

Dr. Delgado who proposes that emotions are composed of a series of fragments, facial expressions, vocal expressions, physiological responses and physical movements.

Any one of these fragments can be evoked by brain stimulation without emotional meaning says Dr. Delgado. Stimulation of one area elicited facial expressions—grimaces, smiles and drooped eyelids, none of which seemed to have emotional meaning for the monkey. Another area provoked loud cries that were again fragments. It was the same with violent running; the animal showed no fear nor did he hide.

Other animals seemed to know the difference between these fragments and real emotions, says Dr. Delgado. An animal could look very threatening to the human eye, but other monkeys showed no response.

There are, however, areas in the brain that integrate these fragments into whole behavior. And at that point, emotions become "very beautiful, well-organized behavior" that utilizes all the animal's stored experience and knowledge. Response can no longer be considered a direct result of stimulation, but varies according to the animal's individual history. ♦

SURGICAL MILESTONE

Spinal Cord Spliced, Paralyzed Patient Starts Recovery

A Toronto general surgeon found himself in an ethical and professional predicament last week because he had announced to a nonprofessional audience what can, if it holds up, be regarded as a major surgical breakthrough—the dramatic and unprecedented rejoining of the severed human spinal cord. He presented a patient during an after-dinner speech, instead of reporting first in a medical journal.

Dr. Gordon Murray, 73-year-old chief of surgery at the Toronto General Hospital, said he did not know reporters were present when he had Bertrand Proulx, 24, of St. Jean de Cherboung, Quebec, wheeled into a fund-raising dinner meeting at the Toronto East General Hospital the week before.

But reporters along with the audience of physicians and laymen cheered as the young farm laborer and one-time quadriplegic raised himself by pulling on weights attached to a bar over his hospital bed. After sitting up, he proceeded to stand with support, then waved his arms.

Young Proulx had been unable to use his arms or legs since he was in an automobile accident four years ago. Last May Dr. Murray cut away the damaged part of the spinal cord near the base of Proulx's neck and rejoined the spliced parts, removing a matching section of the vertebrae to keep the cord from stretching and pulling the sutures loose.

This operation was one of seven such performed by Dr. Murray during the past 18 months—none of which had been reported in technical journals. The situation has left other surgeons nonplussed. Few will comment on work first announced in the popular press. Some are frankly dubious. Others are hopeful but await more definite proof of the operation's success. A Mayo

Clinic neurosurgeon who did not wish to be named said he never expected to perform this kind of operation, which involves cutting through the entire spinal cord and the blood vessels connecting with the brain, although he has removed many tumors from the cord.

The publicity brought Dr. Murray a deluge of communications from families of some of the estimated 125,000 paraplegics, quadriplegics and others with total or partial paralysis.

Dr. John P. Gallagher of Washington, D.C., said he had had an almost immediate call from a young patient who wanted to know if he should make a trip to Toronto for Dr. Murray's operation.

Dr. Murray himself hastened to say he had no wish to raise the hopes of these thousands of paraplegics at this time.

"While the preliminary results are most encouraging," he said, "it will take at least two years or more to reach a final assessment.

"It should be clearly understood that the work presented at the dinner is still highly experimental and in no way reflects a universally acceptable procedure.

"When sufficient data have been obtained the experimental work will be presented to an appropriate medical meeting and published in a medical journal. Only after that time can the work be made available to more than a stringently selected group of patients."

Last week the University of Toronto and the hospital set up scientific protocol for future operations, with Dr. Murray as head of a research team that will select a limited number of patients.

One of the reasons the operation has been considered impossible is that when the spinal cord is cut or crushed, the two ends retract and scar tissue blocks the nerve endings that transmit mes-

sages between brain and body.

Dr. Murray developed his own surgical instrument to curve through bone into the spinal column where scar tissue has formed over the damaged part of the spinal cord.

The six other patients on whom he has performed surgery are all Americans, sent to the Canadian surgeon by U.S. doctors.

In 1965 he reported his experiments in rejoining the spinal cords of rabbits. A team under the direction of Dr. James B. Campbell of the New York University Medical Center has tried to rejoin the spinal cords of cats with some success.

Dr. Campbell, who says he has known Dr. Murray for many years and has great confidence in him, says he believes his present work should get the Nobel Prize. He has sent the Toronto surgeon a telegram of congratulation.

Other surgeons who have attempted rejoining nerve fibers in the human spinal cord have been unsuccessful in getting them to grow back together and become functional.

The next operation Dr. Murray is planning is one that will attempt to rejoin the spinal cord of a man from California who has been paralyzed as the result of a gunshot wound.

The surgeon believes that it is just a matter of time until Bertrand Proulx will walk. He already has some feeling in his legs, and he is able to feed himself and work with his hands in the hospital shop.

GAUGING THE TRICKLE

Soviet Space Efforts Detailed

Information on the Soviet Union's space program trickles out in after-the-fact press releases and other sketchy data. Even from this drought-like flow, however, Westerners manage to gather enough facts to draw a relatively complete picture of Russian activity.

Such a picture was delivered last week to the House Committee on Science and Astronautics. Prepared by Dr. Charles S. Sheldon II, acting chief of the Science Policy Research Division of the Library of Congress, the picture was in the form of a remarkably revealing report, covering in detail Soviet efforts from the start of the Space Age.

The report, *Review of the Soviet Space Program* (35 cents, Superintendent of Documents, Government Printing Office, Washington, D.C. 20402) is a spacewatcher's textbook. Detailed sections describe information sources ranging from a California space company to the British Royal Aircraft Establishment to the United Nations Secretariat. "With effort," says Dr. Sheldon, "one can construct a com-