A MAN AND HIS SCIENCE

Building on Pavlov

For 40 years a Baltimore neurophysiologist has been bucking the main stream of American psychiatric opinion.

by Patrica McBroom

A bell sounds, the heart races; electric current courses through the body. It is an experiment in classical conditioning, one of thousands that have been performed at the Pavlovian Laboratory in Baltimore over the past 40 years.

The experiments have proved a central fact about the heart: it is emotionally unstable.

They have also proved a fact about Pavlovian Dr. W. Horsley Gantt: he's a tough-minded experimental scientist who has spent 40 years bucking the mainstream of American psychiatric opinion.

Every schoolboy knows about Pavlov and his classic experiments in the conditioning of dogs to salivate in response to a signal.

But it is not so well known—or appreciated—that systems as complicated as the human circulation can also be conditioned, or that complicated emotional disorders can be considered in Pavlovian terms.

The cardiovascular system for example adapts poorly to the stresses of living and can readily be pushed into permanent imbalance, explains Dr. Gantt. A single episode—shock or traumatic emotional experience—may produce permanent heart changes that linger in the central nervous system as a source of excitation or a trace of pathology. This source then becomes capable of disturbing the body physically and mentally, long after its original usefulness is past.

Dr. Gantt's theories—this one is called autokinesis—are based upon years of research with dogs and the classical Pavlovian method. Few other Americans have studied the conditioned reflex so exhaustively; Dr. Gantt is something of an exception among students of psychology.

He has been fighting uphill to establish the validity of the Pavlovian approach ever since he introduced it from Russia in the early 30's.

But U.S. psychologists and psychiatrists, preoccupied with Freud, have cared little for Pavlov, the Russian Nobelist. His conditioned reflex, they say, is too meager an explanation for the complexities of human nature.

Dr. Gantt's work, however, has taken Pavlovian concepts far beyond their original mechanistic rigidity. The theory of autokinesis, for example, is closer to Freud than to Pavlov in that it denies that men are controlled by the external facts of their lives.

It holds that visceral reactions, once established through conditioning, persist and may even become worse. This focus of "latent excitation" is capable of acting independently of additional external influences to keep the heart internally stimulated and out of balance. Not only can it act on its own, but it may draw in other organs, such as the liver. So the man who wakes up in the morning with a pounding heart and distressed liver is not out of shape because of his surroundings, but because of his own inner changes.

This all begins to resemble Freud's theory of the repressed childhood experience, which, stored in the subconscious, pollutes conscious behavior.

There is a similarity, says Dr. Gantt, but whereas Freud lacked laboratory evidence to back up his theories, the Pavlovian work on dogs has established the reality of lingering visceral pathology. Conversely, autokinesis may work for the good of the organism if the original conditioning was beneficial rather than harmful.

Disaffection with Freudian writings led Dr. Gantt to Russia in the early 20's. He had taken his degree from the University of Virginia Medical School, intending to enter neurology and psychiatry. "But I saw so much confusion; I couldn't see that Freud led anywhere," and Dr. Gantt switched to treating digestive diseases.

In 1922, he went with the American Relief Administration to Russia, never having heard of the conditioned reflex. There he met Ivan Petrovich Pavlov and was so impressed with the man's methods he decided to stay and learn. That, however, proved difficult.

Once the American relief work was done, the Soviet Government accused its members of spying and requested that they clear out. Dr. Gantt landed at University College in London where he continued to apply for readmission to Russia. More than a year later, his request was granted and Dr. Gantt returned to spend four and a half years with Pavlov.

Pavlov never lost a chance to challenge the Communist regime, says Dr. Gantt. He always waited until an official was around before he let out his worst barbs against the regime and on one occasion would not even let a government minister, his own superior, in the door.

During the years of famine, Pavlov lived on a piece of fish twice a week and

Werner Wolff, Black Star

Dr. Gantt studies conditioned reflex.

half a loaf of bread a day. Lenin offered him all the food he wanted, which Pavlov refused unless his collaborators should get equal privileges. Lenin retracted; Pavlov went hungry.

Dr. Gantt, coming at the tail end of the femine, experienced his own deprivation. "But I was raised in rugged surroundings," says Dr. Gantt.

Judging from his exhuberant physical condition now at the age of 74, that training has stood him in good stead. Dr. Gantt runs two laboratories, one at Johns Hopkins University; the other at the Veteran's Administration Hospital in Perry Point, Md. He swims in the Chesapeake Bay during the dead of winter for the pleasure of it and has hiked mountains since a child.

Born in Nelson County, Va.—its population is now 4,000 less than in 1825—Dr. Gantt comes from a distin-

quished family that included the American novelist, James Branch Cabell and according to legend an Indian princess. The Civil War impoverished the family and Dr. Gantt was educated by his mother in a one-room, wood-heated schoolhouse.

Since he opened his Pavlovian Laboratory in 1932 at the invitation of the late Adolf Meyer, well-known psychiatrist from Johns Hopkins, Dr. Gantt's research has led away from simple reflexology.

Pavlov considered that the conditioned reflex always acts as a balancing mechanism—a means by which the organism maintains equilibrium in the face of its environment. By contrast, Dr. Gantt has found that body systems react differently to conditioning. Some, such as the heart, can be thrown off balance by conditioning. He terms this characteristic "schizokinesis." How many systems are so susceptible to environmental stress in not known. Dr. Gantt is now charting the action of the kidney.

Another curious phenomena goes under the name "effect of person." Petting a dog can lower its heart rate by half, even while the animal is experiencing an electric shock, says Dr. Gantt. The mere presence of a human in the room may have the same effect.

Throughout nature this effect of person can be seen, he says "Freud gave it names like mother transference, but I don't believe it is that all the time." The beneficial impact of one individual on another may simply be the effect of person.

Asked how far the body-mind relationship can be taken, Dr. Gantt says he believes there is an unbridgeable chasm between the two. Some mental effects may never be objectively measured in the brain or the body, since "living organisms are more delicate than any instrument ever made."

The energy that produces mentality, emotions and consciousness could be so low that it cannot be measured even theoretically.

"Pavlov says we should talk only by measurements—that we should stay on the purely objective level. There is reason to believe from my work that the objective does not measure everything. If you want to regulate habits, change gastric secretion, we are learning how to do it. But you should know that you are not really dealing on the subjective level with the emotional and intellectual experiences of an individual. The two should not be confused. The mind can never be equated with any physical measurement. It can be correlated, but whether it can always be correlated in every detail is an open question."

ORBITAL ASTRONOMY

OAO Gets a New Look

"The Orbiting Astronomical Observatory," says Congressman Joseph E. Karth, chairman of the House Sub-committee on Space Science and Applications, "has probably been the least successful of all the unmanned space flight programs."

NASA

OAO-2: better luck this time.

More than three years behind time when it finally got off the ground on April 8, 1966, OAO-1 lasted less than two days before going on the blink. With the aid of some skillful scientific doctoring, however, the program may be back on the road to recovery. And astronomers may get an unprecedented look at the universe.

Project officials at the National Aeronautics and Space Administration's Goddard Space Flight Center and Grumman Aircraft Engineering Corp., prime OAO contractor, have started on a series of major spacecraft changes which they hope will permit future OAO's to reap the program's vast potential scientific harvest.

OAO-1's key problem was with the device that controlled the charge and discharge sequences of the satellite's batteries, allowing them to overheat until they failed. This unit is being extensively redesigned. Another trouble spot was in the satellite's star trackers, optical devices that enabled it to aim its instruments at different parts of the sky with great precision. The trackers built up an electric charge which, in the vacuum of space, allowed them to arc like fluorescent lights, knocking out delicate telemetry equipment. Called a corona discharge, this phenomenon will also be eliminated in future flights.

On OAO-2, the battery sequencer will be changed to connect each spacecraft battery in parallel, while still permitting the device to sense the condition of each battery and charge them individually.

Besides star-tracking, arc-proofing and improved stabilization, other changes being made include expanded command memory, logic changes, addition of a tape recorder for expanded data storage, backup telemetry to prevent data loss due to shorts and expanded ground monitoring displays.

The number of people assigned to the OAO program has nearly doubled since OAO-1 failed.

Now scheduled to blast off in July 1968, OAO-2 will carry a Smithsonian Astrophysical Observatory experiment utilizing four telescopes equipped with photometers to map the sky in the ultraviolet range. A University of Wisconsin experiment, also flown on OAO-1, will include one 16-inch and four eight-inch ultraviolet telescopes and two ultraviolet spectrometers (see p. 504).

OAO-3, scheduled for a 1969 launch, will carry a Goddard 38-inch-aperature telescope to obtain ultraviolet spectral data on stars, nebulae and galaxies with a resolution down to two angstroms.

OAO-4, to be launched in 1970, will fly a 32-inch reflecting telescope for Princeton University to study the composition of interstellar material and to obtain high-dispersion ultraviolet spectra of stars with resolutions down to 0.1 angstrom. Other OAO-4 telescopes will study the X-ray emission of stars and nebulae.

"We visualize the OAO not as a program which will be completed at the end of these three approved missions, but as a program which will continue to be the backbone of the NASA space astronomy program for years to come," says NASA space science chief Homer E. Newell.

As a supplement to the OAO program, NASA last week announced plans to build a $9 million Small Astronomy Satellite for launch in 1969 to map stars emitting X-rays. Data from the SAS could lead to the selection of the more interesting radiation sources which could be studied in detail by more sophisticated spacecraft.

Two prime sources of X-ray energy are the Crab Nebulae, which is the remnant of an exploded star, and the constellation Scorpio. X-ray emissions from Scorpio have been found to be at least half as strong as the sun.