saw was a shadow moving on a screen; what I heard was a gramophone making noises with all the familiar defects.

It is quite possible that in this case the synchronisation of film and record was not perfect, and that its inaccuracy helped to destroy the illusion, but it must be remembered that both one and the other—as Prof. Rankine indicates in the case of speech records—depend in great measure upon suggestion. The dominant part of a word gives us the key to the whole. Both words and pictures are scientifically "imperfect," and when we attempt to amalgamate them the resultant imperfection is so great that the effect is wholly lost. LOUGH PENDRED.

33 Norfolk Street, Strand, London, W.C.2,
October 28.

FROM practical experience I am able neither to confirm nor to contradict Mr. Pendred's interesting observations on the difficulty of practising simultaneous deceptions on the senses of seeing and hearing. It is quite possible, of course—perhaps likely—that it is easier to produce one such effect than both at once; but I can see no reason, *a priori*, for expecting the double deception to be impossible. It must be remembered that both moving pictures and ordinary gramophones have been improved greatly during the years since Mr. Pendred's experiences, and that, could perfect synchronisation be guaranteed, the results he describes might now be modified considerably. Mr. Pendred would, I think, admit that if both pictures and sounds could be sufficiently improved, the remaining imperfections, even though, possibly, additive, might yet be so small that the deceptions aimed at would both be effective.

There is no doubt that the photographic and photoelectric method of recording and reproducing sounds is much superior to the comparatively coarse methods used in ordinary gramophones; and this may quite well be a reason, in addition to the attainment of synchronisation, for the success of the talking pictures produced by Mr. Bergland, and spoken of so highly by the *Times* correspondent and by Prof. Arrhenius. A. O. RANKINE.

Royal College of Science, South Kensington,
London, S.W.7, November 2.

The Differentiation of Boiled and Unboiled Water.

IT is often desirable to be able to ascertain whether water alleged to have been boiled for drinking purposes has in reality undergone the treatment. This may be readily determined by means of indicators appropriate to the type of water, for the effect of boiling is always to lower the hydrogen-ion concentration by removing carbon dioxide from solution and decomposing bicarbonates.

For example, Plymouth tap-water, a soft water from Dartmoor, is now at pH6·8, and gives a yellowish colour with phenol-red. On boiling in a hard glass test-tube it develops the full red with this reagent, a light pink with phenolphthalein, and a yellowish colour with thymol-blue. It is then at pH8·5.

Youghal tap-supply is at pH7·0 but contains far more bicarbonate than Dartmoor water, since on boiling it not only gives the full red with phenol-red, but also gives a more intense colour with phenolphthalein and a slaty-blue with thymol-blue, denoting pH9·0, the limit for water saturated with calcium carbonate in absence of carbonic acid.

Water from Blagdon Reservoir (Bristol supply) was found to be at pH7·8, and at Pusa, in Bihar, the laboratory tap-water is at pH8·1, that of the River Gandak from which it is derived being somewhat more alkaline. Running streams may be up to pH8·3 even when derived from wells at pH6·4. Saunders (Proc. Cambr. Phil. Soc., 1921, vol. 20, p. 350) has shown that supplies in chalk and gault districts are at pH7·1–7·2 very constantly, streams rising to pH8·25–8·5. Sea-water is close to pH8·2.

For these more alkaline waters phenol-red would be an unsuitable reagent to detect the unboiled state, as even in it the full red is developed, but phenolphthalein would serve, showing either a colour or an increase in intensity with the boiled water.

Higher limiting values may be obtained with waters containing magnesium salts, since that for magnesium carbonate, on boiling, is close to pH10·0. Sea-water, therefore, may approximate to this, and fresh-water from a small reservoir on Staddon Heights, Plymouth Sound, was by insolation with its naturally occurring algæ brought up to pH9·7.

On cooling, carbon dioxide is re-absorbed by boiled water. This proceeds until the equilibrium with the bicarbonate stage is reached, which is at pH8·37 for saturated calcium bicarbonate. It is slightly lower for water which has been boiled, since it can no longer be saturated with respect to bicarbonate. This stage still gives a good colour with phenol-red, being more than pH8. With water which is naturally at this reaction when unboiled it is advisable to make a direct test to ascertain the time that elapses before the original reaction is regained, but a positive result may always be accepted as proof of boiling.

Since one omission to boil the water may, especially in the tropics, lead to a fatal illness, it is hoped that the use of phenolphthalein, phenol-red, or other suitable indicator may be of use. W. R. G. ATKINS.

Marine Biological Laboratory, Plymouth,
October 31.

Ophion luteus.

THIS fly, one of the larger Ichneumonidæ, appears in my house every year in late summer. Several members of my family have complained of being stung by it, always at night, usually after they had gone to bed in the top story, third above the basement. All doubt about the aggressor was dispelled by a young lady who, when reading in bed, felt a stab on the arm and saw the insect *flagrante delicto*. I am informed on high authority that, while Ophion is one of the few Ichneumonidæ which are known to sting, and while a small, narrow poison sac has been detected in a few species of that immense family, none has been recorded in *Ophion luteus*. But whereas the sting is followed in every instance by considerable inflammation and pain, such as would not be the effect of the mere stab of a needle, it seems almost certain that some irritant is injected into the wound, possibly for the purpose of paralysing the fly's legitimate victim, as in the case of the hunting-wasps.

It puzzles one to divine the purpose of Ophion in attacking sleeping human beings. The weapon employed is the sharp point of the ovipositor. It seems scarcely possible that the intention is that the progeny should be lodged and fed in the body of man, woman, or child. What is normally the creature which Ophion seeks as a harbour for its eggs and larvæ? Is this known? Only once have I seen Ophion in my own bedroom on the first floor. I was reading in bed one night in August last when the fly alighted on the sheet. I regret that instinct prevailed over reason, and I destroyed the creature before the purpose of its visit was revealed.

HERBERT MAXWELL.

Monreith, Whauphill, Wigtownshire, N.B.