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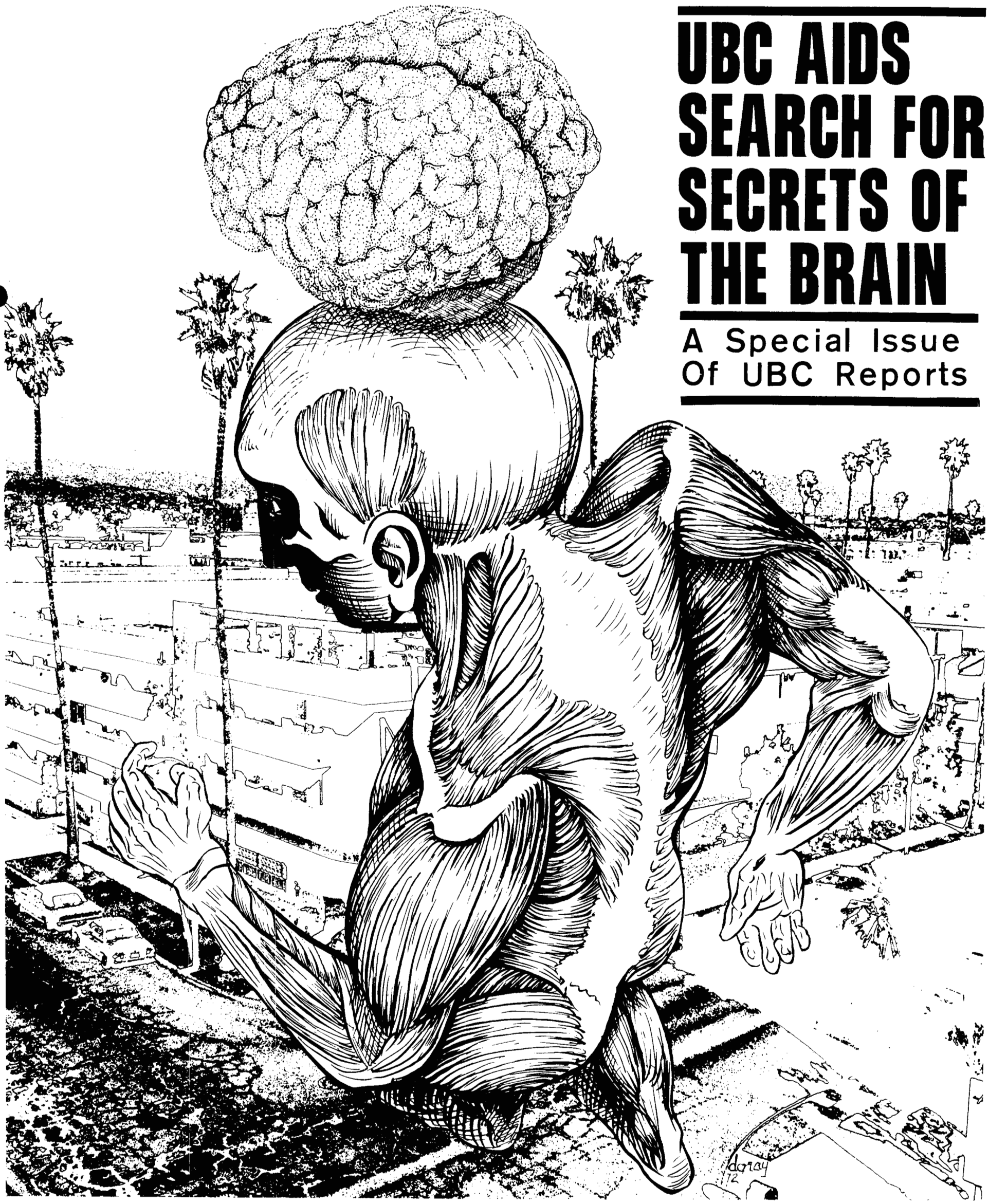
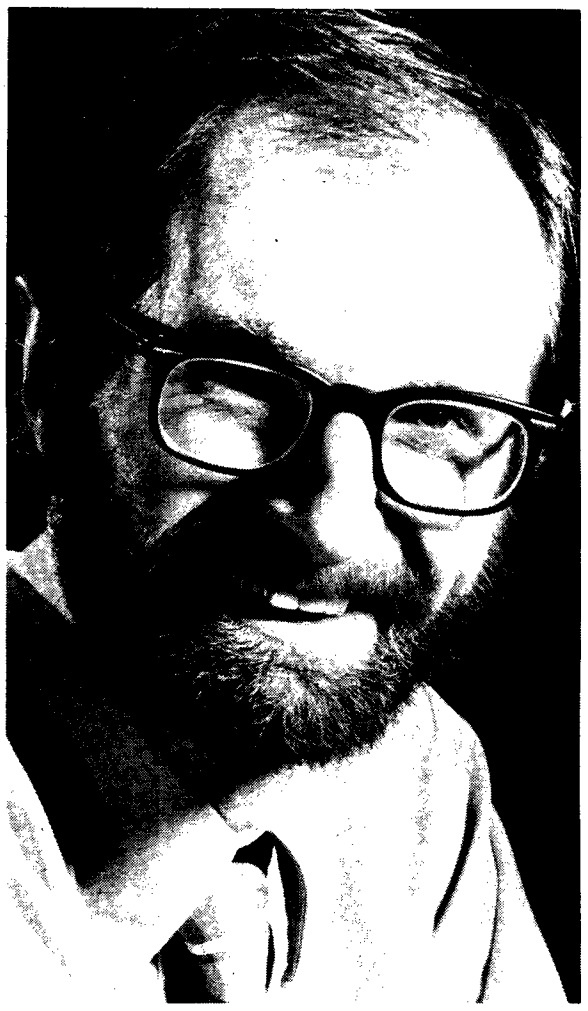
UBC AIDS SEARCH FOR SECRETS OF THE BRAIN

A Special Issue Of UBC Reports





Picture by UBC Photo Department

PETER THOMPSON

Special Issue on Brain Research

Almost all of this issue of *UBC Reports* is the work of UBC's assistant information officer, Mr. Peter Thompson, who spent the best part of a year interviewing UBC scientists who are involved in brain research.

Mr. Thompson, who specializes in reporting medicine and science, was faced with an embarrassment of riches in compiling material for this special issue.

Brain research, he found, was being carried out in a multitude of UBC departments in the Faculties of Medicine, Science, Agricultural Sciences and Arts by neurologists, geneticists, physiologists, neuro-pharmacologists, anatomists, neuro-chemists, psychologists, biochemists, neuro-surgeons . . . the list goes on and on.

The articles beginning on this page and continuing to Page Eleven represent only a fraction of the total brain research carried out at UBC. Because of space limitations, work in the Departments of Pharmacology, Physiology, Pediatrics, and Psychology and others had to be left out.

Summarizing his work on the articles, Mr. Thompson said: "As a result of research on the brain being carried out at UBC and elsewhere, our understanding of that all-important organ is emerging from the darkness of ignorance into the dawn of understanding.

"Our increasing understanding of the brain is reflected in human attitudes toward it. For some people it remains an austere, even inhuman, organ. But for more and more people the appearance and functions of the brain are becoming commonplace familiarities.

"In large measure this is the result of the recent spurt of scientific discoveries by researchers in laboratories around the world."

* * *

UBC Reports is grateful to the many medical scientists who took time out from busy schedules to assist in making this issue possible. We are especially grateful to the Department of Medical Illustration in the Faculty of Medicine for the line drawings and some of the photographs used to illustrate the articles and to the photo department of the campus Instructional Media Centre for their contribution.

The brain has held a fascination for mankind since the dawn of human history. The oldest surgical operation we have any record of is that of trephining or cutting a hole in the skull to release evil spirits. The illustration at right from a medieval manuscript shows a physician making an incision in the scalp prior to piercing the skull. The operation, which is still carried out in Africa, was not always a failure. Skulls have been found which clearly show that holes made in the trephining operation healed over. As western medicine advanced, the idea of grace and sin as a source of sanity and madness gave way to the concept of health and disease. In recent years psychiatric analysis came into vogue, characterized by the image of the psychiatrist making copious notes of his patient's experiences. A more contemporary way of dealing with emotional problems is through sensitivity or T-groups, which sometimes involve direct human contact, as illustrated at far right. Since the end of the Second World War, a new breed of neuro-scientist has attempted to explain the mind in physical terms. The basic unit of their work is the kite-shaped neuron, shown in the illustration at centre right. The human brain contains between 10 and 1,000 billion neurons.

YOUR BRAIN IS

Brains, even the healthiest, suffer from megalomania. They have an over-inflated idea of their own worth. They live out a warped delusion that everything lies in their shadow.

Now that sounds a bit much, doesn't it, even today when it's fashionable for some psychiatrists to tear at their own entrails, wondering whether they're not mad and their patients sane. How can anyone glibly say that a sane brain can be a megalomaniac?

How? Just think about brains for a minute. Think of your own brain.

Your brain never or seldom thinks of itself as an object, as a physical organ. You seldom catch your brain thinking about itself, lying there like three pounds of cold porridge behind your face.

Your brain will let you think about your feet, arms, head, genitals, teeth, even about your heart and the veins inside your hand. But seldom will it let you think about itself. It tries to exclude itself from consideration.

Even in terms of the important questions of life, love and death, your brain deceives you. When you have a strong feeling of love or revulsion, something may happen in your chest or gut, and you identify love with your heart and revulsion with a queasy stomach, even though you know that what you are feeling has to do with your brain.

THINKS OF DEATH

When your brain thinks of death it might imagine that your heart stops, you stop breathing, you don't see or hear anything anymore and you decay.

Such a thought is horrible. But it's a horror your brain can handle because of a subtle, unconscious delusion that it is somehow unaffected. For your brain to think of death not as the death of your heart or lungs or other parts of your body but as the death of your brain itself is for some to flirt with naked terror.

Try it. Make your brain think of your death as the extinction of itself. You can't because it's impossible to think of nothing, to think of what it would be like not to think. Oh, you can imagine nothingness similar to the darkness of sleep. But you can't imagine it for more than a few seconds because your brain is in constant activity, receiving inputs and generating responses.

So, you see, your brain is forever deceiving you.

There are probably sound reasons for this. Your brain really doesn't have much information about itself. It can't see itself. It doesn't have a beat like your heart. It has no sensation of itself at all.

You will never be able to feel your brain. Headaches usually aren't caused by something wrong with your brain but most commonly by dilation and contraction of the blood vessels in your head. The squeezing of the vessel walls is what causes the pain.

If you could anesthetize your scalp and skull, cut through them and plunge a scalpel into your unanesthetized brain, you wouldn't feel a thing.

Apart from no visceral knowledge of itself, your brain still doesn't have much scientific knowledge about itself either.

The brain has always been and is even today associated with the occult and unknown. Historically, madness involved the supernatural. Victims were possessed by demons or divinity. The oldest surgical operation we have any record of is *trephining*, cutting a hole in the skull with a sharp stone to let out evil spirits.

As Western medicine advanced, the idea of grace and sin as the source of sanity or madness gave way to the concept of health and disease. The mentally ill were treated by physicians rather than by the clergy on the assumption that the victims were diseased, though even today no trace of physical disease can be found in the brains of many people who are emotionally ill.

Unable to find a physical cause of many forms of mental illness, therapists at the beginning of this century put forward a variety of theories on the origins of madness. Analysis came into fashion. Psychiatrists relied on religious sources, early sexual experiences, social dynamics, literature, music, art, symbolism, existential philosophy and Marxist theory in their work.

Today, analysis is falling from favor. It has been the prerogative of the rich and it takes too long to be an attractive solution to emotional problems. It is partly for these reasons that less expensive group sessions have become popular — sensitivity groups, T-groups and others that make up the human potential movement.

At a time when analysis is waning, one of its most popular new lights is challenging some of its basic assumptions. Scottish psychiatrist R.D. Laing says that what society takes as "normality" is a half-mad reconciliation of the personality to a world that is insane. Psychiatry, he suggests, is a form of sociology. If you're different or you differ, your community will tell

FOREVER DECEIVING YOU

you you're nuts. But if the patient is sane, what does this say for the psychiatrist?

It shouldn't be taken as evidence that Laing is right that many psychiatrists think he's crazy.

Another reason for the decline of analysis is that the mind is no longer the exclusive domain of psychiatry. A new breed of neuro-scientists — neuro-anatomists, neuro-physiologists, neuro-chemists, neuro-pharmacologists — are trying to explain the mind in physical terms. Many of the advances in the treatment of mental disease since the Second World War belong to them.

MAJOR ADVANCES

Major advances in brain chemistry are reflected in the obsession with the mind that many young people have, who were born during the period the discoveries were made. If the music of the older generation equated love with the heart in a banal way, popular music today revolves around the brain — "... that keeps you on the backroads by the rivers of my memory, and keeps you ever gentle on my mind ..." The mind and its associations are repeated almost endlessly in dozens of ballads.

Preoccupation with the mind shows no sign of slackening. The brain is now a journalistic vogue. Many of the new brain scientists are convinced that brain research will be the fashionable area of medicine in the coming decade. We may have brain institutes, a Brain Month, Brain Sunday, and door-to-door drives for brain research and education just as there are now for the heart.

The ambition of neuro-scientists is to answer the ultimate scientific question. As long as science has existed man has been fascinated by the possibility of some day being able to match mysterious physical activities in the brain with mental events such as memory, color, creativity, sadness, madness, joy. He has wondered what brain changes correspond to, say, the smell of the sea, or the memory of the smell of the sea.

What happens in the brain when man thinks of immortality or is overcome with a rage to kill? Are there physical changes in the brain associated with murder or the idea of divinity? What weird alignment of atoms makes a man think he's Napoleon? When the mind thinks, what strange motion flows through the brain, moving like electronic music up cul-de-sacs, returning, and eventually coming up with something or nothing at all?

This isn't to go into the tedium and profundity of the philosophical argument between mechanical determinism of the brain and the free will of the mind, nor the contradiction — if there is one — of creatures living in both a physical and mental condition at the same time.

Nor are neuro-scientists crass materialists because they prefer to work with what can be measured. Matter and energy are interchangeable. So, some of them might muse, are the brain and mind.

It's just that many neuro-scientists believe that every mental event, whether conscious or unconscious, can be theoretically reduced to a physical process or mechanism.

Many if not all of the emotional diseases now hounding man are "molecular" diseases, they believe, caused by some biochemical misadventure, an inborn error of metabolism or some other complex but wholly unromantic cause.

If some of these diseases have an environmental component — say a miserable childhood, incest, poverty, or an unbearable spouse — the effects will manifest themselves physically somewhere in the brain, they say.

They point to two celebrated examples, phenylketonuria (PKU) and syphilis. The percentage of first admissions to mental institutions in the United States as a result of the ravages of syphilis was eight per cent in the early 1920s. Modern treatment and prevention of venereal disease cut first admissions from this cause to about one per cent in the early 60s.

PKU is a congenital disease. Victims can't produce an enzyme needed in the metabolism of a certain breakdown product of food. The missing enzymatic link results in a build-up in the body of a chemical that can lead to mental deficiency.

Many PKU victims used to be diagnosed as schizophrenics. Today they are treated with nothing more occult than a special diet to short-circuit the enzyme deficiency; diet, the same form of treatment given those of us with such mundane complaints as obesity and ulcers.

The man who gave PKU its name — Dr. J.H. Quastel — and the man who designed its first successful treatment — Dr. Louis Woolf — are now scientists at UBC.

The basic unit of the neuro-scientist's work is usually the brain cell, one of the 1,000 billion or so neurons that make up the brain. Neurons undergo many of the same chemical reactions that cells do in other parts of the body. Under the microscope they look similar.

Yet somehow they have a property no other cells possess. They are the home of the mind. "Were it not for the brain," says Sir John Eccles, distinguished visiting professor to the University of B.C.'s Division of Neurological Sciences, "the drama of the universe would be played before empty stalls."

A typical neuron looks like an old-fashioned, four-cornered kite. The kite's tail is its axon. It's from the axon that electrical impulses travelling through the neuron pass to the next neuron. From the remaining corners of the kite — there may be many more than three — stretch the neuron's antennae called dendrites for receiving impulses from other neurons. The dendrites from each corner divide like the roots of a tree, forming thousands of branches.

The dendrites of a neuron are connected to roots from the axon of another so that neurons are interconnected with each other. These connections are called synapses. It has been estimated that a neuron can have as many as 50,000 synapses attached to it so that the various paths open to a signal travelling through even a small number of neurons are mathematically staggering.

CHEMICALS RELEASED

When an electrical impulse travelling through a neuron arrives at a synapse it's too weak to cross over to the next neuron. Instead it releases chemicals at the base of the axon which carry the impulse across the gap into the other neuron. These chemical transmitters can carry the impulse across the synaptic gap as often as once every 1/1,000th of a second and the impulse can travel through thousands of neurons making up a bundle of nerve fibres at speeds up to 200 miles per hour.

The discovery and manipulation of these neuro-transmitters coincides with major scientific advances into the mystery of the mind.

One breakthrough came in 1943 when Swiss chemist

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DECEPTION

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Albert Hofmann accidentally swallowed LSD. In his famous description of his first "high," Hofmann said that objects and his colleagues appeared to undergo optical change. He went home and went to bed. "With my eyes closed fantastic pictures of extraordinary plasticity and intensive color seemed to surge toward me."

Later the neuro-transmitter "serotonin" was discovered and LSD was found to cancel out the effects of the transmitter in the brain. Researchers began to wonder if this was the explanation of LSD's hallucinogenic effect. Since some aspects of an LSD high are similar to psychosis, they wondered if turning off the effect of serotonin was part of the biochemical basis of madness.

Then, in the early 50s, a scientist discovered that reserpine, a drug used for many years for treating high blood pressure but which also tranquillized some patients and sank some into deep depression, depleted serotonin levels in the brain.

Two years later another drug, iproniazid, used for treating tuberculosis, was discovered to increase serotonin levels in the brain. It also relieved some patients from depression.

At last, simply by studying the side-effects of two drugs, researchers had two chemicals that produced opposite emotions and science had a tiny toe hold on the mind. Reserpine, the chemical that gave birth to the term tranquillizer, and iproniazid boosted or decreased the levels of a neuro-transmitter and brought on either depression or hyperactivity.

Serotonin was added to the two already known neuro-transmitters noradrenaline and acetylcholine. Dopamine and GABA were discovered later.

These five neuro-transmitters — there may be thousands more yet undiscovered — may never be household words but they will come close to it. Speed, LSD, L-dopa, amphetamines, tranquillizers and other chemicals that somehow manipulate neuro-transmitters have entered into our everyday vocabulary. They are our new generation of psychological jargon, jousting with older terms such as neurotic, compulsive, fixation, regressive and narcissistic.

LEVELS AFFECTED

Reserpine marked the beginning of a revolution in psychiatry. It affects not only the level of serotonin in the brain but the levels of dopamine and noradrenaline as well, removing the transmitters from their synaptic vesicles or reservoirs at the end of the axons so that smaller amounts are available to cross the synapse and trigger the next neuron.

The result is profound tranquillization. This allowed psychiatrists to treat many patients effectively for the first time.

"Other tranquillizers followed reserpine and for the first time in history the populations of mental hospitals began to go down," said Dr. Patrick McGeer, head of UBC's Division of Neurological Sciences.

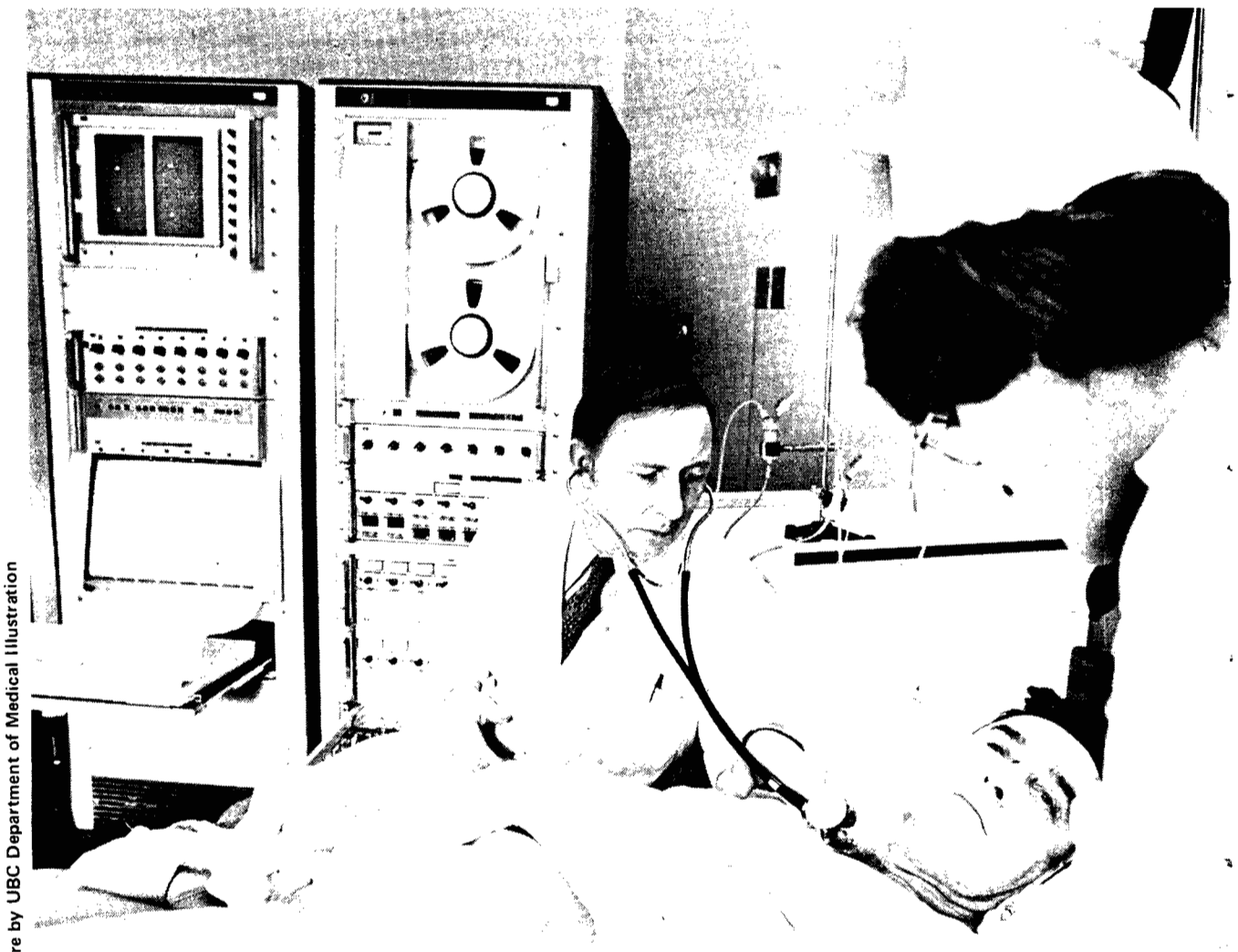
"Medicine's attitude toward mental illness changed. So did the public's and the patient's. You didn't have to take them into the country and lock them up. It became possible to treat them at an earlier stage of their illness.

"Today you never see a classical case of lobar pneumonia. It's treated with antibiotics before it ever gets to that stage. It's a clinical curiosity.

"The same is true of mental illness. The day is gone when you can walk into the back ward of a mental hospital and take your pick of a dozen catatonic schizophrenics."

The new drugs make patients accessible to treatment. But in spite of these new medications, half of all hospital beds in Canada today are for the emotionally ill.

Yet mental illness isn't the whole story of the diseases that lie in wait for the brain. As a physical organ, the brain is liable to many of the ailments common to other parts of the body and then some. The majority of Canadians who will die of brain illness this year have never been diagnosed as emotionally ill. They'll succumb to "physical" disease in the purest sense. Many of those who'll survive will be impaired, slightly or completely. The greater the physical paralysis the heavier will be the burden on society, the family and the victim himself. Who's to choose between mental and physical paralysis? The prospect of lying motionless, speechless and fully conscious for 20 years, or half a century, in an institution, completely dependent on others until your life-span runs out, might make insanity appear to be an attractive alternative.



Picture by UBC Department of Medical Illustration

Two University of B.C. researchers who are concerned with treating people who suffer from strokes are Dr. Vincent Sweeney, above, of the Division of Neurology, and Dr. S.J. Peerless, pictured on the opposite page, of the Division of Neurosurgery. Dr. Sweeney has establish[illegible]n

CLUES SOUGHT FOR

The brain is exquisitely dependent on the blood vessels that feed it. Metabolism in the brain — the biochemical breakdown and reconstruction of substances, with the release of energy — relies completely on a continuous supply of oxygen and glucose, a type of sugar the body uses as a fuel.

Metabolism in many other parts of the body doesn't dangle on the single thread of oxygen and glucose but can use other substances as a source of energy. And many other organs keep an emergency reservoir of glucose, oxygen and other metabolic compounds on hand.

Not so the brain. It has no reservoir of oxygen and little of glucose. Nature has tried to compensate for this folly by giving the brain a generous blood supply. No less than four major arteries — the two carotid and two vertebral — suffuse the brain with a constant supply of blood.

Not content with a large blood supply, nature has added collateral circulation. The four arteries are joined in their network so that if one system is damaged, blood to that area of the brain may be supplied from the other arteries.

DAMAGE OCCURS

Unfortunately, even collateral circulation often isn't enough to keep the brain going after an artery has packed up. If blood supply to vital parts of the brain is shut off, permanent brain damage occurs after four to six minutes.

So the brain is a flower dependent on a stem of four arteries for nourishment. Disturb the stem and the petals wither. Seriously damage the stem and the flower dies. It isn't surprising that cerebral vascular disease — disturbance in the brain's blood supply — is the most common brain disease in the adult population.

These diseases bring on strokes, the third largest cause of death in Canada after cardiovascular diseases affecting the heart and its blood vessels and all forms of cancer.

A stroke is a sudden loss of brain function. The commonest cause is blockage of the arteries by a blood clot. If the clot forms somewhere else in the body and floats through the blood stream until it lodges in the cerebral arteries, it's called an embolism. If the clot forms where the blockage occurs, the block is a thrombosis.

Arteriosclerosis or hardening and narrowing of the arteries is the major cause of thrombosis. The disease is common in industrialized countries and in many cases appears to begin as early as the late teens. It ususally isn't confined to one area of the body. The coronary arteries feeding the heart itself with life-sustaining blood are attacked by arteriosclerosis. A blood clot formed in one of the narrow coronary arteries, cutting off all blood supply, is the mechanism behind coronary thrombosis.

The cause of arteriosclerosis is unknown.

A thrombus that brings on a stroke is usually in the large arteries in the neck and usually forms when the victim is quiet, resting after a meal or while asleep.

Embolisms may be more critical. They tend to blo[illegible] a specific part of the cerebral vascular system, causi[illegible] paralysis. A form of prevention for both embolisms and thromboses are anti-coagulant drugs that interfere with the normal clotting mechanism of blood.

Less common than a cerebral artery blocked by a thrombus or embolism are strokes caused by an arterial blow-out, rupture of the artery wall and damage to the brain by hemorrhage. The ruptures can be either inside the brain itself or just outside and below the brain.

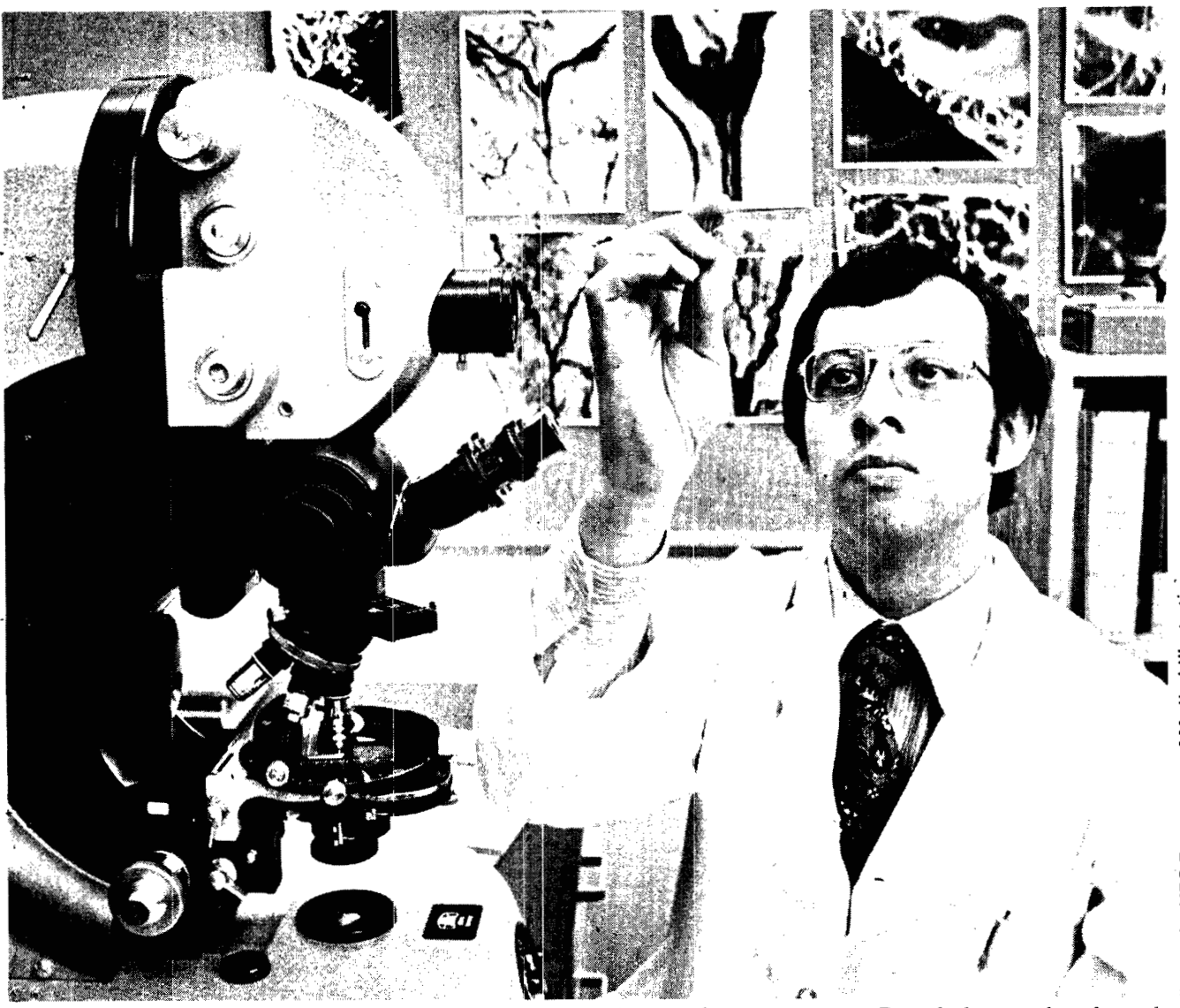
Hypertension is the disease behind the rupture of arteries within the brain itself. Hypertension is continued, abnormally high blood pressure against the inner walls of the arteries of the body. The disease affects 10 per cent of the population. Its cause is unknown.

An arterial blow-out at the base of the brain is usually caused by an aneurysm, a bulge in a weak spot along the arterial wall that finally bursts. Doctors think the weakness is congenital — present at birth — and further worsens with age. Though hypertension and aneurysms can occur in various parts of the body, the arteries feeding the brain are especially susceptible to them.

It was strokes brought on by ruptured aneurysms that earned the name apoplexy. Blood gathers in a pool at the base of the brain. Victims often drop to the ground as if shot but seldom die suddenly.

Since motor and sensory nerves from the left side of the brain cross over at the entrance to the spinal column and control movement on the right side of the body, brain damage through hemorrhage to the left side of the brain affects the right side of the body and vice versa. The speech centre is usually located on the left side of the brain in right-handed people, so damage to the left side of the brain could result in a right-handed person being unable to speak or read though it may leave a left-handed person with speech intact.

Arteries tend to burst during or shortly after some activity that increases the flow or pressure of blood through the circulatory system. If the hemorrhage is



Picture by UBC Department of Medical Illustration

intensive care unit for stroke victims at the Vancouver General Hospital, while Dr. Peerless is concerned with the surgical procedures developed for stroke operations. Detailed records of stroke operations have pinpointed several factors which jeopardize results of such operations.

CAUSE OF STROKES

small, brain function may be recovered, though the threat of further rupture will always be present.

There are often warning signs of an impending stroke caused by thrombosis. Few signs precede a stroke brought on by a hemorrhage or embolism. If you feel a numbness in a leg or arm, have difficulty thinking clearly or have blurred vision or dizziness, you may be experiencing the warnings of an imminent stroke, probably caused by thrombosis. If this feeling lasts from a few seconds to 24 hours and clears up without any side effects, you may have had a "transient ischemic attack." Part of your brain was temporarily deprived of its normal supply of blood. If the feeling lasts longer, you've had a stroke.

LITTLE KNOWN

Little is known of the cause of interference with the brain's blood supply or the consequences. Dr. Vincent Sweeney of UBC's Division of Neurology set up a four-bed cerebral vascular intensive care unit for stroke patients at the Vancouver General Hospital in the fall of 1971 to try to find out.

In a search for clues, equipment in the unit measures the parameters of each victim's condition. Blood chemistry, pressure, pulse, breathing and other factors are recorded. Continuous electroencephalograms or recordings of the brain's electrical activity are made. If a patient has another stroke at, say, three in the morning, researchers will be able to study the readings immediately prior to three o'clock for clues. They may discover a pattern that could serve as a warning of an impending stroke in the future. All the data recorded will be fed into a computer for analysis. When warning signals have been discovered, the computer will be programmed to give instant warning of an impending attack.

All this, of course, is old hat in the treatment of heart attacks. Dr. Sweeney's unit is really a cerebral version of coronary care units that have been available in North America since the early 1960s, units which make detailed recordings of the body functions of heart attack victims so that instant treatment can be given when something goes wrong or threatens to go wrong. Patients entering coronary care units today have twice as good a chance of surviving their heart attack as they would if the units weren't available.

The reason why cerebral vascular intensive care units are only now being established is society's apathetic attitude towards cerebral and mental disease. Up until recently the possibility of understanding the brain, and so of being able to repair what can happen to it, has seemed remote and perhaps unattainable.

Among the things Dr. Sweeney wants to find out at the unit are the factors determining whether stroke victims die or survive, and if they survive whether they have severe paralysis or little impairment.

"A stroke can lead you into a vicious circle," he said. "Let's say a person has advanced arteriosclerosis and eventually a blood clot forms causing a thrombosis, cutting off blood supply to parts of the brain controlling breathing and heart action.

"With breathing and heart rate down, the body's ability to supply the brain with oxygenated blood is hampered, which in turn affects the brain's ability to function, and so on.

"We also want to find out what factors can cause a stroke in a patient with advanced arteriosclerosis apart from formation of a clot. For example, does a temporary shortage of blood to the brain, due to falling blood pressure as a result of a change in heart rhythm, bring on a stroke?"

The Vancouver Foundation contributed $50,000 towards the unit, the Rotary Club of Vancouver $10,000 and the B.C. Hospital Insurance Service $18,000. BCHIS is also picking up the operating expenses.

He has also set up a laboratory at VGH under a $12,000 grant from the Heighway Foundation to study the clotting mechanism of blood. Anti-coagulant drugs now being used are more effective in preventing blood clots from forming in the veins than in the arteries. In the sluggish currents of the veins, a clot usually begins when a fine network of fibrils form like cotton candy. The fibrils are made up of a substance called fibrin. Onto the fibrin meshwork adhere platelets, large cells floating freely in the blood whose main function is to form clots to prevent blood from hemorrhaging out of cuts and wounds. Fibrin isn't normally in the blood, otherwise our blood would freeze into one gigantic thrombosis. Instead, fibrin is manufactured when needed through a long chain of reactions. What anti-coagulants do is interfere with one of the steps in the formation of fibrin.

CLOT FORMATION

But formation of clots in arteries usually follows the reverse procedure. Platelets first stick to the wall of the arteriosclerotic artery where the brittle surface has cracked, exposing a small wound. More platelets stick to the first layer and the thrombus grows. Only when the clot is half formed does a fibrin meshwork form over the platelets.

Dr. Sweeney has been using three drugs in his laboratory to try to decrease the "stickiness" of platelets – aspirin, anturan, a drug used for treating gout, and dipyridamole. He is beginning work on a Canada-wide trial on the effectiveness of two of them – aspirin and anturan – as a preventive treatment for stroke caused by thrombosis. Seven other Canadian centres are involved. The project will try to find out whether the platelets of stroke victims are more sticky than normal and whether the two drugs have any effect on their stickiness.

Neurosurgeons around the world have noticed a strange pattern of mortality among stroke victims following an operation to repair a hemorrhaged artery. Often the patient will regain consciousness in hospital shortly after a stroke and have headache, neck stiffness but few signs of body paralysis. If at that point a neurosurgeon operates, the patient may go rapidly downhill, even though the operation was perfect, and die of massive damage to the brain from 24 to 72 hours after surgery. But if surgery is delayed for two or three weeks, the patient has a better chance of surviving surgical repair of his aneurysm.

RESULTS SUMMARIZED

Dr. S.J. Peerless of the UBC Division of Neurosurgery said that after summarizing the results of stroke operations at VGH over the past 10 years and keeping a detailed record of stroke patients over the past three years, neurosurgeons have discovered several factors that jeopardized the results of stroke operations. "One was our anesthetic technique," said Dr. Peerless. "A common procedure used in neurosurgery is to hyperventilate the patient – give him lots of oxygen so that the amount of carbon dioxide in his body goes down. When this happens the blood vessels in the brain narrow. The technique makes it easier for us to reach the damaged blood vessels at the base of the brain."

Probable reason for the failure of the hyperventilation technique in aneurysm operations, he said, is a spasm mechanism in the cerebral blood vessels. At the time of hemorrhage they go into spasm and contract in a desperate attempt to stop blood from draining out through the rupture. After this first spasm the blood vessels relax. Then between the fifth and tenth day they go into spasm again. This time the spasm is more severe. If the operation to repair the hemorrhage is done during the first spasm or before the second, patients have less chance of surviving.

Dr. Peerless said hyperventilation compounded the spasm mechanism. By using the technique the danger of a thrombus forming in the narrowed arteries has increased.

"Death usually occurs 24 to 72 hours after the spasm mechanism begins. The vessels begin to narrow and the brain becomes hypoxic – deficient in oxygen – and as a result begins to swell with fluid. This causes local compression of the veins and arteries which in turn raises the blood pressure. Once you're into it you usually can't get out. There's almost nothing we can do but helplessly watch the patient go down.

"But what happens by waiting into the second or third week after the hemorrhage before operating is that you're eliminating all the patients who would die of the second spasm anyway. You're avoiding the primary issue."

He says neurosurgeons want to find a drug which will counteract the spasm mechanism so that patients can be operated on safely without having to wait for the second spasm to pass.

SECOND FACTOR

A second factor to come out of the 10-year survey of stroke operations is indirectly linked to research Dr. Peerless has done. For more than half a century medicine has thought that cerebral blood vessels had few nerve endings attached to them and that the nerve fibres had little influence on the behavior of the vessels.

It was also thought, and is still believed in some areas, that the opening of cerebral vessels is controlled by the amount of carbon dioxide and other metabolic breakdown products directly affecting the vessel walls. According to this view, as carbon dioxide goes up, the calibre of the vessel opening increases to bring in more oxygen-rich blood and wash out the carbon dioxide.

Dr. Peerless discovered in the winter of 1969 while at the University of Zurich that cerebral vessels have a rich pattern of nerve fibres attached to them. His

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Picture by UBC Photo Department

Five of UBC's leading medical researchers, each of them concerned with some aspect of brain research, pose for the UBC Reports *camera with a model of the human brain. From left to right are Dr. J.H. Quastel (see story on Page Eleven), Dr. Patrick McGeer (see story below), Dr. Louis Woolf (see story on Page Eleven), Dr Juhn Wada (see story on page opposite) and Dr. Shan-Ching Sung (see story on Pages Eight and Ten). All are members of the Division of Neurological Sciences of the Department of Psychiatry, which is part of UBC's Faculty of Medicine.*

The Brain and the Body

The brain and the rest of the body are different in a number of basic, physical ways. First of all, you have as much brain as you'll ever have the day you're born. Unlike the cells of most of the rest of the body, which are constantly dying and being replaced, neurons have a life-span of about 90 years. Your brain grew while you were a fetus in your mother's womb and stopped a few days before birth. Ruin a few thousand neurons and you'll never replace them. Brain damage is irreparable.

Another difference is the so-called blood-brain barrier. Your brain is finicky. It's very choosy about the substances it extracts from the blood nourishing it. Many chemicals, including some that are poisonous, that easily pass from the capillaries into other parts of the body, never penetrate the brain. Among the materials excluded are the three transmitters dopamine, acetylcholine and serotonin. They must be manufactured in the brain itself. Noradrenaline can't leave the brain. It must be broken down into other substances that can.

CAUSE UNKNOWN

The cause of Parkinson's disease — the "shaking palsy" — is still unknown. It's a degenerative disease that hits older people. Their muscles become rigid, their fingers and hands shake and their body crumples up on itself with the head sunk on the chest and the back and knees bent. If the case is bad the only way the patient can walk is with short, quick, shuffling steps. In advanced cases the victim may be as rigid as a piece of wood.

Parkinson's disease involves destruction of neurons in certain parts of the brain which use dopamine as their transmitter. More than 10 years ago UBC's Dr. Patrick McGeer came up with the notion that the degeneration was because of a low level of dopamine in the brain. Symptoms similar to Parkinson's disease had been noticed in schizophrenics treated with tranquillizing drugs and Parkinson's disease victims had low levels of dopamine in their urine.

Dopamine can't reach the brain if injected into a patient because it can't penetrate the blood-brain barrier. So Dr. McGeer decided to give a group of patients doses of L-dopa, a chemical precursor of dopamine which can pass through the blood-brain barrier and be converted by the brain to dopamine.

The trouble was that his thinly-financed laboratory couldn't afford to pay $23 for each gram of L-dopa, the going pharmaceutical price in the early 1960s. So he had to improvise. He had a research acquaintance in South Carolina send up a large sack of velvet beans used for cattle fodder in the southern U.S. These beans have the largest concentration of L-dopa of any known food source.

At that point he and his wife, neuro-chemist Dr. Edith G. McGeer, faced a problem that neurological science couldn't surmount. Their work in the next few weeks revolved around the kitchen as they struggled to find a way of cooking the beans in a way that would make them agreeable.

"Parkinson's patients would have had to eat three meals of these beans a day to get the amount of L-dopa we wanted to give them," Dr. McGeer said. "But my wife and I couldn't get the stuff to taste any more pleasant than cooked grass. We gave up the bean idea, mostly because of an experience we had had a few years before with a special diet we put together for another disease called alcaptonuria, a rare disease where an enzyme is missing as in PKU. I prepared a processed diet that would get around the enzyme deficiency but it didn't taste very interesting. The patient said he would rather die of the disease than face the diet. And he did."

The McGeers then settled for second best. Unable to afford L-dopa, they bought the less expensive DL-dopa and gave it to a group of patients, becoming the first in the world to try large oral doses as a treatment for Parkinson's. As they feared, the D-dopa interfered with the beneficial action of L-dopa. The sweat and urine of the patients turned black, worrying both the patients and the McGeers. On the threshold of effective treatment, they abandoned the trail because of the bad side-effects.

MASSIVE DOSES

Parkinson's victims had to wait another five years until L-dopa was successfully used in treating the disease. The effectiveness of L-dopa was discovered in 1967 by Dr. George C. Cotzias working in a wealthy laboratory in the United States. He used massive doses of the drug to try to treat another neurological disease which by the sheerest chance also caused a low level of dopamine in the same area of the brain as Parkinson's. It worked. So he tried it on Parkinson's patients. It worked again.

Today two large pharmaceutical firms are manufacturing L-dopa and the price is about five per cent of what it was 10 years ago.

Dr. McGeer is continuing the hunt for the cause of the disease by investigating two compounds that are thought to be neuro-transmitters and which just might be involved in the disease. Trouble is, their chemical pathways aren't known. But if they are transmitters, the body must have a method of manufacturing them and a way of breaking them down to get rid of them. Such

changes always involve enzymes. So he is measuring the suspected transmitters and enzymes in various parts of the brain and the effect of drugs and lesions on their relationships.

Neurologists have described the use of L-dopa in the treatment of Parkinson's as the greatest advance in neurology in 50 years. Dr. McGeer doesn't agree. "The greatest advance will be when the disease is cured. That's what's occupying our work now. We're trying to find a cure rather than a better treatment. In the next 10 to 15 years the cause of Parkinson's will be found."

'Attack From Without'

Epilepsy is probably second only to cerebral vascular disease as the most common neurological disorder among Canadians.

The disease is really a group of symptoms, like coughing, with many causes. Epilepsy, which means "attack from without" and was once considered of divine origin, can result from an old blow or infection in the brain, scar tissue or malformation of the cerebral blood vessels.

According to traditional terminology, if an epileptic goes into convulsions, he's having a major seizure. If he has brief staring spells with or without minor twitching, it's a minor seizure. Still another form of epileptic behavior is a psychomotor seizure. The victim usually goes through some normal action such as tying his shoe laces, choosing a magazine to read, walking upstairs to get a jersey or a number of other events lasting from a few seconds to a few minutes. The only thing that's abnormal about it is that once it's over, he can't remember anything about it.

Seizures can be triggered off by a stimulus. It's possible for a particular piece of music — say Beethoven's Fifth Symphony — to evoke a seizure in some people. Or even a certain touching sensation may bring one on, though this is rare. Physicians often bring on a seizure in a patient through drugs or light stimulus — repeated flashes of light — to diagnose the nature of the epilepsy. Most epileptics have recurring seizures without apparent stimulus.

An essential part of the diagnosis is an electro-encephalogram (EEG). Electrodes are taped onto a patient's head to pick up the electrical activity of the millions of neurons that appear as wave patterns traced by an ink pen on a moving roll of paper. Though brain waves give no clue to a person's intelligence or thoughts, they do provide strong indications as to whether a person has epilepsy or not. An EEG recorded during a seizure is likely to show unusually high bursts of energy. The ink pen traces large waves unusually fast or unusually slowly, the pattern varying with the type of seizure. Even between seizures, the EEG of most epileptics often shows some irregularity.

Seizures usually run their course. But stimulus can break some seizures as well as bring them on. In some patients, for instance, an electrical shock to the foot will snap the brain waves out of their epileptic pattern.

Dr. Juhn Wada, professor in the Division of Neurological Sciences at UBC and director of EEG at UBC's psychiatric hospital, has worked for more than 20 years on epilepsy. He has discovered that the part of the brain causing epilepsy — say an area covered with old scar tissue — can teach other areas of the brain over a number of years to bring on the seizures. He showed this by applying aluminum hydroxide to the surface of the brains of monkeys and placing electrodes in their brains. For some unknown reason aluminum hydroxide causes epileptic-like behavior. Three to seven years later he removed the original epileptic area surgically but the monkeys continued to have seizures because the epilepsy had moved into deeper areas of their brains.

His work concentrates on epilepsy that can be triggered off by stimulus. He is convinced that epilepsy occurring without apparent stimulus is in fact caused by stimulus so far undiscovered, perhaps a biochemical

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Picture by UBC Department of Medical Illustration

Dr. Ian Turnbull, of the Division of Neurosurgery in the Faculty of Medicine, performs operation which he developed to reduce or eliminate intractable pain which is beyond the reach of drugs. A probe is pushed into the patient's brain to destroy target tissue.

An Operation for Intractable Pain

The first lobotomy was performed in Lisbon by Egas Moniz, a neurologist, in 1936. It became very popular and Moniz received a Nobel Prize. It was an operation for schizophrenia. Part of the brain tissue immediately behind the eyes was destroyed. For some unknown reason, the intelligence of the patients wasn't affected, though they ran the risk of developing epilepsy from the scar tissue.

Although schizophrenia was often reduced, about one-quarter of the patients lost interest in life. Many were emotional vegetables. It was a hideous example of the old, black-humor saw that the operation was a success but the patient died. Since that unfortunate venture into psycho-surgery, medicine has been wary of operating on the brain to treat emotional disorders.

TERMINAL CANCER

Dr. Ian Turnbull, of the UBC Division of Neurosurgery, has resorted to psychosurgery for the treatment of intractable pain. Many of his patients have had terminal cancer. All other treatment methods had been tried unsuccessfully. Apart from their cancers the patients were in good general health but they were in constant and excruciating pain beyond the reach of drugs. And if that wasn't enough, the cancer was often of the face, so the patient had the added burden of anxiety. Normally stable, they had become depressed, and for very good reason. They could see the advance of their cancer every time they looked at their face in a mirror and the experience was so distressful that their emotional balance shifted. Most of them had only six months or so to live.

Dr. Turnbull's procedure — he's the only neurosurgeon in the world doing it — is a combination of two neurosurgical operations. It's a stereotaxic procedure. The patient is fitted into an apparatus that holds his head firmly so that it can be manoeuvred in three planes to precisely locate targets in the brain. The target tissue is reached with a probe and destroyed by heat.

The first half of the operation is to sever as much as possible of the pain pathway from the tumor or other ailment to the brain. If the area affected is below the neck, Dr. Turnbull severs the pathways in the spinal cord. If the area is above the spinal cord, in the face for example, he makes lesions — destroys a small segment of tissue — in the thalamus, an area the size of an acorn at the core of the brain. The thalamus is a major relay station of sensory impulses from the body to the cerebral cortex, the outer layer of the brain.

These operations are to eliminate as much of the pain as possible. They are combined with another operation to make two lesions in a part of the brain, called the cingulum bundles, which is involved in generating anxiety and is directly connected to the pain pathways. The uniqueness of the procedure is that not one but three specific targets are hit using a heat probe, each within an accuracy of one millimeter.

In cases involving cancer of the face, "the thalamus lesion alone doesn't knock off all the pain," Dr. Turnbull said. "There are too many pathways from the cancer into the brain.

"And in the cingulumotomy, lesions in the cingulum bundles aren't enough to reduce anxiety because the pain is too overwhelming. The two operations should be combined." He said the operations have little effect on the patients' personalities. They remain interested in life. One patient went to the races the day he was discharged.

SUICIDE THREAT

"I must say I was really quite concerned that the operation would have a bad psychological effect when I did my first patient," he said. "He was a man about 35 with cancer of the face. He was threatening to commit suicide and was terribly distraught. Someone had to help him so eventually I went ahead. But after the operation he was fine. He went back to work for a while. His cancer progressed. There was swelling but it didn't upset him much. The pain did return but not as much as before."

EPILEPSY *Continued from Page Seven*

trigger within the body itself. If this hunch is correct, and if he is able to unfold the workings behind the type of epilepsy that can be brought on by stimulus, he will have unravelled the mechanism controlling all forms of the disease.

Some of his most promising work involves baboons. About five years ago a group of researchers in Marseilles, France, accidentally discovered that a few baboons imported from Senegal went into seizures when given light stimulus. The discovery was amazing. Light is the most common form of stimulus inducing seizures in humans. Until then, sound had been the most effective stimulus in animals.

This led the Marseilles group, internationally known for their work in epilepsy, to examine 600 Senegal baboons. The animals had a tendency to seizures similar to photogenic or light-caused epileptic convulsions in humans. Meanwhile Dr. Wada imported 12 baboons from Senegal. Four died. He went the Marseilles group one step better and ran tests on the surviving eight baboons to see if they were in fact true epileptics and not just susceptible to photogenic seizures resembling epilepsy.

He placed 50 to 70 electrodes in each of their brains and continuously recorded their EEGs and monitored their behavior on videotape during the past four years. He found that at least two of them had spontaneous and recurrent seizures, the first discovery of true epilepsy outside of man. He had found the ideal experimental animal. Instead of artificially inducing in animals conditions similar to epilepsy in humans, and so never being sure of the validity of the experimental results, researchers now have a source of naturally occurring epilepsy in a colony of baboons in Africa.

In 1971 Dr. Wada received a shipment of 20 baboons about eight to ten months old, probably corresponding to two to three years old in human terms. He wants to do an uninterrupted study of the changes in their seizures over their life-time – something difficult to do with humans – to judge the effectiveness of different treatments. There is a definite pattern to epilepsy in many humans. The frequency of the seizures often peaks between the ages of three and seven and then again in the teens. Sometimes the disease completely disappears in later life.

While in Marseilles last year on sabbatical, Dr. Wada discovered that if the baboons are given doses of the neuro-transmitter serotonin, their EEGs showed brain-wave patterns usually associated with epilepsy.

Results of that experiment are now being used to diagnose epilepsy in patients in Vancouver. Physicians can now give a patient a serotonin precursor – to get around the blood-brain barrier – and bring on epileptic brain activity that can be recorded on the EEG without putting the patient through the experience of having an actual seizure.

One of Dr. Wada's contributions to epilepsy is a test to determine exactly where a patient's speech centre is located. It's generally located on the left side of the brain in right-handed people and vice versa. Knowing exactly where it's located is critical since surgery to brain tissue that turns out to contain the speech centre may leave the patient "speechless."

He took up the problem while a resident physician in Japan after seeing a patient lose his speech following brain surgery. His technique is to inject a small amount of sodium amytal, a fast-acting barbiturate, in turn into each of the two carotid arteries feeding the brain. Injection of amytal into the left carotid artery feeding the left side of the brain causes temporary paralysis of the right side of the body and vice versa. It would also affect the patient's ability to speak if his speech area is partly or totally in the left side of his brain.

He published the successful results of his procedure in a Japanese research journal in the late 1940s. Because few of the international medical community read Japanese, it went unnoticed. The procedure was used for the first time on a non-Japanese patient in the mid-50s. The operation was done by Dr. Wada while on the staff of the Montreal Neurological Institute. It's now being used throughout the world not only to locate speech areas but to evaluate memory function as well.

The cortex or outer part of the brain is divided by a gap or fissure into two hemispheres. According to text books, the two hemispheres are anatomically identical. Work by Dr. Wada not yet published shows that the two halves aren't symmetrical at all. The area of the left hemisphere where the speech function is usually located is much larger than the corresponding area in the right

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Picture by UBC Department of Medical Illustration

DR. MORTON LOW

Recording Brain's Activity

German psychiatrist Hans Berger was the first man to record electrical brain activity. He began in 1929, worked in secrecy for five years, doing brain recordings on his son. He also gave the electroencephalogram its name.

EEG has since become a major diagnostic tool. Dr. Morton Low, head of the EEG department at VGH, is taking EEG beyond its normal use. He's using it to investigate what up until now have been regarded as "mental" states – anxiety, motivation, attention, performance and other complex brain functions.

A simple test for anxiety, for example, would be to ask a person to choose the louder of two bells. A mistake would cause a buzzer to sound. What's the brain's reaction, as measured by the EEG, to the sound of the buzzer? Is the EEG normal? Is the person abnormally anxious?

ANXIETY TEST

The research may lead to objective EEG tests for measuring the effectiveness of psychiatric treatment. Is the patient less anxious than when treatment began? Run an anxiety test and find out.

Before coming to UBC Dr. Low was with the Baylor Medical School in Houston, Texas. While there he was involved in medical research which was a spin-off from the National Aeronautics and Space Administration's projects. Baylor was commissioned to produce a method of taking the EEG of an astronaut while in flight. Some of this research is being applied here.

Conventional EEG equipment is large and clumsy. About 21 electrodes are taped one at a time to the patient's skull. It takes about 20 minutes to get a patient ready for a recording. Baylor's solution is a disposable cap of elasticized fabric with electrodes attached. The cap can be put on and tied around the chin and the astronaut is ready for recording immediately. Baylor also developed power amplifiers and pre-amplifiers to boost the recording over the noisy electrical background of the inside of a space capsule. The cap and electronic equipment were used in the NASA Tektite project and will be used in the SKYLAB flight this summer.

Dr. Low, associate professor in the Faculty of Medicine, plans to use both cap and electronic hardware on patients. VGH is a monster hospital. Some patients must travel two blocks underground through a maze of tunnels that resemble something out of *The Phantom of the Opera* to get to the EEG lab. Or clumsy, conventional equipment must be wheeled through the tunnels to them.

Cables will be run from the Intensive Care Nursery and the neurology and neurosurgery special care units to the EEG lab. The caps will be put on the heads of critically ill patients in their own wards and their EEGs will be passed through power pre-amplifiers and amplifiers in these areas, then through the cables to the EEG lab for recording. The system will be especially advantageous in the Intensive Care Nursery. At present the critically controlled atmosphere of incubators in the unit is destroyed each time an EEG is taken because the incubators must be opened for up to 20 minutes while electrodes are attached.

Eventually other areas of VGH will be linked to the EEG lab with cables. Dr. Low has designed similar systems, following circuit diagrams from Baylor, for installation in teaching hospitals being built at the University of Western Ontario and McMaster University as well as the new Children's Hospital in Ottawa.

He is also developing a telephone link for use between remote community hospitals and the VGH EEG lab so that patients in these areas can have their EEGs recorded without travelling to Vancouver or Calgary. The Mr. and Mrs. P.A. Woodward Foundation has footed the cost of the cable connections within VGH and of the EEG cap and electronic equipment, as well as the telephone links.

Recording equipment in his lab is being connected to a computer he is installing under a $115,000 grant from the Mr. and Mrs. P.A. Woodward Foundation and $43,000 from the B.C. Hospital Insurance Service. The computer system will be unique in Canada. It will be a pilot project to show that it's feasible to automate the monitoring of patients receiving critical care and will be used initially to process information on the condition of babies in the Intensive Care Nursery and patients in the adult Intensive Care Unit and Stroke Monitoring Unit being installed by Dr. Vincent Sweeney.

USE COMPUTER

The computer will also be used to determine whether a patient is dead or not. Dr. Low worked in the [redacted] institution in Houston as Dr. Michael DeBakey and right next door to Dr. Denton Cooley, the two American heart transplant surgeons, and did the terminal EEGs to determine whether the donors were dead on the first four heart transplants done by Cooley.

"It's much more difficult than you think to determine clinical death," Dr. Low said. "At present we have to record a potential organ donor's EEG for 20 minutes when we think he's dead, then leave and come back and record again. But we don't know what went on during the time we were away.

"We know that if there has been no EEG activity for between six and 12 hours the patient has no hope of recovery. The computer will materially shorten the time necessary for being able to declare a person dead. The computer will easily decide whether the electronic [redacted] it is picking up is from the patient's brain or from the electronic equipment itself, something we find impossible to do now when the signals are extremely weak."

Secrets of DNA Sought

Deoxyribonucleic acid (DNA) has been said to be the most important word of the second half of the century. For better or worse, the solution to its molecular structure by two obscure scientists, James Watson and Francis Crick, nearly 20 years ago opened a Pandora's box of genetic possibilities. Molecular biologists may soon be able to change the genetic structure of a human being in the embryo stage. This knowledge could make it possible for an oligarchy to manipulate legions of zombies, or it could correct genetic defects which lie behind an estimated 50 per cent of human afflictions.

DNA's molecular chain is the basic material of our genes. Written into DNA's structure is the formula for creating every scrap of the staggering thousands of

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Picture by UBC Department of Medical Illustration

DR. LOUIS WOOLF

He Found Cause Of PKU

There are several thousand known metabolic disorders affecting the brain and there may be thousands more yet undiscovered. These afflictions damage the brain because food can't be metabolized properly. The chemical that can't be broken down builds up in the system and is toxic to the brain. The most famous of the known metabolic diseases is probably phenylketonuria (PKU).

Dr. Louis I. Woolf of UBC's Division of Neurological Sciences wrote the scientific paper giving the cause of the disease in 1949, published it two years later while at the Hospital for Sick Children in Great Ormond Street in London, and developed the first effective treatment which is now being used around the globe.

Phenylketonurics have a missing or defective enzyme needed to metabolize phenylalanine, an amino acid derived from the diet, which builds up in the body and damages the brain, bringing on mental retardation. The process begins almost as soon as the victims are fed for the first time after birth.

The defect is caused by an abnormal gene. It's an inherited disease. PKU hits about one out of every 20,000 live births in North America. In Japan the incidence is approximately one in 60,000. In Western Scotland and Southern Ireland about one in 4,000. No cases have been reported among Africans living in Africa.

Soon after publishing his paper Dr. Woolf prepared a diet free of the amino acid, using a technique he had worked on during the Second World War for producing pre-digested food to be given to those in the liberated populations starved to the brink of death. He didn't have a phenylketonuric to try it on but was approached by a Birmingham physician who did.

"She was two-and-one-half years old," Dr. Woolf said. "Today we'd regard this as very old to start treatment. But in those days we didn't know any better. Besides, we couldn't diagnose PKU any earlier with the techniques available.

"It must have taken great courage for the doctor to give her a completely unproven diet. I warned that some of the amino acid would have to be given to her in the form of normal food, otherwise the child wouldn't be able to grow. In the first few years of this treatment for PKU this advice either wasn't known or wasn't followed by some other doctors and the results were disastrous."

The Birmingham child's condition changed dramatically in a few days as did others treated in the first group under Dr. Woolf's guidance. Most of the epileptics – about one of every four phenylketonurics is epileptic – stopped their seizures two or three days after beginning treatment. Their EEGs began to change to normal.

Slowly, their IQs began to increase from 30 to about 70 to 80, the point at which they can probably just manage to live in society without being put into an institution. One hundred is considered a normal IQ. The average university graduate has an IQ of about 118.

"Back in 1956 we were very lucky," Dr. Woolf said. "We got a child about two years old with severe PKU. She was fitting all the time. We put her on the diet and she was one of those who showed no response at all, neither frequency of fits, IQ or anything. Then we discovered that her mother wasn't coming to visit her in hospital and we found out why. Her mother was in maternity hospital giving birth to twins.

"So at age 17 days the twins were brought to our hospital and – I still remember this, it was a Sunday morning – we tested their urine and discovered that one twin was phenylketonuric and the other wasn't. They were fraternal and not identical twins.

"We began putting together a diet for the phenylketonuric twin. The problem was to come up with a liquid diet she could take in a bottle. All the other phenylketonurics treated up until then had been given a solid diet. We couldn't think of any way of putting fat – human milk contains quite a lot of fat – into the liquid. We tried corn oil and emulsifying agents and mixed them up and it was a horrible mess.

BRAIN DAMAGE

"Then a dietitian said, why not try whipping cream – double cream, it's called in Britain – and it made a wonderful milk and the child took it beautifully. Her IQ was measured repeatedly as she matured and it has levelled off at about 90. Her untreated older sister has an IQ of 20. Her twin's IQ is 110. It was a splendid comparative test for the effect of PKU and our treatment."

Dr. Woolf was among the first to suggest what enzyme defects are involved in another disease of metabolism, Maple Syrup Urine disease, named because the urine of its victims smells like maple syrup. Victims seldom live past a few months of age because their brains are so badly damaged.

Despite the fact that doctors know how to treat the inherited disease, only a dozen or so victims have been saved. By the time doctors realize what's wrong the baby is usually dead.

Dr. Woolf was one of three groups of researchers in different parts of the world which simultaneously and independently suggested the current treatment for the disease. If treated in time, victims survive and are completely normal.

Today he is trying to isolate the enzyme involved in PKU to find out how it differs in different forms of the disease. He is also studying lipids, a group of fat-like compounds, in the brains of patients suffering from lipidoses, an ailment in which certain lipids are in excess in the brain. Lipidoses is really a number of diseases. Most of them are inherited and affect the central nervous system. Victims die between the ages of two and 10, depending on the variety of the disease. The process is especially hard on the parents because the child doesn't die suddenly but slowly deteriorates and becomes a human vegetable before succumbing.

A Pioneer In Brain Research

The name of J.H. Quastel is known in every biochemistry lab from Vancouver to Vladivostok. He was one of the first to apply modern scientific and systematic methods to neuro-chemistry, a watershed in brain science. Previous to this most psychiatric patients were cloistered somewhere in the country, far from the curiosity of both society and biochemistry. And many of the few scientists working with problems concerning emotional illness prior to this were so overwhelmed and discouraged by the staggering complexity of the brain that they retreated into obscure research little connected with psychiatric treatment.

Half a century ago few were involved in biochemistry, the chemistry of life. Today it is one of the strongest sciences. The half century Dr. Quastel has devoted to it coincides with its period of bloom. Much of his work was concerned with the basic roots from which the science has blossomed.

His associates and admirers describe him as a Darwinian scientist. There are styles among scientists just as there are among musicians. Some are rhapsodic, some meticulous and conservative. Some scientists are brilliant experimenters but mediocre theoreticians, unable to grasp the implications of what they find. Others are clumsy experimenters who excel in exploring the various theoretical possibilities of their and other's work.

EARLY EXPERIMENTS

Dr. Quastel's style includes the best of both – meticulous experimentation combined with a shower of insights, few of which he's ever been able to chase down himself.

He was born in Sheffield, England, in 1899 and took his Ph.D. degree from Cambridge University in 1924 and D.Sc. degree two years later from London University.

Some of his fundamental work was done before he considered the problems of the chemistry of the brain. His neuro-chemical research began in a small lab in the Cardiff City Mental Hospital in Wales. Like most of his labs it was meagre. Hospital staff had to pass through it on their way to the dispensary.

Much of the modern view of the action of enzymes was laid down by him more than 40 years ago. He did much of the early work on the citric acid cycle years before science devoted serious attention to it. The cycle is the second stage of the metabolism of glucose, a series of chemical reactions in the cells from which the body gets most of its energy. It is often called the Krebs cycle after the man who received the Nobel Prize for solving it.

Almost two decades before science became excited over the neuro-transmitters Dr. Quastel discovered the existence in the brain of the enzyme monoamine oxidase which destroys the neuro-transmitter noradrenaline. He also showed that certain drugs such as amphetamine inhibit or block the action of monoamine oxidase, increasing the amount of noradrenaline at the synapses and increasing transmission and relieving depression.

He discovered the phenomenon of "competitive inhibition." It was this work which led ultimately to the creation of sulfa drugs, antihistamines and some anti-cancer drugs. Competitive inhibition is one of the major areas of cancer research today.

He coined the name phenylketonuria and was the first to confirm the findings of the Norwegian physician who discovered the disease.

"I began brain research in 1930 in a mental hospital laboratory in south Wales," Dr. Quastel recalls. "It was the first asylum for the insane called a mental hospital. It was also the first mental hospital to employ female nurses.

NARCOSIS TREATMENT

"It had a wonderfully progressive superintendent who was able to urge his views on the Cardiff City Council because he was so extraordinarily fluent in Welsh. The Council would do almost anything for him if only he spoke to them in Welsh. One of his ambitions was to have a research laboratory attached to the hospital. Unfortunately he couldn't find the money to run it and so he asked the help of the Medical Research Council in England, which had a very able and efficient secretary at that time by the name of Sir Walter Fletcher, who had done pioneering work in biochemistry and physiology. It was through Fletcher's encouragement that I went to this hospital from Cambridge.

"I went to work in a very modest way with one assistant. Our work was fundamental research on the biochemistry of the brain, oriented in such a way that it could throw light on the problems of mental disorder. At that time many patients were given prolonged narcosis treatment – they were put to sleep for several days by giving them barbiturates – and remarkable progress was made by some of them.

"Soon after I arrived a new superintendent, a very able Scotsman and a humane man, said, Well it's all very well giving this treatment but some of our patients have died. And since quite a number of these patients are

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Picture by UBC Department of Medical Illustration

DR. SHAN-CHING SUNG

DNA

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complex biochemical substances that make up the human body.

Most DNA is in the nucleus in the centre of cells. When a certain substance is needed, atoms and molecules form into a chain beside the appropriate section of the long DNA molecule giving the code of the substance needed. The new chain – called ribonucleic acid or RNA – is an exact copy of the appropriate section of DNA. When the matching is complete, the RNA leaves the nucleus for another part of the cell where the RNA chemical code is read off and the wanted substance manufactured according to instructions.

When a cancer grows in a human body, cancer cells multiply, endlessly reproducing more DNA, RNA and protein, the basic material of living tissue, until the host body is killed. But in the adult brain there is almost no synthesis of DNA because there is no cell reproduction. The brain is almost fully grown at birth. That's why the heads of infants are so large compared with the rest of their bodies.

Dr. Shan-Ching Sung of the Division of Neurological Sciences at UBC is trying to unravel more of the mystery surrounding DNA. He has chosen the DNA in the nucleus of brain cells as his field of work. DNA is of course the same all over the body, whether in kidneys, brain or heart cells.

The main reason why he has selected brain DNA is that there are some proteins manufactured in brain cells that aren't made anywhere else in the body. They're brain-specific. This means that the RNA to make these proteins from the DNA code must also be brain-specific. So by limiting himself to the brain, he is making his research less complicated by narrowing the number of substances involved.

MASTER MOLECULE

Unlike human brains, the brains of rats continue to grow for about 18 days after birth. During that time the part of the rat brain called the cerebellum multiplies 10 times. By concentrating on the cerebellum of rats, Dr. Sung has an easy source of rapidly growing DNA, since each new cell must have the DNA master molecule to carry on its functions. A number of vital body functions seemed linked to the production of protein from RNA. Memory, for example. Experimental animals injected before a learning session with a substance known to interfere with the production of protein from RNA don't recall what they normally would 24 hours later.

Certain antibiotics act by inhibiting the production of

PIONEER

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going to get better sooner or later, I don't think it's worth exposing them to unnecessary risk.

"He was about to abandon the whole thing. I used to accompany him on rounds through the hospital and I said to him, This is not the way to handle the situation. Here is a treatment that seems to be effective in certain cases. What we have to find out is why certain patients don't respond but become ill. If we find out, perhaps we will be able to modify it.

"The superintendent, who had been completely adverse to our work, turned completely round in our favor when, as a result of our work, we found that these barbiturates have effects on glucose metabolism that might result in some of the ill effects that distressed the patients. So I advised him that insulin be given to the patients, together with large doses of glucose, so that glucose utilization in the body would be improved.

"The result was that the toxic effects of the barbiturates were alleviated. Prolonged narcosis treatment then became much safer.

"This persuaded the psychiatric staff that work in the lab could have practical results. The people who were hesitant about our work really swung round. The pendulum swung round so much the other way that it became rather embarrassing. They began to think that we could solve any problem, which of course was never true.

DOMINANT POSITION

"We were able to show that of all substances, glucose has a dominant position in providing the main fuel for the brain, that almost the entire energy of the brain comes from the combustion of glucose.

"We were also able to show for the first time that acetylcholine is synthetized by brain cells at the expense of glucose breakdown. We also demonstrated that acetylcholine exists in the brain cells in what we call a bound form. This bound form exists in what are now called vesicles and occupies the attention of hundreds of physiologists and biochemists. When acetylcholine is liberated to affect another brain cell it comes from either the breakdown of these vesicles or through liberation of the substances from them.

"We also did the early work on the effect of barbiturates on the brain. We showed how barbiturates affect metabolic events in brain cells, particularly their suppression of the oxidation of glucose. At that time – well over 30 years ago – the theory was put forward that the mode of action of barbiturates in bringing about the unconscious state might be linked with its ability to suppress glucose oxidation in the cell and thereby the energy the cell needs for normal activity. Today the main concept still survives.

"In the same old hospital laboratory we showed for the first time the existence in the brain of monoamine oxidase. We started to work with the group of chemicals known as the amines because we thought it possible that, in certain cases of mental disorder, amines might affect metabolic processes in the nervous system. Today this is an enormous subject. Many of the amines with which we worked are formed in the brain. They are called biogenic amines and include the neuro-transmitters. We took a gamble that they might play an important role in the nervous system and investigated them in the brain. That was 35 years ago.

"It was only much later than the time of our work that it was discovered that these amines actually do exist in the brain. But it was our work which led scientific interest to concentrate on monoamine oxidase and our finding that certain neurotropic drugs such as amphetamine, or benzedrine as it was then called, blocked the action of monoamine oxidase." Dr. Quastel has been able to function simultaneously in a number of fields. Agricultural chemists can't believe that he's a neuro-chemist and vice versa. During the Second World War he discovered the non-toxic, bio-degradable herbicide 2,4-D and guessed at the properties of 2,4,5-T but didn't pursue it because it was toxic.

'Understanding our own behavior is more precious than a ton of moon rocks'

"The effects of 2,4-D we discovered in 1941, only one year after we started work," he said. "We were interested not so much in the fact that it could destroy weeds but that it was a potential weapon in the war. We weren't allowed to publish a word until the war was over. As a result of which my colleagues and I never really got credit for it.

"Another thing to come out of our war work was our finding that it was possible to condition the soil by well-known chemicals so that it would support crop production without the necessity of using manures for the necessary humus. This gave rise to work on what are called artificial soil conditioners which later was taken up by Monsanto Chemical Co. They came out with a substance called Krilium. Soil conditioners stabilize the soil so that it crumbles and is porous, allowing roots better access to air and water, both of which they need for growth.

"We also evolved a technique, used extensively nowadays, usually referred to as the perfusion or percolation technique, for measuring the stability of substances in soil; for example, how long a herbicide or pesticide persists in soil and what happens to it while it lasts."

Dr. Quastel went to McGill University in 1947 where he worked in cancer research and, as a teacher, spawned legions of younger scientists. Many of them are now eminent researchers, some still pursuing the leads he gave them. He guided more than 70 students to their Ph.D. degrees and supervised about 50 post-doctoral fellows, Ph.D. holders continuing their research.

He joined UBC's Division of Neurological Sciences in 1966 to resume his work in neuro-chemistry. He says that progress in brain research now demands that neuro-scientists come together in co-ordinated efforts. Their disciplines individually "can't understand exactly what happens when a sensory impulse affects a nerve cell, what exactly happens when this cell stimulates a neighboring one.

"This to me is the central problem for understanding what we mean by the conscious state, the faculty of memory. To understand memory we must know not only how a passing impulse can leave a permanent trace but how the impulse can be recalled and re-shaped. Is memory a chemical substance, a new form of circuitry, a chemical modification of something already present in the brain cell? These are problems of the future."

The future seems to promise a return of man's attention from outer space to problems more at hand. Over the centuries the ring of science has been drawing closer and closer to man himself. Modern science began with the outer universe and the classical ideas of Newton, Galileo and Copernicus. Interpretation of the formation and movement of the surface of the earth itself had to wait at least one century after the motion of the planets was charted until the science of geology was established. Biochemistry, the chemistry of living things, came into being more than one century after the fundamental laws of inorganic chemistry were laid down.

Perhaps the decade of expensive space exploration we have gone through is the last fling of the type of science that still concentrates on the universe beyond us. The turning of interest from sterile space to man and the earth has influenced even the people central to the space programs. Standing for the first time on the surface of the moon, astronauts were fascinated by their vision of the earth which they had spent so much time and money to leave.

Seven years ago when the excitement of space exploration was just beginning to quicken, Nobel Prize-winning neuro-physiologist Sir John Eccles said space travel is a low-level type of human activity. "It will be appreciated quite soon how sterile it is," he said, "because what are we finding? Dust and craters everywhere. . . . "In a million years man will never be to get to and return from any of the planetary systems that there may be, even the nearest fixed star such as Alpha Centauri, which is 4.3 light-years away."

MAN'S FATE

If the planets of other solar systems are closed to man, so are the planets in our own system. They are uninhabitable. Man will be able to live nowhere in the universe except on earth. We are beginning to realize that understanding our own behavior is more precious than a ton of moon rocks. Discovering the secrets within the three pounds of warm tissue, within the inner universe behind our eyes, is worth more than the mountains of the moon or all the mysteries of the universe worth knowing. As has often been said, man's fate is within himself. Our destiny, whether madness or sanity, will not be decided among the stars.

"The working of man's own brain," says Sir John, "must transcend every other activity."

RNA in bacteria cells but don't interfere with RNA production in animal or human cells. Other chemicals have the opposite effect.

Strangely, there is an enzyme in the brain whose only job is to break down DNA, an odd thing to do since DNA can't be replaced in the adult brain. Normally, this type of enzyme is present in the body to get rid of a substance after it has done its job.

One theory that tries to explain the presence of the enzyme concerns the body's defence mechanism against viruses. There are two general types of viruses. One contains only RNA, the other DNA as well as RNA. Perhaps the mysterious enzyme is in the brain to attack and destroy DNA viruses invading the brain.

There is one type of RNA virus that causes a certain kind of cancer. And, weirdly, it has an enzyme associated with it that can make DNA, a complete reversal of orthodox molecular biology. As a result of this information, a drug has been found that will inhibit the formation of this DNA and stop the cancer from spreading.

There are also indications that certain neurological disorders may be caused by viruses.

Besides studying the production of DNA in the brain, Dr. Sung is also working on the inhibition of the production of DNA in cancer cells, production of RNA from DNA and how the body breaks down RNA after it has manufactured the protein it was coded for.

STROKES *Continued from Page Five*

observations were confirmed when he returned to UBC. He also discovered that the nerve fibres have a direct effect on the size of the opening of the vessels.

His hypothesis is that the brain itself, through the nerve fibres attached to the vessels, controls the size of the vessel openings. This is how blood vessel diameter is regulated in the rest of the body.

His experiments have shown three types of nerve fibres attached to the vessels. The largest system has noradrenaline as the transmitter linking the nerve fibre and the vessel wall. The second system uses acetycholine as its transmitter.

The fibres also pick up noradrenaline passing through the vessels in the blood stream. Dr. Peerless believes that after a hemorrhage the fibres are damaged by the pool of loose blood and can't remove noradrenaline from the blood stream as they normally do. The accumulated noradrenaline then acts directly on the vessel wall, bringing on the second and often fatal spasm.

It's probably for this reason, he said, that reserpine has proved a poor drug for reducing the blood pressure of cerebral hemorrhage victims. "It's important to reduce blood pressure and relieve tension on the rupture. Almost all drugs used for reducing blood pressure fail in the case of cerebral hemorrhage."

Reserpine, the drug used for reducing blood pressure for years before its effects as a tranquillizer were noticed, had a bad effect in its trials at VGH. This may be because reserpine slows the uptake of noradrenaline from the blood stream into the nerve fibres, compounding the direct action of noradrenaline on the vessel walls, and bringing on more severe spasm and a greater chance of thrombosis.

Going on the hunch that hemorrhage victims would have abnormally high levels of noradrenaline in their blood stream because their nerve fibres would be out of commission, VGH began measuring the noradrenaline level of stroke patients a year ago.

Some patients showed levels 10 to 20 times higher than normal. Results so far indicate that patients with high noradrenaline levels died more often following surgery than those with lower levels.

EPILEPSY *Continued from Page Eight*

hemisphere. He also found a curious sex difference. A larger number of female brains had a larger speech area in the right hemisphere. The larger speech area in both males and females is present long before speech develops and is visible as early as in the brain of a five-month-old fetus, indicating that the hemisphere where the speech centre is located is determined genetically.

He believes this genetic influence is partially responsible for determining whether a person's speech centre will shift or not if part of the brain is injured when the person is learning to speak during early childhood. For example, if a person's dominant speech area is damaged and the "reserve" speech area in the other hemisphere is small, his speech function may not shift or there may be partial shift. But if the reserve speech area is large and the dominant speech area is damaged, speech function may shift to the unharmed hemisphere so that speech is unaffected.

UBC NEWS IN BRIEF

UBC representatives told a committee of the B.C. Legislature Feb. 18 that the principle of tenure for faculty members should be retained.

And UBC, they added, should remain free to work out appropriate internal procedures for granting tenure to junior faculty members and for dismissing those who already hold tenure.

Support of the tenure principle was the main feature of two briefs presented to the Legislature's Select Standing Committee on Social Welfare and Education, which was asked in the Throne Speech that opened the 1972 session of the Legislature to review tenure at UBC's three public universities.

Full texts of the briefs presented to the committee appeared in the Feb. 23 edition of *UBC Reports*. Readers wishing copies should write to the Department of Information Services, UBC, or telephone 228–3131.

Separate briefs were presented to the Legislature Committee by Dean Ian McT. Cowan, head of the Faculty of Graduate Studies, who represented UBC's academic administration, and Dr. Robert Kubicek, president of UBC's Faculty Association.

Both Dean Cowan and Dr. Kubicek emphasized that UBC is currently involved in the second year of a detailed assessment of tenure and has drafted a more detailed restatement and elaboration of principles and procedures that will retain the advantages of tenure while removing most of the potential seeds of discontent.

Other groups which plan to appear before the committee are the UBC Alma Mater Society and the Women's Action Group, a women's organization made up of representatives of faculty, staff and students at UBC.

* * *

March 15 is the final day for the receipt of nominations for the post of Chancellor of the University and Convocation members of the Senate.

Nominations should be sent to UBC's Registrar, Mr. J.E.A. Parnall, who has full details of the method of nomination for the posts.

If an election for Chancellor and the Convocation members of Senate is necessary, it will take place on June 7. Ballots will be counted on the afternoon of June 7 and the results announced that night at a meeting of the Senate.

* * *

UBC's Library is now the second largest academic library in Canada, but physical deficiencies for education, fine arts and the sciences are detrimental to campus teaching, learning and research.

Such are the paradoxes outlined by UBC Librarian Basil Stuart-Stubbs, who notes in his annual report to UBC's Senate that the Library now has 1,500,000 catalogued volumes on its shelves, but will be faced with moving more of its collection into storage unless new facilities for 2,525,000 volumes are constructed by 1980.

The most pressing needs of the UBC Library system, he notes in his report for the 1970-71 academic year, are construction of an education library and learning resource centre, a fine arts library within a fine arts building and units for the pure and applied sciences.

These needs, detailed for the Senate Committee on Academic Building Needs, fared badly in the assignment of priorities by the committee in the fall of 1971. No proposed library facility was included in the list of four projects recommended by the committee for construction in the next two years.

Turning to the ultimate requirements of the UBC library system, Mr. Stuart-Stubbs says 10,450 study places will be required when UBC reaches the enrolment limitation of 27,500 students established by Senate in 1970.

* * *

Six Canadians prominent in the worlds of entertainment, science and business will receive honorary degrees at UBC's Spring Congregation on May 24, 25 and 26.

Honorary Doctor of Laws degree will be conferred on Miss Frances Hyland and Mr. Arthur Hill, well-known stage personalities; theatre and television producer Mr. Lister Sinclair, who is currently producer of arts and science programs for the Canadian Broadcasting Corporation; and Mr. Allan M. McGavin, Chancellor of the University.

Honorary Doctor of Science degrees will be awarded to Dr. M.Y. Williams, professor emeritus of geology at UBC, and Prof. Norman J. Berrill, a noted invertebrate zoologist who formerly taught at McGill University.

* * *

A total of eight active and retired members of the UBC faculty have died since Dec. 31, 1971. Dead are:

– Mr. Benjamin R. Whitinger, associate professor of Education, on Dec. 31, 1971. Mr. Whitinger was the founder of an audio-visual training program for students in the Faculty of Education and was 58 years old at the time of his death.

– Mr. Hugh M. McIlroy, professor emeritus of Mechanical Engineering, died Jan. 9 at the age of 66. Prof. McIlroy was a member of the UBC faculty for 34 years and during the Second World War was commander of the UBC naval contingent. He also headed the University ceremonies committee for 10 years.

– Mr. Richard W. Pillsbury, assistant professor emeritus of Botany, died on Jan. 11 at the age of 68. A UBC graduate, Mr. Pillsbury taught at UBC from 1946 until his retirement in 1970.

– Dr. Robert J. Clark, honorary lecturer in the Department of Physics, died Feb. 2 at the age of 78. Dr. Clark studied at Cambridge University, where he was associated with Nobel Prize winner Dr. Ernest Rutherford. He lectured at UBC from 1946 until his retirement in 1963.

– Dr. G. Howell Harris, professor emeritus of Horticulture, and his brother, Dr. J. Allen Harris, professor emeritus of Chemistry died within 24 hours of each other on Feb. 5 and 6.

Prof. Howell Harris, who died the day before his 74th birthday, was a UBC graduate and a member of the faculty from 1925 until his retirement in 1963. His brother, Dr. J. Allen Harris, was also a UBC graduate and was widely-known for his discovery of a rare earth element called illinium at the age of 25. He joined the UBC faculty in 1932 and retired in 1966. He was 72 at the time of his death.

– Prof. Patrick Guthrie, of the Department of Classics and a faculty member since 1936, died on Feb. 11 at the age of 59.

– Dr. John A. Gower, a UBC graduate and associate professor in the UBC geology department, died Feb. 22 after a long illness at the age of 50. He was one of Canada's leading experts in the field of mineral exploration.

* * *

Four leading scientists and humanists, including two Nobel Prize winners, will give a total of ten public lectures at the University of B.C. in March.

Three of the lecturers will be the first visiting professors brought to UBC as the result of a gift from Dr. Cecil Green, a former UBC student, and his wife, Ida.

The fourth speaker will give two Dal Grauer Memorial Lectures.

The Cecil H. and Ida Green Visiting Professors are:

Dr. Gerhard Herzberg, Canada's 1971 Nobel Prize Winner and a research scientist at the National Research Council in Ottawa;

Dr. Donald O. Hebb, one of Canada's best-known experimental psychologists and Chancellor of McGill University, and

Dr. J. Tuzo Wilson, one of the world's leading geophysicists, who teaches at the University of Toronto.

The Dal Grauer Memorial Lecturer is Prof. George Wald, professor of biology at Harvard University and winner of the Nobel Prize for Physiology in 1967.

Prof. Wald is perhaps best known for a 1969 speech that he gave at the Massachusetts Institute of Technology in which he attacked U.S. militarism and analysed the disaffection of contemporary young people.

A flyer listing the dates, titles and locations of the lectures is available from UBC's Department of Information Services, telephone 228–3131.

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UBC ALUMNI Contact

ALUMNI government relations committee member Mrs. Bev Field (left foreground) discusses university problems with New Democratic Party leader Dave Barrett and Deputy NDP leader Mrs. Eileen Dailly (centre foreground). Standing behind carrying on their own discussions are (left to right) government relations committee chairman Mr. Bob Dundas, UBC Commerce Dean Philip White, Surrey NDP MLA Mr. Ernie Hall, Alumni Association President Mr. Frank Walden, Executive Director Mr. Jack Stathers and Vancouver East NDP MLA Mr. Bob Williams. Jim Ryan Photo.

ALUMNI CAMPAIGN FOR:

Erosion Control Project

This has been a winter of intensive activity for the UBC Alumni Association's government relations committee.

The committee began its activities by co-ordinating development and dissemination of 15 FYI information bulletins to all members of the provincial Legislature, all B.C. municipal councillors, all B.C. school trustees and other education officials. The bulletins conveyed information about the latest developments and trends at UBC in fields ranging from oceanography to continuing education.

Following the completion of that program, the government relations committee met with members of all parties in the provincial Legislature to discuss questions relating to higher education in B.C. Accompanying the committee for these discussions were Dr. Robert Kubicek, president of the UBC Faculty Association, and Dean Philip White, head of the Faculty of Commerce and Business Administration.

"Tenure was a major topic of discussion," said Mr. Jack Stathers, Association executive director. "Many of the MLAs expressed concern at the difficulties universities seemed to have had in the recent past with tenure disputes. We pointed out to them that the problems centred not so much on tenure as on cases involving faculty where tenure was not being granted or teaching contracts were not being renewed."

Mr. Stathers said that various MLAs expected that our Association would be invited to submit a brief on university tenure to the Legislature committee that is studying the subject during the current session. The government relations committee hopes to do so, said Stathers, after first making its views known to UBC.

Another important topic of conversation with provincial government members was the question of continuing erosion of the Point Grey cliffs. It was pointed out that the cliffs were eroding away at a rate of up to one-and-a-half feet a year and that now several University buildings were threatened with collapsing into the sea.

As the land in question is under provincial jurisdiction, the government relations committee recently launched an appeal to persuade the provincial government to finance an erosion control project to stop the continuing erosion in the area.

"We are urging the provincial government to undertake an erosion control project before it's too late – before public buildings collapse into the sea," said Mr. Stathers. "It's our hope that the engineering work will be of such a nature that it will do minimum disruption to the natural environment of the beaches around Point Grey."

A report on the progress of this campaign will be contained in the spring issue of the *Chronicle*.

Films and Talks

The Young Alumni Club has launched a special series of current affairs discussions and classic films as part of its expanded spring program.

The film series began in February with Thursday evening showings of flicks involving such comedy greats as Charlie Chaplin, W.C. Fields and Laurel and Hardy. On Thursday, March 2, the feature films will feature Little Rascals and Burns and Allen. And on March 9 the attractions will be Buster Keaton, Fatty Arbuckle and Charlie Chase. Shows get underway at 9 p.m. at Cecil Green Park.

The UBC Young Alumni are joining with the McGill University Young Alumni in Vancouver to stage the current events discussions. The program began on Feb. 15 with a panel discussion of Canada-U.S. economic relations.

At 8 p.m., Tuesday, March 21, the program will feature a panel discussion on "The Environment: Some Ideas as to How We Can Ensure the Survival of Our Air, Forests and Waters – and Ourselves." Participants will be Mr. Ben Metcalfe of the Greenpeace Foundation and representatives of the Council of Forest Industries of B.C. and the Society for Pollution and Environmental Control.

Young Alumni Club members are invited to attend these events. Membership in the club is open to alumni and members of the graduating classes of all faculties for a $3 fee. Information may be obtained by phoning: 228–3313.

HON. JOHN TURNER

Turner Speaks At UBC Dinner

The Hon. John Turner, Canada's minister of finance, will be guest speaker at the annual awards banquet of the UBC Big Block Club to be held at 7 p.m., Thursday, March 16, in the UBC Faculty Club.

The annual banquet will see the awarding of Big Blocks to top University athletes. The affair will begin with an alumni reception at 6 p.m., followed by dinner and the address by Mr. Turner. Tickets at $10 per person may be obtained by contacting the UBC Athletic Office, War Memorial Gymnasium (228–2531).

John Turner, BA'49, BCL, MA (Oxford), is himself holder of a Big Block in track, having been Canadian champion in the 100-yard and 220-yard sprints in 1948. He won his "blue" in track at Oxford, while studying there on a Rhodes scholarship.

New Secretary For Branches

The UBC Alumni Association's recent appointment of a field secretary is expected to result in further expansion in the alumni branches program.

Leona Doduk, BA'71, was appointed field secretary at the beginning of February and is now hard at work helping alumni groups in various communities organize meetings and programs. She has already completed trips to Kamloops, Vernon, Kelowna, Penticton, Calgary and Edmonton to meet with alumni and help them plan future activities. February, in fact, was a busy month for branches, with other functions being held in Edmonton and Seattle.

The Association's ultimate ambition is to help alumni organizations develop more meaningful programs.

Preferred Parking

Alumni returning to study at UBC in the 1972-73 academic year may qualify for preferred parking spaces.

Such parking is restricted to students who by Aug. 31, 1971, have completed at least three years of study at UBC or are enrolled in fourth-year or more senior courses for 1972-73. Inquiries and applications (together with a $1 fee, which is over and above car registration fees) should be directed to the Traffic Office, Wesbrook Crescent, University of B.C., starting April 4.