

Spiders Are Taking LSD 'Trips'

*Animals being used
in new research tests
for studying drugs*

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WITH NO other animal do we have access to such detailed information on its behavior."

Its behavior is orderly and geometric. Its behavior pattern is repeated daily throughout its life cycle, and the animal cannot survive without this constant pattern.

And so, for more than 15 years, Peter N. Witt, present director of research at the North Carolina Mental Health Department, has been studying this behavior pattern, and particularly the effects of various drugs on it.

The animal is the spider, its behavior pattern the web.

The theories of Witt, who now resides in Raleigh, N.C., were featured at the recent conference at Wesleyan University in Middletown on the theme of "LSD: Man and Society."

The spider chosen for the experiments is a common variety in Northern Europe where the investigation was begun. It is also found in New England. After 15 years of friendship, Witt refers to it as "Zilla." It spins a web once every 24 hours, usually in the early morning," Witt said. Construction of the web, described as an "orb," usually takes from 20 to 30 minutes.

Through the use of photographs of the web, detailed measurements of angles, distances and size of various parts of the web can be made, computerized, and compared under varying psychological and physiological conditions.

Witt's experiments, first in Switzerland and now in the

United States, have been conducted primarily with drugs, tranquilizers and stimulants, as well as hallucinogens.

According to Witt, every web "contains more than 1,000 measuring points. The web can be studied from the regularity of spacing, the size, the shape, the radial angles."

What might be described as a "utopian" web, for instance, was spun while "Zilla" was taking an LSD "trip."

"It was surprising," Witt said. "The web was more regular, geometrically, than normal."

He explained that the spider, under the influence of the hallucinogenic drug is detached from its surroundings. There is less interference from things around it and it can build a more perfect web.

"The web," Witt comments, "is a convenient and precise record of the operation of the sensory and motor apparatus of the spider. . . . We may view the spider as a web-building machine which integrates sensory information regarding the current state of muscles, spinning glands, appetite, and other bodily conditions before and as it builds its web. Faulty information can be supplied in one way or another, with consequent distortion of pattern."

In original experiments, dead house flies were injected with a drug, along with sugar water, and thrown into the spider's web. The spider received its drug dose by eating the fly, as the sensitivity of the spider to needle injections caused a high percentage of deaths. Later, using a microsyringe and

very fine needles, direct injection was used and is the present method of giving the drug to spiders.

SOME OF Witt's results indicate that small doses of tranquilizers and barbituates decrease the catching area of the "strictly spiral part" of the web.

Changes in the spiral of the web and radial angles are seen with higher doses of barbituates, but not with tranquilizers.

The introduction of another chemical psilocybin acts similar to a tranquilizer, Witt said, and the spider builds a smaller web.

"The glands contain as much silk as usual, but the spider doesn't use it all," he said.

Mescaline, another hallucinogen, produces "quite irregular webs," and acts a little like some of the stimulants such as benzadrine and dextrine. "There is a change in the distribution of areas in the web," Witt said.

Witt also noted that the "memory traces" of "Zilla" after some of the experiments have left what might be permanent effects on the insect.

He said a group of researchers in Canada—George Groh and Marcel Lemieux at Les Laurentides Mental Hospital in Quebec, are making "an interesting addition" to the studies of spiders.

These men are studying the chronic changes induced in the web-building by the drugs.

Witt himself is a native of Switzerland, and attended Har-

vard Medical School in 1952-53. He taught at the University of Berne, Switzerland, from 1956 to 1966, and some of his first experiments in the field were financed by funds from Sandoz Ltd., a Swiss pharmaceutical company which discovered LSD in 1943. "This was before Federal study grants were available," Witt said.

The whole spider web, Witt said, "may be regarded as an extended organ of touch, because the slightest vibration in the area of the net is transmitted via radii and signal thread to the spider."

"Experiments," he continued, "showed that web-building as well as feeding are probably determined by the sense of touch alone. The spider measures distances by walking along a thread, it probes the tension of thread by pulling it, and it orients the shape of the web according to gravity."

In a paper presented while he taught pharmacology at the State University of New York at Syracuse, Witt pointed out that measurement of a typical web shows more than 18 yards of thread in the spiral, and more than six yards for the "scaffold," or radii and frame. In the webs of adult spiders tested, there are 1,225 points where the spiral is fixed to the radii.

Establishing a basic control or normal web, Witt, along with Charles F. Reed, associate professor of psychology at Temple University, was able to chart the effects of various drugs on the frequency of building, the

size, regularity and shape of the webs.

A few examples show that the introduction of caffeine has no effect on the frequency of the building, but decreases the regularity of the web and its shape from the "control." Mescaline, one of the hallucinogens, has no effect on the frequency or the shape, but decreases the size and the regularity. LSD changes only the shape. Most of the amphetamines, in small doses, have the effect of increasing the frequency of web-building as well as the size, while larger doses adversely affect these areas of the spider's behavior pattern.

In practical application of the "spider test" on humans, small amounts of hallucinogenic drugs in human body fluid have been discovered by injecting the body fluid into the spider and using the web as a means of identifying the drug.

"The kind of record provided by the orb-web-builder is unfortunately not a common phenomenon in behavioral study," Witt said, "and it would be of questionable usefulness to propose similar investigations with other animals."

What is important, Witt concluded, is that "the spider and its web compose a relatively clear system, an instance of complex but measurable biological operation. Successful reconstruction of it would probably be significant as a model for the operation of other behavioral system of whatever complexity."