the northwest, showing the gap left by the fall of the north transept tower, at what date is not certainly known. The corresponding transept tower on the south side is seen, to the right hand of the great tower, rising above the roof of the west front. In the eastward part of the building a beautiful octagonal structure, of moderate height, marks the junction of the nave with the choir, here crossed by the great transept, which is chiefly Norman, and the most ancient portion of the Cathedral. To the left hand in our view, and thus situated, not as usual, east of the choir, but parallel with the choir on its north side, is the Lady Chapel, which was originally the shrine of St. Etheldreda. The entire length of the Cathedral is 565 feet, which is greater than that of any other Gothic church in Europe; and if the Lady Chapel were in the ordinary position, behind the choir, the whole edifice would be 100 feet longer. The nave, 203 feet long, 72 feet 6 inches wide, including the aisles, and 72 feet high, is of late Norman construction. Its ceiling has recently been adorned with a series of paintings on wood, representing Bible history subjects, by two accomplished amateurs, the late Mr. Styleman Le Strange, of Hunstanton, and Mr. Gambier Parry. The great tower, and also the two transept towers near the west end, were probably built by Bishop Geoffrey Riddell in the latter part of the twelfth century; but the upper turrets are of Perpendicular style. The noblest feature, however, of the whole Cathedral is the central octagonal structure, which was built in about twenty years, from 1321 to 1342, by Prior Alan, of Walsingham, in place of the old central tower of the Norman Abbot Simeon, which had suddenly fallen. The octagon is so arranged as to take in the entire breadth of the church, including the aisles, both of nave and choir; its interior presents four large and four smaller arches, with lofty clustered shafts to support a ribbed vaulting of timber, and the lantern above all. This is said to be unique in Gothic architecture. Part of the choir, and the Lady Chapel also, which is of unusual dimensions and very beautiful, are of the same period, the first half of the fourteenth century. There is, perhaps, no cathedral in Great Britain which displays more adequately the characteristics of different stages in the progress of ecclesiastical architecture than this Cathedral of Ely, the Queen of the East Anglian Fenland.—*Illustrated London News.*

SUGAR IN THE NECTAR OF FLOWERS.*

By ALEX. S. WILSON, M.A., B.Sc.

NECTAR is the term applied by botanists to the sweet-tasted fluid which is secreted within the cups of insect-fertilized flowers; and the object gained to the plant by its presence is that insects, induced to visit flowers for its sake, are useful to the plants by effecting a cross fertilization. Mr. Darwin has shown what an amount of additional vigor is thus conferred on the seeds, which subsequently result in contrast with the evil effects produced by continuous inbreeding. In many instances this sweet liquid is exuded from special glands, but in other cases from portions of the flower that do not seem to have been specially adapted for this purpose. Morphologically, nectaries may represent very different structures, but not unfrequently they are of the nature of an aborted organ—such as a petal or stamen.

It is a point in dispute among biologists whether this saccharine matter is a true secretion or simply an excretion of effete matter from the vegetable cells—a by-product of the chemical changes taking place within these cells. The latter view seems to be favored by the fact that a similar sweet-tasted fluid, much sought after by insects, is exuded on different parts of some plants quite unconnected with the flower, as in the laurel, brake fern, lime tree, acacia, etc. As to the use of such exudation of sweet liquid, various suggestions have been made by those who are disposed to regard it as a true secretion; as, for instance, that it serves as an attraction to certain insects to frequent the plant, these insects rendering service by keeping off animals to whose attacks the plant may be subject. Probably this is to some extent true, but it cannot be said to hold universally. Nectar is of course the source whence the bee derives honey, but it also affords food to many kinds of insects which do not possess the habit of storing up.

A division of the humming birds is named Melliphagi on account of living on this substance; but it is probable that in some cases the small insects seeking the nectar, and not the nectar itself, may be the object of the visits of these birds to nectar-producing flowers. The bright colors, as shown by Sir John Lubbock's experiments, serve to guide insects to the flowers, and the odors which they emit fulfill the same end. The markings on a flower's petals, it is to be noted, always converge toward the nectar, as in the violet. The importance of these guides to insects will be apparent from the following estimations, which show how indispensable it is that as little time as possible should be lost by an insect collecting honey. It must also be remembered that the nectar is usually contained in the most secure and best covered parts of the flower, the object being to prevent the access of rain, which, owing to the extreme solubility and diffusibility of sugar, would speedily cause it to be transferred to parts of the plants where insects could reach it without being of any service in the way of cross fertilization. The chief purpose of the flower would in this way be frustrated.

The formation of nectar is observed to take place most freely in hot weather, and to be prevented by cold or wet. So great economy is exercised by the plant that it is only formed at the time when insects' visits would be beneficial, *i. e.*, when the anthers are ripe and shedding their pollen, or when the stigma is matured and ready to receive pollen. By biologists the visits of bees, butterflies, and other insects are believed to have exercised in past time an important influence in modifying the size, shape, color, etc., of flowers, and the following experiments, in spite of their incompleteness, are of interest as showing to what an extent this action takes place in nature, and as helping to determine the value of this factor. These estimations are only the first of a series, and the writer regrets that he has been unable to give them the desirable completeness, but hopes to continue them.

The nectar was extracted with water, and the sugar determined before and after conversion by means of Fehling's copper solution. Many of the estimations were done in duplicate, and gave results that agreed perfectly. In the case of fuchsia—which is not deprived of its nectar by any insects in this country, the nectar being inaccessible to native species—we have probably the whole amount formed, but in the other cases the visits of bees, etc., may have reduced the amounts considerably. In this case it is a clear colorless

liquid, having an acid reaction and an intensely sweet taste; that of many others has the strong characteristic odor of honey:

Sugar in Flowers.			
	Total.	Fruit.	Cane? (as Fruit.)
	M.m.g.		
1. Fuchsia, per flower	7.59	1.69	5.9
2. <i>Claytonia alsinoides</i> , do. . .	0.413	0.175	0.238
3. Everlasting pea, do	9.93	8.33	1.60
4. Vetch (<i>Vicia cracca</i>), per raceme	3.16	3.15	0.01
5. Ditto, per single flower . .	0.158	0.158	—
6. Red clover, per head	7.93	5.95	1.98
7. Ditto, per floret	0.132	0.099	0.033
8. Monkshead, per flower . .	6.41	4.63	1.78

Approximately, then, 100 heads of clover yield 0.8 grm. sugar, or 125 give 1 grm., or 125,000 1 kilo. of sugar; and as each head contains about 60 florets, 125,000×60, that is, 7,500,000 distinct flower tubes must be sucked in order to obtain 1 kilo. sugar. Now as honey, roughly, may be said to contain 75 per cent. sugar, we have 1 kilogram. equivalent to 5,600,000 flowers in round numbers, or, say, two and a half millions of visits for one pound of honey. This shows what an amazing amount of labor the bees must perform, for their industry would thus appear to be indispensable to their very existence. Another point worth notice in these results is the occurrence of what appears to be cane sugar, and that in the case of fuchsia in the proportion of nearly three-fourths of the whole. This is remarkable, as honey is usually supposed to contain no cane sugar, its presence being usually regarded as certain evidence of adulteration. The question therefore arises whether this change, which takes place while the sugar is in the possession of the bee, is due to the action of juices with which it comes in contact while in the honey-bag or expanded oesophagus of the insect, or whether the process of inversion goes on spontaneously, as may perhaps be the case.

NOT THE EGYPTIAN LOTUS.

THE Hartford correspondent of the Springfield *Journal* claims to be well acquainted with the Connecticut flower recently reported to be a stray Egyptian lotus, and says that the report is a mistake. We quote:

"Recently I visited the creek where it grows, and found few flowers, but buds in great abundance, yet it is worse than useless to gather these, as they never open (a fact gatherers will do well to remember) unless they are on the very eve of flowering when picked. I succeeded in getting a half dozen in this condition, of which one in full and glorious bloom is before me at this writing. The real name of the flower, which is similar to but *not* the Egyptian lotus, is the yellow nelumbo or water chinquapin, and it is thus described in Gray's Botany: 'Corolla pale yellow; anther tipped with a slender hooked appendage; waters of the Western and Southern States; rare in the Middle States; introduced into the Delaware, below Philadelphia, Big Sodus Bay, Lake Ontario, and in the Connecticut near Lyme; perhaps introduced by the aborigines. Leaves 10-20 broad; flower 5-8' in diameter. Tubers farinaceous. Seeds also eatable.' It is from this seed, known to the Indians as the nelumbium or sacred bean, that the flower takes its name. It is only once in seven years that it is found in profusion at Hadlyme, the number that flower annually being very small, and the number of people who seek them of late years being about in the same ratio to the flowers as the number of trout fishermen in Connecticut bear to the number of trout caught, *i. e.*, about 10 to 1. The leaves are if anything more interesting than the flowers, as they are very large, sometimes 18 or 19 inches in diameter, of a beautiful dark green, with a soft, velvety surface and tough, fibrous stem five or six feet long. From the center of the leaves little spokes radiate in every direction. The leaf is very strong and will bear a considerable weight as it floats upon the surface of the water. Unlike the common water lily the flowers do not float upon the water, but rise several inches above it. Their stems are similar to those of the leaves of the plant.

"The 'tradition' that the original seeds came from Egypt is new and probably false, as botanists generally hold that the first seeds were probably bird sown. It is true that so far all efforts to make the plant grow elsewhere have failed, but the cove that contains them is one of such rare beauty, and the flowers and leaves so curious, as to well repay a visit."

FRUIT CULTURE IN THE UNITED STATES.

FRUIT culture is making rapid progress in the United States. According to recent official statements, the land appropriated to this branch of industry is 4,500,000 acres. Upon this there flourish 112,000,000 apple trees, 28,000,000 pear trees, 112,270,000 peach trees, and 141,260,000 grapevines. The total value of the fruit crop throughout the United States is set down at \$138,216,700, an amount equal to half the value of the average wheat crop of the country. Toward that large sum apples are held to contribute \$50,400,000, pears \$14,130,000, peaches \$46,135,000, grapes \$2,118,000, strawberries \$5,000,000, and other fruit \$10,432,000.

THE MILK OF THE COW TREE.

As long ago as fifty years, while the now eminent chemist, Boussingault was taking part in the war for independence, in the ranks under Bolivar, he made some very interesting observations on the cow tree or *Palo de vaca* of the natives (*Brosimum galactodendron*), the juice of which almost exactly resembles milk, and is used for the same purpose in Guiana, where it is native. Some specimens of this tree exhibited this year in the Champ de Mars have enabled him to complete his studies on vegetable milk, and he has now presented the results of these to the French Academy. The cow tree is an evergreen belonging to the natural order *Urticaceae* or nettle-worts of botanists. It attains a height of from 50 to 75 feet, and is clothed with oblong, pointed, leathery, alternate leaves. In order to obtain its milky sap it is only necessary to make incisions in the bark, when it flows very copiously; this operation is called by the natives "milking the tree." Of this sap Humboldt, who first brought the tree to the notice of foreigners, writes: "We were assured that the negroes on the farm, who are in the habit of drinking large quantities of this vegetable milk, consider it as highly nutritive; an assertion which startled us the more, as almost all lactescent vegetable fluids are acrid, bitter, and more or less

poisonous. Experience, however, proved to us during our residence at Barbula, that the virtues of the cow tree, or *Palo de vaca*, have not been exaggerated." The investigations of M. Boussingault go to confirm the same opinion. He states that he used it for several months with coffee and chocolate; it has much more consistency than cow's milk, and offers a feebly acid reaction. Exposed to the air it soon coagulates and forms a sort of cheese, containing a fatty matter (undoubtedly complex), melting at 50°, and very much like beeswax. Of this material M. Boussingault made candles of excellent quality. It also contains a nitrogenous substance, apparently albumen, and also sugar, salts of potassa, lime, magnesia, phosphates, and water. Although containing the same elements as cow's milk, it differs from the latter in its quantitative composition. On the contrary, it exhibits with cream the strictest analogy, as may be seen by the following figures: Cream of cow's milk contains in 100 parts—butter, 34; sugar, 4; phosphates, caseine, and albumen, 3.5; water, 58. The milk of the cow tree contains in 100 parts—butter, 33; sugar, 3; phosphates, caseine, and albumen, 4; water, 58.

In conclusion, M. Boussingault gives it as his opinion that the tree might be naturalized in Algeria; but he adds that this new vegetable recruit would be much more valuable on account of its wax than for its milk.

FRESH EGGS THE YEAR ROUND.

MAKE a hen comfortable and she will lay; if a laying breed, so much the better. It is with Biddy much as with Brindle: good treatment disposes to maternity—in the hen, to the greater production of eggs; in the cow, to the increased secretion of milk. How then are we to make the hen most comfortable? This depends upon circumstances, some situations being more favorable than others.

In winter there must be warmth as well as light. Windows will readily give entrance to the light of the sun and the reflection of the snow, but they should be made double, so as to secure warmth, and well fitted in, especially the outside sash. Keep firmly secured during the winter, and have ventilation elsewhere. Secure the sides and roof well against the cold. In no case permit a crowded condition of the fowls. The light will make it pleasant; the roominess will dispose to ease and freedom, the latter being a prominent element of the fowl which cannot be abridged much without harm, though the Asiatics are somewhat an exception to this, probably from their long habit of close quarters and petting in the thickly inhabited countries of the East, hence they are well calculated for our cities. Cleanliness and fresh air are a necessity. Ventilation and disinfectants are the means to secure them, the latter not lacking in variety to meet circumstances, among which dry air, secured by a cold stove, stands first, the stove also serving as a superior ventilator to carry off the heavy noxious air below. This for the more imposing structures. The windows, of course, are to be on the south side, and if the north side is secured by a rise of ground or the wall of another building, anything that effectually keeps out the cold, all the better. This for winter.

Summer requires a different thing, and largely the opposite. How to attain coolness instead of warmth must now be the study. Not only ventilation but shade is wanted. Trees are one of the greatest advantages—trees and plenty of fresh air. These can be obtained readily by movable buildings, which are somewhat in vogue, and which favor the other advantage of turning about the building, the south side with the windows now facing the north, and getting the morning and evening sun and shade the rest of the day. In the great majority of cases, however, this is not done and cannot be done in the cities, but is the best of all plans where practicable, as it is the most efficient means of securing cleanliness; also affording pasture and freshness for the fowls. Where the hen house is a fixture a temporary awning is a great help in securing relief from the heat.

These are mainly the principles that govern in keeping fowls successfully. As circumstances vary, so the means for carrying out the principles will also vary, so that every one must judge for himself what is best suited to his case, how most readily and cheaply he can conform to its requirements, for the man who has not aptitude enough for this is not likely to succeed after he is furnished with what is necessary. But with intelligence and prompt action success is always attainable, not so much at first as after experience has aided him. It is a trade, like all other business, which even the most capable must learn before they can realize its greatest advantages.

To carry out the true spirit of a successful hennery the keeper must be on good terms with his feathered family, and permit of no strange intrusions to frighten the fowls, for no frightened fowl will lay; all disturbance of whatever kind must be avoided, and kindness and good treatment exercised from earliest chickhood to the end. This makes a fowl at home, and eager, if a prolific breed, for propagation. If she now has a sufficiency, not an excess, of food, the necessary variety, so that she is satisfied, is strong but not fat, with pure water whenever she wants it, and some gravel to grind her food, also room enough in her quarters so that she does not feel confinement—in a word, if she is happy, she will lay. Avoid by all means an exclusive diet of corn. Let corn be one among several other grains, buckwheat leading. Scraps of meat or other animal food should occasionally be given, as well as green vegetable material, or in summer access to grass and a range in the fresh air. An occasional forage of this kind, say once a day, is of vast benefit and a pleasure to the fowl, as well as to the keeper who observes it.

But who will take all this trouble? The answer is, those who succeed. You cannot succeed if you treat your fowls indifferently, whatever the breed may be. There may be eggs, and sometimes quite abundant, but in the long run they will cost more than they are worth, and often do so in the start. However, a little judicious management goes a great way, only let it cover the more prominent points; but full success can only be obtained by observing all that relates to the well-being of the hens; then a family can possess itself of cheap and fresh eggs the year round.—*Ulster Herald.*

PRESERVATION OF WINE.—Bogdan Hoff.—The author added to twelve bottles of turbid wine respectively a variety of substances, among which was aluminum phosphate to the extent of 1½ to one per cent. The bottles were then allowed to stand open from December 15 to April 14. The bottles containing this addition remained perfectly good, and tasted older by six years. The others were either covered with mould or had passed into the acetic fermentation. In the wine treated with phosphate of alumina the acidity had diminished.

* Read before the Chemical Section of the British Association, Dublin, 1878.