period of time, though my work has taken me afield frequently, I have in person come across barely a half dozen of these conspicuous and not very swift lizards. This indicates, first, the extent to which people gather up specimens of animal life that excite their curiosity, and transport them in a spirit of helpfulness, curiosity or cupidity. (I have been asked to pay ten dollars for a very ordinary Gila monster, and been solemnly assured that they were worth one hundred dollars.) Secondly, the modern auto tourist is likely to tire of and release his "specimen" unless he can dispose of it to advantage. I have been the recipient of two *Helodermas,* each of which had been carried for some time by auto touring parties, and for distances of not less than two hundred miles. Further, such a specimen is frequently carried tethered somewhere on the outside of the car by an insecure noose about its neck or leg. Tourists in this region often express a desire to take a "Gila" "back home," anywhere from five hundred to fifteen hundred miles from here—and no doubt many of them attempt to do so. A certain dealer in live animals sells surprising numbers of them for this very purpose.

The finding of the specimen in Texas is no surprise to me. It seems much more certain than "guess work" to assume that such an animal, or any interesting animal of readily transportable size, found even hundreds of miles from its native home, has been carried most of the distance by rail or auto, especially the latter. The *Heloderma* mentioned might easily have wandered from the nearest main highway, even though the distance be considerable, for this lizard is tenacious of life, and that locality would not, I believe, be a particularly unfavorable environment for it.

The principles involved in the foregoing statements have many and various illustrations, as every inspector at a horticultural inspection station on a main auto highway in the southwest can testify. The auto tourist carries everything interesting from where he finds it to some other place; anything from a "horned toad" to an entire cotton plant, leaves, bolls, boll weevils and all. The *Iguana tuberculata* record is, to be sure, somewhat less likely to be the result of transfer by auto, but not unlikely to have come up by train. I have now a live *Iguana sp.* which recently arrived in Tucson in a bunch of bananas by rail from the west coast of Mexico. A few years ago I was the recipient of a live five and one-half foot *Boa imperator,* picked up by an autoist just beyond the border town of Nogales, Sonora. This, I should judge, came up from Central America nearly to the United States by train, thence it certainly came another seventy miles by auto. Mr. Roy McCain, of Tucson, relates that, while hunting a few miles northwest of Pantana, a station about thirty miles east of Tucson, in the foothills of the Rincon Mountains, he met a large lizard which he killed with a stick. This measured three feet in length and must have been an *Iguana sp.,* though unfortunately it was not saved. This was in October, 1927.

I have now alive in my laboratory an opossum, carried into this new (and probably unfavorable) environment from Arkansas. Its captor chanced to tire of it just at this point, but might equally well have elected to turn it loose in some favorable looking spot in the state—or in California. It is known that opossums have previously been released in this region. Arizona (likewise California), has a cordon of horticultural inspectors stationed at strategic points for intercepting and inspecting autos coming into the state. The findings of these inspectors, plus the other instances cited, have served to emphasize for us here the possibilities of auto traffic as a factor in animal distribution in a manner which, perhaps, has not come forcibly to the attention of biologists in many other states. The cotton plant incident is a fact from the experiences of the inspectors.

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THE HALL EFFECT IN SINGLE METAL CRYSTALS

IN spite of the very great amount of work which has been done on the Hall effect the fact that we have not yet a satisfactory explanation of this and its allied phenomena justifies further work.

As a result of observations which I made some years ago on tellurium, I came to feel that the crystal structure of metals must play a much more important part in the Hall effect than had been recognized. In fact, I expressed doubt as to whether there would be any Hall effect as we find it in metals unless that metal is crystalline. Since then, thin films of bismuth have been obtained in the amorphous state and no Hall effect was found. It appeared, however, as soon as the film, by suitable heat treatment, became crystalline.

Not much work has been done on single metal crystals and yet it seems that this should be a particularly promising line of attack. Some time ago, Van Everdingen and others showed that the Hall effect is different in different directions in a large crystal of bismuth. Two years ago I studied the Hall effect in single copper crystals, the crystal being in the form of a pencil about six millimeters in diameter and ten centimeters long, and the effect appeared to be independent of the direction.

More recently, I have made measurements on a number of specimens of silicon steel, the alloy of 3.8

per cent. silicon commonly used in transformers. By suitable heat treatment Mr. Ruder, of the Research Laboratory of the General Electric Company, had brought these specimens into a monocrystalline condition, the orientation of the cubic lattice being different in the different samples. The Hall effect, measured up to field intensities of 25,000 gauss, was about fifteen times as large as for pure iron and appeared to be independent of the direction of orientation of the crystal.

In his work on a single bismuth crystal, Van Everdingen found that the Hall effect in any direction was given by the relation $E = a \cos^2 \theta + b \sin^2 \theta$, where a and b are the Hall effects, parallel to and at right angles to the principal axes of the crystal. In the case of a cubic crystal one would expect that a and b would be equal; in which event, according to Van Everdingen, the Hall effect should be the same in any direction. Our measurements on copper and on silicon steel confirm this and it would appear, therefore, that further investigation of the effect of crystal structure should be on metals with other than the cubic lattice structure.

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A NOTE ON REPUTED ANCIENT ARTIFACTS FROM FREDERICK, OKLAHOMA

IN SCIENCE for February 10, 1928 (p. 160), I voiced several objections to the view that certain artifacts found at Frederick, Oklahoma, were of early Pleistocene age. I suggested that the objects called metates by Figgins and Cook might not be artifacts. This is an error. Having since examined them at the Colorado Museum of Natural History I am certain that two or more are unequivocably metates. This does not militate against my other objections.

During a recent visit to the site Dr. Frank Melton and I found chips, the refuse of blade flaking, on the surface of the gravel deposit, but none occurring in the bed itself. This is conformable with my suggestion that the artifacts taken from the bed are surface material recently included. Dr. Hay will recognize that if the surface chips are of Aftonian age, a possibility he suggests,[1] they should occur in the gravel bed.

This gravel deposit caps a narrow ridge. It is markedly gullied by erosion along its margins, especially in the vicinity of the finds. My suggestion was that the artifacts may have lain in such a gully. Dr. Hay misunderstands that I envisage a deep hollow on top of the ridge, which, as he observes, is incredible, and to which I add, unnecessary.

The replies of Dr. Hay and Mr. Cook[2] do not impel me to revise my opinion that the case for antiquity is unproven.

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AN EXPLANATION

IT has been brought to my attention that in the paper entitled "The Common Ground of the Chemist and Biologist" in the issue of SCIENCE for July 13 there is a statement referring to tuberculin that has been given a significance which was not intended. This sentence at the bottom of the first column on page 23 reads as follows:

> It is a dirty compound of many substances concentrated from a boiled beef broth medium and bacilli and yet it is used as the basis for destroying millions of dollars worth of cattle annually and for the diagnosis of human tuberculosis.

This was an unfortunate use of the word "dirty" and has resulted in a wholly erroneous impression. The word "complex" would have been more accurate and better from every point of view.

The tuberculin long employed has unquestionably proven of great value and while we hope that a product of more definite composition will prove of even greater utility, this awaits further investigation.

WILLIAM CHARLES WHITE

U. S. PUBLIC HEALTH SERVICE

A MAGNETIC STORM

A SEVERE magnetic storm was recorded at the magnetic observatory of the U. S. Coast and Geodetic Survey at Cheltenham, Maryland, on July 7–8, 1928. It was characterized by its sudden onset, great intensity and comparatively short duration. It began at about 6:30 P. M. eastern standard time, July 7, and continued until about six o'clock the next morning. The period of greatest intensity occurred in the early morning hours. About half an hour after midnight the magnets of the horizontal intensity and vertical intensity variometers went beyond the limits of the record and the motion of the declination magnet was frequently too rapid to make a record on the photographic paper. The extreme range of the fluctuations, as nearly as could be determined, amounted to 4° in declination, more than 1,270 gammas in horizontal intensity and more than 640 gammas in vertical intensity. During this storm there was a wonderful display of aurora borealis and telegraph and telephone lines were seriously disturbed.

GEORGE HARTNELL

U. S. COAST AND GEODETIC SURVEY

[1] SCIENCE, April 27, 442.

[2] SCIENCE, April 6, 371.