Semantography Series No. 255

THE MIRACLE OF THE BEEHIVE

An article and a futile correspondence.

The following article, which relates directly to my findings concerning ethics in cells and animals, appeared in the Reader's Digest of August 1966 under the following title NATURE'S MOST ASTONISHING ANIMAL: THE BEEHIVE.

It is no mere collection of insects, scientists now believe, but a single, pulsating, life-giving organism.

Condensed from FRONTIERS written by Jean George.

The tiny honey-bee dived on to a blue delphinium, braked on a petal and walked into the flower. Glistening on her back as she drank the nectar was a red dot, placed there by a scientist. After her drink the bee turned her eyes toward the sun, took a bearing on it and started home. At her hive a quarter of a mile away, the scientist was waiting, for this honey-bee might well add another bright chink in an extraordinary mosaic of new and awesome bee research.

Today the beehive is no longer thought of as a mere collection of insects: it is considered a single organism of many glittering parts. An infant when it is swarming, the hive progresses from adolescence to maturity, gives birth to new swarms, finally subsides into the quietude of winter. A wounded, starving or plundered hive can actually suffer, moan in agony, and then, in its drive to live, repair itself by a healing process like that of any other feverish creature.

This concept is founded on a set of extraordinary discoveries. Any single bee, it is now known, can grow old quickly or, more unbelievable, grow young! The sterile can lay eggs: the senile can rejuvinate glands that have atrophied. A single bee can in short, do the "impossible," in order to maintain the wholeness of the hive.

Specialists at Work. To understand the new bee research we should look into a typical wild hive that has lodged inside a hollow tree. There is always a main entrance with several combs of lustrous waxen cells hanging inside the door. Some combs contain honey, others hold pollen. A third type of comb, the brood comb, contains the larvae - unfledged bees in the wingless and footless state. Each hive has one queen, a large bee that lays up to 3000 eggs a day. There are also a number of drones who exist only to mate with the young virgin queens as they hatch during the hive's sexually productive time of life.

Most of the other 20,000 to 40,000 bees in an individual hive are "workers" who perform a variety of specific tasks. One is nursing, feeding protein-rich "bee milk" - formed by special glands in the nurse bee's head - to the queen and the larvae. Making wax is another. In this process, the bees eat honey which is converted by special glands into beeswax. With the spines on their hind legs, they pick up wax scales protruding from pockets on their abdomens and pass them to their mouths. They then chew and fashion the wax into six-sided cells which form the combs. The workers also forrage for pollen and nectar. The nectar is fed to "receiver" bees who convert it - by using the secretions of special glands - into honey and store it in the comb.

Some workers act as hive guards, admitting only foragers that belong to the hive - they are recognised by odor, scented through the 12,000 scent organs on the antennae. Strange bees are killed on the spot. Air-conditioning the hive (by standing inside the entrance and fanning their wings), building cells and cleaning the hive complete their list of duties.

As apiarists watched all these jobs being done year after year, the question arose: How did the bees know what to do? What intelligence told them the hive needed more brood cells, or a new guard detachment?

In 1925 a German Scientist, G.A. Rösch, had a hunch that the age of the bees had something to do with their work. He daubded with paint a group of bees as they emerged from the brood comb. No sooner had their twinkling wings hardened than they started cleaning the cells, then moved towards the oldest larvae in the combs and began feeding them honey andpollen. Rösch examined one of the marked bees under the microscope to see if her physical development correlated with her job. It did: in a few days she had enlarged pharyngeal or bee-milk glands that lie in front of the brain. She was physically a "nurse". Then the marked nurses abandoned their original charges and began to feed the youngest larvae with bee-milk. After repeated studies Rösch was convinced that younger nurses fed the older larvae, old nurses the younger.

As days passed, the marked bees gave up their nursing duties and began taking nectar from the foragers and storing it. Examination showed that their bee-milk

glands had begun to degenerate, and the honey sacs in their bellies were filled with nectar. Their mean age was 11 days. Around the 15th day these bees began making wax. The microscope showed that their bodies had changed once more to fit the job - their wax-making glands were highly developed.

On the 18th day the bees did guard duty: after the 21st day their wax glands ceased to function. Now the bees were occupied with foraging. Rösch found that the workers died when they were about 38 days old.

Adaptable Bees. With the publication of Rösch's findings, other scientists joined the investigation. In Munich Dr. Martin Lindauer noted certain variations in Rösch's time schedule - he had watched a marked bee stand guard duty for an unheard of nine days. In Russia, Mrs. L.I. Perepelova announced that she had several precocious bees - one two-day-old was making wax, ordinarily a job for the 15 day old.

Obviously a beehive was extremely adaptable. Jobs could be done earlier if the well-being of the hive demanded it. Bee students everywhere set out to discover just how adaptable bees were.

The most spectacular experiments were performed by Mrs. Perepelova. She removed the queen, larvae and eggs from the hive and watched to see what the workers would do. For several hours the hive did not miss the queen. Then one of the attendants lifted her antennae and began to circle. She exchanged food with a nearby wax maker, and the wax maker drummed her wings. She approached and exchanged food with others. The cluster moaned. The moan spread through the hive, and the whole group began to throb as if besieged by fever.

Several weeks passed. Then Mrs. Perepelova noticed some workers rushing over the empty brood cells and thrusting their heads far down into them. Then came the impossible, the supreme effort to heal the wound - a few "sterile" workers began to lay eggs! Nurses clustered round the egg-laying workers, feeding them bee milk. Slowly, laboriously, the workers gave forth eggs - six to eight a day as compared to a queen's 2000 to 3000. Mrs. Perepelova's conclusion: "When the queen is gone, some inhibitory factor that prevents the workers from laying is missing from the hive."

Roundthe world, bee experts pressed on to find out what else a hive could do to heal itself. Mykola H. Haydak, now of Minnesota's Agricultural Experimental Station, removed the brood comb from a hive and isolated it. Then he put upon it newly emerged bees. There were no nurses, hive cleaners, guards, wax makers, foragers. He waited.

The adjustment was violent! The entire developmental process was speeded up so dramatically that three-day old bees took survey flights from the hive while others of this age built cells, a job normally for the 16th day. On the fourth day the bees collected pollen. After a desperate week, the premature hive began to function as usual.

With the publication of Haydak's findings, experts wondered whether bees could also reverse their development. In Yugoslavia, Mrs. Vasilja Moskovljevic placed 503 marked foragers, all about 28 days old with dried-up bee-milk glands, onto an isolated brood comb with the queen. The bees would either have to produce bee milk or let the hatched larvae die. Days passed: no brood was reared. Then one afternoon Mrs. Moskovljevic noticed a forager leaning into a cell. The scientist looked closely. A glittering drop of bee milk was deposited near the mouth of a hatched larva. Quickly Mrs. Moskovljevic placed the forager's glands under a microscope, and there was the proof. The old dried glands were swollen and filled with bee-milk - the impossible had been achieved!

Language of the Dance. Meanwhile, in Austria, zoologist Karl von Frisch discovered a "language" used by foragers to tell others the distance and direction to sources of pollen. A bee that had found some flowers returned to the hive and performed a dance for her fellow foragers. A vigorous figure-eight dance meant that the flowers were near. A feeble tail-wagging dance meant the flowers were far away (distance, near or far, could be spelt out explicitly in metres). If the bee's body was pointed vertically up on the comb, the flowers were in the direction of the sun. Body pointed down on the comb meant that the flowers were in the opposite direction of the sun. A bee dancing at a 60 degree angle from the vertical was telling her coterie to leave the hive at 60 degrees from the sun. The kind of flower was communicated by a taste of the forager's nectar or pollen.

Next, Martin Lindauer discovered that this dance language was also used by forager "scouts" to inform a swarming hive of the location of a new home - on several occasions he noted the angle and the rapidity of the dance movements and was able to get to the new location in time to observe the arrival of the bees!

Animal of Many Parts. The final question: What stream of intelligence flowed through the hive that told its separate parts what to do? England's bee expert Dr. C. Ribbands tackled this one. He noted an aspect of hive life that no one had seriously studied - the constant circulation of food in the hive. Food moved steadily from nurse to queen, from nurse to wax makers, to the cell cleaners, to the receivers, to the foragers, and back from the foragers to the receivers, the cell cleaners, the wax makers, the nurses, and the queen.

Ribbands became convinced that each stage of bee development contributed a distinct glandular secretion or an enzyme which, if all were present and in sufficient supply, would tell the individuals that the hive was balanced.

Dr. Ribbands kept coming back to Mrs. Perepelova's remark: "some inhibitory factor" preventing workers from laying eggs was missing when the queen was gone. He also saw that it took the hive several days to make the adjustment - the time necessary to circulate the food with the missing ingredient and lift the inhibitions. Could the food be a kind of circulatory system, a bloodstream of sorts?

Thus Ribbands conceived the idea of the hive-animal of many individually functioning parts, controlled by the essence of a hive - its golden food. Much study remains to be done: the chemical properties of the food ingredients, for instance still need to be isolated and identified. But most bee researchers today agree that the concept is sound.

I realise now that many years ago I was present when a wild hive died. It had lived in the kitchen walls of our summer home, humming gently and giving birth to new swarms for 12 years. Then, one autumn day, there was a hum in the walls different from anything we had ever heard. We ran outside to see what was the matter. A few bees dropped from the hive doorway to the ground. Then there was silence.

Next spring the bees did not come out. A year later when the walls were opened to make room for a picture window, my uncle described what he had found. "A little dried queen in a circle of attendants, some of them close against her, as if to keep some vital life-blood going."

A beautiful golden creature had stopped breathing. We had always spoken of "the hive" as a single thing, but none of us realised how close we were to the truth: that something with a thousand sparkling parts had lived and died among us - the humming, life-giving hive without which the earth would be a less fruitful place.

End of Article.

I wrote to the editors.

The Chief Editors
Readers Digest
Pleasantville N.Y. U.S.A.

Sydney 2 Oct. 66

Dear Sirs,

Throughout the years past I have written to you, and have always received a well-meaning, but meaningless short letter signed "The Editors" which clearly was not signed by you. I understand that you must have some sub-editors, or no-editors which sort out the thousands of letters written to you, and who decide what you should read or not. This is a reasonable arrangement, but sometimes a letter may be rejected which contains news of great importance, news which your readers should know.

You prefer to take your news from articles already printed, from books already best-selling. This too is a reasonable arrangement, were it not for the fact that sometimes important news are not contained in writings of accepted scientists and writers. Sometimes a new idea, a new discovery comes up, which over-turns the theories and ideas of the accepted scientists and writers. Naturally such a discovery is in contrast to the old ideas, and hence shunned not only by the upholders of the old ideas, but shunned too by the sub-editors who read the letter sent to them, and discard it all with a short letter signed "The Editors".

The Readers Digest is fighting a valiant fight against the dark forces of destruction. In wonderful articles and condensations you present a world in which ethical behaviour as a natural force in many human beings is shown to act. But when it comes to scientific articles, ethics as a natural force is not mentioned in these articles, simply because the scientists of the West and the East, believe in brutal competition and destruction of those creatures less fit in brutality to survive a brutal world in which ethics has no place.

Sometimes you throw up your hands in despair, and then you print an article asking the question in the title "Can scientists believe in God?" Then come quotations from some scientists, who bring some quotations from the Bible, but no one is convinced, and everyone, including you, are convinced that our scientists in general keep ethics as a strict verbal construction not found in nature.

And here is where I come in. I am a scientist who throughout my life have questioned existing theories. I have found answers which overturn the existing ideas, and I have pioneered new discoveries which one day will be taken as self-evident - not now when the defenders of the old theories hold sway and write in learned journals and magazines like the Readers Digest. This explains why your sub-editors turn my letters into the garbage bin. But a day will come when you will write about me and my work, and it may be quite soon, because I am at the end of my life, and won't last long. I am happy in the knowledge that great university libraries have given a standing order and are collecting

everything I write, and this includes even my letters to the Reader's Digest.

I have resigned myself to the fact that you will wait until I am dead, and until some good article will be written about myself which you will then reprint. But sometimes I cannot wait for my death. I see how you are sometimes desperate in trying to explain a world of brutality and destruction to your readers, who need nothing more desperately than an explanation of our purpose on earth, and why we must suffer so much in this world in which ethics has no place.

And it is this desperation I feel in most of your readers which prompt me to make one last attempt to catch your eye and your mind, because I, the scientist who does not believe in a God of war, of wrath and vengeance as described in the Bible, have found that ethics is a natural force acting in every cell of every creature. But how can I catch your eye and the eye of your sub-editors when the very same thing has been said by one of the greatest biologists of our age, and a Nobel prize winner too Alexis Carrel - and yet his discovery has not caught the fancy of the world. Is it perhaps because he happened to be an ordained priest? I think that his discovery is being shunned by the scientists of today, because he accused them of gross ignorance, and because his discovery is in contrast with everything our accepted scientists say. What chance have I then, when that great biologist had to die without seeing his own chance realised?

It is an article in your last issue (August 1966) which prompts me to make one more attempt, perhaps the last, to make you see the light so that you can give the light to your readers who are yearning for just this. This article is reprinted from Frontiers and it bears the title "Nature's most astonishing Animal: The Beehive". Surely, the beehive, a community of bees, is not an animal, as a community of human beings is neither an "animal" . But the scientists you mention try to convince the readers that the beehive is an "animal". And the readers, being made once more to realise that they are not scientists but ignoramuses, are given to swallow theories which are not theories at all, but indirect confessions of the ignorance of the scientists. I wonder whether you will, at this stage, be prepared to follow me.

According to your article the beehive is an animal in which the "golden food" is the bloodstream which tell all the bees what they have to do if something is wrong in their community. If the queen is dead, some sterile workers begin to lay eggs. Why? Mrs. Perepelowa of Russia explains it by saying

> "When the queen is gone, some inhibitory factor that prevents the workers from laying is missing from the hive."

This is "not an explanation" but is nicely in line with scientists who give us words ("some inhibitory factor") instead of explanations, and it is also in line with dialectical materialism in Russia and elsewhere where ethics is shunned and banned as a natural force in the universe. But suppose we tell the story in a different way about another "animal" a family of human beings. Let us assume that a family of say 7 children is suddenly deprived of their parents. Quite suddenly the oldest girl will assume the tasks of her mother, and the oldest boy will assume the tasks of the father, so that the "animal" consisting of little children will survive this violent upheaval. Is this not an ethical act? Or is the explanation according to Mrs. Perepelowa that there was "some inhibitory factor" present in the children as long as the mother and father were still alive which factor prevented them to act?

That all the scientists mentioned in this article are gross ignoramuses is proved by two quotations in the article which somehow in desperation ask:

> "What stream of intelligence flows through the hive that told its separate parts what to do?"

and

> "How did the bees know what to do? What intelligence told them the hive need more brood cells, or a new guard attachment?"

Look throughout the whole article. You will find no explanation, not even a hint what that great intelligence could be. Surely the food cannot be an explanation but only a "factor". But what is the essence of that great intelligence which makes the bees realise that something is wrong in the hive, and that a supreme biological effort is needed to put the beehive right, in order that all the bees should survive? Is this not an "ethical intelligence?" And if not, what else is it? Surely not the food, surely not some "inhibitory factor."

And now let's have a look at Alexix Carrel and what he has to say to this phenomenon of a great ethical intelligence. This is what he wrote, not only of creatures like bees, but of every living cell, and every living atom which make up the living cells of all living creatures:

"Cells are like bees, erecting their geometrical alveoli, sythetizing honey, feeding their embryos, as though each of them understood mathematics, chemistry and biology, and unselfishly acted for the interests of the entire community... this cannot be explained in the light of our present concepts."

Mark how Carrel himself is afraid to speak of an "ethical force" acting within the atoms which form the cells, which form the bees and the organisms

of all creatures. He wanted to get recognition in the eyes of his scientist colleagues. But he has accused them of their ignorance. He put their ignorance even in the title of his book "Man the Unknown". He had to pay the supreme penalty. He got the Nobel prize for his construction of a mechanical heart, but he got no recognition for his discovery that within the cells of every creature a power of unselfishness is acting. And what is unselfishness but ethics working in our world?

Carrel is dead, and I shall live not long now, I am 70. But here are a few lines from my own writings:

"Our Universe is permeated by invisible gravitational and electrical energies which manifest themselves in the majesty of stars and planetary matter. On temperate planets another energy manifests itself in the atoms of living matter."

"This energy creates within the wombs of mother animals amazing organs and organisms of co-operative complexity, within which, as Alexis Carrel pointed out "Cells act unselfishly for the interest of their entire community," When you cut your finger, the cells of your body rush to help their injured brother cells. This is the manifestation of ethical energy which permeates the spaces of our universe."

and

"How can our wise men ever explain the fact that cells can manufacture strange chemicals which induce love and care, conscience and courage in parents birds and animals, making them feed and teach, protect and defend their helpless children, so that they shall survive".

"Is this the chaos our professors talk about? Or does it not prove that ethics is a natural force like electricity."

Of course, I am not a writer. I am only a scientist who cannot write fine prose which can tell the readers of the Reader's Digest of the tremendous message contained in the foregoing lines, a message of hope, a message of our ethical purpose on earth, a message of the bankruptcy of the scientific theories of brutal competition.

But you have acknowledged and renowned writers, and quite often you commission them to write an article about a theme which would interest the readers of the Reader's Digest. I don't want recognition. I don't want that even my name be named. I only want that the human beings should take heart and go on building a better world. Or in other words which I have written

"Every intelligent boy and girl can see (once it has been pointed out to them) that within the molecules which build a budding flower, a busy bee, a baby bird, a baby animal, a human baby, A POWER OF MIRACULOUS CO-OPERATION BETWEEN THE ATOMS AND THEIR CELLS IS AT WORK, in which every cell "unselfishly acts for the interest of the entire community" as Alexis Carrel observed."

This time, I shall not accept a meaningless letter signed "The Editors". I shall send printed copies of my letter to every main editor of the Reader's Digest, until they all have read my message, and acted on it. As for me, I don't want a single penny for myself. I want only that the Reader's Digest should at last recognise and propagate the message of ethics as a natural force as preached in vain by the greatest biologist and Nobel prize winner of our age Alexis Carrel.

Awaiting your spirited response, I am,

Yours sincerely,
C.K. Bliss, B.Sc.

and received the following meaningless answer. Not a word that they have understood what I told them. To hell with them.

Dear Mr. Bliss, October 31, 1966.

In the first place, we would like to mention that almost all of our general mail is signed The Editors simply because most correspondence involves an expression of collective staff opinion. Then too, our editorial duties are not cut and dried: they often overlap. An editor who handles one job this month is often assigned something else for the next.

Secondly, we cannot promise that the Reader's Digest will do a report on your work. Judging from the hints you have given us, the material seems better suited to a scientific journal and we suggest that you contact a few representative publications in this special field.

Thank you for writing again and for your continued interest in the Reader's Digest.

Sincerely
The Editors.

The End.