ENTOMOLOGY

Queen Bee's Perfume

A special secretion that is manufactured and discharged by the queen bee throughout her life attracts and stabilizes her swarm—By Elizabeth Mirel

➤ A MYSTERIOUS PERFUME that rivals the best Paris has to offer keeps honey bees swarming after their queen.

As long as the fragrance lingers, the bees flock to her. But when it disappears, they get restless. Eventually, the swarm will scatter in search of another sweet-smelling queen.

The queen does not have to fly from flower to flower in search of her alluring scent—she manufactures it herself in the mandibulars, a pair of little glands in her head. The queen makes the perfume throughout her life. Apparently, "a living queen discharges the secretion frequently and contaminates her surroundings with it," said Prof. J. Simpson of the Rothamsted Experimental Station, Harpenden, Herts., England.

A series of experiments by Prof. Simpson led to the discovery of this "essence of queen bee."

In the beginning research the queen was screened off from her swarm, whereupon the bees that landed on the cage "immediately started running agitatedly over the wire screen," Prof. Simpson said. "Some," he said, "tried to get their heads between the wire of the screen and extended their tongues toward the queen."

Even when put in a double walled cage, the queen held the bees around her for more than 12 hours, so great was her power of attraction.

The queen's allure finally broke down, Prof. Simpson reported, when she was put in a plastic bag. Although the bees could see her and hear her, her smell could not reach them.

To investigate the origin of the scent, a queen's body was cut in sections. Only the crushed head attracted the bees. The pure form of the main secretion of the mandibular glands had no charm. The bees, Prof. Simpson found, did not respond to this substance.

In his report in Nature, 199:94, 1963, Prof. Simpson maintained that it must be "some other compound of the secretion" that makes the queen so attractive. The formula, however, is still a mystery.

• Science News Letter, 84:38 July 20, 1963

MATHEMATICS

Formula for Difficulty

➤ IS IT EASIER to add 2 and 8 or to add 3 and 7? Is it harder to multiply 598 by 94 or to multiply 832 by 79?

A formula for finding the answer to such questions has been proposed by H. B. G. Thomas of the Psychological Laboratory, Cambridge University, in Nature, 199:99, 1963.

"It seems clear that the chief source of difficulty with a given combination is the size of the numbers concerned," he said.

Old formulas based on this assumption fall into two types: 1. those considering only the average value of the numbers being added or multiplied, and 2. those considering only the value of the sums or products.

Thus, in a generalized problem, such as A plus B equals C or A times B equals C, the first formula would consider the value of A plus B divided by 2. The higher that answer, the tougher the problem.

The second formula would look simply at C.

The new Thomas formula combines the two. It says that the harder the problem, the higher is the sum of the logarithm of A, the logarithm of B and the logarithm of C.

Thus, 2 plus 8 would have a difficulty value of .301 plus .903 plus 1.000 or 2.204. And 3 plus 7 would have a difficulty value of .477 plus .845 plus 1.000 or 2.322. Therefore, according to the Thomas method, it is tougher to add 3 and 7 than to add 2 and 8.

As for the multiplication problem mentioned in the first paragraph: 598 times 94, which equals 56,212, would have a difficulty value of 9.499.

The other problem, 832 times 79, which equals 65,728, has a difficulty value of 9.636. The second problem is tougher.

The article claims that the formula proved to be more accurate than older formulas in tests on groups of children and adults. The tests considered the time taken to answer arithmetic problems and the accuracy of answers.

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FORESTRY

Sand Caster to Aid In Fighting Forest Fires

➤ THE LATEST WEAPON in the war against forest fires is a sand-casting machine capable of digging and throwing 100 cubic feet of sand per minute.

A prototype of the device has been built at the State of Michigan Forest Fire Experiment Station at Roscommon. Known as the Model II Michigan Sand Caster, it is designed to be towed by a tractor and weighs 7,000 pounds.

The main element of the caster is a rotor, three feet in diameter, that is driven by a 130-horsepower engine and spins at 675 revolutions per minute. This rotor can be adjusted to various angles and lowered up to seven inches into the soil. As the machine is towed forward, it ejects a stream of earth, leaving a round-bottomed trench up to 28 inches wide.

Maximum towing speed varies considerably with ground conditions, but averages about 90 feet per minute. The sand caster is most effective in regions with sandy soil and little heavy growth. It has proved capable of halting flames ten feet high and considerably decreasing larger blazes.

It can be adjusted to cast sand distances up to 100 feet, but is most useful within 50 feet, where it can be used to combat the flames directly. Farther away it is used primarily for "fireproofing" the area toward which the flames are advancing.

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MEDICINE

Fatal Infections Traced To Bird Sanctuary Area

➤ TWO DEATHS from a type of meningitis traced to bird droppings near an Oklahoma bird sanctuary were reported in the New England Journal of Medicine, 268:1112, 1963. A third man in the same geographical area contracted the illness, cryptococcal meningitis, but recovered.

The patients were all living in or near Kingfisher, Okla., a town of slightly more than 3,000 population 40 miles northwest of Oklahoma City, where they entered the Veterans Administration Hospital.

Kingfisher's garden clubs have a sign at the edge of town welcoming visitors and telling them the town is a bird sanctuary. The town was originally named for a ranchman named King Fisher who operated a way station on the cattle trail near the Cimarron River, but after his death the bird influence prevailed.

The scientists reporting the three illnesses suggest that there are additional unrecognized cases of cryptococcal infection in the Oklahoma community, which may offer opportunity for further epidemiological study.

They examined 71 environmental samples from the Kingfisher area and isolated six that contained the fungus *Cryptococcus neoformans* from cultures of bird droppings and other material.

C. neoformans attacks skin, lungs, and especially the brain and its membranes, but the respiratory tract was evidently the point of entry in these Oklahoma cases.

Drs. H. G. Muchmore, E. R. Rhoades, F. G. Felton and R. E. Carpenter, all associated with the University of Oklahoma School of Medicine and the VA hospital at the time these cases were treated, and G. E. Nix, technician at the VA hospital, reported the findings.

• Science News Letter, 84:38 July 20, 1963