JANUARY FLORA OF THE INDIAN RIVER COUNTRY, FLORIDA.—The species common to this section are pretty well known and I anticipate that our friend Mr. Curtiss, who has spent the entire summer in botanical work on the Indian River, will give us very interesting results, but for the purpose of showing what may be found in that sunny land whilst our own north is frozen, bleak, and barren, I have preserved the following list of plants collected by me from Jan. 10th to Jan. 15th, 1879. Some are probably autumn forms not done flowering. Others are early spring bloomers However, I found them all very abundant and they looked very inviting at this season of the year. On the low wet pine barrens I gathered *Lobelia glandulosa*, *Liatris paniculata*, *Heterotheca scabra*, *Ericocaulon gnaphalodes*, *Sagittaria natans*, *Hypericum fasciculatum*, *Drosera capillaris*, *Chaptalia tomentosa*, *Pinguicula lutea*, *P. pumila*, *Polygala lutea*. The following were collected on dry sandy barrens: *Eupatorium aromaticum*, *Tecoma radicans*, *Chrysopsis Mariana*, *C. aurea*, and *C. graminifolia*, *Solidago pilosa*, *Erigeron vernum*, *Hieracium Gronovii*, *Aster squarrosus*, *Ascyrum amplexicaulis*, *Sabbatia Elliottii*, *Andromeda nitida*. A month later would no doubt increase the number several times. I intend to make a more thorough examination during the coming winter.—W. W. CALKINS, *Chicago*.

THE COLORADO BERBERIS.—The November number of the GAZETTE contains a note from Edward L. Greene relative to an error of mine as to *Berberis Aquifolium*, Pursh., being found in Colorado. The mistake is a palpable one on my part, and as such, the correction is kindly accepted, as indeed any others, made in the same honest spirit, would be.

I would add, however, that the determination of the plant in question was made before the relations of this and the allied *B. repens* were clearly understood. It should have been rectified by me as the volume was going through the press; at which time, however, it was unfortunately overlooked.—J. T. ROTHROCK.

FERTILIZATION OF YUCCA.—At the meeting of the Amer. Association last August, Mr. Meehan read a paper bearing the above title. It contains the following statements, and as they will be seen to conflict somewhat, it may be that some of the readers of the GAZETTE may have the means of proving either Mr. Meehan or Prof. Riley right, or possibly both:

"In the transactions of the Academy of Science of St. Louis of April 15th, 1873, our distinguished associate Dr. George Engelmann

has some "notes on the genus Yucca" in which occurs the following passage: "The conspicuously papillose termination of the pistil had always been considered the stigma, but closer examination showed its papillae to be epidermal appendages, corresponding to similar ones on the filaments, and entirely destitute of stigmatic function; never did they contribute to the development of a pollen grain occasionally adhering to them. Dr. Mellichamp's notice of a drop of glutinous liquid in the tube formed by the coalescense of the so-called stigmas, led me to further experiments. That tube proved to be the real stigma, exuding stigmatic liquor, and insects must be the agents which introduced the pollen into the tube." Subsequent investigations by our esteemed associate Professor Riley, led to the discovery of a new genus of Lepidoptera—*Pronuba yuccasella*—and which has proved to be the insect agent which fertilizes the flower. In the same number of the Proceedings, Prof. Riley describes this insect and says "with her maxillary tentacle, so wonderfully modified for the purpose, she collects the pollen in large pellets, and holds it under the neck and against the front trochanters. In this manner she sometimes carries a mass twice the size of her head. Thus laden she clings to the top of the pistil, bends her head, thrusts her tongue into the stigmatic nectary and brings the pollen-masses right over its mouth. In this position she works with a vigor, that would indicate combined pleasure and purpose—moving her head and body from side to side, and apparently making every effort to force the pollen into the tube. Such is the method by which our Yuccas are fertilized."

It may be remembered that at our meeting at Buffalo I produced three capsules that had not been produced by this elaborate process, but simply by mere touching of the papillose apex with one of the flower's own polleniferous anthers. Prof. Riley was so sure that the seed-vessels could not have been produced in that way, that there must have been some insect agency unknown to me in addition to my work, that at the conclusion of my paper he asked permission to cut open the capsules, sure of being able to show the larvae in the fruit; but he found them not. I recall these matters to show that I have not misapprehended the position our friends take on this question.

I now again exhibit numerous seed vessels from this plant of *Yucca angustifolia* in which no trace of larvae can be found; and seed vessels of *Yucca filamentosa* growing but a few yards from the other, which are infested by the *Pronuba yuccasella*, as this species always is when it seeds at all.

The history of the fruiting of the *Yucca angustifolia* is as follows: It flowered in 1875 but produced no fruit. In 1876 the early flowers proving infertile, I applied the flower's own pollen to the apex of the pistil of the four last flowers that opened; these produced the four capsules examined by Professor Riley as already noticed. In 1877, noticing that the Pronuba abounded in the flowers, no hand application was made, and there was no fruit. In 1878 the flowers were again left to the insects with no fruitful results. The past season pollenization by hand was resorted to, and the numerous seed vessels I exhibit followed. As the pollen was merely applied to the papillose apex it shows that in this species the elaborate and wonderful ingenuity of the insect in applying pollen as described by our friend is wholly unnecessary."

Fungi on Forest Trees.—In Part I of the Trans. Mass. Hort. Soc. for 1879, we find a lecture delivered by Dr. W. G. Farlow, Prof. of Cryptogamic Botany in Harvard University, upon the "Diseases of Forest trees."

"He said that it was difficult to define disease in trees, as well as in man. Plants, unlike animals, are not subject to functional diseases but only to such as in animals are accompanied by alterations in the tissues. The diseases of trees progress slowly, but go on for many years. They may be divided into three classes: first, those caused by insects; second, those caused by fungi; and, third, those called spontaneous, a term used to express our ignorance of their cause. Prof. Farlow said that he should omit the first and third classes, and speak only of the diseases caused by fungi.

Every fungus consists of two parts, the vegetative and the fructifying. The former appears in the shape of white threads, known as mycelium, and the fruit consists of bodies more or less round, and called by the general name of spores. Fungi are divided into several large groups or orders, most of which include species which attack trees. In mushrooms or toadstools the cap is only an arrangement for bearing the fruit. Of the toadstools which grow upon trees, many do considerable harm. The most common of those found upon trees is the *Agaricus melleus*, or, as it is called in Germany, *hallimasch*. The cap, which is the most prominent part, is not that which does the injury, but the delicate cells of the mycelium penetrate the wood and cause a rotting—not to be confounded with what is vulgarly called dry rot. A specimen of the mycelium, looking like dirty paper or felt, was shown by Prof. Farlow. Another was shown

in a hardened condition, looking like roots. The spores of this species fall on the bark, and grow there. The mycelium will not stand the cold until the threads of which it is composed assume a black and hardened condition. In warm weather the hardened mass softens again. This fungus is instructive because it is so injurious to forest trees, and shows its changes so plainly. The punks all belong to the same class with the mushrooms. A specimen was shown, which, unlike the mushrooms, grew laterally from the tree, without any stalk. Another species was shown, consisting of finger-shaped masses, with flocculent masses attached, and having the spores in pits, covering the whole surface. This is the type of another large class, and is a help to those who clear land of wood. It absorbs the cells and cell walls, until the whole mass rots away. Another fungus, which was shown, is known as Indian paint. It was cut from a piece of bark, the remnant of the tree on which the fungus grew, but of which only traces of the trunk were left. The red color from which this species takes its name is caused by decay of the cells of the bark. Another species from San Bernardino Pass, also called Indian paint, was shown. The color of this is caused by the spores, but it is doubtful whether the species last shown was ever really used for paint.

Fungi closely related to the blights and rusts on wheat and other grain, are also found on trees, where their character is more permanent, and where they cause some of the most important diseases. A portion of the swollen trunk of a pine from California was shown, having a fungus of a pale yellow color, which, when fresh, was a brilliant red. The branches of the white cedar and other conifers, are found distorted into a mass resembling a nest in appearance, which is caused by a rust.

The rusts show great variations in character, and pass through transformations, like insects. One called the red cedar apple, late in May consists of a bright orange-colored mass. When dry, it is smaller and of a brownish color, consisting of swollen stems of cedar, from which the conical substance of the fungus projects. It is very gelatinous, and in rainy weather swells up into the orange-colored mass, consisting of spores. In three or four weeks, or earlier in a heavy rain, the mass is washed away, and the contents of the cells pass out into tubes, which give out other bodies. These bodies, sown on the leaves of hawthorn, crab, or mountain ash, produce a secondary form, appearing in red patches on the upper sides of the leaves. These patches consist of horn-shaped bodies, which are sacs,

and come from threads which grew from the spores. These sacs contain one-celled spores, which when sown on the red cedar produce the original form. This is one of the simplest kinds of rusts. Its different forms were shown by magnified and colored diagrams, and an incidental view was given of sacs on the upper side of the leaves. It will be seen from this that in studying rusts on forest trees we must study two kinds of trees.

Rusts produce distortions of the stems of trees. One species, which grows out into orange-colored points, causes a slight swelling the first year, after which the points drop off, the mycelium remaining behind. The tree tries to grow around the swelling, but the spawn grows through the wood, and the tree again attempts to grow around it. The result, in a few years, is a swelling which remains after the fungus dies. Another fungus, which looks like a brownish mass, and swells up when moistened, produces so large a knot as to cut off the nourishment from the branch above, which consequently dies, and is blown off by the wind. Such branches are called by the Germans *hexenbesen*, or witches' brooms."

Comparative Anatomy of Leaves.—The writer was very much interested last summer, while attending Prof. Goodale's summer school, in a study of the various distribution of fibro-vascular bundles in stems, in roots, in petioles, in the leaves of *Coniferæ*, etc. For the purpose of suggesting a line of investigation to such as have like tastes and suitable instruments, the following review, by Dr. Gray, of a late memoir of Casimir DeCandolle, is copied from the Amer. Jour. of Science and Arts.

"One of Casimir DeCandolle's earliest studies was into the structure and relations of the fibro-vascular elements of the leaf, and the results and deductions were brought out in his brief article entitled *Theorie de la Feuille*, in the year 1858. The present paper is in no respect theoretical, nor does it investigate the minute anatomy and formation of the vascular bundles. But it presents a comparative view of the general structure of the woody system of the petiole and principal veins in a very considerable number of Dicotyledons, mainly trees, and belonging to different natural orders. In this way the nature of the principal differences from species to species, and from one order to another, are brought to view, and the taxonomical value of such characters indicated. It is found that different species of the genus sometimes accord, but sometimes differ notably in this part of their anatomy. Wherefore the classificatory importance of these dif-

ferences is low, yet they may often be turned to good account in the discrimination of related species. The essential fibro-vascular system of the petiole, as displayed on a cross-section, forms either a closed ring or an arc open superiorly between the outer or cortical and the inner or medullary tissue; in the first case it is said to be closed or complete, in the second open or incomplete. Very commonly this is the only vascular system of the petiole, ribs, or veins. Not rarely there are additional or accessory bundles, sometimes external to the essential system, or *intracortical*; sometimes within the arc or ring, or *intramedullary;* occasionally there are both intracortical and intramedullary bundles. Generally plants of the same order will agree, at least approximately, in having the closed or open system, and in having or wanting the accessory bundles without or within. But, while *Acer Pseudo-platanus* has a well developed intramedullery cord, *A. platanoides* has none, and in general the Maples are divided in this respect quite independent of other characters; and the difference is similar and equally marked between the species of *Æsculus*. The oaks, which have been made a special study in this regard, appear to be somewhat equally divided between species provided with and those destitute of intramedullery bundles; but related species generally belong to the same category, yet not always. For in one case two species, of doubtful distinction until now, are confirmed by the discovery of an anatomical difference of this sort. All the Birches examined want the intracortical bundles and the principal system forms an open arc, and one or two Alders nearly agree with them; while the others have a closed ring and are furnished with intracortical bundles."

Notes from Colorado.—There seems to be much confusion about the two species of *Oxytropis* found on the plains. No. 73 of my Colorado collection, named by Dr. Gray *O. Lamberti*, is of interest because it is the "Loco" so dreaded by stock men for its poisonous properties. No. 14 is *O. campestris* and a full description of the two would show that they differ materially from the two species of Gray's Manual and the Synopsis in King's Report.

Malvastrum coccineum is poisonous. Mr. Ruble, a stock man of Pueblo, lost twelve hundred sheep in four hours from eating this plant, in October of this year. Specimens of the plant were sent me, which prove to be the above without any doubt. The Agricultural Department at Washington has received similar reports from other sources, on the poisonous properties of this plant.