drift in their migrations towards those latitudes which their natures demanded, and so must man move in accordance with the necessities of the time as regards temperature and its consequences.

It is calculated that we are about 403 years distant from the time when the pole of the heavens in its revolution, the pole of the ecliptic, and that of the second rotation will be in the same colure — that is, in the year 2295 A.D.; and then the least differences in temperature between summer and winter will be experienced. From that time forward this difference will increase, and about 6,000 years later — or about the year 8300 A.D. — the earth will enter upon the next glacial period, and attain its greatest severity about the year 18,136 of our era; that is, when one half-revolution of the pole, occupying 15,841 years, will have been completed from the point indicated, of the pole and two centres being in the same colure.

The evidences of geology now attest the accuracy of this discovery, though twenty years later than it was discovered by this astronomer. Herschel, in his "Outlines of Astronomy," described the movement of the pole as describing a circle round the pole of the ecliptic as a centre and at a uniform distance from it of 23° 28′, though in another article he admitted a decrease of obliquity of 48″ per century; and these two contradictory assertions appear to have been copied or misunderstood by astronomers and mathematicians for more than a hundred years. Twenty-five years ago General Drayson pointed out the error, but no attention was paid to this. Now, however, all who look for the truth will receive a fresh impetus to independent enquiry, and signs of a change are already appearing which nothing can arrest, substantiated as his calculations are by the observations of the last 2,000 years.

In concluding these remarks, it may be observed that the axis of the planet Uranus very nearly coincides with the plane of its orbit, which varies only about 46′ from that of the earth, and astronomers, observing that its satellites moved in a contrary direction to that of the other planets, assumed that the satellites of Uranus "moved in opposition;" but General Drayson pointed out that this was not the case, and explained that it depended upon which pole of the planet was turned toward the earth which way the satellites would appear to revolve, whilst their real motion round the planet was not in opposition, but in conformity with the law that all satellites move round their primaries in the same direction.

It is possible that this discovery has never been suitably acknowledged by any scientific society, but in a work published in 1862, viz., "Common Sights in the Heavens," General Drayson, at pages 172 to 175, pointed out that former writers on astronomy had been in error in attributing to the satellites of Uranus a movement different from that of any others in the system. His geometrical proof of this fact is very simple, and it seems surprising, when we see the solution of the mystery, that writer after writer on astronomy should have copied each others' mistakes for more than seventy years.

Lastly, it is to be hoped that the discoverer of the second rotation may live to see the triumph which he has achieved universally admitted by all true lovers of science.

ALABAMA BAUXITE.[1]

BY HENRY MCCALLEY, UNIVERSITY, ALA.

BAUXITE was first discovered in Alabama in 1889. The first discovery was at the Dykes Limonite Banks, Cherokee County. Since then it has been found at the Walker Limonite Banks, near Jacksonville, Calhoun County, and at the Laney Old Manganese Banks, Cleburn County.[2] These deposits are all in the lower part of the Lower Silurian. The Cherokee and Calhoun deposits are at the bottom of the Knox Dolomite of Safford of Tennessee, now believed to be Upper Cambrian. The Cleburn deposit is in the upper part of the Weizner Quartzites, Middle Cambrian, believed to be identical with the Chilowee Sandstone of Safford. They are all in sections of country that are badly broken up by sharp folds and great thrust faults, and in which the characters of the rocks have been greatly changed, doubtless by the great heat produced in their folding and faulting. They are all pocket deposits, though they occur along regular leads and show more or less stratification in all of the cuts that have been made upon them. They occur about as do the limonite and clays with which they are closely associated, though they appear to show more evidences of stratification. They are so closely associated with the limonite and clays that their deposits appear to be greatest where the limonite and clay deposits are greatest.

The Cherokee deposits appear to occur along the crest of two sharp parallel anticlinals covered by *débris*, that run in a general north-east and south-west course and are from 150 to 200 yards apart. Between these anticlinals is a sharp synclinal, and it is more than probable that some of the bauxite deposits of the opposite anticlinals, as irregular stratified seams, are connected or are continuous, under the surface, across the synclinal trough. The largest limonite and clay deposits of this immediate section are in the synclinal trough, and it is believed that future developments will show the largest bauxite deposits to be also in the trough. The bauxite, in places at least, is on the top of a friable sandstone and under or in the lower part of an unctuous clay. The limonite is usually on the top or in the lower part of this unctuous clay. In places, however, there is bauxite seemingly on the top of the limonite, and in still other places it occurs in the clay as large masses and as small nodular concretions.

The Calhoun deposits, in the few shallow cuts that have been made upon them, also appear to be on the top of a sharp anticlinal. The Cleburn deposit has never been dug into and shows only as a few loose bowlders on the surface.

The Alabama bauxites have not as yet been dug into sufficiently to enable even a rough approximate estimate to be formed as to their quantity, still enough has been done on the Cherokee deposits to show that they alone have in them an immense amount of ore. They show on the dip in limonite old diggings to the depth of 75 feet. In one limonite old digging, the Dykes Bank proper, the bauxite, as an irregular seam about 60 feet thick, shows from the top to the bottom of the digging about 75 feet deep. This is the only place in which the full thickness is shown, though in half a dozen other places from a few feet to 50 feet in thickness of it can be seen. It has been seen by the writer at intervals on both of the anticlinals for a distance of about one and a half miles, and it is said to show at intervals on both anticlinals for a distance of nearly five miles.

The Calhoun deposits show at intervals in a north-north-east and south south-west course for about 250 yards. They have not been dug into sufficiently to show either the thickness or even the quality of their ore. In one of the pits or trenches, however, a thickness of about 25 feet of ore can be seen.

The Alabama bauxites are mostly concretionary or pisolitic, though some of them are earthy or clay-like. The eyes or concretions are usually of the size of a small pea, though sometimes they get to be irregular concretionary nodules of some two inches in diameter. The earthy or clay-like variety has often a metallic ring. The Alabama bauxites are of white, red, and gray colors.

The Cherokee bauxite, in car-load samples as sent to the manufacturers, is said by Mr. J. M. Garvin, superintendent of the Bass Furnace Company, Rock Run, Ala., to have about the following approximate analysis:—

Alumina, from	50 per cent to 60	per cent.
Ferric oxide, about	2.75	per cent.
Water, from	25 per cent to 30	per cent.
Insoluble matter, principally silica, about	7	per cent.
Titanic acid, from	2 per cent to 3	per cent.

This analysis shows the Cherokee ores to be of very fine quality. They carry, as said by the manufacturers, a somewhat smaller percentage of alumina than do the Baux, or France, ores with which they come in competition, but that they are more soluble, and hence are more valuable.

[1] An abstract of a paper prepared for the Fall Meeting, on Nov. 16, of the Alabama Industrial and Scientific Society.

[2] Since the above was written, it has been heard that Bauxite out-croppings have been found in two other places in Calhoun County, near Anniston.

Up to date only about 5,000 tons of bauxite has ever been shipped from Alabama. It has gone to Philadelphia and Natrona, Penn., and to Syracuse, Buffalo, and Brooklyn, N.Y., and to other places. It has been used principally for the manufacture of alum by the sulphuric acid method. The Alabama ores cannot be laid down in the above markets as cheaply as the Baux ores, and hence, if it was not for their superiority, they could not compete at all with the Baux ores. As it is, the profits are said to be small, and so it is not likely that the bauxite industry of Alabama will become very great until a home market is created for the ore. This, it is hoped, will soon be the case, as an aluminum plant is said to be now under way near Rome, Ga.

THE INTRODUCTION OF FOREIGN SPECIES.

BY JOHN GIFFORD.

NATURE maintains an equilibrium, and when this is interfered with by man evils ensue which are even more serious than the one he attempts to obviate. No man can predict the results of the introduction of an exotic animal or plant. Such a step should be attended with more study and caution than are usually exercised. One animal preys upon another to such an extent that by the introduction of other species the damage indirectly done is much more real than apparent.

When the cultivation of cane and the manufacture of sugar, molasses, and rum were at the height of their glory, the plantations of Jamaica were infested by rats. In order to rid the island of this pest the mongoose was introduced from India. In spite of the damage done to some of the domestic animals of the small property owners, the result was on the whole at first beneficial, since the prosperity of the island depended upon the products of the large plantations. Times changed, and the sugar industry faded. The negroes now have their own patches, and being favored by an indulgent Nature, with low ambitions and few wants, are forced to keep dogs to protect their poultry. They feel the loss of a pullet more than ever before. This class of people constitutes more than half the population. The mongoose has been increasing, and other small animals in consequence decreasing. Snakes are now extremely scarce, and many of the birds which nest on the ground have been destroyed. This animal inhabits both the lowlands and mountains, so that rats and mice take refuge in banana bunches, where they often build their nests. But these are only the direct consequences. Animals upon which this animal preyed fed upon other animals, especially insects. These have increased accordingly. Tics, for instance, which they say were introduced on South American cattle, have become an awful pest. There was no enemy to subject them, and only those who have walked through the beautiful pastures of this island, shaded with pimento and ceiba trees, can judge of their abundance. In crossing a pasture your legs become covered with these parasites, which, unless removed at once, bury in the flesh and cause much pain. While botanizing in the region of Mandeville, in the mountains, after each excursion the writer was forced to undergo a tedious operation: it was to have these tics picked out of the skin by negro boys, who have become expert by long practice, and many are the sixpences they have thus earned.

Out of revenge the Indians introduced the fer-de-lance, the ugliest and deadliest of reptiles, into Martinique and other West Indian islands. This snake increases rapidly in numbers, and many are its victims yearly. By the thickness of its skin the pig, and by its agility the cat, alone withstand this animal. Thus what they failed to do in war the Indians accomplished by a peculiar stratagem.

The abominable life-plant was introduced, perhaps as a curiosity, into certain parts of the West Indies. It has become a troublesome weed. It is impossible to combat or exterminate it. It grows in spite of you. Cut it up as you like, and it will sprout. Pull it up and hang it in a dry place or put it in your pocket, and from every indentation on the edges of its leaves there will come a sprout.

Every visitor to Nassau knows of the Giant Ceiba, with its far-reaching branches and curious butresses on the public plaza. This was planted by John Miller, and its history is of interest in showing how accidentally and rapidly the introduction of a species may be effected. He was a sea-captain, and traded to Brazil. He admired the ceibas so much that he brought home a seed or sprout to plant in his garden in one of our southern cities. He was a Loyalist; and when the War of the Revolution began he went to Nassau with his ceiba tree. This is the tree to which I refer — a tree many times photographed and described, the object of much admiration and the pride of Nassau. From the seeds of this others have come until now it is one of the commonest trees of the Bahamas. Thus animals and plants of benefit and detriment to a country have been almost everywhere accidentally introduced. In spite of warnings, grape-cuttings were introduced from America into Europe, and with them went the diseases of our vine with serious consequences. No matter how beneficial the introduction of a foreign species may at first appear, a sort of quarantine should be established, the government alone taking it in hand, introducing species only, after much study, with much caution.

New Orleans, Nov. 5.

PALÆOLITHIC MAN IN THE SOUTHERN PORTION OF THE DELAWARE VALLEY.

BY DR. HILBORNE T. CRESSON, PHILADELPHIA, PENN.

THE revival of the old feud in regard to palæolithic man is certainly a most interesting one, and I fully concur with my friend, Professor G. Frederick Wright, that "full discussion will dispel the uncertainty that may exist."

A great deal has been said about the finds in the Wilmington gravels (Columbian of McGee), and I notice that for some inexplicable reason the finds of others than myself have been ignored. I will give, presently, a brief *résumé* of the finds in supposed Columbian deposits, but before doing so it may be well to explain that I am not a professed geologist, but I do claim to have had the opportunity, by reason of a residence of twenty years in the vicinity of Wilmington, to study the aqueous deposits in that vicinity, and at times, in company with those who are authorities upon the subject. I take pleasure in quoting the names of Professors McGee and Wright and the late Professor Lewis. Messrs. McGee and Wright visited the Wilmington gravels at my request, and the former gentleman was accompanied by so distinguished an archæologist as Mr. W. H. Holmes of the U. S. Bureau of Ethnology. It was my good fortune to meet Professor Lewis at Claymont, during visits that he made to relatives who lived in a property adjoining my father's, and in these, our youthful days, we made many excursions over the gravels and brick clays which now bear his name. As Dr. Abbott suggests, in a recent publication in *Science*, "When I find gravel stratified and unstratified, I know and assert the difference," and it may be suggested, without conceit, that those who have spent years in studying glacial deposits, and searching among them for evidences of primitive man, aided at times by suggestions from the full-fledged geologist, ought to have some slight development of the perceptive faculty, in this respect, and be able to judge whether the condition of the gravels, in question, was disturbed or undisturbed, as the case may be.

During Professor McGee's visit to the Wilmington gravels (I have designated them thus, as Carpenter Station, on the Baltimore & Ohio Railroad, is but a few miles distant from this place), Mr. Holmes found what is now called, at the Peabody Museum, Harvard University, "the Holmes Palæolith." It is a piece of white quartz, bearing, according to the opinion of Professor Putnam, Dr. Abbott, Professor Wright, and Professor Wilson, evidences of artificial fracture. When the quartz in question was found by Mr. Holmes, I requested Professor McGee to examine the place from which it had been taken. He pronounced it to have been found in undisturbed Columbian deposits, but I here call especial attention to the fact that neither Holmes nor McGee deem the implement in question to be artificial. The palæolith was then submitted to Dr. D. G. Brinton for examination, who also condemned it. There is this to be said, however, that when