tion. If at any point of its course the bird readjusts his position so as to present the full area of his wings to the line of flight, he will shoot upward, still with motionless wings, to a height of some feet, but never to the height from which he descended. I have seen an eagle at the end of a half-mile sail, glide upward ten or fifteen feet to his objective point, and I think this is about the limit he can attain without beating his wings.

Now with the aerodrome of Professor Langley's dream, if, with an initial impulse, it could be maintained on a horizontal, forward, course by adjustments of its inclinations to the internal working of the column of air over which it is passing, its force of gravity would be immediately neutralized, and its onward flight consequently arrested. A plane body many times heavier than air cannot be sustained in direct horizontal flight through the air, except by an expenditure of internal energy sufficient to propel it with a speed proportionate to the requirements of its specific gravity, qualified by its surface area.

Professor Langley will not have failed to observe, or the mention of the fact will recall it to his recollection, that sailing-birds pursuing an onward course do not maintain a horizontal line by availing themselves of any internal motion in the air, but simply by their own unaided physical energies.

Recurring now to the less clearly apprehended problem of circling, I believe that Professor Langley's argument that the bird could not circle with motionless wings in a horizontal current, requires one important qualification—he should have added "at least not if he carries his own wings level with the horizon." This the circling bird never does. He could no more circle while he did so, than a bicyclist could circle on an upright wheel. But by holding his wings obliquely to the horizontal circle of his flight, he can utilize the wind as a lifting power for about five-eighths of his course, and for propulsion also over nearly the same length, provided the wind blows faster than he flies. This is precisely on the principle on which a perforated card or messenger screws its course up the string of a kite. The wind blows horizontally but strikes the messenger obliquely. If the bird describes an oval, facing the wind only on the short course, he may utilize the wind for driving, over three-fourths of the course or even more. There is hence at every sweep an accumulation of impulse to urge it over the difficulty of sailing against the wind. At that stage, the bird can most easily adjust his wings, so as to make the opposing air lift him; the effort is required only to force himself into the wind's eye. By gliding slightly downward over the one-half or more of the course, with the wind, he acquires an impulse from the joint action of wind and gravity, almost, or quite sufficient, to drive him over the remainder of the course, and to raise him to his original level while facing the wind. If the impulse is not strong enough, the effect will be seen, not necessarily in the bird falling to a lower level, but in his circling further and further to leeward at every sweep. In fact the aerodrome of the future, although, like the bird, it may not sail a straight horizontal course without an expenditure of energy, may nevertheless, like the bird, be maintained in circling flight, in a moderate breeze, indefinitely, with a minimal expenditure of energy, not in consequence of the "internal work" of the air, but in spite of it. But while this explanation of the mechanics of circling flight renders it conceivable that, given the initial impulse, it can be accomplished in a moderate breeze without any expenditure of energy, beyond what is required for constant readjustment of the inclination of the plane, I am by no means certain that, in the case of the bird, the tail is not an important adjunct in propulsion. This obliquity of the direction of the wings to the horizon of flight is the clue to the whole mystery of circling or soaring flight.

The clue being given, the following propositions will, I think, serve to completely unravel it:

First. A bird gliding down an inclined plane owes his forward flight to the force of gravity.

Second. To maintain himself in horizontal flight, whether in a direct line or in a circle, power is necessary, first to overcome the force of gravity, second to propel him on his course.

Third. The bird flying in a direct line provides both lifting and driving power by beating his wings, as the boatman uses his oars; the circling bird achieves the same ends by trimming his wings to the wind, as the sailor trims his sails. Professor Langley suggested the solution when he argued that the power must come from the air.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all [illegible] proof of good faith.

On [illegible] one hundred copies of the number containing his communication [illegible] free to any correspondent.

The Editor will be glad to publish any queries consonant with the character of the journal.

A Curiosity in the Vegetable World.

NEAR a country roadside in Tate County, Miss., is a curiosity which is of interest to every passer-by, but is especially interesting to a student of nature.

All of us, doubtless, have observed "twin" or "double" trees, which have a common stock for some distance above ground, and which might be accounted for by the cessation of growth of the terminal bud of the trunk, and by the upward development of two branches from lateral buds. But the phenomenon I speak of is this: two large elm trees (*Ulmus Americana*) about 1/2 and 2 feet in diameter, respectively, have crossed each other, and have grown together, in this wise. The trees are about 8 feet apart at the base, and one crosses the other about 6 feet from the ground, the trees and the ground between forming a right-angled triangle; rather an obtuse-angled triangle; for the tree which is most nearly erect is inclined slightly in the direction in which the other lies. It seems that when young, or at least some years ago, one of the trees was blown up against the other, the two uniting where they crossed as solidly as if one were a branch of the other, the one growing almost upright, while the other continued its growth in a nearly horizontal direction.

The latter is, I should say, about 50 feet long, and the upper end of its trunk about 15 feet from the ground.

T. O. MABRY.

University of Mississippi, Jan. 23, 1894.

Red Ants.

A SHORT time since I read an article in *Science* concerning red ants. I wish *somebody* could tell me how to rid a building of them.

Upon our grounds are two buildings, hardly fifty rods apart, the "South Hall" being infested from garret to cellar and the "North Hall" being absolutely free from them. I can find no great difference of soil or position to account for this. Why the one building should be so infested with them and the other *not* is more than I can explain. I have tried almost every known remedy against them without success.

For weeks, even months, our rooms will be apparently clean and free from these pests. Let me bring a piece of meat on a plate into the room, set it anywhere I choose, and within twenty-four hours there will be hundreds,—if it remain over night thousands,—literally, of them covering it and the neighboring objects. I have held plates over the lamp or stove and burned them by the thousands, yet in twenty-four hours as many more would appear. Where do they come from? Leave them alone, and they will eat the refuse and disappear as mysteriously as they came. A dead bird, animal, or glass in which there has been sugar; a piece of cake or bread, even—it is just the same.

I have made some interesting observations in watching these small, apparently insignificant animals. They march in long slender lines and with the regularity of clock work. I have dropped a small crust of moist bread in the centre of a room and of a tapestry carpet, and in half a day or less found it one living, red mass of these small red ants. They seem to be everywhere. I believe they have regular scouts, always roving about, seeking food.

An ant that has found a bit of food will turn and retrace his steps until he finds a companion, they will put their heads and their antennæ, or both, together, touching each other a number of times, as if really in communication with one another (as I do not doubt they are), when the first ant will return to the food, and the one bearing the message will rove round until *he* can communicate with another ant, when *he* will return, likewise, to the same food. And so it goes on. It seems to be necessary that each communicate with some other before he can take his course to where the food is. So each communicates with another or some others. I have, in this way, seen a single ant turn the course of a procession of five hundred and over.

I have had much amusement in keeping these ants from the table of a sick person, upon which were an assortment of provisions. First the ants crawled up the legs of the table,—then I tied papers of naphthaline around the legs. This kept them off for awhile, but they soon walked fearless over the naphthaline and were up the table again. Old lemon did no good, various kinds of "sure cure" did no good; finally I cut four squares of sticky fly paper, a foot square, and put a piece under each leg. The ants came up to it, walked all around it, tried it in various places and then backed out. They would daintily step here and there upon it, feeling all about with their antennæ, and retreat again. About a dozen, and no more, lost their lives by venturing on it. But let the dust collect or the paper bend or break, and in less than half an hour the table was alive with them. They appeared in a procession orderly, and, when the food was gone, disappeared in a procession orderly. They often come from the least crack in the wall or floor in the centre of a room,—whether they crawl around the room, in and out of the chinks, or come directly from the walls in which they live, I cannot tell. I once had a nest of them between the leaves of a book catalogue in the interior of my writing secretary. When and how they came there I do not know. I could, doubtless, fill a whole issue of *Science* with the results of my watching of these interesting scavengers, for they are nothing else, but space forbids. I have had them *all over the body of a sick person*, without any attempt to bite the person and only intent upon eating or carrying away crumbs of bread left there and in the immediate vicinity. I have put food in various situations for them and watched them find it. Some kinds of food they do not touch, apparently; others they are greedy for and swarm to. Is it possible to clear the building of these pests? I call them pests, as they are so active, so abundant, and will not let food placed for others, and not for them, alone.

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On the Coloration of the Ruffed Grouse.

ONE is rather left to suppose that Mr. J. H. Bowles believes from what he says in his article of the above title (*Science*, No. 571, p. 16) that the Eastern forms of *Bonasa* exhibit a dichromatism of plumage such as we find in the screech owls of the genus *Megascops*. This is the more likely to be so from the fact that he nowhere has stated in his article that ornithologists recognize at least two forms of *Bonasa* in New England. He simply explains his "meaning by selecting three birds from a bag taken in this vicinity (Ponkapog, Mass.), as they show to perfection the three different phases seen in this species, viz.: gray, brown or red, and intermediate." Now *Bonasa* in the matter of plumage is *not* dichromatic as is *Megascops*, but two of the forms described by Mr. Bowles are either well-recognized species or sub-species of ruffed grouse.

In his "Manual of North American Birds" Mr. Ridgway gives us the following representatives of this genus, viz.: *Bonasa umbellus*, *B. u. umbelloides*, *B. u. togata* and *B. u. sabini*. Of these I compare *Bonasa umbellus* and *Bonasa umbellus togata* with Mr. Bowles's specimens.

MR. RIDGWAY.	MR. BOWLES.
B. umbellus. a^1. Paler, with brown markings on lower parts rather indistinct (except on flanks), and more or less concealed on breast and belly by broad whitish tips to the feathers, these brown markings usually without distinct edges; bars on flanks usually clear; hair, brown.	
b^1. (*B. umbellus.*) Upper parts mostly or entirely rusty, the tail usually rusty ochraceous. Hab., eastern United States, west to edge of Great Plains (?), north to Massachusetts (lowlands), south to Georgia (uplands), Tennessee, Arkansas, etc.	("The Southern form.") The phase found in the southern portions. Its fan is of a decided rufous tint, appearing in no way like that of the northern bird, except for proportions, and the transverse black bands. (These bands are always black, having a decided tinge of rufous in but *very* few cases). The tail coverts and upper parts are also of a reddish tint, the ruffs being a strong brownish red, tipped with dark brown and tinged with iridescent brown."
Bonasa u. togata. a^2. Darker, with brown markings on lower parts very conspicuous, everywhere exposed and bordered by very distinct dusky bars; bars on flanks very dark brown or brownish black.	
b^1. (*B. u. togata.*) Upper parts with more or less gray, often mostly grayish, the tail usually gray (sometimes tinged with ochraceous). Hab., eastern Oregon and Washington Territory, east to Moose Factory, Nova Scotia, Maine, etc., southward on mountains of New England, New York, etc.	("The Northern form.") "Taking the one in the gray plumage, which is the type found most commonly in Maine and the other northern parts, the fan of long tail-feathers is of a decided grayish cast, the back, upper and lower tail coverts being of the same shade. (The tail coverts and back vary in intensity to a greater or less extent in individuals). The ruffs are black throughout, with a strong tinge of iridescent green."