

condition, except that there was a heavy loss of bees as the dead ones dragged out showed. Even the colony that had been compelled to store sorghum syrup were as lively as rats. The colonies fed on sugar syrup fared the worst, though the main part of the bees fed on sugar were apparently all right, bees were seen dragging themselves out of the entrances of the hives so loaded that they were helpless so far as wing power was concerned. I gathered up some of those loaded bees and took them to my office and emptied the contents of their abdomens on a sheet of white paper. Guessing at it, I would say that the contents of the abdomen of an individual bee was twice as much as the ordinary load of a bee. The contents of the abdomens of these sugar fed bees were to all appearances except as to sweetness, identical with the syrup when it was fed in the fall. And although some of it was put under a glass of considerable power it showed the presence of nothing foreign to ordinary sugar syrup unless it was a slight logwood tinge in streaks through it. The bees wintered on natural stores were examined, and although they were of natural size, lively and active, they all had a small amount of pollen in the form of a paste in their intestines. But unlike the sugar fed bees, their honey sacs were entirely empty, at least of anything resembling pollen or syrup. The sugar fed bees examined, were brim full of the syrup like liquid, and felt cold and clammy. Now here was a case of bee diarrhoea *so far as the distended abdomen of the bee was concerned*. I am now satisfied that sugar is inferior to honey as winter food for bees in this climate.

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There is one thing certain that bees *have* wintered well, and do winter well on pure honey, and if no sugar is used except in special cases, perhaps with our new light on wintering we may be able to succeed without using sugar. The non-use of sugar will certainly reduce the quantity of honey on the market, so that any benefit arising from the use of pure honey alone, as a winter food, will accrue to the bee-keeper in the decrease of quantity and consequent increase in price.

FOR THE CANADIAN BEE JOURNAL.
SCIENCE AND APICULTURE.

UNDER the above head, page 722, Prof. Cook very courteously calls attention to my article on "Exercise and Heat" page 692. He states that those are "not the views of the leading Physiologists of to-day," that they

were once held by Liebig but like many other theories lack the important element of truth and that Carbon is not fuel to be burned as wood is burned in a stove, and he illustrates by describing certain physiological experiments which would seem to support his statements. He also says that "nutrition or the changing of food into tissue and the breaking down of such in work results in heat and in this complex process oxidization results, but it is direct and only to supply heat."

I would say that I did not go back to Liebig for my ideas but received them from late teachings and books of our most eminent medical men. I do not wish to advocate error and would ask Prof. Cook to give the late authorities who hold views as given by him that we all may look it up for ourselves. I will then give the source of my views. I would not have anyone think that I meant that Carbon is burned in the body just the same as wood is burned in a stove. I used the illustration to make it plain, not to give the idea that fire was the same as vital action. But does not the Prof. compare the result from flesh subject to electrical current as the same as vital action, which it is wholly unlike? We know that water may be decomposed, its gases separated and dead bodies made to move their limbs by such agencies, but that is not vital action. In regard to nutrition being the changing of carbonaceous and other food into tissue, does not the Prof. tell us in his essay on the "Pollen Theory" that nitrogen is what makes tissue and that bees require no nitrogen when quiescent, only honey (which is almost entirely carbon) to keep up—what? tissue? No, heat, force, without which there can be no vital action. In my article I said that the slow wearing away and oxidization of tissue also furnishes some heat. I would have it read "the wearing away and slow oxidization of *tissue* also furnishes *some heat*," and that most of it is produced by the carbon combining with oxygen as brought about by vital processes. Does carbon produce heat in a stove lamp, etc. and not in the body? Then what is done with it. Is a hog all tissue?

That is all, now, on the part which refers to my views, but as the subject of the rest of his article interests me I will call attention to parts of it. The Prof. has advanced substantially the following, that possibly the air in a hive alone may be sufficient to supply the wants of the bees in winter quarters if kept in the quiescent state; to support this, he gives experiments of scientists and speaks of the girl who was buried alive. That human beings under certain conditions breathe so little air that the air in a coffin suffices perhaps for days and weeks, that it is like hibernation when animals live with almost