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 Cherbourg, 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 messages 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-

bined worksheet tabulation with a considerable amount of information about space flights, but no single document gives a complete record."

Dr. Sheldon's report reveals that the Russians have suffered 18 failures of various kinds in 19 attempted planetary probes, though one of them, Zond 3 in 1965, which apparently began as an intended Mars flyby, captured headlines by photographing the dark side of the moon. Nine of the spacecraft never got out of earth orbit; two more never got into it. Half a dozen died of communications breakdown. The only success was the Venus 4 probe, which soft-landed on that planet's surface (SN: 11/4).

The Soviet moon program has been luckier, with nine successes in 17 attempts. Through the end of 1965, there had been only three successful flights (one hard-lander similar to U.S. Ranger spacecraft, and two flybys) out of 11 tries. Last year, however, almost everything seemed to go right. Only one of six attempted missions failed.

That one was not identified by the Russians as a moon attempt. Instead, it was passed off as Cosmos 111, lumped as part of the catch-all Soviet satellite series. It lasted two days in a low orbit around the earth, then fell back through the atmosphere.

The brief stay in orbit, however, provided a clue to its real purpose. The flight came just "at the right time for lunar launches, consistent with other Soviet lunar launches for a soft landing or orbital mission," the report says. Such are the scraps upon which Western observers must base their deductions.

Dr. Sheldon also briefly discusses the possible future of the Soviet manned space program. "There is still a possibility," he says, "that the Russians could run enough tests unmanned that they would be willing to send men around the moon either before or concurrent with the resumed manned flights of Apollo in this country, in the summer of 1968."

Certainly the Russian pace in space has accelerated in recent months. "At the same time that space efforts in the United States appear to be slackening," Dr. Sheldon says, "the pace of Soviet space flight has picked up by about 60 percent this year."

Military space-watchers have more information available than their civilian counterparts, such as detailed radar tracking reports on the individual signatures of Soviet spacecraft. Why, then, is a civilian report necessary for Congress? "This report," says Dr. Sheldon, "is intended to navigate its way between the rocks of security information which must be protected on the one side, and the shoals of inaccurate speculation and misinformation on the other."

EFFICIENCY IN HEALTH

A National Campaign to Prevent Catastrophes

The staggering cost of medical care and the difficulties patients face in getting any care at all are hardly new. Hospital authorities, health insurance agencies and Federal officials frequently recount the fact that medical costs in the United States rose from $12.9 billion to $36.8 billion between 1950 and 1964—an increase of 186 percent. Expenses will climb another 140 percent by 1975.

Paradoxically, while the numbers both of physicians and hospital beds rise faster than the population, the availability and quality of care decline.

Patients spend long hours in waiting rooms only to receive quick, cursory care. Fewer and fewer persons have the attention of family physicians—98 percent of all medical school graduates choose specialities instead of general practice. Experts estimate that 40 to 70 percent of hospital care is less than optimal.

Standard answers have been to increase the numbers of physicians, dentists and nurses as well as hospital beds by pouring more money into school and hospital expansion. But last week a White House panel—the National Advisory Commission on Health Manpower—declared that this line of attack will not work unless the basic system of health care and the methods of paying for it are drastically revised.

J. Irwin Miller, chairman of the Commission, which President Johnson appointed in May 1966, says that from 1950 to the mid-1960s the nation's health system had problems to correct. "Now," he stresses, "we have catastrophes to prevent."

The 15-man Commission, Miller observes, began its work expecting to come out with recommendations for more manpower and more beds. But it changed its thinking as soon as the members got a good look at the glaring inadequacies.

The Commission finds that, in health care, the nation needs greater efficiency and higher quality. To achieve them it urges drastic revision in methods of paying for medicine—a system of economic incentives that will reward well-run, high-quality institutions and cost the laggers money.

It takes its cue from the successful experience of the Kaiser Foundation's Hospitals in California, which provide care to 1.5 million persons on a prepaid instead of cost-plus basis. Stressing that it sees no value in a master Federal plan to assume control of health services, the Commission believes economic incentives will induce the private sector to do the job, a notion likely to draw strong political support, and fire.

Even before the Commission reported, Representative Wilbur Mills (D-Ark.), chairman of the tax-writing Ways and Means Committee, declared, "I do not want to see Government intrude more into this (health) process. I believe we can depend on hospitals to exercise the restraint and good judgment necessary to meet the problems."

Under the Kaiser plan in California and other prepaid plans, the administering agency agrees to provide comprehensive care for a fixed sum of money. If inefficiency, profligate utilization of hospital beds and high fees cost the hospital more than the fixed sum, it loses. Between 1960 and 1965, while nationwide private bills jumped 40 percent, Kaiser's costs rose only 19 percent, according to Dr. Peter Bing, executive director of the Commission. And, Dr. Bing says, Kaiser has been able to obtain adequate funds from private sources for expansion.

When payment is made on a cost-plus basis, as it is for Medicare, Blue Cross and other private groups, the hospital or doctor provides his services and the funding source pays the bill whatever it is. Under this system, Dr. Bing says, inefficiency and high costs are fostered rather than discouraged. Hospitals receiving Medicare payments recover their full costs plus an additional two percent capital for future investment or expansion. Therefore, it makes two dollars for every $100 it charges and six dollars for every $300. "It actually pays the hospitals to charge more," Dr. Bing points out.

Anticipating the accusation that the economic incentive of the prepaid plans could merely foster lower quality, the Commission recommends a system in which review boards of medical leaders would constantly survey and evaluate quality. High-quality hospitals would be paid more than low-quality ones.

"Ideally," Dr. Bing says, "there should be an objective measure of quality but until such standards can be worked out, the subjective system of peer review is better than nothing at all."

If the Commission's recommendations are accepted, they could mean an eventual change in the Medicare legislation, but that does not appear likely for some time. It is difficult to assess what impact the report will have. President Johnson says it is required reading for all Cabinet members and