hang together by reason of the attraction between their opposite charges. It is also certain that when an electromotive force—*i.e.* any force capable of propelling electricity—is brought to bear on the liquid, the hydrogen atoms travel on the whole in one direction, viz. down hill, and the oxygen atoms travel in the other direction, viz. up hill; using the idea of level as our analogue for electric potential in this case. The atoms may be said to be driven along by their electric charges just as charged pith balls would be driven along; and they thus act as conveyers of electricity, which otherwise would be unable to move through the liquid.

Each of this pair of opposite processions goes on until it meets with some discontinuity—either some change of liquid, or some solid conductor. At a change of liquid another set of atoms continues the convection, and nothing very particular need be noticed at the junction; but at a solid conductor the stream of atoms must stop: you cannot have locomotion of the atoms of a solid. The obstruction so produced may stop the procession, and therefore the current, altogether; or on the other hand the force driving the charges forward may be so great as to wrench them free, to give the charges up to the electrode which conveys it away by common conduction, and to crowd the atoms together in such a way that they are glad to combine with each other and escape.

Now notice the fact of the two opposite processions. One cannot have a procession of positive atoms through a liquid without a corresponding procession of negative ones. In other words, an electric current in a liquid necessarily consists of a flow of positive electricity in one direction, combined with a flow of negative electricity in the opposite direction. And if this is thus proved to occur in a liquid, why should it not occur everywhere? It is at least well to bear the possibility in mind.

Another case is known where an electric current certainly consists of two opposite streams of electricity, viz. the case of the Holtz machine. While the machine is being turned, with its terminals somehow connected, the glass plate acts as a carrier conveying a charge from one collecting comb to the other at every half revolution; but, whereas it carries positive electricity for one half a rotation, it carries negative for the other half. The top of the Holtz disk is always, say, positively charged, and is travelling forward, while the bottom half, which is travelling backward at an equal rate, is negatively charged.

In the Holtz case the speeds are necessarily equal, but the charges are not. In the electrolytic case the charges are necessarily equal, but the speeds are not. Each atom has its own rate of motion in a given liquid, independently of what it may happen to have been combined with. This is a law discovered by Kohlrausch. Hydrogen travels faster than any other kind of atom; and on the sum of the speeds of the two opposite atoms in a compound the conductivity of the liquid depends. Acids therefore in general conduct better than their salts.

OLIVER J. LODGE.

(*To be continued.*)

JOSEPH BAXENDELL, F.R.S.

WE have already announced the death of Joseph Baxendell, an event which took place on Friday, the 7th inst., at the Observatory, Southport.

Born at Manchester in 1815, he had not the advantage of a thorough scientific training, such an education being much less frequent at that early period than it is at the present day. On the contrary, he had to make his way in the world, and went to sea when quite a youth. We are all of us moulded by circumstances, and while Baxendell no doubt inherited an aptitude for science, yet the particular bent which this took was unquestionably determined by the circumstances of his profession. An intelligent seaman cannot fail to be impressed with the importance of astronomy and meteorology, and it was in these two sciences that Baxendell especially distinguished himself in after life.

Meanwhile, notwithstanding the engrossing duties of a sailor, his energy and perseverance in the pursuit of science were such that he was enabled to supplement the deficiencies of his limited education, acquiring a knowledge of mathematics which was of great service to him in his investigations. A training of this kind is well qualified to produce a mature and thoughtful student of Nature, and it had this effect upon Baxendell. Owing to a retiring disposition, he was not much seen in general scientific society, but was, on the other hand, very highly esteemed by students like himself. A gathering of such students usually takes place once a fortnight during the winter months at the rooms of the Manchester Literary and Philosophical Society. At these meetings Baxendell was a most regular attendant, and he ultimately became Secretary of the Society as well as editor of its publications. It is in the Memoirs and Proceedings of this Society that most of his scientific contributions will be found, and in astronomy it is only necessary to notice his catalogue of variable stars, which is very highly esteemed by all observers.

Baxendell's contributions to meteorology are very important, and in one branch of this science he may claim to be the pioneer. In 1871, from an analysis of eleven years' observations of the Radcliffe Observatory, Oxford, he came to the conclusion that the forces which produce the movements of the atmosphere are more energetic in years of maximum than in years of minimum sun-spot activity. This conclusion has now been confirmed in various directions by other observers. We have heard it objected that Baxendell generalized from a comparatively small number of observations, but in a question like this such a procedure is essential to the pioneer. His task is to deduce with a mixture of boldness and prudence something of human interest out of the mass of observations already accumulated, and thus to stimulate meteorologists not only to go on with their labour, but to cover more ground in the future than they have covered in the past. Baxendell's procedure in this respect has been abundantly justified by the fact that many other men of science are now following in his footsteps.

It is believed that he was the first to propose the use of storm-signals which are now universally adopted by all maritime nations. He likewise foretold the long drought of 1868, and enabled Manchester to take precautionary measures which had the effect of rendering the inconvenience less severe. As an astronomer and meteorologist Baxendell was naturally interested in a study of the sun, and was an independent discoverer of the fact that the faculæ which accompany sun-spots are for the most part thrown behind them—the word *behind* having reference to the direction of rotation of our luminary. It was, we believe, his opinion that the behaviour of sun-spots is intimately connected with that of meteoric matter around the sun. Without asserting the exact nature of the bond between these two phenomena, we think that various students of the sun's surface are now inclined to be of this opinion.

He was a Fellow of the Royal Society and of the Royal Astronomical Society. He was likewise a corresponding member of the Royal Society of Königsberg, of the Scientific and Literary Academy of Palermo, and of the National Observatories of France, Germany, and Italy. For some years he enjoyed the use of his friend Mr. Robert Worthington's observatory at Crumpsall. On the death of the Rev. H. H. Jones, in 1859, he was appointed Astronomer to the Manchester Corporation. Latterly his health forced him to reside at Southport, in the neighbourhood of which he continued his observations until his death.

BALFOUR STEWART.