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ESSAY ON BEE CULTURE.

Read Before the State Agricultural Society, by W. F. Shultz, Esq., of Salem, N. C., Oct. 1870.

In presenting an Essay upon Bee Culture and Honey Making, I deem it proper to say in the outset, that the subject is so vast and comprehensive, that it is impossible, in the limits of a paper like this, to give anything more than a synopsis of the many points of interest which it embraces. Volumes have been written upon the subject, and any practical and experienced apiculturist could produce a lengthy article upon any of its various topics of interest, not only theoretically discussed, but replete with practical illustrations. These points, in detail, would be proper material for discussion in a Convention of Bee Keepers. Addressed to a body like this such a discussion would be wearisome, and naturally uninteresting to the greater portion of the audience, owing, in some part, to the fact that scientific Bee Keeping, as it is at present conducted in our section of country, is so little understood by the masses that many would be incredulous as to the assertions made. With a great majority of the Bee Keepers in North Carolina, the business is to-day conducted on the "chance" principle; and even with a portion of these we find no little superstition alloyed with their idea of "luck." With the lights now before us, and which all who are interested may be enabled to attain, Bee Keeping may readily be reduced to a perfect system of science; and there is not a point in the system which any person of ordinary capacity may not become possessed of by application and study. This acquired knowledge of the system, and its practical application in a well-ordered apiary, precludes all possibility for the "bad luck theory" to come in; nor will there be any further need of slightly moving the hives early on the morning of the 22d of February to ensure good luck during the season.

The Honey Bee is of Asiatic origin, and has been propagated by man from the earliest ages. His habits were but little understood until the year 1712, when Miraldi, a mathematician of Nice, invented a glass hive, which enabled Reaumur, Hunter, Schirack, Huber, Dzierzon and many others of a later day to study these habits, and giving the fruits of their researches to the world, they have become as familiar to the student as household words. The first movable bar was invented by Dzierzon in Germany, in 1838, but it was too imperfect to become of practical utility. In 1852, Mr. Langstroth, of Ohio, perfected it, and the movable comb frame is as necessary now to successful bee culture as the plow and the hoe are to the culture of cotton and other products of the soil; yet how little it is used, and how few there are who comprehend its science. Each colony of bees, when in good and healthy condition, is composed of the queen—the mother of all—and the working bees, which are her progeny; while from March until September there is a certain proportion of drones, or male bees. The Queen being of the first importance as mother of the whole colony, a brief description of her, and how she is originated, may not be out of place. Whenever a colony loses its queen, either by death or by removal from the hive by the keeper, the bees will immediately proceed to supply her place by raising another. A very general, but very erroneous opinion prevails that when bees lose their queen they will leave the hive or go to nothing. Such is by no means the case. Whenever bees are left queenless at any period between April and October, and the hive contains seed or eggs deposited by her, or young grubs not more than seven days old from the laying of the eggs, they are perfectly independent within themselves as to the means of supplying themselves with a queen. To rear a queen, a common cell is selected containing an egg or small grub; the cells which immediately adjoin it all around are then cut away, and a much larger cell constructed for the use of the larval nursing; the embryo insect is then fed with what apiarists call "royal jelly," or queen food, consisting of the pollen of flowers and honey and water, and which is said to be partly digested in the stomach of the nursing bee before it is fed to the young larva. The queen remains five days in the larva, or grub-like form, during which period she is fed with this aliment; the large queen cell is then covered or sealed close with wax, for her metamorphosis into a perfect queen. A queen will usually hatch in from nine to thirteen days, according to circumstances, after the death or removal of her predecessor. The theory is, that from the time the egg is laid, a queen will reach maturity in sixteen days, a working bee in twenty-one days, and a drone in twenty-four days. As soon as the first queen hatches,

(for more than one royal cell is already started), she speedily learns if there are any others in the hive to dispute her prerogative. If the bees intend swarming they protect as many young queens as they desire swarms, and as each younger queen is protected, one or more of these queens issue from the hive with the great bulk of the colony. Now this applies to what are called irregular swarms, and also to after swarms, which issue subsequently to the first from the same hive. When bees intend swarming (with no artificial intervention,) they will construct queen cells, and when the cells are capped up, the old queen will depart with the swarm, leaving nothing in the hive in the shape of royalty, except the embryo queens. After the first swarm issues, the queen will hatch, and if the bees intend to swarm a second time, they will do so then; but if no swarms issue, it may be relied upon that they have destroyed all the royal cells and queens but one, swarming being over in that hive. The young queen, now absolute mistress, when about three days old, (the weather being favorable,) flies out to meet the drones in the air, and then returns to her important duties in the hive, never again voluntarily leaving her faithful subjects unless to lead a swarm as her predecessor had done before her. She deposits during the season from 50,000 to 200,000 eggs, according to the climate and surroundings. These eggs are of two sexes, male and female. The male eggs are deposited in the drone cells, which are much larger than those prepared for the workers. The theory is that eggs in the ovaries of the queen are all alike, and that the queen has the power, at will, of impregnating them while in the act of depositing them; that the semen of the drone is retained in a sack, and that the queen at will, brings the egg whilst passing in contact with the seminal fluid. A queen that is infertile, that is, one that has never been impregnated, will lay eggs, but they will produce drone only; and very often in hives, in the absence of a queen for a long time (queenlessness,) there will be found among the workers one or more—every working bee being an undeveloped queen—which are sufficiently developed to lay drone eggs. Some seasons we have been very much troubled with these fertile workers. The drones of an Italian bee are always as pure as the queen from which they originate, although she may have been impregnated by a black drone; but in that case the workers are hybrids. After the first year the queen begins to fail and is not so prolific; she should then be removed from the hive and a young queen substituted. A queen will live to be past three years old, whereas the workers are regenerated about three times in one season.

A close observer will notice that while one swarm prospers, another under equally as favorable circumstances, accomplishes nothing. The workers in a strong swarm number about 20,000. They are the "hewers of wood and drawers of water," performing all the labors of the colony. The drones are the male, and have but one office, which is to impregnate the queens. They are larger than the workers, are stingless, and after living a brief life of luxurious idleness, are killed off by the workers when the season is over. The first fifteen days, the young bees perform the office of nurses, feeding the larvae and discharging other duties necessary within the hive; after that period they become laborers in the field and are forced, until they are lost on duty or are foreed by age to return to indoor work. The Italian is far more profitable than the common bee. It is more prolific, hence the colony is always stronger, besides which it is more industrious. There is no clustering in dense masses on the outside of the hive as is so often the case with our native black bee, but every bee seems to be at work.

It may be asked by some how so many interesting facts in regard to the bee were discovered? Dzierzon, of Germany, studied the habits of this valuable insect with great care, and made discoveries so apparently absurd that they were disputed by other scientific men. No means of proving the facts stated by Dzierzon existed until the Italian bee was obtained by German apiculturists from the mountains of Italy; by this means the secrets of these wonderful little insects were fully discovered, made public, and the vexed questions settled.

In a paper like this it would be almost impossible, as well as useless, to detail actual results that have been obtained by scientific bee culture and from the Italian bee. I may state, however, that in a recent number of the American Bee Journal, a practical apiculturist makes a report of his success this year, which appears to be almost incredible. This bee-keeper reports having last spring forty-six hives, and from these forty-six hives he took six thousand, one hundred and sixty-two pounds of surplus honey in about five weeks' time! This gave him an average of one hundred and thirty-four pounds of surplus honey from his forty-six hives. Other instances might readily be quoted from the files of the same journal during the past few years, but time and space forbid. Any one interested in bee-keeping ought to become a subscriber to that journal, as it is devoted entirely to the bee interest, is edited and published by one of the most experienced apiculturists in America, and a reader cannot fail to have his ideas enlarged upon the subject, besides gleanings many facts from its pages of which he is now profoundly unconscious. The general lack of information prevailing amongst bee keepers in our State is almost beyond belief. With all the sources of knowledge upon the subject accessible, it

appears to me inexcusable in bee keepers whom I have conversed with, and who say they have kept bees all their lives, yet have never seen a queen bee! Others, again, are so completely wrapped up in their bigotry and self-acquirements, that no one can make them believe there has been any improvement in the management of bees, especially of late years. I ment of bees, especially of late years. I know one old fossil keeper whose great boast is, that he has had forty years' experience in bee keeping and naturally must know all about the business. He is an advocate of the old box hive system, and is adverse to all modern improvement, particularly the movable frame hive. He dwells upon the idea that our forefathers never used such now-fangled contrivances, and that he has made one improvement upon it: he has inserted a pane of glass in the back of each of his hives, so that he can tell at any time by looking how the bees are progressing. It is his opinion that the frames afford the bee keepers too much opportunity to work with the bees and thus disturb them, a thing which by all means ought to be avoided as the insects should be left in peace and quietness. To illustrate his wonderful success in bee-keeping on his system I will state that never in the last twenty or thirty years have I known him to have more than ten to twenty stocks at a time, and that he bought the honey for his own consumption and food for his bees. He is particularly severe upon the Italian bee; he denies that it is a distinct and separate variety; but declares that it originated by a cross between the common black bee and the yellow-jacket! One of his favorite amusements is to kill all Italian bees which he finds flying about his hives, and he boasts of it. As every apiary in our vicinity has become more or less mixed up, or hybridized, with the Italians, no doubt his bees have a due proportion of this hybridized element; and, as a natural consequence, he knocks down with his bee paddle as many of his own as stinger bees. Yet this old fossil has the temerity to write articles on the subject of apiculture for publication, most of his assertions, however, being mere fancies which he mistakes for facts.

The foregoing is a digression from my subject, and given only as an illustration of the stolid ignorance and bigotry prevailing with a certain class, who, whilst in their own conceit, are entirely wanting in a knowledge of the first essential principles of this most interesting and profitable business in North Carolina. The climate is well adapted to it, and there are all the natural honey resources in this State that can be found in any other. With very rare exceptions, many species of diseases incident to bees, are quite prevalent in the Northern and Western States, are unknown to us. Amongst these diseases may be mentioned Foul Brood and Dysentery. A few years ago these diseases prevailed so extensively in some portions of Kentucky, Indiana and Ohio, that they came near depopulating the whole bee stock of that country. In some sections there was not a hive left within thirty square miles of territory. Again, we have all the flowers that other sections have, together with many richly nectariferous species which are found growing wildly in our warmer climate; and as our agricultural interests are advanced in the way of an increase of all kinds of grasses and forage, bee pasturage is improved also. First, however, in the way of resources, is the honey-dew, of which we have every year more or less. From this the bees gather the largest quantity of surplus honey, and it is the purest honey we have. While the season for the honey-dew lasts, which sometimes is four weeks, strong stocks will collect from five to ten pounds of honey per day. The question will here naturally occur: What is honey-dew? We have two species of honey-dew. The one which is the more common and of more frequent occurrence is the secretion of a genus of insects known to entomologists as Aphides, or plant-lice, which make their appearance about the end of April, until the season is remarkably wet, which is a great destroyer of insect life. This secretion is to be found upon a variety of our forest growth. I have seen it so abundant that had there been 10,000 stands within reaching distance, all would have obtained their full share. The other species of honey-dew is said to be produced by a peculiar condition of the atmosphere, and is either a dew, or a sweet, saccharine exudation from the leaves of the plants and trees. This is a point upon which there exists a difference of opinion. As regards the species first referred to, it can be seen with the naked eye—both insects and secretion upon the leaves.

The white clover furnishes the next best honey we have, and if our agricultural friends would raise more of it our honey would be greatly improved. Distinguished bee-keepers have asserted that an acre of white clover in full bloom will yield ten pounds of honey daily while in bloom. The red clover is very prolific of honey, but the proboscis of the bee is too short to reach the nectarium, or honey-receptacle in the bloom. It is claimed by many bee-keepers that the Italian bee has the advantage in this respect, and will gather honey from the seed crop of red clover in the fall; but upon this I have no positive testimony. The Italian will frequent the red clover more than the black bee.

Beside the foregoing, there are innumerable other sources of honey deposit during the summer months. From the first of August until the middle of September there is usually a great dearth of honey resources; but about the latter part of September our fall field flowers begin to

bloom, the most prominent of which is the small, white flower of a plant belonging to the Aster genus. This will bloom until after frost, and frost does not affect the bloom sufficiently to destroy or vitiate the honey secretion. I have known, in a bad honey year, the bees to gather more honey from the Aster during the months of September and October than they made from all other sources put together during the summer. In our section, during the past summer, bees did little more than make their own support, and many of them require additional fall stores, which I think they are now rapidly amassing. The question is often asked: Cannot a country become overstocked? Statistics show that in some parts of Germany there are sections where there are two thousand hives to the square mile, and there is no country where bees are propagated that can in success compete with the Germans. And they are kept there not alone as a matter of pleasure, but are a source of profit. No one Southern State averages one colony to the square mile. There are 50,000 square miles of territory in North Carolina, and as there are 640 square acres to the square mile, we have 32,000,000 of acres. Now each acre, at a very low estimate, will yield one pound of honey, making thirty-two millions of pounds. This honey at fifteen cents per pound would produce the sum of four million, eight hundred thousand dollars. And so I might go on *ad infinitum*. Tons upon tons of the sweet substance go to waste in every county, merely from the want of the industrious little workers to gather it. This is no wild theory sprung from a disordered brain, but a serious and stubborn fact, and one which it would be agricultural economy to profit by.

Apiculture is particularly adapted as a pursuit for the ladies. One of the most distinguished apiculturists in the Union is a lady residing in the State of Iowa, Mrs. Ellen Tupper, whose writings upon the subject are known where ever bee literature circulates. I would refer any one seeking information, to her writings published in the Department Reports of the Department for the last few years. She is an indefatigable laborer in the cause, and is at this time an editress of a joint Agricultural and Bee Journal published in New York. Born and bred in New England, but being in failing health, and declared by her physician to be a hopeless case, she emigrated to the West. She now says that by out-door exercise amongst the bees, she has entirely recovered her health, and she strongly appeals to her own sex to take up the same occupation.

There are many other points regarding the bees themselves, which would be of great interest to bee-keepers, but they must of necessity be passed over.

I will now briefly allude to the hives and their appendances. The greatest invention of the age in bee-keeping, is the movable comb hive, and next to that is the honey extractor. In regard to the movable comb hive I will remark that any hive that has movable combs, provided they are not too complicated to take apart, will answer; but the simpler the better. The first and the only simple hive is the Langstroth hive, which was the first patent granted in 1852. Since that time there have been at least three hundred patents issued, but the leading feature in nearly all of them is the movable frame and as such are infringements upon the Langstroth patent. And here I would beg leave to make some extracts from the Report of the Commissioner of Agriculture for 1868, from an article on the subject of bees, headed "Statistics of Bee Keeping":—"The reports show that the movable comb hive of the Rev. L. L. Langstroth is generally preferred by the Bee Keepers of the United States. The Bee Keeper's Association of Tennessee, at their recent Convention, by an unanimous vote gave this hive the preference over all other forms. Patent hives have been the curse of bee-keeping in this country. Many of the reports say that the bee-keepers in their vicinity have abandoned all manner and style of patent hives and gone back to the plain box and rude 'gum.' Patent bee palaces, moth traps, and self-dividers have done as much as the bee moth, perhaps more, to hinder the progress of bee culture in this country. That hive can only claim superiority over the common box which permits the bee-keeper to have ready access to every portion of the hive, allows the transfer of frames from one hive to another, will winter bees well, is not complicated in its structure, and is not expensive. The movable comb hive is used by about one-fourth of the bee-keepers of the United States, and its introduction is rapidly extending. Whenever its use becomes general, bee-keeping will become profitable." Upon the subject of the honey extractor, I beg leave to quote another short extract:—"Twenty pounds of honey being required to make one pound of wax, the economy of saving and utilizing combs is rendered evident. In order to accomplish this saving, a honey emptying machine has been invented, and has now been so simplified that it is within the reach of all. By this machine, the comb is emptied by centrifugal motion without breaking the combs, leaving them in a perfectly sound condition, so that they may be inserted again and used for years in succession, thus effecting a great saving in the consumption of honey, and giving the market a purer article than when rendered by heat." I can fully endorse this statement, having made the machine during the past season and tested it fully. It will take out every particle of honey from open cells, and not interfere in the least with the brood in any of its stages.

Yet one more quotation I cannot refrain from making. The Commissioner says:—"The reports show that in the Southern States, where bee-keeping is in its primitive state, it would yield, if properly conducted, the largest return. The abundant wild plants yielding honey, the long seasons and mild climate there are all very favorable to profitable bee-keeping. The chief expense of an Apiary is the expense of the hives. When these are procured they form a permanent capital; the hive will last for years. Bee-keeping will be found profitable, not only to those who engage in it largely, but both profitable and interesting to any person having room sufficient to hold all the year with honey, and find in the nature and workings of these little insects, subjects for most interesting study and critical investigation." I would earnestly recommend to any one having the Report within reach to carefully read the article from which I have quoted.

The movable comb hive is so constructed that the bees will build their comb in separate frames, rendering it an easy matter for the apiculturist to examine each frame by itself, by removing it from the hive without injury or seriously disturbing the bees. With a movable comb hive nothing but skill and attention is required to accomplish everything that is desired, the frames being used exclusively for rearing brood and storing honey for the use of the colony. The surplus honey boxes are placed above these frames, and covered with a cap to protect them from the weather.

I would advise those who desire to embrace the pursuit of bee-keeping, to first ask themselves whether they intend to study its mysteries and gain a thorough understanding of its requirements so that they may apply them practically, or whether they think, like many others, that by procuring a new, patent hive, nothing more is needed, and that the hive of itself will bring about the desired result? Let it be distinctly understood that I advise no one to use any other than a gum, or a box hive, without first becoming acquainted with the wants of the bee so that they may be enabled to attend to them as the necessity of the case may require. As well might a law student expect to become a successful lawyer by simply having the law authorities within his reach and not studying them, or a theological student expect to become an eminent divine by merely keeping the Scriptures and Commentaries as so much dead stock on hand, as for a man to become a successful apiculturist by merely having his bees in a patent movable comb hive, and not storing honey and practicing the science of apiculture.

There are a vast number of other points of interest connected with my topic, upon which I might dilate, but this paper has already exceeded its proper limits. My remarks and suggestions have been somewhat hastily, having been thrown together desultory, and without much regard to order. The subject is one of exhaustless interest to a real lover of bees, and it would be impossible to do it full justice in any essay or paper that might be prepared. It would require a volume, and even then much would remain untold. However, by the efforts of a few persevering experimentalists, interest upon the subject may be kept alive, and the science of apiculture, in the Southern States, may give it more attention. North Carolina is truly a favored section, for Nature has been to it a bounteous and indulgent mother. Our climate, our soil, and our growth have, been singularly diversified, and by dint of a little application we can make our "hills and valleys blossom like the rose"—we can realize the glorious scriptural ideal of a "land flowing with milk and honey." Only let apiculture receive some portion of the attention that is so often wasted upon chimerical and fruitless pursuits, and it may be made the means of developing one of the richest of the latent resources of our section, and thereby not only add millions to the future income of our people, but become, under God, a benefit and lasting blessing to the persevering agriculturist.

Rotation a Law in Agriculture.
The farmer grows a certain kind of potato year after year, until it fails to produce the same good crops it once did. He sends a few hundreds of miles for new seed of the same variety, and it will at once, and without adding anything to the soil produce as good crops as it ever did. We have heard agriculturists deny the possibility of this, but we think that most practical farmers know that this is really the case. Yet surely the same variety of potatoes require only the self-same elements. There has been no other difference but the change.

So also in the matter of manure. People sometimes find benefit from phosphates, or guano, or some other commercial fertilizer. But in a few years it turns out to be no better than brick dust; but any other kind of manure will have a wonderful effect. We knew a friend once who used to raise enormous crops in his vegetable garden, which was annually manured from his horse stable. It failed at last. Eren weeds seemed to despise it. He changed from horse to cow manure, and again wonderful crops rewarded him. Chemically there was not much difference in the manure. The change was more than all.

It is well to remember that this is a general principle. Nature loves change. There is a seeming contradiction, for we speak of the certainty of nature's laws. But those who know her best, know that she has laws which seem contradictory. The same elements that make fire, largely make water, which is the enemy of fire; and some of her most harmless elements will often unite to make the deadliest poisons. At any rate, constant as she generally is we know she sometimes likes a change.

Of the 258,027 emigrants who left the shores of the United Kingdom in 1869, 90,416 were English, 23,569 Scotch, 73,325 Irish, 65,752 foreigners; the nationality of the remaining 5,975 is not distinguished in the returns.

Every plain girl has one consolation. Though not a pretty young lady she will if she lives, be a pretty old one. Sheet music—singing in bed.