sists mainly in the reduction of species of this large group, and his work bears evidence of care and judgment. It is accompanied by two plates giving outline figures of the "hands" of these crabs. The third notice comprises a revision of the genus Ocypoda or sand-crabs, and here the author has no doubt wisely reduced the number of nominal species of the genus. In the fourth series of notes is given a synopsis of the Grapsidæ.

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The structure and affinities of Euphoberia Meek and Worthen, a genus of Carboniferous Myriapoda. By S. H. Scudder. (From Amer. Journ. Sci., Vol. XXI, March, 1881.) pp. 5. From the author.

The stomach and genital organs of Astrophytidæ. By Theodore Lyman. (Bull. Mus. Comp. Zool., Vol. VIII, No. 6.) pp. 9, plates 2. From the author.

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The Development of the Squid, Loligo pealii Les. By W. K. Brooks. (Anniv. Mem. Boston Soc. Nat. Hist.) 4to, pp. 22, plates 3, 1880. From the author.

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Gaceta Cientifica de Venezuela. Año IV, No. 1, Feb., 1881. Carácas. From the editor.

Notes on Liberian Coffee. By D. Morris. Folio, pp. 14. Jamaica, 1881. From the author.

Biennial Report of the State Geologist of the State of Colorado, for the term ending Dec. 31, 1880. 8vo, pp. 75. Denver, 1881. From the State geologist.

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GENERAL NOTES.

BOTANY.[1]

ON THE EVAPORATION OF WATER FROM LEAVES (TRANSPIRATION).—The following investigations, made by Miss Ida Twitchell, in the Botanical Laboratory of the Iowa Agricultural College,

[1] Edited by PROF. C. E. BESSEY, Ames, Iowa.

during the year 1881, are important as throwing light upon the nature of plant evaporation, and its dependence upon light and heat. Dehérain's experiments (*Chimie Agricole*, p. 175) appear to indicate that the evaporation of water by the leaves of plants takes place almost as freely in a saturated atmosphere as in the open air, evaporation being regarded as a strictly vital process. As the accuracy of Dehérain's results depend upon the perfect saturation of the air in his experiments, some careful experiments were first made upon so-called saturated atmospheres. Wet sponges were placed in bell jars and were found to continue to lose water by evaporation long after the moisture began to condense upon the sides of the bell-jars. A psychrometer was next placed under a bell-jar which fitted tightly upon a ground glass plate. A number of saturated sponges were placed in the jar also. The humidity as shown by the psychrometer rose from 71 per cent. at the beginning of the experiment (8.55 A. M.) to 95 per cent. fifteen minutes later. It remained at or near this point for nearly eight hours (7 hrs. 55 mi.), when at 5.10 P. M. saturation was reached, both thermometers indicating 84° F. During the experiment the temperature gradually rose from 73° F. (dry) to 84½° F. at 4.20 P. M., the two thermometers differing then but half a degree. At 5.10 P. M. the temperature dropped half a degree, when complete saturation was for the first time reached. These observations show that perfect saturation is obtained with considerable difficulty, as the experiments upon leaves are ordinarily performed, and they indicate that it is desirable to carefully review the whole question of plant evaporation.

As one step in this review, the following experiments were made to determine the nature of the influence of light and heat upon evaporation from leaves. A glass bottle with two openings was filled with water, the temperature of which was varied to suit the requirements of the experiment, and to keep the temperature more nearly constant this bottle was set into another glass jar filled with water having the same temperature. A thermometer was placed in one of the openings, and through the other a six-inch test-tube was thrust up to its top. Into this test-tube a cork was fitted, which was covered with tinfoil to prevent its absorbing moisture. This was the weighing cork, and had a loop of platinum wire attached to it, by means of which the whole could be hung upon the hook of the weighing scales. Another cork was similarly prepared, and then split open and a healthy leaf of Orchard Grass (*Dactylis glomerata*) placed carefully between the two halves. By means of tinfoil and putty the cork was rendered impervious to moisture, while not interfering with the healthy and normal action of the leaf, which was still attached to the plant.

The test-tube, with a small thermometer in it, and the weighing cork in place, was then accurately weighed and put into one of the openings of the bottle and allowed to remain there until the small thermometer remained constant at about the temperature of the surrounding water. The weighing cork was then quickly changed for the one attached to the grass leaf. After leaving the grass leaf in the test-tube for half an hour, the weighing cork was put in place again, and the test-tube weighed, care being taken to remove completely all the external moisture. The following table embraces the results. The weights are given in grams and decimals, and the temperatures in degrees of Fahrenheit's thermometer. The same leaf was used in all the experiments, excepting Nos. 16 and 17. The observations were continued through several days.

	Light.	Temperature.	Weight of empty tube.	Weight of tube after ½ hour.	Increase(=water evaporated).
1	Sunshine..........	45–52	25.8700	25.8853	0.0153
2	"	41–45	25.8670	25.8814	0.0144
3	"	45	25.8665	25.8780	0.0115
4	"	50	25.8650	25.8739	0.0089
5	"	43–48	25.8619	25.8713	0.0094
6	"	48	25.8619	25.8763	0.0144
7	"	43–48	25.8615	25.8723	0.0108
8	"	68–72	25.8605	25.8703	0.0098
9	"	95	25.8308	25.8460	0.0152
10	Diffused light......	41	25.8695	25.8700	0.0005
11	" "	59	25.8632	25.8655	0.0023
12	" "	59	25.8627	25.8643	0.0016
13	Leaf in darkness....	41	25.8667	25.8688	0.0021
14	Whole plant in darkness.............	61	25.8615	25.8615	0.0000
15	Whole plant in darkness.............	61	25.8615	25.8619	0.0004
16	Sunshine..........	93	20.4408	20.5036	0.0628
17	Darkness..........	95–97	20.4402	20.4420	0.0018

A careful study of the foregoing table shows that the leaf invariably lost more water in sunshine than in darkness. The question now arises whether it is the light, or some accompaniment of it which in these experiments produced the evaporation. If the light, it must be through some vital activity of the plant, for light itself can not directly promote ordinary physical evaporation. We here come squarely upon one of the questions in dispute among vegetable physiologists, one party holding that the evaporation from plants is a purely physical phenomenon, exactly like the evaporation from any other moist substance, the other, including Dehérain, that it is different from ordinary evaporation in that the vitality of the plant controls it; or in other words, the two views may be expressed by saying that on the one hand it is regarded as a *physical* action, and on the other as a *vital* one.

A pine splinter from a board was now cut into about the size and form of a grass leaf, and after being soaked in water until saturated, it was fastened into a cork exactly as the grass blade had been, and a number of observations were made upon it to see whether it would respond to the changes in light as the grass leaf had. The results are given in the table below:

	Light.	Temperature.	Weight of empty tube.	Weight of tube after ½ hour.	Increase (= water evaporated).
1	Sunshine	63–68	20.4437	20.4717	0.0280
2	"	90	20.4418	20.5120	0.0602
3	Darkness	97–74	20.4418	20.4450	0.0032
4	"	109	20.4430	20.4480	0.0050
5	"	61–97	20.4425	20.4439	0.0014
6	"	99–120	20.4422	20.4471	0.0049

Here we had, without doubt, a purely physical action, and yet the evaporation was about ten times as great in light as in darkness. Now, light itself could not have been the cause of this increased evaporation in this case, and it is a just inference that it was no more the cause in the previous experiments upon the leaf.—*C. E. Bessey.*

THE FLORA OF ARKANSAS.—From the geological formations, varied surface features and central geographical position of Arkansas, one would expect to find a flora rich in genera and species.

The State embraces Silurian, Sub-carboniferous, Cretaceous, Tertiary and Quaternary formations. The surface comprises mountains, uplands, prairies, alluvial bottoms and swamps.

Geographically it is so situated as to invite the floras of the States on the north-east, south and west, and also has a flora of its own.

These important elements, favoring plant occurrence and distribution, combine to make the botany of Arkansas interesting, and the species numerous and varied. A few instances will serve to show the richness of the flora of Arkansas as compared with that of Iowa, which lies on the same side of the Mississippi river, but some degrees further north.

There are 34 species of the order Rosaceæ in Iowa, while the order is represented in Arkansas by 35 species. There are 208 species of Compositæ in Arkansas and only 156 in Iowa; 18 species of the genus Quercus in Arkansas, only 10 in Iowa; 110 species of grasses in Arkansas, only 90 in Iowa. The genus Carya is represented in Arkansas by all the 8 species found in the United States, while only 4 are recorded from Iowa.

The flora of Arkansas is represented by all the orders found in Iowa and in addition by Magnoliaceæ, Droseraceæ, Calycanthaceæ, Melastomaceæ, Loasaceæ, Passifloraceæ, Hamamelaceæ, Aquifoliaceæ, Styraceæ, Loranthaceæ, Saururaceæ, Ceratophyllaceæ, Myricaceæ, Palmæ, Hæmodoraceæ and Bromeliaceæ.

The most of the species found in the adjoining States east of the Mississippi, are also found in Arkansas. The same may be said of the flora of East Texas, Indian Territory and Kansas.

I will close by giving a few of the trees of the gulf and coast flora that are found in South Arkansas, viz: *Magnolia glauca* L., *Sapindus marginatus* Willd., *Nyssa uniflora* Wang., *Fraxinus platycarpa* Michx., *Olea Americana* L., *Persea Carolinensis* Nees, *Carya myristicæformis* Nutt., *Quercus aquatica* Nutt., *Q. Phellos*, L., and *Pinus Tæda* L.—*F. L. Harvey, Ark. Ind. Univ., Jan. 13, 1881.*

BOTANICAL NOTES.—M. E. Jones, of Salt Lake City, well known as a collector of western plants, has recently sent out a printed list of his second fascicle of Utah plants. It includes about four hundred and fifty species, many of which are rare and interesting.——Grawitz has recently shown that the moulds Eurotium and Aspergillus possess forms which are highly malignant when they obtain access to the circulatory system of animals. Their spores germinate in the veins and arteries and are carried to various parts of the body, producing death within a few days. The other forms of these fungi do not exhibit this malignity.——In a paper on the preservation of grain in closed vessels, presented to the Paris Academy of Sciences, Jan. 10 and 17, 1881, Muntz announced that the production of CO_2 was but one-tenth as much in air-tight vessels, as when the air had free access. Increase of moisture and of temperature, increase the production of CO_2. The presence of CO_2, although indicating the physiological combination of the material of the grains, is in one sense beneficial, as the asphyxiating gas prevents the attacks of certain insects.——Woronin has been studying the curious Myxomyceteous organism, known as *Plasmodiophora Brassicæ*, which is supposed to be the cause of the hernia of the cabbage.——Dr. Koch has shown, in Cohn's *Beiträge zur Biologie der Pflanzen*, that perfectly dry seeds can withstand a temperature as high as 120° to 125° Cent. (248° to 257° Fahr.), without injury——In the same publication Dr. Miflet details the results of the studies of the Bacteria in the air. The air from a sewer contained an abundance of germs; that from the soil contained a few, while that from a fever hospital contained none, because of the excellence of the ventilation.——Dr. Heilsher has shown (in Cohn's *Beiträge*) that one of the cotyledons of *Streptocarpus polyanthus* is persistent and develops into a perennial foliage leaf.——In *Nature* for Feb. 10, Mr. Francis Darwin reviews at length Dr. Herman Müller's recent work on the fertilization of Alpine flowers (*Alpenblumen, ihre Befruchtung durch Insekten und ihre Anpassungen an dieselben*).——According to Baron Ferdinand von Müller, the blue-gum tree (*Eucalyptus globulus*) of Australia will endure a temperature as low as 20° or even 15° Fahr. It would appear from this that it might be grown in places in the Gulf States.——J. C. Arthur publishes a valuable paper on "The various forms of Trichomes of *Echinocystis lobata*," in the March *Botanical Gazette.* It is accompanied by a plate with nine figures.——In the March *Torrey Bulletin*, J. B. Ellis hazards the belief that Coleosporium of Solidago (*Uredo Solidaginis* Schw.) is the rudimentary stage of the Dothidea (*Sphæria Solidaginis* Schw.) common somewhat later in the season on the same leaves.——In the same number a translation appears of Dr. Herpell's method of preparing the fleshy fungi for the herbarium. The essential features of the process are these: Stout sheets of paper are coated over with gelatine. The fungus is cut into thin longitudinal sections and these are laid upon a moistened sheet and afterwards placed in an ordinary press. Such preparations are said to retain their colors excellently.

ZOÖLOGY.

New Texan Unio.—The following description is based upon a series of shells received from the late Prof. Boll, of Dallas, Texas. They were collected by him in the last trip but one made in the interests of science. With them came a number of other Texan forms, perhaps all referable to described species and of great interest from the light they throw on geographical distribution, and the variations to which the Unionidæ are subject, dependent thereon. It is hoped to make them the subject of a future communication.

Unio bollii (sp. nov.).—Testa lævi, sub-rotunda, ventricosa, subinæquilaterali, postice obtuse angulata, antice rotunda; valvulis crassissimis, antice paulisper crassioribus, postice ad dorsum paululum tuberculatis; natibus subelevatis, tumidis, ad apices valde granulatis; epiderme pallido-lutea usque albofusca aut viridicante, eradiata; dentibus cardinalibus magnis, erectis, acuminatis crenulatisque; lateralibus sublongis, crassis rectisque; margarita alba et postice iridescente.

Shell smooth, rather rounded, inflated, somewhat inæquilateral, obtusely angular behind, rounded before; valves very thick, thicker before, behind on dorsal aspect very little tuberculated; beaks somewhat raised and swollen, much granulated at the tips; epidermis pale yellow to light brown, or greenish, without rays; cardinal teeth large, erect, acuminate and crenulate; lateral teeth rather long, thick and straight; nacre white and iridescent posteriorly. Diameter 1.5 in., length 2.75 in., breadth 3.12 in.

Habitat, Colorado river, Texas. J. Boll. My cabinet, and cabinet of Arthur F. Gray.

Shell smooth, rather rounded, inflated, somewhat inæquilateral, obtusely angular behind, rounded before; substance of shell very thick, thickened anteriorly, on dorsal aspect, posteriorly, a number of small tubercles with a tendency to arrangement in rows; beaks somewhat raised and tumid, much granulated at the tips; ligament long, thick, in color partaking of the general character