so far as possible, the nature of the earliest fishes which appeared in Silurian times, and compare them with the type of arthropod which had been evolved up to that time. Ammocœtes was chosen rather than Amphioxus because it resembles the extinct Cephalaspids more closely than does any other living fish, while, on the other hand, Limulus is the only living example of the great arthropod group which dominated those Silurian seas, a group which gave origin to both arachnids and crustaceans, and was, of necessity, nearer to the ancestral annelid type than most of the arthropods of the present day. In the attempt, then, to generalise the characteristics of such a group, it naturally follows that account should be taken of the structure of annelids and of such a low type of arthropod as Peripatus.

In remarking upon my statement that, judging from Limulus, the *cartilaginous* skeleton of the arthropod race, which was dominant when vertebrates first appeared, had arrived both in structure and position exactly at the stage at which the vertebrate *cartilaginous* skeleton starts, the reviewer states:—"This almost sounds like proving too much, yet it does not account for the vertebrate's dorsal axis." I fail entirely to understand the purport of this remark; there is no *cartilaginous* dorsal axis in Ammocœtes; he cannot, surely, be thinking of the notochord, which cannot possibly be classed among cartilaginous skeletal tissues. W. H. GASKELL.

## "Blowing" Wells.

IN NATURE of May 20 Mr. Sydney H. Long describes some "blowing" wells near to Norwich, and intimates that he had not heard of such before. Actually, such wells are not uncommon, and in a recently published memoir of the Geological Survey, on "The Water Supply of Bedfordshire and Northamptonshire from Underground Sources," some are described (*cf.* Duston, Long Buckby, Northampton).

A consideration of the varied phenomena presented by "blowing" wells seems to necessitate belief in three possible causes:—wind, variations in atmospheric pressure, and fluctuations in water-level.

Wind can only be effective in very special and obvious circumstances, and so a gusty "blowing" well is a comparatively rare phenomenon.

Most water-bearing beds are fed by the slow percolation of water downwards through porous material, and when such a bed is filling up there must of necessity be a displacement of air under a pressure greater than the then atmospheric pressure; indeed, the rate of percolation of water through moderately fine material, such as sand, deep down in the ground, must be materially retarded by the increasing air pressure. Supposing, however, that a well exists in such a formation, and that the rock is exposed, then fluctuations in atmospheric pressure will be immediately effective in the well, but only after a considerable period acting through the water-feeding area, hence every such well will in a sense "blow" when the atmospheric pressure falls. Quite recently I have been interested in a new well being made to the Lower Greensand; here, at a depth of about 100 feet, when the barometer dropped to 29·3 inches candles were extinguished, and, of course, the men could not work, although at a higher atmospheric pressure no inconvenience was experienced. Naturally, at first, the air squeezed out of a deep-seated porous bed is likely to be highly charged with carbonic acid gas, as this was. An old, deep, disused, and covered well a mile or more away from the one just referred to, that had a pipe fixed in the cover, is said by the people living near to give a "trumpeting sound during stormy weather."

In the case of rocks yielding water abundantly only from fissures, in-draught and out-draught of air from these fissures, in a well, is essentially a question of a falling or rising water-level. When the water-level in such a rock is sinking over a large area, slight though it may be as measured in depth, it draws in, mostly through the fissures, an amount of air equivalent in volume to the water being lost by running springs or by pumping elsewhere. A rising water-level, which may only be obvious in the well long after the rainfall causing it, will, of course, convert such a well into a "blowing" well, with or without a hissing sound depending upon the size of the fissures and the rapidity of rise in the water-level.

The Drumming Well at Oundle, in Northamptonshire, which was rather noted some 200 years back, no doubt owed its peculiar characteristics to air being forced through a water-lock in the crevices whence the water itself came, with a rising and possibly also a falling water-level. It was sometimes silent for years, and then broke out again, which naturally precludes variations in atmospheric pressure as a cause.

Northampton. BEEBY THOMPSON.

## Dew-Ponds.

THE article in NATURE of April 22 emphasises the fact that the interesting problem of the dew-pond still awaits a definite solution. That these ponds are mostly fed by mist, and not dew, can hardly be doubted by anyone who has visited them at night, situated as they are on the topmost ridges of the Downs. In the driest summer the prevailing south-west wind, as it comes up from the sea, forms on these heights after dark thick clouds of mist, which soak everything that comes in contact with them, and keep green the short grass characteristic of the Downs.

The source of the water in these ponds, therefore, seems evident, but the mechanism by which the mist is precipitated into the ponds is not so apparent. The question also arises, Why is it essential that the pond be built on the very summit of the ridge of the Downs? Why is it, also, that a few weather-beaten bushes and trees often grow along the ridge of the otherwise bare hills? It appears to me that the only possible explanation is that the particles of mist must bear charges of electricity differing in potential from that of the earth. The charge on the earth would, of course, be most dense at the summits of the hills. Hence the tendency for the mist to deposit on the top of the ridge.

About ten years ago I made a rough and somewhat crude experiment to test this theory. The result, which was published in NATURE, September 20, 1900 (vol. lxii., p. 495), was satisfactory so far as it went. Unfortunately, I have never been able to repeat the experiment with better appliances. I feel confident, however, that it is by the investigation of the electrical phenomena of mists that the problem of the dew-pond will be solved.

ARTHUR MARSHALL.

Naini Tal, India, May 12.

## The Colours of Leaves.

THE notice of Prof. Stahl's book under the heading of "Why Leaves are Green" in NATURE of June 3 (p. 393) leads me to direct attention to the effect of protection when applied to our copper beech trees. For the last two years I have, in the spring, partially covered with sacking about half of a small tree (less than 6 feet high), leaving one side open so that there should be some access of light. The aim was to protect a few branches from the effects of frost. This year the cover was put on the part which last year was left uncovered, and about the middle of April, before any leaves had appeared. The cover was removed on May 22 in the presence of several members of the Geologists' Association; the whole of the sheltered leaves were seen to be quite green, and a remarkable contrast to the others. In two days, however—protection being abandoned—the green leaves commenced to resume their usual spring coloration, and now are, with a few exceptions (as where one leaf may have been shielded by another), of the same tint as the other leaves, and probably no one would suspect they had ever been green.

The experiment, I suppose, shows the effect of our cold nights in April and May, which damaged, producing slight chemical change, but did not actually kill the foliage. In a few months' time all the "copper" colour will have disappeared (? been absorbed), and the tree be as green as our common English beech. GEORGE ABBOTT.

4 Rusthall Park, Tunbridge Wells, June 7.