

intended to withstand heat have plumbago mixed in the inner surface of the vessels. There are many fanciful designs of this ware, some very large jars, pots of all shapes, bowls, cups, pitchers, etc.

HENRY HALES.

Ridgewood, N. J.

The Sense of Boundary in Dogs.

I HAVE followed with much interest the discussion in *Science* caused by the recent communication of my friend, Dr. Hall, entitled "Is there a Sense of Direction?"

Dr. Hall's query recalls to my mind a striking example of animal intelligence which I witnessed in a dog, and of which I sent a brief notice at the time to the *London Spectator*.

Some eight years ago I was staying with friends who had a full-blooded Irish deer-hound. On the adjoining estate lived a pointer. Our dog was scarcely more than a year old, while our neighbor's dog was quite well along in life. The dogs had never been friendly; indeed, from the first, the pointer manifested a decided aversion to the young deer-hound. Whenever the old dog caught his youthful neighbor trespassing he would immediately drive him back over the boundary between the estates. Both dogs, even when going at full speed, would invariably stop the moment our dog had crossed the line. The two estates are virtually continuous, there being neither hedge nor fence separating them. The dividing line runs between two stone posts about a foot in height and some two hundred feet apart. These posts, of the existence of which I was quite unaware, until the singular behavior of the dogs called my attention to them, are in the summer time usually hidden by the grass, and in winter are often buried under the snow. I mention them, not because I think it at all probable they served as guides to the dogs in determining the boundary line, but merely because they enabled us to observe more accurately the phenomenon in question.

This exhibition of canine intelligence was first observed by my neighbors, who kindly pointed it out to me. It was repeated almost daily for several months, and was a constant source of amusement and wonder to those who witnessed it. The question arises, How did the pointer know where the line ran, and how did his canine neighbor know when he was safely across it? The only answer which occurs to the writer is, that dogs (some dogs, certainly) possess a very acute sense of boundary.

Whether this sense is shared by other animals I am unable to say, though, on this point, it is possible that some of your readers may be able to throw light. The question is certainly an interesting one from its bearing on the general question of animal intelligence.

F. TUCKERMAN.

Berlin, Germany, Feb. 28.

The Results of Search for Paleolithic Implements in the Ohio Valley.

THOSE engaged in the recent discussion of Glacial Man have had little to say of the Ohio Valley. Without laying any claim whatever to geologic skill, I will submit some extracts from my private journal. These are submitted from the standpoint of a "field searcher" who knows nearly all the village sites and primitive remains of southern Ohio.

"May, 1891. Found in ash-pits near the Little Miami River, at Fort Ancient (Warren County), several objects of the character of those in the United States National Museum labelled from New Jersey and District of Columbia, commonly called paleoliths. These are in various styles — broken and whole, rude and well formed, large and small. Pottery fragments, bones, and flint chips side by side with the rough forms.

"Spent a large part of three days in inspecting the river banks, gravel strata and river bars. Pottery, several celts, arrow-heads, and paleoliths numerous. Two hearths discovered, the one six and the other nine feet below the surface. A modern brick was found lying just above one of them. Rough implements were gathered from the village sites and in the clay and sand of the river banks. No implement was seen protruding from the gravel layers.

"Rowed up the stream all day Saturday. Three experienced field-searchers were in the boat. No gravel bank was seen which contained implements. We saw no spot in clay bank, on village site or bar where only rude implements of paleolithic type (or approaching that type) were found. The rude objects, finished objects, pottery, etc., are always found together. Careful searching long continued might reveal isolated paleoliths. The river frequently washes cans, bricks, etc. out of its banks and transports them to remote parts. Just so it might carry a piece of pottery or a paleolith to a gravel bar and deposit it. A finder of an implement thus deposited would attach to it great importance, especially so were he a stranger in the valley."

This important point has been overlooked in the discussion. So far as Ohio goes, I think I am safe in saying, Dr. Metz is the only thorough archæologist who claims to have found paleoliths in the drift. All others have been found by travellers or persons not familiar with the prehistoric sites of occupation. Professor Wright does not claim to have found them himself. How is it that those of us who spend all of our time in archæologic work cannot find them? Were they so numerous in drift, surely we could see them whether we knew anything about geology or not. The type is fixed in everyone's mind, and while a searcher might not be able to name the deposit in which the implement occurred, he certainly could tell the implement when he saw it!

Dr. Cresson — strong in "paleolithic faith" — never found one specimen while he was for four months in my camp in Paint Valley, Ross County. Yet he often searched the creek banks or gravel exposures. My men, all good specimen hunters, quick to see an artificial object, could never find them in any kind of stratified gravel. I lay no claim to a knowledge of the gravels, but had implements been found in them geologists from Columbus or Cincinnati would have examined and named the deposits for me. During the coming summer I will spend as much time as possible in a further search for implements like those found by Metz and Mills. Any number can be found on the surface, but as yet I have not been able to find one in gravel layers. Probably my eyes are not sharp enough!

WARREN K. MOOREHEAD.

5,215 Washington Ave., Chicago, Ill., Mar. 24.

Probable Causes of Rainy Period in Southern Peru.

In your issue of Oct. 21, Professor A. E. Douglass of Arequipa Observatory presents important facts evidencing a former rainy period in that region which is now nearly rainless. This change he attributes to a considerable increase in the elevation of the Andes in recent geological times. A most serious objection to this theory is, that in order to entirely cut off the precipitation from the trade-winds, an average height of broad mountain range not exceeding 6,000 to 8,000 feet would be necessary. Our experience in the Hawaiian Islands is that the trade-winds rarely surmount 5,000 feet of mountain, and, if they do this, they still more rarely carry much rain over that height, nearly all the moisture being precipitated upon the windward slope. It seems impossible to suppose that the Peruvian Andes were not more than at least one-half their present height during any recent geological period.

I would suggest that the glacial period was the cause of the former moisture of the climate of Peru. During the reign of ice in the southern hemisphere, it seems probable that the weather of the temperate zone was transferred to the tropic — was pushed towards the equator. Peru would at that time have enjoyed the westerly gales now prevalent in southern Chili and Patagonia, together with the heavy rains accompanying those winds.

In support of the very recent existence of such temperate zone climates in the tropics, I will adduce a fact stated to me by Professor A. B. Lyons of Oahu College, who recently found on the now arid slopes of Diamond Head buried land shells, *Achatinella*, of a species now only found upon the cold and wet summit of Kaala, 3,700 feet above the sea. This fact indicates that the present dry and warm climate of southeastern Oahu has been a change from one formerly cold and wet, such as would probably have existed during the ice age.