In order to be sure that I had rightly identified the two forms, I sent specimens to Professor Riley. He at once replied: "You are perfectly correct. A. [this refers to the lettering of the specimens] is the form which I described as *Pulvinaria maclurae*, while h. is identical with typical specimens of *Pulvinaria innumerabilis* on maple."

It appears that Robert Kennicott was the first to suggest the name *maclurae*, and Fitch to publish it. This was in the *Country Gentleman*, Jan. 18, 1855. In 1868 Messrs. Walsh and Riley published another description of the osage orange scale, also using the name *maclurae*. Those who do not consider the *Country Gentleman* a proper medium for scientific description may cite Walsh and Riley as nomenclators. If this should be done, it would seem that *innumerabilis* Rathv., published in the *Pennsylvania Farm Journal*, 1854, has at least no better standing, in which case Fitch's name *acericorticis*, given in the *Trans. N. Y. Agric. Society*, 1860, should be employed, or if it be insisted that the description must appear in a purely scientific publication, we must fall back on *acericola*, Walsh and Riley, 1868! For my own part, I would use the earliest name in each case, but one must allow that this is a matter for legitimate differences of opinion.

Thus we have—

(1.) *Pulvinaria innumerabilis*, Rathv., 1854. The Cottony Scale of the Maple.
= *acericorticis*, Fitch, 1860.
= *acericola*, W. & R., 1868.

(2.) *Pulvinaria maclurae*, Kenn. MS., Fitch, 1855. The Cottony Scale of the Osage Orange.
= *maclurae*, W. & R., 1868.

It need hardly be pointed out that the separation of these races or species is a matter of some interest to economic entomologists.

T. D. A. Cockerell.

Las Cruces, N. Mex., July 29, 1893.

Explosive Gas in Hot Water Apparatus.

In the hot water apparatus, used in heating houses, it is well known that gas or "air" accumulates from time to time. This is let off from the radiators where it may collect by turning the "air" tap provided; otherwise the accumulation under ordinary circumstances would interfere with the circulation of water through the pipes. Being curious as to the nature of this gas, on a certain occasion I smelled it when escaping from the tap, and detected a peculiar odor of what I took to be a hydrocarbon compound. Collecting some of the gas, I cautiously applied a light to it, which produced an explosion.

The furnace was a small, upright one, with the water heated between its double walls, large enough to warm in winter time a house of seven or eight ordinary rooms. Anthracite coal was used.

With a larger upright furnace, having tubes for the smoke and heated gases to pass through in its upper part, in addition to the water-filled sides of the first, the amount of gas collecting in the highest radiator in the house was more abundant, especially when anthracite was used instead of bitumenous coal, for which the furnace was also adapted. As a matter of fact, several litres of gas were produced each week in two neighboring houses supplied with this latter style of furnace, during the period of observation,—a few weeks during last winter.

A considerable quantity of the gas was collected for demonstration before a popular meeting of the Institute of Science. Jars of various sizes were filled with the gas, which was burned under various conditions. 1st—The peculiar odor of the gas was tested. 2nd—It burned in the jars when inverted, and otherwise very much like pure hydrogen, giving forth very little light, but much heat. 3rd—The products of combustion showed no trace of carbonic dioxide which could be detected by the lime water test, which was sensitive enough to detect its presence in the room from the respiration of those present. From this it was inferred that neither carbon monoxide nor a hydrocarbon could be present in any considerable quantity. 4th—Pure nitrogen dioxide injected into the gas gave no ruddy discoloration. Hence, there was no oxygen in the gas. 5th—When mixed with air it would explode like air and hydrogen. 6th—It was not convenient at the time to apply any other tests, or any very accurate ones. The impression was formed that the gas must be nearly pure hydrogen.

If it was nearly pure hydrogen it must have come from the decomposition of the water, which would apparently imply a corresponding oxidation of the iron piping or of the heated iron in contact with the water within the furnace. The greater abundance of the gas when anthracite was used suggested that the origin of the gas was the rapid oxidation of the water tubing within the furnace when the heat was particularly intense. If so, every litre of hydrogen produced would mean the conversion of over one and a half grains of metallic iron into "rust."

Again, if a lighted match should be applied to the tap when this gas (pure) is being allowed to escape, the jet would catch fire and "roar" with a hot, bluish flame, of dimensions as terrific as the bore of the tap would allow. As by the "boiling over" of the furnace the small tank and upper coils under some conditions of water pressure may be emptied and filled with air, what would the consequences be were the mixed gases allowed to escape at night with a lamp held in the hand carelessly near such a jet?

The discussion of these demonstrations revealed the fact that no one present ever knew or heard that the gas escaping from radiators might be explosive—not even the builders, plumbers and founders.

Query 1. Is the formation of explosive gas within the hot water apparatus of our houses rare, peculiar to certain furnaces, or is it common?

Query 2. Has an accurate analysis of such gas been made; and if so, what are its constituents?

A. H. MacKay,

Halifax, N. S.

Mineral Wax.

In *Science* of July 14th, page 25, I notice an article on "Mineral Wax," from which the following is an extract: "In the United States it (mineral wax) is mined *in situ* at Soldiers' Summit, Uintah County, and in Emery County, Utah." Permit me to state that Soldiers' Summit of this Territory is in Utah County; that mineral wax or ozocerite is not mined at Soldiers' Summit, nor in Uintah County, nor in Emery County, Utah. I greatly regret to have thus to correct the writer of the aforesaid article, for it would be an especial pleasure to me to be able to report mines and mining of ozocerite from Utah. I think a small quantity of it occurs in Emery County. But it is not yet mined. Of course, it may occur in large quantity in Utah, but up to the present time no satisfactory evidence of such occurrence has been presented. It is, however, possible at present to report ample and satisfactory evidence of the occurrence in Utah of large quantities of three related hydro-carbons, viz.: *wurtzillite, uintahite* and *asphaltum*. Of these, the first has not yet been mined; but the second and third are being mined with some degree of activity.

Uintahite, often called Gilsonite, after a resident prospector and miner in this vicinity, yields black varnish. It is very light, being only a little heavier than water. Its color is black, and its streak is brown or reddish-brown. It possesses a brilliant, shiny lustre, and has a perfect conchoidal fracture, like that of glass, quartz and obsid-

ian. In fact, it is not infrequently mistaken for black obsidian or volcanic glass, which also occurs in great quantity in this Territory. Uintahite is also very brittle. When heated it melts readily, but will not burn. This substance is hauled in wagons from the mines near Fort Duchesne, in Uintah County, to Pleasant Valley Junction, on the Rio Grand Western Railway, a distance of more than a hundred miles, to be shipped East for the manufacture of varnish.

Wurtzillite bears a remarkably close resemblance to uintahite. It has a similar color, lustre, fracture and specific gravity, and it is about equally brittle. But wurtzillite readily burns, yielding a bright light from the combustion of illuminating gases. Again, its streak is black, and it is slightly sectile, being capable of being cut or pared by a knife much as rubber or horn may be pared. Wurtzillite has been reported from Wasatch County, as well as from Emery and Uintah Counties, in considerable amount. Asphaltum occurs in Emery and San Pete Counties. It is somewhat mixed with sand and other impurities, but it is already being mined in considerable quantity for paving the streets of various Western cities.

In addition to wurtzillite, uintahite, asphaltum and ozocerite, other hydro-carbons are found in Utah; for example—albertite, petroleum and natural gas. But, as yet, none of the latter have been made productive.

HENRY MONTGOMERY.

University of Utah, Salt Lake City, July 29.

ANIMAL VOCABULARIES.

A GOOD deal has been said about the probable existence of definite vocabularies in the language of the lower animals, and I believe one has gone to Africa to study Simian speech. This is all well enough, but there is no need of going beyond the barn yard to hear a definite animal vocabulary of a considerable number of words. Hear the rooster's warning cry when he sees or hears indications of danger. It is a definite sound, and perfectly understood by every hen and chick. Drop food to the mother hen. She quickly inspects it, and if approved, tells the little ones to eat, by uttering her well known "Coot, coot, coot!" If she decides that it is not fit to eat, she as plainly tells them to let alone. The other day a green worm fell from a tree near a brood of chickens. Every chick ran to seize the morsel. The mother gave one quick glance at the insect and said, "*Skr-r-r-p!*" Every chick stopped instantly. But one wilful child, loth to believe his mother's assurance that it wasn't fit to eat, would make him sick, etc., started a second time to pick up the worm. "*Skr-r-r-p!*" commanded the hen sharply. Even the wilful child obeyed this time, and the whole brood walked off contentedly. Discuss as we will the particular reason for the hen's cackle before and after laying, the fact remains that it is a definite utterance, as plainly understood by both gallinæ and homines as any expression in human speech.

My horse has a low whinny which means "water," and a higher-keyed, more emphatic neigh means food. When I hear these sounds I know as definitely what she means as if she spoke in English. This morning, passing along the street, I heard that same low whinny and, looking up, saw a strange horse regarding me with a pleading look. I knew he was suffering from thirst, and no language could make it plainer.

The language of the lower animals is not all articulate. It is largely a sign language. The horse does a deal of talking by motions of the head and by his wonderfully expressive looks. He also, upon occasion, talks with the other extremity. A peculiar switch of the tail and a gesture, as if threatening to kick, are equine forms of speech. The darkey was not far wrong who said of the kicking mule, "It's just his way of talking!"

The dog can not only "look volumes," but can express whole sentences by wags of the tail more readily than can the waving flags of the signal corps. All that is necessary is to learn his code. We expect our domestic animals to learn our language, and punish them cruelly if they fail to both understand and obey our commands; yet, notwithstanding our higher intelligence, we fail to learn their language, by means of which we might better understand their wants and dispositions, and thus control them by kindness and sympathy, instead of by harsh and arbitrary treatment. I see horses passing along the street, which are saying by every look and motion that they are suffering acute torture from a too short check rein. Their drivers are often people who would be shocked if they could comprehend their own cruelty. But they do not understand horse language, and some of them do not seem to have horse sense.

The language of animals is a neglected subject. The facilities for its study are within the reach of all, and no previous preparation is required. The study can be pursued without interfering with other occupations, and even a little systematic observation will bring large returns in both pleasure and profit.

CHARLES B. PALMER.

Columbus, Ohio.

A MAYA MONTH-NAME—KHMERS.

IN *Science*, Aug 4, Professor Thomas gives a new name to the 17th month of the Maya calendar on the basis of a phonetic rendering of its symbol.

I do not intend to dispute the correctness of his rendering; I think it quite possible he is right; but I seriously question his inference, that, because the symbol reads *ak-yab*, that therefore was the month-name.

The work *kayab* is from the verbal stem *kay*, to sing or warble. As this concept cannot be objectively represented, the Mayas had recourse to a method very familiar with them, that of the rebus, to convey or keep in memory its approximate sounds. They chose to indicate the guttural initial *k* by a turtle, called in their tongue *ak*; prefixing it to the syllable *yab*.

This method of writing is what I have called "ikonomatic," and I have shown abundant instances of it in Mexico and Central America. (See my "Essays of an Americanist," pp. 213-229). Through neglecting to regard its principles, both Prof. Thomas and Dr. Seler have made several obvious errors in translating the Mexican and Maya codices, as I expect to show in a work I am preparing on the calendar system of those nations.

With regard to the origin of the Khmers and their ethnic affiliation, I do not think that Professor Keane's claim is relevant to that put forward by Dr. Maurel. The latter maintains that the Khmers belong to the "Aryan," in the sense of the "Sanscritic" peoples; and that they are in Cambodia an intrusive stock, arriving practically within historic times. I understand Professor Keane to differ with both these opinions.

D. G. BRINTON.

Media, Aug. 7.

THEORY OF COLOR SENSATION.

An objection to my theory of color-sensation (an abstract of which has lately appeared in *Science*) has been more than once made to me, which needs to be met, but which can be met very easily. It is that I suppose the three primary color-sensations to be conveyed to the brain by one and the same nerve, and hence that the theory is not consistent with the widely accepted doctrine of the specific energy of nerves,—the doctrine, namely, as applied to the eye, that we recognize two reds to be like sensations, not by any specific quality in the sensation, but by the fact that they affect the same set of nerves, and that if a pure blue light could by any possibility be