

village, a church, and a pastor. One winter night when a fearful storm was threatened, three Finns (*i.e.* Lapps) entered the valley and begged shelter in vain of the inhabitants. At last they asked the priest, and he too refused. Then the wrath of the heathen wizards was raised, and they solemnly cursed the valley and doomed it to destruction by the crawling power of the ice, until the glacier reached the lake below. The Lapps were seen no more, but on their disappearing the snow began to fall. The winter was awful. The glacier approached by awful steps, and by degrees engulfed the cursed valley and farms. Nor is the curse yet exhausted, for the glacier creeps down the valley each year, and has yet a mile to go before it reaches its destination in the lake above Odde. I am no judge of folk-lore, but this weird tale seemed to me a genuine piece of it, and not invented for the occasion, as Olsen gave it half jokingly as the tradition of the district. The farmer who owns the remnant of the doomed valley, wanted then to sell it, as he saw his acres swallowed up each year, but no one will buy. If this tale be genuine, it points to a prolonged advance of the Folgefond, which has led to the tale of the Lapps' curse. Those interested in ice-action will see a fine example of the "Tyssenstrengene," or polished stone fells of Norway, between Odde and the splendid Skjægdals (or Ringedal's) Foss. The rocks are so polished by the ancient ice that a path is made over them by putting rough fir trees down to give a foothold. The ice-polishing on the Grimsel Pass in Switzerland, is a mere nothing to these "Tyssenstrengene."

J. INNES ROGERS

### Intelligence in Birds

OUR English jackdaws are not behind Miss Bird's Japanese crows in at any rate one of the instances of intelligence told by her. Many years ago it was a frequent amusement of ours to watch the encounters between a tame jackdaw and the stable cat. The cat's dinner used to be put down outside the stable-door, and, warned by experience, she hastened to dispose of as much as possible before the arrival of the jackdaw. He seldom went directly to the meat in the plate, but attacked the enemy in the rear, settling himself with both feet on her outstretched tail to steady it, and then administering pickaxe blows on it with his beak. Of course it was impossible to stand this, and with a forcible exclamation the cat used to spring away, and Jack took possession of the plate, until our sense of justice obliged us to recall and defend the rightful owner.

E. HUBBARD

March 6

### Auroral Display

I SEE by your number of NATURE, vol. xxv. p. 386, that an auroral display was witnessed in England on February 20, between 7 and 8 p.m. A very magnificent one was seen in the Hardanger-fjord on the same evening at the same hour, by a friend of mine, and the Captain of the ss. *Folgefonden* says he has never seen a finer. Could it have been the same aurora?

W. E. KOCH

Lysefjord near Stavanger, Norway, March 9

## ON THE CHEMISTRY OF THE PLANTÉ AND FAURE ACCUMULATORS

### PART II.—The Charging of the Cell

IN NATURE (vol. xxv. p. 221) we directed attention principally to the local action that takes place on the negative plate of a Planté or Faure battery. We pointed out the close analogy between zinc coated with spongy copper, and lead coated with spongy peroxide, in their action on water or dilute sulphuric acid; and we showed the importance of the lead sulphate produced in moderating this action. We now propose to treat of the chemical changes involved in the preparation of the cells.

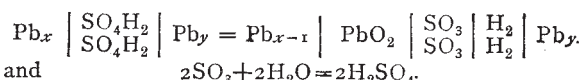
The procedure of Planté in forming his battery is at first sight extremely simple. He takes two coils of lead, separated from one another, and immersed in dilute sulphuric acid; a current is sent through the liquid from one lead plate to the other, and the final result is, that the one becomes covered with a coating of lead peroxide, while hydrogen is given off against the other plate. On the view that the sulphuric acid merely serves to diminish

the resistance, and so facilitate the electrolysis of water, the ready explanation would be given that the two elements of the water are simply separated at the two poles. But it seems more in accordance with the facts of electrolysis, to suppose that the sulphuric acid,  $H_2SO_4$ , is itself the electrolyte, and that the oxygen results from a secondary chemical reaction. As a matter of fact, if water be employed, no peroxide is formed, but only the hydrated protoxide, even though a current from twenty-four Grove's cells be made use of. The addition of a single drop of sulphuric acid to the water is enough to cause the immediate production of the puce-coloured oxide.

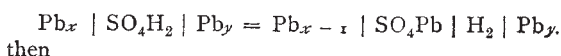
If we take two plates of lead in dilute sulphuric acid, and pass the current from only one Grove's cell, a film of white sulphate, instead of peroxide, makes its appearance on the positive pole, and the action practically ceases very soon. If, however, the current be increased in strength, the sulphate disappears, and peroxide is found in its place. In Planté's procedure, spongy lead, and lead peroxide are indeed found on the respective plates. But, in consequence of the local action which takes place during the periods of repose, lead sulphate will be produced from the peroxide, and afterwards, in the course of the "formation," this must be reduced to metallic lead by the hydrogen.

It may seem at first sight improbable that an almost insoluble salt of the character of lead-sulphate should be decomposed under these circumstances. To test this fact by direct experiment, we covered two platinum plates with lead-sulphate, immersed them in dilute sulphuric acid, and sent a current through. We found not only that the sulphate was reduced by electrolytic hydrogen, but that it was peroxidised by electrolytic oxygen. The white sulphate was, in fact, decomposed to a large extent at each plate, the positive being covered with deep chocolate-coloured peroxide, the negative with grey spongy lead.

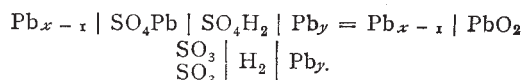
The reaction which takes place in charging a Planté battery may be viewed in two ways. The simplest may be thus expressed in the notation which we have employed in some previous papers. For convenience, the reaction is divided into two stages:—



But it may be that lead-sulphate is always formed in the first instance, and decomposed on the continuation of the current.



then



and



It seems not improbable that both these reactions may take place according to the varying density, or other circumstances of the current. The coating of peroxide interposes a great difficulty in the way of the further oxidation of the metallic lead. Hence Planté needs the successive periods of repose, to admit by local action of the formation of lead-sulphate, and the oxidation of the increasing amounts of finely-divided lead thus brought into the field of action.

To obviate this waste of power and time, Faure covers both plates with red lead, and converts this into spongy peroxide and spongy lead respectively by the current. Now the first thing that happens, when the plates are immersed in the dilute sulphuric acid is a purely chemical action. The minium suffers decomposition according to the formula—

