

**'Matador' with a Radio Stops Wired Bull:
Modified Behavior in Animals Subject of Brain Study**

By John A. Osmundsen
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Afternoon sunlight poured over the high wooden barriers into the ring, as the brave bull bore down on the unarmed "matador"—a scientist who had never faced fighting bull.

But the charging animal's horns never reached the man behind the heavy red cape. Moments before that could happen, Dr. Jose Delgado, the scientist, pressed a button on a small radio transmitter in his hand and the bull braked to a halt.

Then he pressed another button on the transmitter, and the bull obediently turned to the right and trotted away.

The bull was obeying commands in his brain that were being called forth by electrical stimulation—by the radio signals—of certain regions in which fine wires had been painlessly planted the day before.

The experiment, conducted last year in Cordova, Spain, by Dr. Delgado of Yale University's School of Medicine, was probably the most spectacular demonstration ever performed of the deliberate modification of animal behavior through external control of the brain...

He has been working in this field for more than 15 years. Techniques that he and other scientists have recently developed have been refined to the point where, he believes, "a turning point has been reached in the study of the mind."

"I do believe," he said in a recent lecture, "that an understanding of the biological bases of social and antisocial behavior and of mental activities, which for the first time in history can now be explored in a conscious brain, may be of decisive importance in the search for intelligent solutions to some of our present anxieties, frustrations and conflicts."

Dr. Delgado's contention that brain research has reached a stage of refinement where it can contribute to the solution of some ... problems is based he said, on many of his own experiments.

These have shown, he explained, that "functions traditionally related to the psyche, such as friendliness, pleasure or verbal expression, can be induced, modified and inhibited by direct electrical stimulation to the brain."

For example, he has been able to "play" monkeys and cats "like little electronic toys" that yawn, hide, fight, play, mate and go to sleep on command.

With such techniques, Dr. Delgado has shown:

* Monkeys will learn to press a button that sends a stimulus to the brain of an enraged member of the colony and calms it down, indicating that animals can be taught to control other's behavior.

* A monkey, stimulated to extremely aggressive behavior will make "intelligent" attacks only on competitive members of the colony, sparing other, friendlier, ones.

* Monkeys and cats can be triggered into sequential behavior in which one might open its mouth, turn around, walk to a corner, climb a wall, jump down and return to "start," repeating those movement in the same order every time they are stimulated but will modify the pattern if other animals get in the way or if they are threatened.

The latter two experiments show that electrical brain stimulation does not simply evoke automatic responses but reactions that become integrated into the social behavior according to the individual's own personality or temperament, Dr. Delgado said.

Experiments have been conducted on human beings by Dr. Delgado and other scientists, primarily during the treatment of certain types of epilepsy. Stimulation of particular areas of the brain have produced anxiety, profound feelings of friendliness and, in one case, a six-fold increase in word output.

The Yale neurophysiologist believes that techniques such as the one he is using can lead to the discovery of the cerebral basis of anxiety, pleasure, aggression and other mental functions and that "we shall be in a much better position to influence their development and manifestation (in various ways) especially by means of more scientifically programmed education."