{n^2 - 2f^2} \quad \ldots\ldots\ldots (4)$$

Working out the equation for c we find that the amplitude of c is greatest when

$$q = n \quad \ldots\ldots\ldots (5)$$

If instead of being closed upon itself this part of a circuit containing R, L, and K has the voltage v established between its ends, and if $v = v_0 \sin qt$, the current amplitude is greatest when

$$q = n \quad \ldots\ldots\ldots (6)$$

Let us take another case. Between a point A and a point B we have a coil of resistance R and inductance L, and there is a condenser K parallel with the coil. A current C proportional to $\sin qt$ enters the system at A and leaves at B, dividing into the two parts c_1 through the coil, and c_2 through the condenser. We have $C/c_1 = KL(\theta^2 + 2f\theta + n^2)$. This is a minimum when

$$q = \sqrt{n^2 - 2f^2} \quad \ldots\ldots\ldots (7)$$

A more complex condition makes C/c_2 a minimum. If we regard $c_1 - c_2$ as a circulating current, it may be important to make $C/(c_1 - c_2)$, or $(c_1 + c_2)/(c_1 - c_2)$, a minimum, and for this we find

$$q = n \quad \ldots\ldots\ldots (8)$$

Other simple interesting examples may be given. In every one of these we look for a critical value of q;

we usually say that the forcing influence ought to be in tune with the natural frequency of the system. In every case the natural q is $\sqrt{n^2-f^2}$, but we find the critical q to be either n or $\sqrt{n^2-2f^2}$.

This is probably known to mathematicians, but it is certainly not known to electrical engineers; it is a most important matter for people engaged in telephony, and especially for persons engaged in wireless signalling.

JOHN PERRY.

Inheritance of Paternal Characters in Echinoid Hybrids.

IN the Journal of the Marine Biological Association for October, 1911, we published a "Preliminary Notice on the Experimental Hybridisation of Echinoids." It comprised the results up to date of an investigation which had been carried on at the Plymouth Laboratory during 1909, 1910, and 1911. The forms experimented on were *Echinus esculentus, E. acutus,* and *E. miliaris.* Certain characters were studied in the hybrids, which appear in the late larvæ and do not vary in the parental forms. As the result of three years' work, we came to the conclusion that the inheritance of these characters was always strictly maternal.

The work has been repeated this year, but our results differ from those of previous years in several important points. It may, therefore, be of interest to other workers in this field if we give a brief statement of these new results at once.

The outstanding feature of this year's investigation has been the fact that *E. miliaris* eggs, when fertilised with their own sperm, have only been raised with great difficulty to a late stage. In previous years this species has always grown more healthily and developed more rapidly in the laboratory than either *E. esculentus* or *E. acutus.* This fact, we have suggested in our preliminary paper, is possibly due to *E. miliaris* being a shore form, the conditions of growth in the laboratory being more favourable to it than to the other species, which are deep-water forms. This year, however, *E. miliaris* has developed less readily under laboratory conditions than *E. esculentus, E. acutus,* or any of the hybrid crosses. Evidently some condition of the environment which was not present in previous years has affected the germ cells of *E. miliaris* this season.

Hybrids between *E. miliaris* ♂ and *E. esculentus* and *E. acutus* ♀ were obtained this season with ease and were, as before, strictly maternal. The crosses with *E. miliaris* ♀, on the other hand, could only be made with the greatest difficulty. Probably, then, it is the eggs and not the sperm of *E. miliaris* which are at fault. The hybrid larvæ in all the cultures of the cross *E. acutus* ♂ × *E. miliaris* ♀ turned out to be strictly paternal and not maternal, as in previous years. With one exception all the cultures of *E. esculentus* ♂ × *E. miliaris* ♀ have also been paternal with regard to the inheritance of the posterior ciliated epaulettes and the green pigment masses. The *E. miliaris* egg this year seems to be unable to transmit its characters to the hybrid offspring, as in previous years. The exception mentioned above was in the case of the only cross between *E esculentus* ♂ and *E. miliaris* ♀, in which a large percentage of the eggs fertilised. In cultures from this fertilisation the hybrids were maternal with regard to the above-mentioned characters. Thus in the only hybrids with *E. miliaris* ♀, in which a large number of the eggs fertilised, we found the usual maternal inheritance.

CRESSWELL SHEARER,
WALTER DE MORGAN,
H. M. FUCHS.

Laboratory of the Marine Biological Association, Plymouth, June 22.

Taste or Smell in the Laughing Jackass (Dacelo).

WHEN experimenting on the palatability of insects, I have often noticed that birds appear to be able to tell whether an object is nice or nasty by merely holding it between the extreme horny tips of the bill. From this observation I inferred that actual contact with the tongue or soft palate was unnecessary for the purpose.

A case came under my notice to-day, however, which not only strengthened this conclusion, but suggested that some birds at all events are able to ascertain the distastefulness of some insects without actually pecking them. I offered the larva of the small Eggar moth (*Eriogaster lanestris*)—a velvety black hairy grub, ornamented with brown spots and yellow streaks —to a laughing jackass (*Dacelo cervina*). The bird was preparing apparently to take it, but when the tip of his beak was about an inch away, he drew back his head and shook it, and opened and shut his beak, exactly as I have seen birds do when tasting an unpleasant flavour. Every time the caterpillar was presented to him he behaved in the same way, and nothing would induce him to touch it. I repeated the experiment with two examples of *Dacelo leachii* and *Dacelo gigantea,* with precisely the same result.

The birds' behaviour so forcibly suggested a keen olfactory sense that, despite the distance the larva was held from their nostrils, and despite the usually accepted belief that the sense of smell is defective or absent in most birds, I do not know how to emend the keeper's remark, "They don't like the smell of it." It appeared to me, indeed, that they "smelt" the larva with the mouth, if such an expression may be used, and considering the intimate connection in ourselves between taste and smell, I think this explanation is possibly correct, although to me the larvæ individually have no appreciable scent.

A large number of the larvæ of this moth were sent to me for experiment by Mr. F. C. Woodforde, and I was able to try them with many species of birds. There is no doubt that they are, on the whole, unpalatable, but not very highly so. Some of the birds refused to touch them, others pecked them once or twice, others persevered for a long time, beating and shaking them about on the ground, generally giving them up in the end, but in one or two cases eating the mangled remains. None, however, behaved towards them as the laughing jackasses did.

Zoological Society, June 16. R. I. POCOCK.

Rearing Asterias rubens, L.—Larvæ with Double Hydrocœle.

THE note may be of interest that some young *Asterias rubens* have recently completed their metamorphosis here, while others are at present in the stage of sucker fixation.

The successful culture was one of several made by me in April last at the Millport Marine Biological Station, from a good supply of healthy starfish put at my disposal by the Superintendent of the station. All the cultures were taken up to Glasgow that same evening, and two days afterwards the swarming larvæ were transferred to small vessels holding about half a gallon of sea water and provided with an arrangement for securing gentle and continuous internal circulation.

In a week or so, the larvæ were fed with a culture of Nitschia. Two weeks afterwards a considerable number from the best jar were transferred to a second hatching vessel, and, a fortnight later, selected specimens from these were brought into a third vessel of the same type. The result was thus obtained with an expenditure of about two gallons of sea water, although a good deal more was actually employed in