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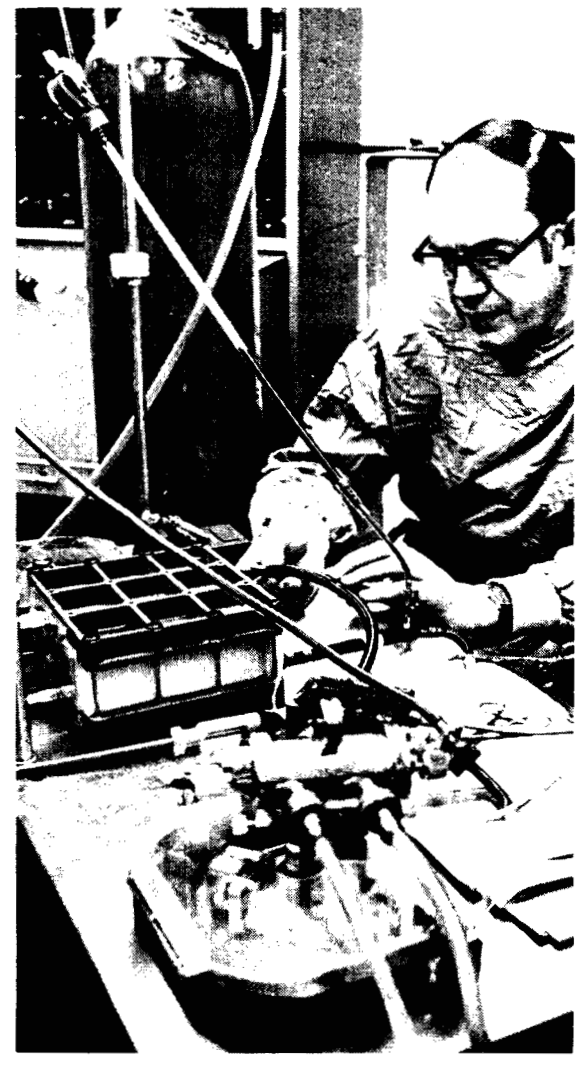
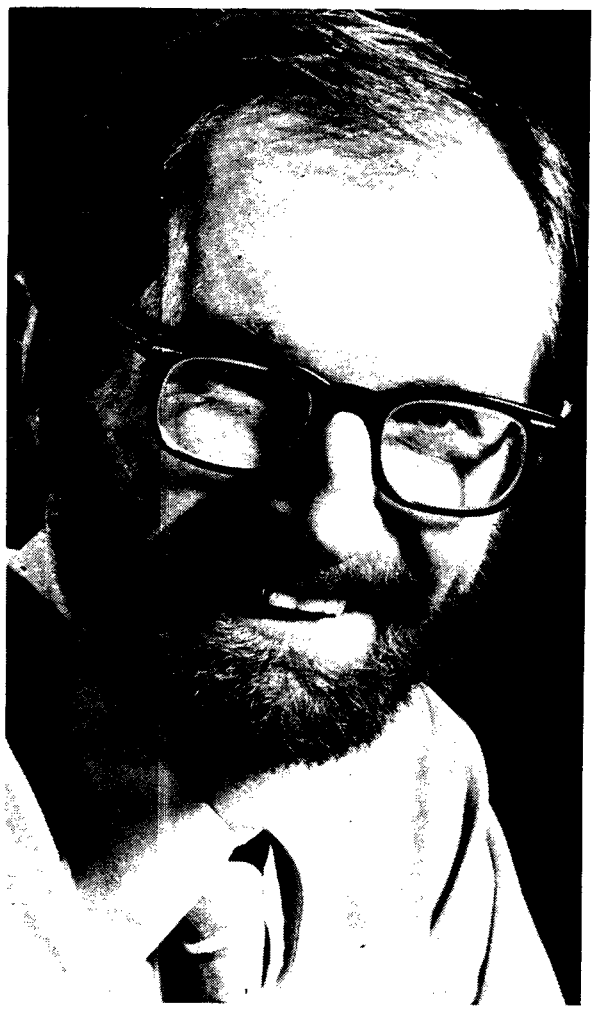
HEART RESEARCH AT UBC

Dr. Dennis Vince diagnoses heart malformations in children in a specially-equipped laboratory. See Page Five.

Dr. Peter Allen, holding an experimental heart valve, is also involved in heart transplant studies. See Page Six.



Dr. P.G. Ashmore is experimenting with a blood-oxygenating machine for use in operations. See Page Five.



PETER THOMPSON

Unique Issue Devoted to Heart Research

This is a unique issue of *UBC Reports*.

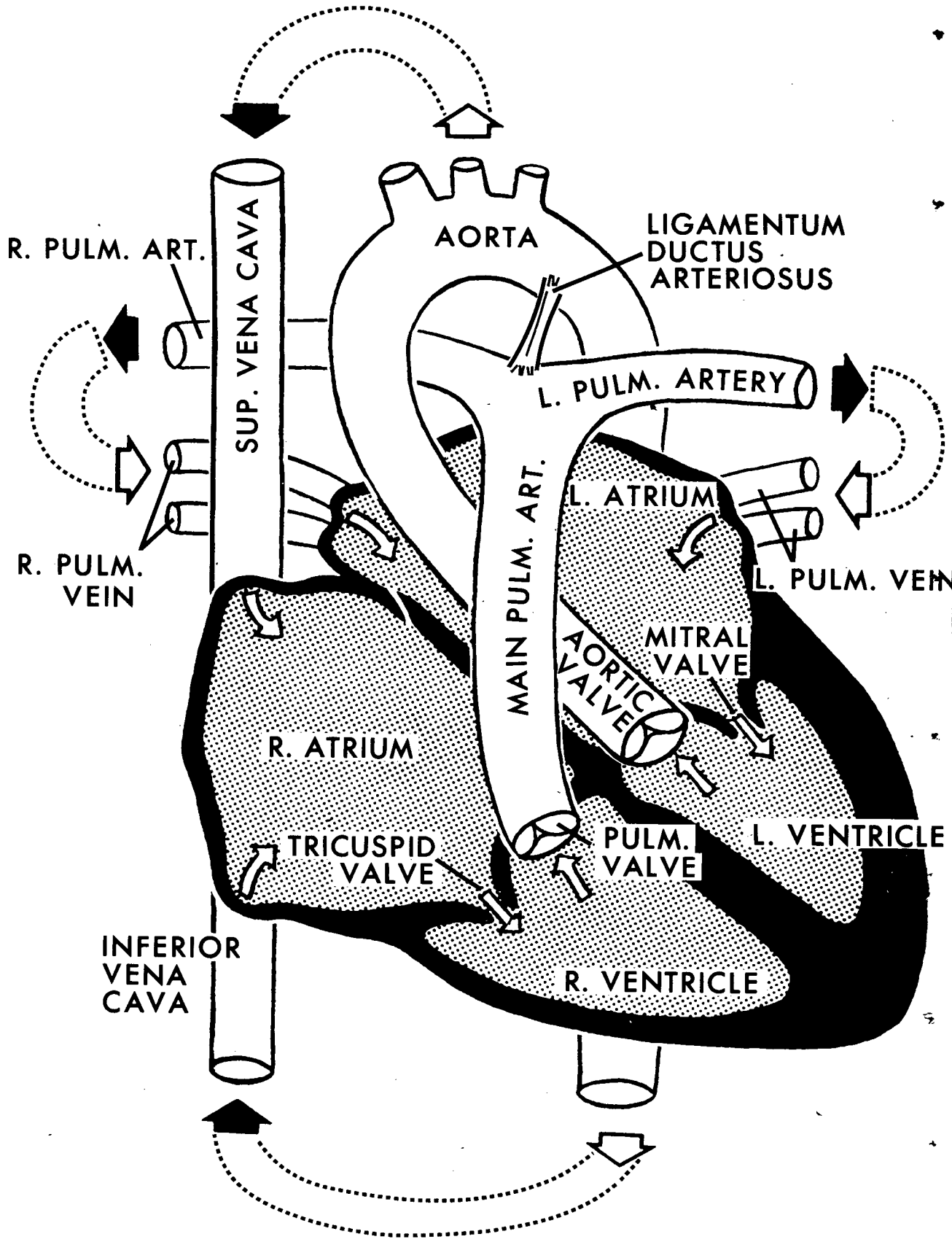
For the first time in the 16-year publishing history of the paper, its contents are devoted almost entirely to a single topic — the research being carried out by UBC scientists on diseases and defects of the human heart and circulatory system.

The seven major articles from Page Three to Page Ten of this issue are the work of Assistant Information Officer Peter Thompson, who began interviewing UBC medical scientists in July, 1970, to gather material for the series.

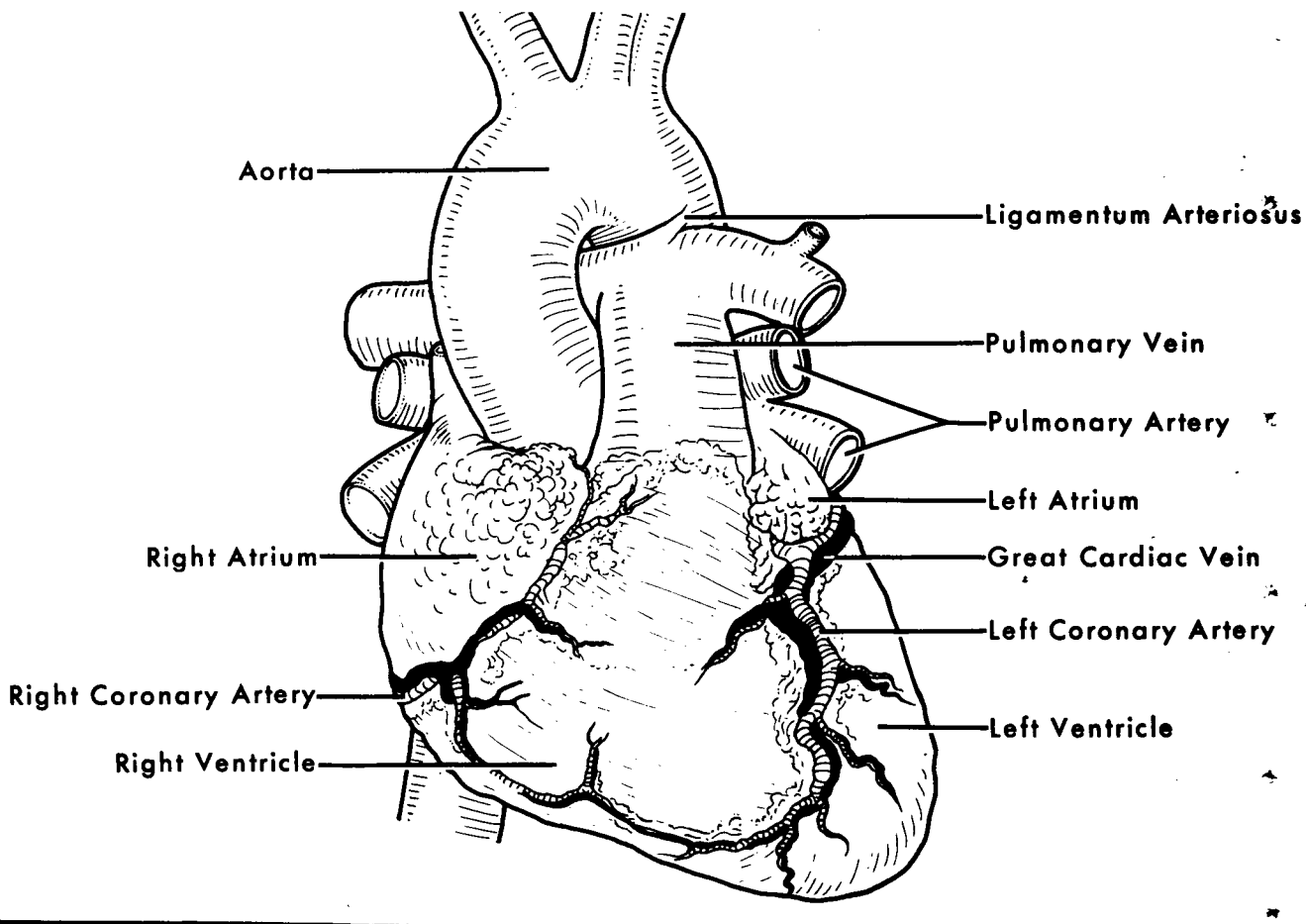
The projects described in this issue of *UBC Reports* are not an exhaustive catalogue of the work being carried out at UBC in the field of heart research. The limitations of space and time forced Mr. Thompson and the paper's editors to make a selection of material. It is our hope that we have not overlooked any significant projects.

"The article could not have been written without the patience of the researchers," Mr. Thompson said, "many of whom took time out from very busy schedules to talk to me. Before they could even describe their research results many of them had to condense an entire course on some feature of the cardiovascular system into an hour's interview to give me some seedbed knowledge."

The editors of *UBC Reports* are also grateful to the Department of Medical Illustration in the Faculty of Medicine, and particularly Mr. Victor Doray, the head of the department, for his assistance in supplying the illustrations of the heart on this page and for the photographs used to illustrate some of the articles.



The illustration above, prepared by the UBC Department of Medical Illustration for *UBC Reports*, is a schematic drawing showing blood circulation through the normal human heart. The large dark arrows indicate the pathway of venous, or deoxygenated blood returning from the body to the right half of the heart (shown at left in diagram) where it is pumped to the lungs for fresh oxygen. Large white arrows show the pathway of reoxygenated arterial blood to the left half of the heart where it is pumped into the aorta for another trip through the body. Diagram below shows the exterior of the heart and how it is supplied with blood by the coronary arteries.



THE HUMAN HEART

is an incredibly tough muscle that will beat some 2.5 billion times during a normal life span of three score years and ten. Despite a number of built-in safety factors, the various parts of the heart and the circulatory system are subject to disease, defects and the ravages of time. At the University of British Columbia, scores of faculty members and technicians are at work on various heart problems supported by grants from a myriad of agencies, including the B.C. Heart Foundation, which granted more than $160,000 to researchers in the current year. In the article below, Assistant Information Officer Peter Thompson describes how the heart works and the chief danger points where trouble can occur. In subsequent articles he describes how several top UBC medical scientists are grappling with heart defects and disease.

The sight of a heart beating in an open chest is terrible. It's terrible because it completely ruptures the image of the heart most of us have formed over the years.

It isn't the tranquil, pulsing organ we think it is. Lying there in the middle of the exposed chest, it is much bigger than expected, about the size of a fist.

Watching it for the first time is an existential moment. Its movements seem tortured. It writhes, almost jumps with each beat. And the question that passes through one's mind is: My God, if I owe my life to something like that thrashing in my chest, how long can it continue?

The reason for our false pre-conception of the heart is simple. So central and dramatic is the heart to life that almost all societies have given the heart and the blood it pumps some symbolic meaning.

SEAT OF THE MIND

It is only relatively recently that the brain, a visually dull sight compared with the heart, has been looked upon as the seat of the mind. The heart had occupied this role for some time.

And before the idea of the mind took root in the western tradition, the heart was considered the site of the soul. Sir William Harvey, who discovered the circulatory system in 1628, supported the old idea that the soul is centred in the blood.

The heart and blood are part of the rites of many religions. And poets and song writers still associate the heart with love and beauty. Our genteel and tender attitude toward the heart is partly responsible for the furore over heart transplants following the first by Dr. Christiaan Barnard in 1967.

Ignoring the question of whether the heart transplants should have been done or not, all sorts of other transplants had been going on for years without a ripple of public excitement. Kidney transplants, for example, are now almost routine. But then, no one has written a poem about an unrequited lover dying of a broken kidney.

So our idea of what a heart should look like is conditioned. And after a few minutes of watching an exposed heart beating out a constant rhythm of life one begins to realize how incredibly tough the heart is.

With proper care and a bit of luck, the human heart will beat some 2.5 billion times during a life-time of three score years and ten. Its repeated and almost monotonous lubb-*dup*, lubb-*dup* beating pushes between four and eight quarts of blood through the body depending on body weight.

Dark venous blood coming back from the upper part of the body, laden with carbon dioxide, pours into the right atrium of the heart through a large vein called the superior vena cava while blood from the lower part of the body returns through the inferior vena cava.

From there the blood passes into the right ventricle where the pumping action of the heart pushes it out into the pulmonary artery leading to the lungs.

After exchanging its carbon dioxide for a fresh supply of oxygen in the lungs, the blood – now crimson in color – returns to the other half of the heart and enters the left atrium.

It finally leaves the heart for another trip through the body with its freight of life-sustaining oxygen when squeezed out of the left ventricle into the aorta, the major artery of the body.

So the heart is really two separate pumps each feeding a separate circuit. The right heart operates the pulmonary circulation through the lungs. The left heart receives the re-oxygenated blood from the lungs and recirculates it throughout the body. This is the "systemic" or greater circulation.

The aorta branches out into a series of arteries. Together they make up the arterial system. The walls of arteries are lined with smooth muscles which help force the blood through them in a rippling movement.

After passing through a maze of millions of tiny capillaries, the blood returns to the heart through thin-walled veins. Body muscles, themselves moving against the veins, help move the blood through them.

WRINGS BLOOD OUT

The left ventricle must do more work than any other part of the heart so its walls are the most muscled. The three muscle layers making up the heart are so arranged that with each "lubb" of the heartbeat, the heart literally wrings blood out of its ventricles.

Like any pressure pump, the heart has a series of valves. One between each atrium and ventricle and one at the beginning of each artery leading from the heart. The "*dup*" part of the beat is the sound of the crucial aortic valve slamming shut after the left ventricle has squeezed its contents into the aorta.

The heart normally contracts about 70 times a minute. Each contraction occurs when heart cells receive a signal to contract through a system of nerve-like fibres.

The signal originates in a knot of cells called the sinoatrial node at the top of the right atrium. The S-A node recharges itself as soon as the impulse to contract is set off. The signal fires off both atria and travels through fibres down to another bundle of cells at the bottom of the right atrium. From here it moves down through a network of fibres branching out through both ventricles so that the ventricles are triggered off in a definite time interval after the atria.

This outline points to the potential disaster areas where something could go wrong. Something might happen to the valves, for instance. Or the critical left ventricle could be weakened or stopped. Or the suppleness of the arterial walls may wither away.

If the heart breaks down, the result can be disastrous, of course. The heart, though it weighs about 1/200 of the total weight of the body, must itself receive 1/20 of the body's blood to sustain it. It receives its own supply of blood through two coronary arteries, the first arteries to branch off the aorta. If something happens to the coronary arteries so that blood supply to the heart muscle is cut off, death can occur within minutes.

A number of safety factors have been built into the heart in case something does go wrong. The atria, for instance, have the ability to pump blood into the ventricles. Normally this pumping action isn't needed. But if the valves between the atriums and ventricles become defective, the extra capacity can mean the difference between life and death.

Blood will also continue to circulate even if the right ventricle is dead. Circulation will continue if the muscle of the critical left ventricle is more than half dead.

The other node in the right atrium, the atrioventricular node, can take over, though only at about 50 contractions per minute, if the S-A node packs up. And the conducting network within the ventricles can operate at between 30 to 50 beats per minute if both the S-A and A-V nodes give up.

But for many, even these safety factors aren't enough. More than half of the deaths in Canada this year – some 80,000 – will be from diseases of the heart and circulatory system – cardiovascular disease.

About 35 per cent of these deaths occur among Canadians between the ages of 45 and 64, men and women in the prime of what would normally be their life span. And each year the age group of people affected by cardiovascular disease is younger and younger. Some 2.5 million Canadians, more than 10 per cent of the population, suffer from some form of cardiovascular disease.

CAUSE OF DISEASE

Most people have a hard time understanding heart and circulatory diseases and for good reason. To most of us a disease is usually caused by a virus or bacteria. And most of the diseases we are familiar with are clear-cut. Appendicitis, for example, or tuberculosis, typhoid fever and diptheria.

Not so with cardiovascular diseases. A few are caused by bacteria, some aren't, many have unknown causes. And their effects are diffused, often affecting more than one part of the body. A good example of a clear-cut, cause-and-effect bacterial heart disease is endocarditis, infection of the inner heart lining. Virus myocarditis is infection of the heart muscle itself. But

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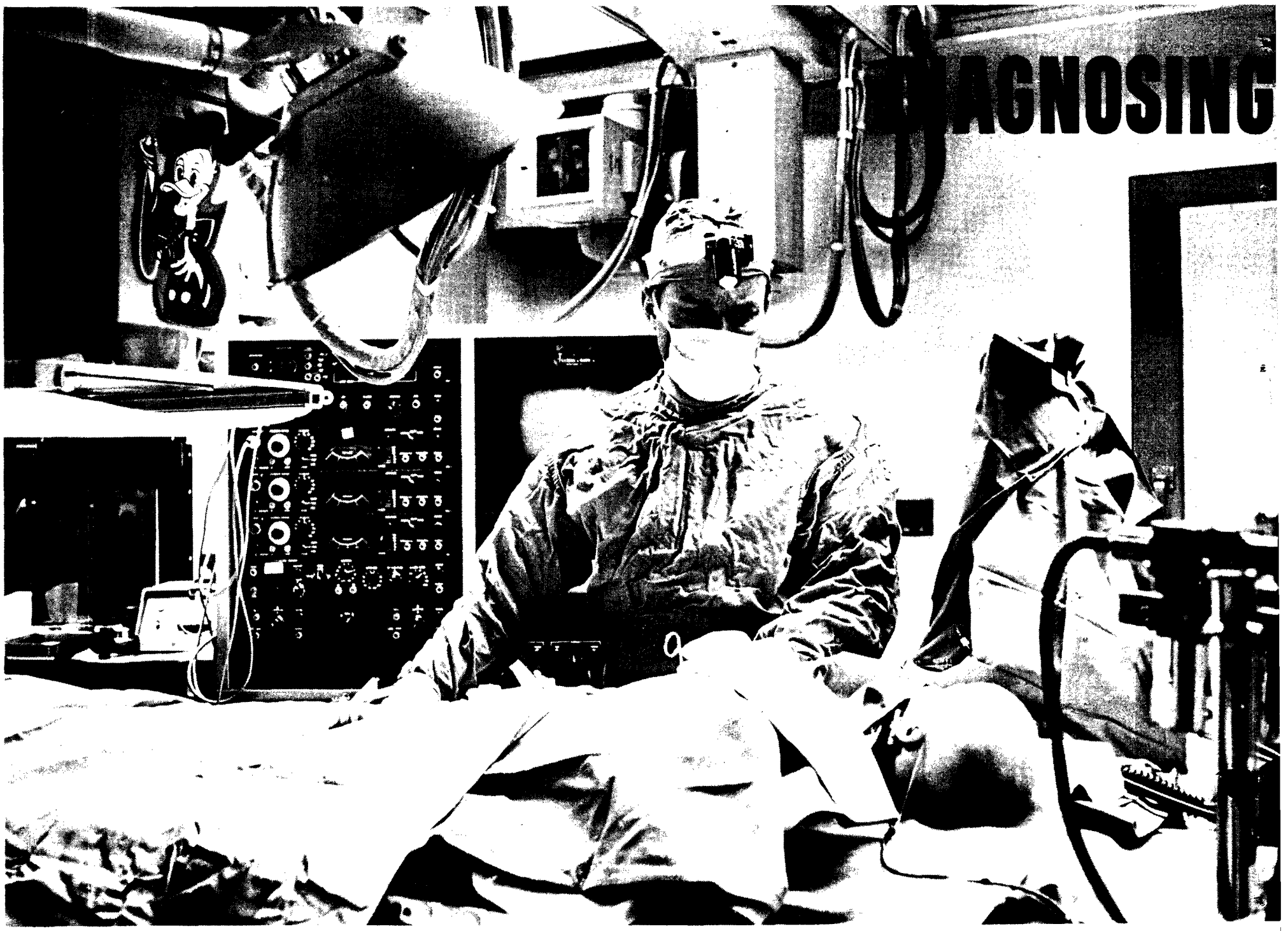


Dr. Dennis Vince prepares to carry out a diagnostic procedure on an infant with a heart malformation. See story on opposite page.

HEART *Continued from Page Three*

there are less serious or at least less frequent diseases. In comparison, origin of the most insidious "big four" cardiovascular diseases is obscure.

Arteriosclerosis or hardening of the arteries leads to graduai narrowing of the opening of the arteries as fatty material is laid down along the inside walls. Blood clots forming in the narrowed arteries can bring on heart attacks or strokes. The arteriosclerotic process can begin as early as the late teens. Its cause is unknown.

HIGH BLOOD PRESSURE

Mystery still surrounds about 90 percent of the cases of hypertension or high blood pressure. Recent research advances have made it possible to determine the origin of some cases of hypertension, which affects more than 10 per cent of the population. It can lead to a stroke or heart or kidney failure.

Rheumatic heart disease has struck nearly 200,000 Canadians living today. It is caused by rheumatic fever which occurs two to four weeks after a streptococcus infection, for example, a "strep" throat or ear infection or scarlet fever. But its exact cause isn't clear. Rheumatic fever can strike at any age, though it usually occurs in childhood. It can lead to rheumatoid arthritis as well as rheumatic heart disease, permanent damage and scarring of the heart valves.

About one out of every 250 babies is born with congenital heart disease, some 300 each year in B.C. alone. The heart or the major blood vessels connected to it are misshapen, malformed. Before specialized diagnostic laboratories came into existence a few years ago, surgery was seldom attempted and about 75 per cent of these babies died. Today the survival figure is closer to 80 per cent.

One of the most common congenital defects is patent ductus arteriosus where a normal pre-natal connection between the aorta and the pulmonary artery fails to close when the baby is born. Blood nourishing the fetus is from the mother's circulatory system. The fetus naturally can't breathe, so the loop to its lungs between the right ventricle and left atrium is short-circuited through the connection between the pulmonary artery and the aorta. The ductus closes at birth. If it doesn't it must be severed by surgery.

Another common but more complicated congenital defect is tetralogy of Fallot. Tetralogy refers to the four conditions usually present. The most important two are a narrowed pulmonary valve and a hole between the two ventricles. The result is that amounts of venous blood returning to the right heart from the body, low in oxygen and high in carbon dioxide, are recycled through the body without being re-oxygenated in the lungs. Hampered from entering the pulmonary artery because of the defective valve, the venous blood shunts through the hole in the septum separating the two ventricles and is pumped into the aorta. The dark venous blood gives babies with this condition a bluish hue, thus "blue babies."

Corrective surgery for this condition usually isn't performed until the baby is at least five years old. But stop-gap palliative surgery usually must be done while the infant is in its first few months of life to ensure that it will survive and develop until corrective surgery can be done more safely when it is older.

Palliative surgery doesn't change original defects. The most important of palliative surgery for tetralogy of Fallot is the creation of a shunt between the pulmonary artery and aorta.

In effect, a ductus is re-established between the two blood vessels, reversing the surgical correction for patent ductus arteriosus.

MORE COMPLICATED

The new ductus allows part of the venous blood, which poured through the hole between the ventricles and entered the aorta, to return to the pulmonary artery for re-oxygenation in the lungs.

Other malformations are much more complicated, almost bizarre. Some hearts are so misshapen they seem the work of something mindless and diabolically evil.

The aorta and vena cava could be switched, for instance, with the aorta leaving the right ventricle instead of the left. Death is inevitable when this happens, unless by some irony another malformation is present, such as patent ductus arteriosus or a hole in the wall between the atria. These additional malformations, through the process of a double negative, to some extent cancel out the reversed blood circulation caused by transposition of the aorta and vena cava.

Researchers at the University of B.C. are trying to understand and treat or prevent most of the major forms of cardiovascular afflictions. Investigations are going on in both the basic medical science departments on campus such as Anatomy, Pathology and Pharmacology, and in such clinical departments as Surgery and Pediatrics associated with Vancouver hospitals.

Funding for their work comes from a variety of agencies, though the main source is the B.C. Heart Foundation.

CARE IMROVED

Clinical investigators occupy a small middle ground between the laboratory type of medical research scientist and the practising physician. These are people who don't have to make the choice between being a full-time physician or a full-time scientist. Their research is usually intimately involved with their practice and is often stimulated by a problem they have come across as a health professional.

A patient or many patients may have an affliction the doctor doesn't know how to treat. He can't find the answer in any book. So he starts a clinical investigation to find out for himself.

By solving the problem he advances medical knowledge, increases the quality of care to his patients and makes himself a better doctor.

HEART PROBLEMS IN CHILDREN

Heart disease in children is the specialty of Dr. Dennis J. Vince, associate professor in UBC's Department of Pediatrics, especially where the difficulty is such that without correction the baby would die within a few months of birth.

Often congenital malformations are tremendously complicated. Cardiac surgeons must operate on these babies to save their lives so that further surgical improvements can be done when the child is older and more developed. Because such malformations in new-born infants are hard to diagnose, Dr. Vince has developed one of the most advanced diagnostic laboratories in the world for infants and children with these problems.

The laboratory was built at the Vancouver General Hospital for $160,000 three years ago. It is multi-purpose. It is used by UBC for teaching and research and by practising specialists for investigating children with heart abnormalities from all over the province.

TRAIN SPECIALISTS

By concentrating the three functions in one unit, patients benefit from the best diagnostic care available and the use of advanced equipment, some of which is financed through research grants, and the University is able to carry on its research and teaching functions under clinical supervision.

Dr. Vince has trained five pediatric specialists in the use of the laboratory. These are people who have taken their MD degree after completing their university prerequisites for entering medical school, have taken five years of postgraduate training in pediatrics, and then have studied for another two years under Dr. Vince.

A method used to detect heart malformations in the lab is cardiac catheterization. A catheter or tube is passed through the major blood vessels of the body and into the various chambers of the heart to measure – among other things – the amount of oxygen in the blood. This is the common technique for detecting septal defects – abnormal holes in the walls between the atria or ventricles.

ELECTRIC CIRCUIT

Another catheterization method of picking up blood shunts through holes too small to be detected using the above procedure is the hydrogen ion test. A chatheter is used with a platinum tip which acts as an electrode. The patient is given a small portion of hydrogen to breathe. When the hydrogen ions in the blood stream reach the catheter, an electric circuit is formed. By plotting the circuit doctors can add to the information which will eventually be weighed in arriving at a diagnosis.

Another technique is to inject a substance, which will show up on x-rays, through the catheter and into the heart. X-rays taken while the substance flows through the heart in effect create a motion picture of blood travelling through the heart while it is beating in the patient's chest.

Dr. Vince's main concern today is preventing rather than treating cardiovascular disease in children. Prevention of malformations in babies due to rubella or German measles is one of the two areas he is active in.

"Our research statistics, which we have presented to national and international meetings, are dreadful," he said. "They show that we spend a large part of our time and money treating diseases which are preventable.

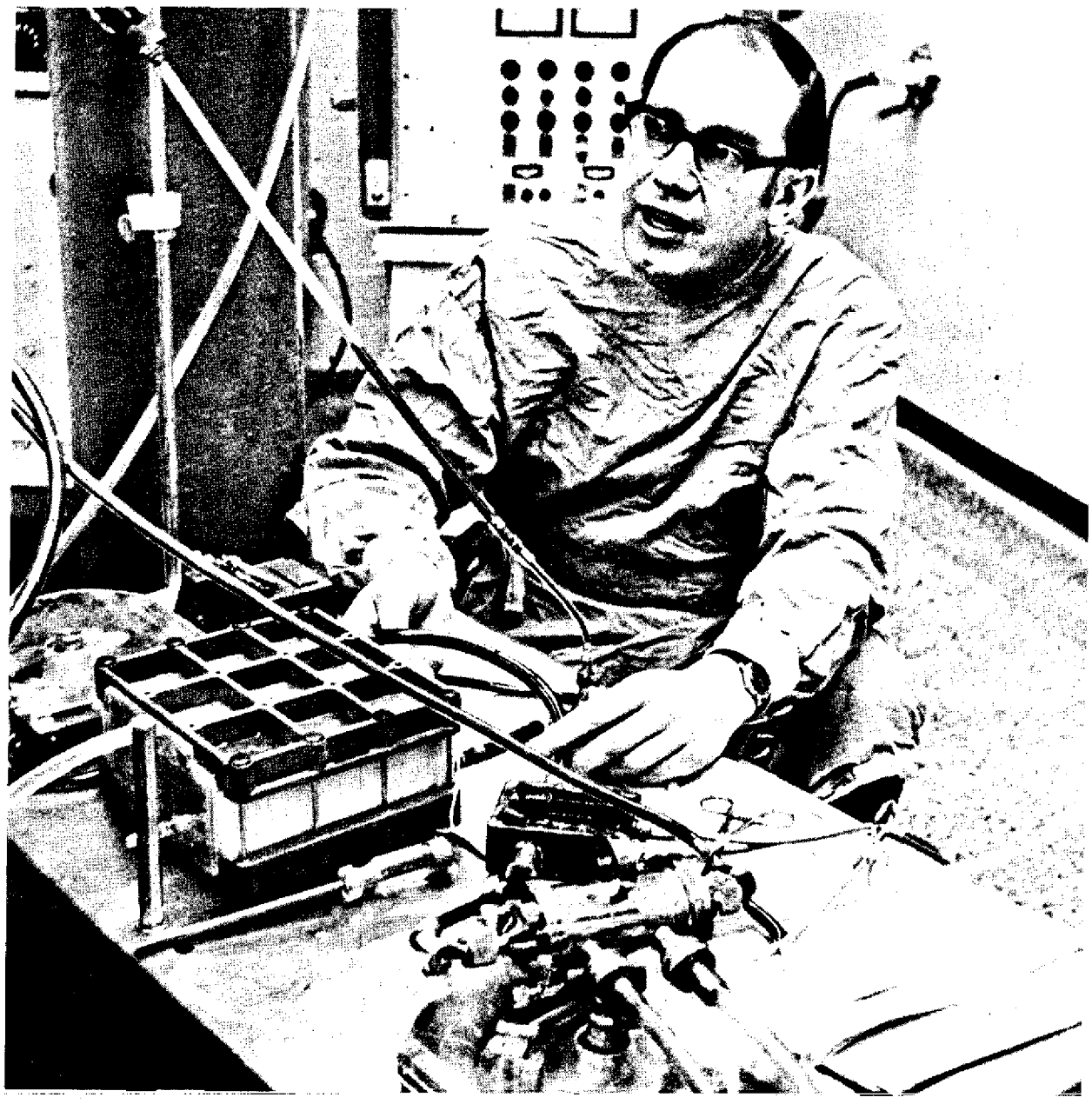
"At VGH we're spending more than $60,000 a year on treatment of children born with heart malformations because their mothers were exposed to rubella during their pregnancies."

Dr. Vince and his group became interested last year in the possible effect on the fetus of tranquillizers taken by pregnant women. They had come across cases of women who had taken tranquillizers during their pregnancies and had given birth to babies severely malformed by some unknown cause.

There was also evidence that a group of tranquillizers known as phenothiazine do cause damage to the heart tissue of adults and can result in severe damage, including sudden death, especially if they are withdrawn.

"We took this lead," he said, "and postulated that the fetus would also be affected because the tranquillizers would be transferred across the placenta. Perhaps the fetus, because of its immature development, may even be more sensitive to the tranquillizer than the mother."

Dr. Vince conducted an experiment with mice which showed no damage to the heart tissue of fetus. But other malformations appeared. "The experiment was a pilot study to determine if the malformations were caused by other factors. And the number of mice wasn't sufficient to lead to anything conclusive. So we're planning an extended experiment to see if phenothiazine does cause malformations."



Dr. P.G. Ashmore works on a machine for oxygenating blood.

Search for an Oxygenator

In certain kinds of open-heart surgery the patient's circulatory system is interrupted so that a machine takes over the job of his heart and lungs. His blood picks up a new supply of oxygen and gets rid of carbon dioxide by passing through a pump-oxygenator instead of the lungs.

But pump-oxygenators in use throughout the world have one serious drawback in common. Unlike the mechanism nature uses in the lungs themselves, the pump-oxygenators bring the blood into direct contact with the oxygen. If blood is in direct contact with oxygen for more than four hours, the blood can be damaged. A serious result of this is that the electrical charge is changed on platelets – the cells in the blood which help in clotting – as well as on lipoproteins and other blood molecules. This can cause the molecules to attract each other and group together into micro-aggragates which could lodge somewhere in the circulatory system causing – among other things – stroke, paralysis or death.

For four years Dr. P.G. Ashmore, clinical associate professor in UBC's Department of Surgery, has headed a group trying to perfect an oxygenator in which blood doesn't come into direct contact with oxygen. The machine he has been working on approximates the design of the lungs themselves.

Blood passing through the machine is divided into smaller and smaller capillaries. By reducing the size of the capillaries a greater portion of blood comes into contact with the capillary walls through which the oxygen-carbon dioxide exchange takes place. The machine uses a membrane of silicone rubber to separate the blood from the oxygen.

"The other types of membrane oxygenators have the disadvantage that the blood passing through them is in thicker layers so that blood near the surface is well oxygenated but blood beneath the surface isn't," Dr. Ashmore said.

"Right now our machine has a capacity of 1,000 cubic centimeters of blood per minute, a lot less than the average man's cardiac output but sufficient to supply partial oxygenation in babies."

He said it is possible to oxygenate more blood by building a larger machine but that this would mean too large a volume of blood would be outside of the body. He is experimenting on the oxygenator's performance by artifically causing respiratory failure

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See BLOOD

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in dogs and hooking their circulatory system to the machine.

If successful, the oxygenator could be used on babies to give long-term support to their circulatory system – say three or four days – so that their own systems have a chance to recover.

As a surgeon, Dr. Ashmore specializes in heart diseases in children.

Dr. Ashmore and his group have also been studying another method of getting around the problem of blood damage because of direct exposure to oxygen. For about six years they have been adding substances to the blood to try to eliminate or reduce the toxic effect of direct oxygen. More recently they have been experimenting with methods of filtering the blood to remove damaged ingredients.

HYPERBARIC CHAMBER

Some of Dr. Ashmore's patients, whose congenital heart malformations have been diagnosed in Dr. Vince's catheterization lab (See Page Five), are operated on in UBC's hyperbaric chamber at VGH. This is done so that the babies, usually in grave danger and desperately ill, can benefit from the chamber's supply of pure oxygen under high pressure.

The chamber – 24 feet long and eight feet in diameter – was installed five years ago to explore the new field of hyperbaric oxygen therapy. Today, pure oxygen under pressure is used as a treatment itself of patients who can't supply their bodies with enough oxygen. The conditions include decompression sickness, carbon monoxide poisoning, pneumonia and low cardiac output.

The chamber is also used in conjunction with surgery to repair congenitally malformed or diseased hearts or to remove pulmonary emboli – small clots of blood which have circulated through the blood stream and come to rest in the lungs. Everything that is available in a normal operating theatre has been installed in the chamber with the exception of x-ray equipment, which would present a fire hazard. At the high oxygen levels used in the chamber any spark could cover the interior in flames. Because the chamber isn't as large as the normal operating theatre, some of the equipment – such as the anaesthetic and lighting apparatus – has been condensed.

"Some of the infants operated on in here are so sick they wouldn't have much chance of surviving their first few months of life," said Dr. W.G. Trapp, clinical assistant professor of Surgery and director of the unit.

"Sometimes the infant's oxygen level goes down while in the chamber under normal pressure and its heart stops. We can't get it started again. Electric shock, cardiac massage, chemotherapy, artificial respiration – nothing we try revives it.

"Then we close the door and turn up the pressure and watch as the baby's heart starts to beat all by itself. The baby's circulation may remain low but the extra pressure gives its heart the oxygen it needs."

The chamber works by saturating the blood with oxygen. Normally it is hemoglobin, a component of the red cells of the blood, which picks up oxygen from the lungs. At normal pressures about 95 per cent of the hemoglobin's oxygen-carrying capacity is used.

The chamber has been effective in treating carbon monoxide poisoning. At normal pressures, carbon monoxide is 30 times more successful than oxygen in competing for the hemoglobin. Increasing the oxygen pressure reverses this reaction so that hemoglobin resumes its job of carrying oxygen.

When pure oxygen under pressure is given to patients the excess oxygen bypasses the hemoglobin and is forced into the fluid of the blood and circulated through the body.

A similar blood mechanism lies behind the chamber's successful treatment of massive cyanide poisoning, the only recovery ever reported.

In a series of experiments using dogs now underway, Dr. Trapp and his team are trying to perfect a method of installing a small, inflatable balloon in the aorta.

CORONARY SHOCK

The procedure is designed to treat coronary shock. This sometimes occurs after coronary occlusion and thrombosis. The shock can be due to pain, abnormal chemicals released from the section of dead heart muscle, or other factors. Blood pressure drops, pulse rate increases; cold perspiration and extreme weakness comes on. Victims of severe coronary shock face 5-to-1 odds against survival.

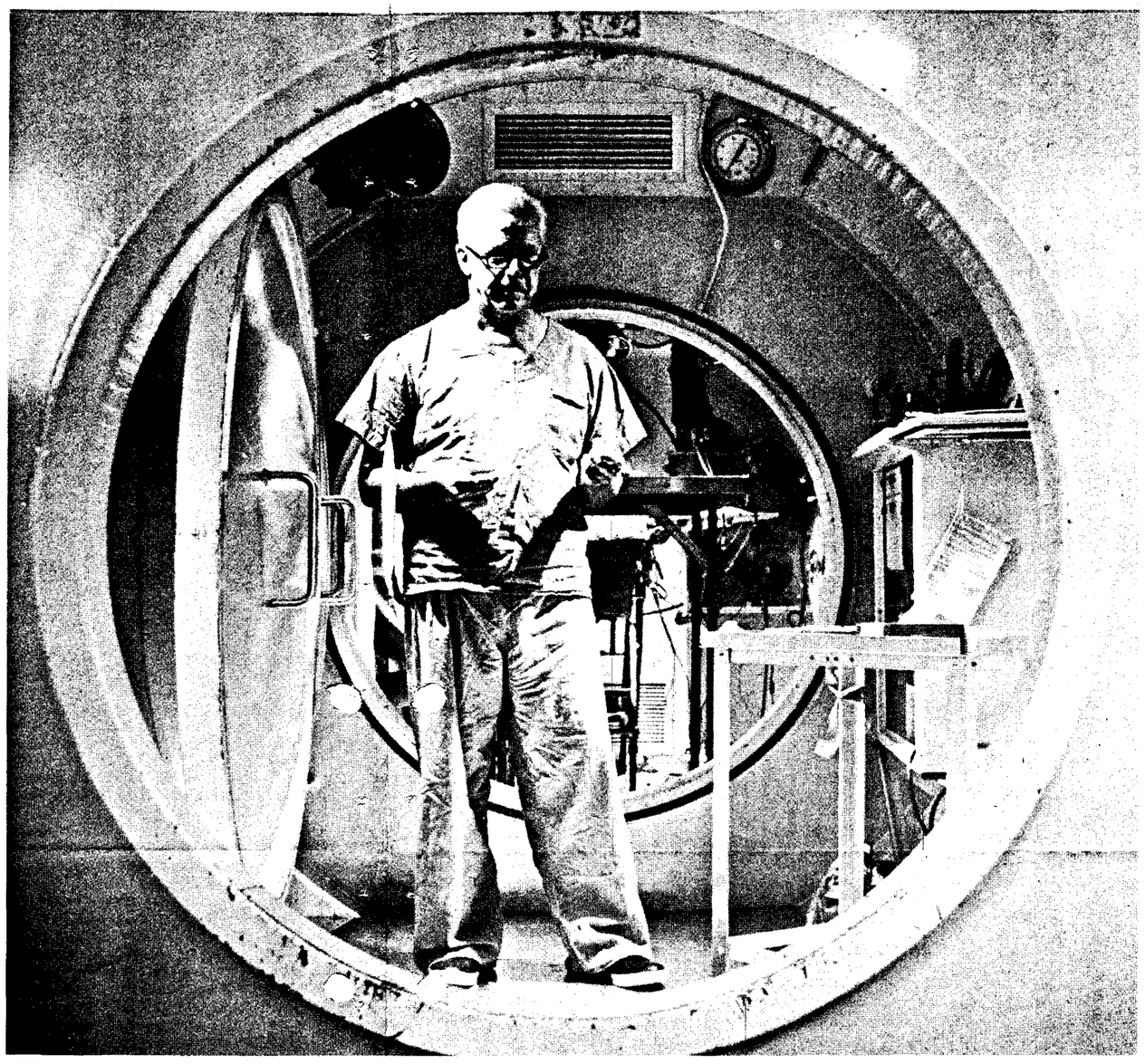
Dr. Trapp ties off the coronary arteries of the dog to bring on a thrombosis. He passes a catheter with a balloon at the tip into the mid-aorta.

Helium gas is pumped in and out of the balloon through the catheter in sequence with the heart beat so that the balloon deflates, creating a low-pressure area just before the left ventricle pumps blood through the aortic valve.

When the valve closes the ventricle expands during its resting period and takes in more blood from the left atrium. During this part of the cardiac cycle the balloon expands, pushing on the blood just pumped out of the heart.

The pushing action would normally be done by the left ventricle. Under optimum conditions as much as half of the ventricle's work load can be taken over.

This procedure has been used on humans in some medical centres, though not in Vancouver. Dr. Trapp said success so far in humans has been estimated at only 30 per cent. Dr. Trapp doesn't think 30 per cent is good enough. His results of treating dogs experimentally with coronary thrombosis, with hyperbaric oxygen therapy alone, appears to be even better than the helium counterpulsator.



Dr. W.G. Trapp operates in UBC's hyperbaric chamber where new techniques of oxygen therapy are explored. See story at left.

REPAIRING THE DAMAGED HEART

Ghostly Dr. Peter Allen holds an experimental heart valve made of metal, fabric and rubber.

Dr. Peter Allen, clinical assistant professor of surgery, has been involved in heart repair and heart transplant investigations. The first searched for a better way of replacing heart valves and the second involved experimental use of immuno-suppressive drugs to stop a body rejecting a new, transplanted heart.

REPLACE DAMAGED VALVES

For about six years now heart surgeons have been replacing damaged heart valves, particularly the aortic and mitral valves, with artificial ones made of metal, fabric and rubber. But these valves frequently produced a thrombus or blood clot. A blood clot would build on the fabric and extend onto the metal which it failed to grip. The clot would often break off in many tiny pieces and circulate through the body, often lodging in the brain with usually disastrous results.

More than two years ago Dr. Allen began an experiment with sheep, replacing the pulmonary valve with the aortic valve of another sheep. Usual problems of rejection don't occur with transplanted, natural valves because they are made of the same kind of bloodless material that lines the joints of the skeleton.

"The reason we did an aortic-to-pulmonary transplant was because it was technically much easier than replacing the aortic valve with another aortic," Dr. Allen said, "and we would learn as much anyway."

Twenty sheep were used over the two-year period of the investigation. When the transplanted valves were re-examined after being in the sheep for some time, many of them had developed leaks because the area actually regulating the flow of blood had shrivelled. But after a year or a year and one-half, the same part of the valves had begun to regrow, though the shrivelled deformity never corrected itself.

Dr. Allen, like Dr. Ashmore and Dr. Trapp, a member of the VGH cardiac surgery team, said "the experiment was designed to see if the transplanted valve would remain competent, which it didn't. But we found out that the valve actually lived, it didn't remain in the body as dead tissue, as we expected." The experiment ended about six months ago.

"In the meantime," he said, "the design of the artificial valves or prosthesis has improved immeasurably. They no longer have exposed metal on them and they don't produce emboli to float through the body in the bloodstream in any significant volume."

His two current projects involve the problems surrounding cardiac transplants. About 160 human heart transplants have been done in the world and only about 15 patients are still living.

"Cardiac transplant is not yet a practical method. The surgical technique has been solved but the ability to keep the patient alive afterwards has a long way to go," he said. "Patients often die of pneumonia because the immuno-suppressive drugs they are given to reduce their bodies' resistance to the foreign heart also reduces resistance to other foreign organisms such as bacteria."

To study the effect of various immuno-suppressive drugs, Dr. Allen transplanted the heart of one dog into the abdomen of another, tying the new heart into normal blood circulation of the dog so that the new heart received life-sustaining oxygen. But the new heart didn't do any pumping of blood. It was attached to the dog's life system but didn't function as a heart. The dog continued to live on his own heart in his chest.

The advantage of this method is that the new heart could be studied even as it died since the animal wasn't dependent on the new organ. Dr. Allen discovered that a combination of steroids and azathioprine kept the new heart alive for the longest period "which towards the end of the experiment was three to four weeks."

KEEP DONOR HEARTS ALIVE

If the transplanted heart had taken over the function of the dog's own heart and *no* immuno-suppressive drugs had been given, the dog would have died within a week.

A project Dr. Allen has just begun is to devise a way of keeping a donor heart alive outside the body for a long period of time before being transplanted into a recipient. Success might make it possible for cardiac banks to be formed.

He is studying the effect of different types of solutions which he perfuses over the experimental hearts to keep them alive in a special chamber. Effectiveness of the more promising solutions will be checked by transplanting the hearts involved into the abdomen of dogs.

Coronary Care Units Cut Deaths

Dr. Dwight I. Peretz's clinical investigations have improved the chances of heart disease patients surviving life-threatening arrhythmia or change in the rhythm of the heart beat following a heart attack.

Dr. Peretz, a clinical assistant professor in the UBC Department of Medicine, is director of the Medical Intensive Care and Coronary Care Unit at St. Paul's Hospital.

The 20-bed unit is for patients who are severely ill. Rather than have them scattered throughout the hospital wards, they are concentrated into one unit under the constant vigilance of doctors and specially trained nurses. The private beds are arranged around the perimeter of a large central nursing and monitoring station.

Six of the beds are designed and equipped for coronary patients, though between 10 and 12 beds are usually occupied by coronary victims.

MORTALITY RATE

Dr. Peretz began his investigations under grants from the Medical Research Council when the unit, financed by the P.A. Woodward Foundation, opened in 1965. The mortality rate of heart attack victims is normally between 30 and 35 per cent, Dr. Peretz said. But where well run coronary care units are available – the first were built in North America only about seven or eight years ago – the rate has been cut down to 17 per cent or less.

About half of heart attack deaths are caused by damage to centres controlling the electrically-stimulated pumping action of the heart. The other half is because muscle tissue has been damaged to the extent that pumping is impossible.

Dr. Peretz has concentrated on the electrical disruption of the heart by studying the electrocardiograms of some of the 3,500 patients who have passed through the Unit.

The electrocardiogram of each coronary patient is projected on a monitor in the nursing station and recorded on magnetic tape. If something goes wrong, a warning light flashes and a buzzer sounds so the staff can apply immediate therapy.

When an arrhythmia occurs the heart may fibrillate, go into a flutter, and heart beats can increase to a frantic 400 to 500 per minute. Doctors or nurses immediately apply an electric current across the chest to cancel out electrical activity in the heart so that the normal rhythm of the heart can re-establish itself.

"A patient can literally be revived from a condition of technical death to a normal, conscious, talking state in a few moments using the defibrillator," Dr. Peretz said. "This emergency procedure may be applied a dozen times or more until the heart finally takes over its natural electrical activity."

ALARM TRIPPED

As soon as the alarm is tripped, warning that something is wrong, the electrocardiographic record of the five minutes preceding the alarm is automatically transferred to a paper print-out recorder. By studying these records Dr. Peretz has discovered which events give an early clue that an arrhythmia is imminent.

"A tremendous amount of information has been produced at coronary care units around the world," he said. "Now we know what to ignore on the electrocardiogram, what we should just watch carefully and what could lead to something serious and often when we can expect it to occur."

A great deal of attention is being paid at his unit to serious arrhythmias following myocardial infarction – injury and death to part of the heart

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See ARRHYTHMIA

Diagnostic Tool Brings Recognition

More disabilities and deaths are caused by diseases of the critical coronary arteries feeding the heart its life-sustaining blood than by any other single disease in the western world.

A group of UBC researchers have won international recognition for developing a new machine to help diagnose these ailments. Clinical studies involving several thousand patients have shown that the method significantly improves the accuracy of diagnosis of coronary artery disease.

A 15-year research program co-ordinated by Dr. Gordon E. Dower, assistant professor in the Department of Pharmacology, has resulted in a machine called a polarcardiograph (PCG) for recording more accurately the electrical signals from the heart as it contracts.

A prototype PCG was first used at the VGH Heart Station in 1955 but was too large and complicated for anything but experimental operation. Six years later a large clinical version was available for trials at VGH and Shaughnessy Hospital.

PATIENTS STUDIED

In a study of 253 patients at Shaughnessy who had suffered myocardial infarctions — blockage in the coronary arteries leading to death of part of the heart muscle — damage was detected by the PCG in 225 or 89 per cent. The standard electrocardiograph (ECG) detected only 150 or 59 per cent. Of 58 patients whose diagnosis was confirmed at autopsy, the ECG was accurate only 40 per cent while the rate for the PCG was 79 per cent.

The PCG also revealed that many patients had suffered non-fatal heart attacks not picked up by the ECG.

Dr. Dower got the idea for the PCG in 1954 while he was a cardiology fellow at VGH. He was then building yet another type of electronic diagnostic machine for heart damage, the vectorcardiograph. VCGs at that time weren't commercially available.

Development of the PCG was an interdisciplinary effort. Dr. A.D. Moore, professor of Electrical Engineering, was consultant throughout the project and several of his graduate students earned their master's degrees working on the design of various stages of the machine.

The PCG system is now manufactured by Totemite Inc. in the U.S. The company used all of the research group's data in the final design. The system incorporates three unique pieces of equipment.

The electrical activity of the patient's heart is recorded on a high-fidelity tape recorder small enough and fully mobile so that it can be wheeled to the bedside.

Dr. John A. Osborne, director of cardiology at VGH, who was involved in the project as clinical cardiologist, suggested a method for displaying the PCG information in a way familiar to the cardiologist. So the recorded signals on the tape are fed into a playback unit from which three separate outputs are available for ECGs, VCGs and PCGs.

The PCG output is fed into a graphic or analogue computer and then onto a multi-channel recorder as polarcardiograms.

Information from the research studies and two years' experience in the clinical application of the PCG system at VGH has led to three major areas of research and development.

IMPROVE DIAGNOSIS

The first is an extension of the diagnostic information on the PCG tracings. Improved diagnosis of myocardial infarction was done using only a small fraction of the PCG information. Refinements in the use of additional PCG data in detecting cardiac abnormalities are now underway in carefully controlled clinical evaluations of patients at VGH.

The second is an extension of PCG facilities to include other hospitals and patient populations throughout B.C.

Diagnosis from PCG tracings is done by measuring parts of the graphs. When done manually these measurements are long and tedious. Dr. Dower and Dr. Osborne are now feeding the PCG information into UBC's Computing Centre. They anticipate the computer will be able to provide an interpretation guide to physicians throughout the province in the near future as refinements are made in matching disease and PCG tracings. Province-wide use of the facility will require a transmission network so that patients' ECG signals can be fed into the computer for analysis.

RACIAL DIFFERENCES

A third project now under consideration aims at determining the normal variations in the PCG tracings of healthy people.

It's impossible to use previous standards of what is normal because they depend in large part upon ECG and VCG interpretations which are less accurate than the PCG. One way of establishing normal PCG variations is by examining a large number of healthy patients of various ages. Because of racial differences in electrical heart signals, it would be necessary to find a Caucasian population with a known, low incidence of heart disease.

Several large-scale studies of the incidence of heart disease throughout the western world have been done indicating that some areas, particularly the Mediterranean, have a remarkably low mortality rate due to heart disease.

For example, people living on Corfu and Crete have been studied for more than 10 years and heart disease ranks but a fraction as a cause of death there compared with North America. It isn't known why this is.

But the populations of the two islands could be a source of the normal PCG variations if money can be found to finance the project.

Angiography Aids Diagnosis

Cholesterol has been associated with arteriosclerosis for more than a century now. The disease can be induced in animals by giving them a high cholesterol diet. But the cause-and-effect relationship between cholesterol fat and arteriosclerosis isn't tidy. Statistically, groups of people with high levels of cholesterol in the blood also have the disease and those with low cholesterol counts tend to be relatively free of it. But there are a substantial number of people with low cholesterol who have arteriosclerosis.

Between 1950 and 1960 Dr. John Gofman of California put forth the idea that a closer correlation would be found between arteriosclerosis and cholesterol if the fat was studied as part of lipoprotein molecules, of which cholesterol forms a part, instead of by itself as it had been till then.

Lipoproteins are still on the frontier of biochemistry. Not much is known about them. They are a family of large, composite molecules made up of three different protein molecules and three different fat molecules, one of which is cholesterol, arranged in different combinations and structures. Function of lipoproteins is unknown.

But medical scientists do know that lipoprotein molecules penetrate the wall of arteries to begin the physical damage of arteriosclerosis.

After Gofman's claim, the American Heart Association financed feverish research in five laboratories. Their work led to the conclusion that Gofman's claims were overestimated and the theory was dropped.

Two developments led a group of workers at UBC to reopen Gofman's approach.

"A difficulty lay in the Gofman technique itself," said Dr. Kenneth A. Evelyn, professor of Medicine and director of the G.F. Strong Laboratory at VGH. The technique he used led to varying results. Different labs doing measurements on the same compound varied in their conclusions. What we have done is modify some of Gofman's procedure. We have cleared up some of the uncertainties in it."

The second impetus was the recent development of coronary angiography. "Up until angiography," Dr. Evelyn said, "it was difficult to get a definitive diagnosis of arteriosclerosis. So medical researchers had varying results from the unmodified Gofman technique which they could only compare with an uncertain clinical opinion as to whether a patient had arteriosclerosis or not."

Angiography makes it possible to decide conclusively if a patient is arteriosclerotic. The method was applied to the diagnosis of arteriosclerosis in the heart itself about 1½ years ago.

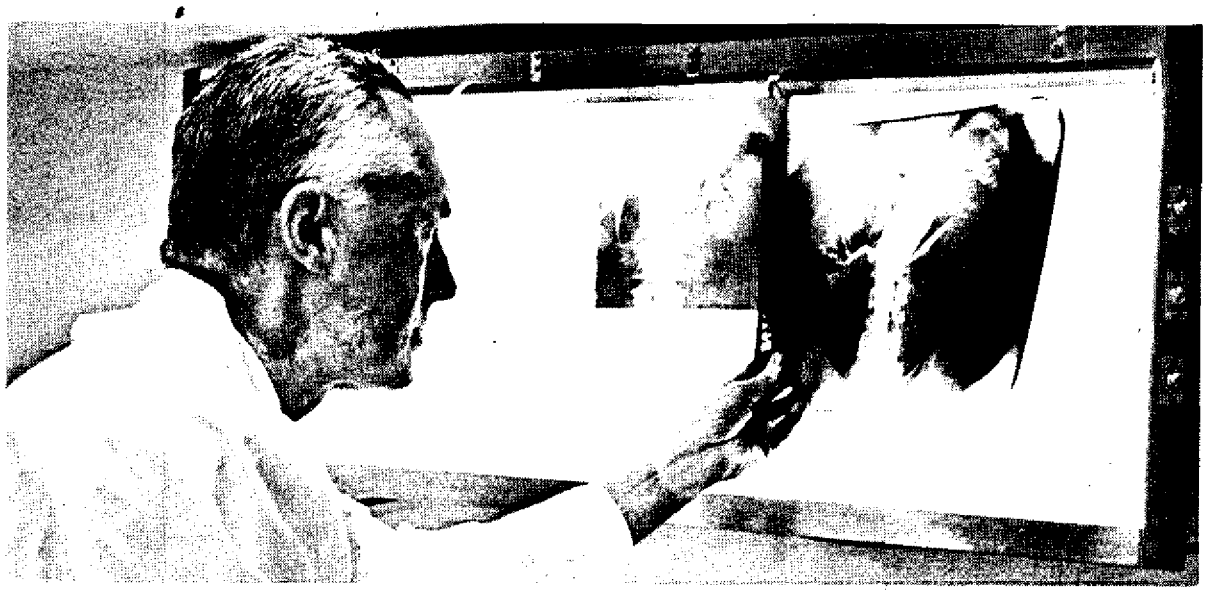
A thin, flexible catheter or tube is slipped into the femoral artery in the leg, up into the aorta and then into one of the two coronary arteries which supply the heart itself with blood.

X-RAYS TAKEN

Then a substance is injected through the catheter into the coronary artery. The substance is opaque to x-rays and while it travels through the various blood vessels in the heart x-rays are taken which show if any narrowing or blockage of the vessels is present.

These two developments led to a clinical investigation in the Strong Laboratory by Prof. Evelyn, Dr. M.B. Walters, a clinical instructor in Medicine, and Dr. Alexander R.M. Cairns, assistant professor of Medicine.

The group has selected certain patients of Dr. Walters' for study. They are patients with undoubted arteriosclerosis but with none of the factors which often contribute to the disease, such as age, hypertension, diabetes and high cholesterol levels. So far more than 100 patients have been analysed. "It will take another six months to gather enough material for us to see if we're on the right track," Dr. Evelyn said.



Dr. Kenneth Evelyn examines an angiograph.

RESEARCH AIDS CLINICAL STUDIES

Complementing the work done in the clinical departments downtown is research done in the basic medical science departments on the UBC campus. As the name implies, basic medical research is more "scientific," more removed from the day-to-day health care of people. It often has not even an indirect connection with patients currently under treatment. It routinely uses animals in experiments and typically uses a laboratory setting that appears as inert as a chemist's.

Most basic medical research aims at understanding the fundamental workings of the cardiovascular system. What, for instance, is the connection between hardening of the arteries and blood clots? Why does the local anesthetic lidocaine cancel out an arrhythmia? How does it work?

Prof. Paris Constantinides has won an international reputation for establishing that tiny cracks in the inner walls of arteries are always associated with the fatal blood clots formed in the victims of coronary thrombosis.

Up until Prof. Constantinides' work, breaks were noticed in the coronary arteries of only about 20 per cent of thrombosis victims and were not recognized as the cause of coronary thrombosis in most cases. Then in 1966, while on a sabbatical at the University of Washington at St. Louis, Prof. Constantinides methodically examined the blocked portions of the arteries of 20 consecutive victims of coronary thrombosis. He cut the clotted part of the arteries – about one-half-inch to three inches long – into cross sections 10 microns thick until he had tens of thousands of doughnut-shaped sections each about 1/2,500 of an inch thick. Then he laboriously examined each one under a microscope. The arterial wall of every victim showed tiny cracks, some of them only as wide as two or three cells – which explains why most of them escaped detection in the past.

LOSE FLEXIBILITY

Every victim had arteriosclerosis, or hardening of the arteries. During their lifetime the elastic and muscle linings of their arteries had been replaced by scar tissue in which fatty material was often embedded. This process caused their arteries to lose their flexibility, their ability to expand and contract. They had become brittle. Eventually cracks developed.

Prof. Constantinides is working on the theory that the cracks form blood clots. When the crack appears, he says, the ruptured cells release a chemical called adenosine diphosphate into the blood stream. The chemical attracts platelets in the blood which rush to the opening of the crack to form a sealing clot. This is a normal healing mechanism of the body. When a finger is cut, for instance, platelets are attracted to the wound to form clots which seal severed blood vessels and check the bleeding. He believes the same mechanism is involved in coronary thrombosis. He thinks that when the minute cracks occur in the inner wall of the diseased coronary arteries, local accumulation of platelets brings on the fatal thrombosis. In other words, clots are a misadventure of a normal mechanism. A sealing process which normally saves life turns against the organism and kills it.

A year after his investigations at St. Louis, he did similar microscopic examinations of 10 Vancouver victims of cerebral thrombosis or strokes and found that each one showed cracks in the arterial wall under the clot similar to the coronary thrombosis victims.

Since first publishing his results in 1964, his work has been confirmed by five independent research teams around the world. He was one of a group of scientists recently asked by the U.S. National Institute of Health for guidelines on where American funds for cardiovascular research should go during the next 10 years. And he has been asked to choose his topics and the speakers for a symposium on the molecular biology of the arterial wall which will be central to an international congress on internal medicine in West Germany next year.

The next step in his work is to find out what causes the cracks. Prof. Constantinides says he may have to work for another 10 years before finding out.

PROF. PARIS CONSTANTINIDES

PROF. JAMES FOULKS

Common to much of the work in the Department of Anatomy and Pharmacology at UBC is an effort to understand the chemical and molecular reactions in heart muscle and the smooth muscle making up part of the wall of the arterial network.

The cells of the skeletal muscles, the heart, the smooth muscles of the arteries and veins are all contractile – they can be made to contract and shorten by either a chemical or an electrical stimulus setting off a series of reactions leading to the final triggering of contractile proteins inside the fluid of the cell.

The triggering mechanism involves the transfer or release of ions – atoms with either too few or too many electrons. The four main positively charged ions involved are potassium, sodium, magnesium and calcium.

Before a cell can be excited, there must be a high concentration of potassium ions and a low level of sodium ions inside the cell and a low level of potassium ions and a high concentration of sodium ions outside the cell membrane.

Electrical imbalance or ionic gradients involving these two ions across the cell membrane must exist before any activity – whether voluntary, such as running, or involuntary, such as a heart beat – can occur.

When fast-moving muscles such as the heart and skeletal muscles are excited, the ionic imbalance is suddenly reversed. First sodium ions rush into the cell. Then potassium ions pour out. A similar process occurs when impulses travel along nerve fibres.

In this way body cells use ionic gradients to store energy, much as an ordinary lead battery does. The major difference is that when a cell is triggered off and the gradients discharged, the cells can rebuild their gradients again so that another excitation can occur. The cells actively pump the sodium ions from inside the cell out across the cell membrane.

A biological definition of life might be the ability to maintain these gradients. At death, the ionic imbalance of the cells runs down and the amount of sodium and potassium inside and outside each cell becomes equal.

IONS INCREASED

Somehow the sudden discharge of the potassium and sodium gradients during excitation increases the number of calcium ions inside the cell's fluid. It is the calcium ions which finally spark the contractile proteins in the cell's fluid.

It isn't known definitely whether the calcium travels through the cell membrane into the cell to do this or whether the calcium forms part of the membrane itself and is released to act on contractile proteins inside the cell.

Local anesthetics such as lidocaine simply interfere with the movement of the potassium or sodium ions so that in turn the calcium ions don't trigger off contractile proteins. So lidocaine stops wild contractions of the heart cells which could lead to fatal fibrillation. And lidocaine can paralyse a nerve cell so that the brain doesn't receive a pain signal.

Prof. James G. Foulks, head of the Department of Pharmacology, has worked for more than a decade on the regulation of contractile mechanisms. He wants to find out how muscles work normally and what happens when something goes wrong.

As a pharmacologist, he is experimenting with various drugs to see what effect they have on activation of contractile processes. In this way he is using drugs as an investigative tool, much in the same way as classical anatomists used a scapel.

Responses to different drugs used may help to reveal the true workings of the process regulating

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ARRHYTHMIA

Continued from Page Seven

tissue because its supply of life-sustaining oxygen has been cut off.

When certain electrocardiographic abnormalities appear, the staff at the Unit know that a life-threatening arrhythmia, such as fibrillation of the ventricles, may be on its way. Among the drugs administered at the unit to prevent or treat the arrhythmia is lidocaine, a local anesthetic carried by all doctors, given intravenously.

Since the forewarning arrhythmia can also be detected by a stethoscope, Dr. Peretz wondered if an intramuscular injection of lidocaine could be given by general practitioners and other doctors who are usually the first to see heart attack victims before they reach hospital. An injection into the muscle rather than into the vein would take longer to act but the effects would last longer and span the time usually needed to rush the victim into a coronary care unit.

There had been speculation that lidocaine injected intramuscularly caused bad local side-effects and no one was sure just how long the effect would last. Dr. Peretz and his group have shown that there are no harmful effects at the site of the injection and that the effect of the lidocaine lasts about one hour, long enough to get the victim to hospital.

BASIC RESEARCH

Continued from Page Nine

contraction and may lead to better drugs for treating abnormalities when something goes wrong.

Prof. Foulks is primarily concerned with what happens between the discharge of the sodium and potassium gradients and the rush of calcium into the interior of the cell. He is trying to find out how the two events are linked.

Prof. Foulks and other members of his department have been investigating the response of both skeletal muscle and heart muscle cells when the chloride ions normally outside the cells are replaced by other negative ions.

Different ions, they discovered, have different effects. Even when they used large negative ions whose size made it impossible for them to pass through the cell membrane, there were still large differences in the strength of contraction and sequence of electrical events. And large negative ions with different chemical structures had very different effects.

This means that the negative ions must be acting on the surface membrane in some way which effects the link between the discharge of the sodium and potassium gradients and the final action of calcium on contractile proteins.

Everyone has blood pressure; otherwise blood wouldn't circulate through the body. Everyone also has high blood pressure from time to time. Running up a flight of stairs will increase the pumping action of the heart and increase the force of the blood against the arterial walls.

Hypertension is continuous, abnormally high blood pressure and is caused by internal narrowing of the opening of the arteries.

PRESSURE BUILDS

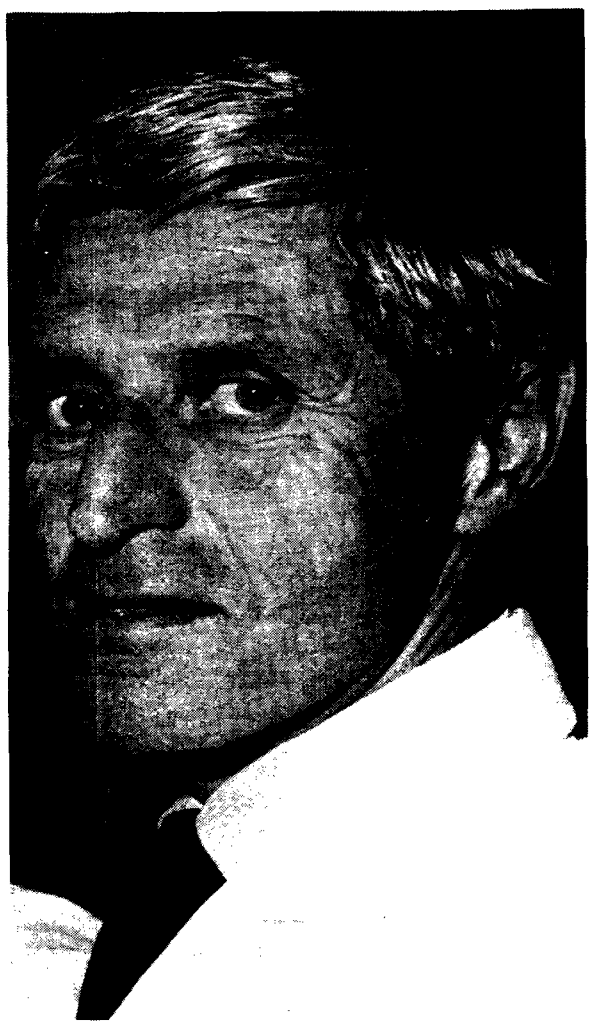
If sufficient pressure is built up the cardiovascular system will tend to break down at its weakest point.

When hypertension develops, the heart must do more work to pump blood through narrowed arterial channels. Over the years heart hypertrophy occurs – the heart muscle grows larger in an effort to handle the extra work. But while it grows bigger it receives the same volume of blood through the coronary arteries as before, so it becomes undernourished. And if heart hypertrophy is associated with arteriosclerosis, even less blood gets through the coronary arteries to the heart and coronary thrombosis becomes more of a possibility.

The walls of some parts of the arterial network are weaker than others and if subject to hypertension develop hypertrophy and increase in size. One of the areas where this happens the quickest is in the arteries of the brain. So people with hypertension may have arterial blow-outs in their brains – strokes, which if large enough can be fatal.

The question is, what narrows the arterial channels? The mechanism involves the triggering of the contractile protein in the smooth muscle cells in the arterial wall. When the cells surrounding the vessel contract, they decrease the size of the opening by drawing inwards like a noose.

A major difference between the triggering of smooth muscle surrounding vessels and skeletal and heart muscle is that smooth muscle cells can be contracted in stages. The vessel opening can be made to narrow to a certain point and remain there for some time.



PROF. SYDNEY FRIEDMAN

But in skeletal muscle, contraction is all or nothing. What determines the force of a flexed bicep, for instance, is the number of muscle fibres triggered off.

Fundamental regulation of the contraction of the smooth muscle cells of the blood vessels begins with the sodium and potassium gradients. It's been known for decades that salt-free diets reduce hypertension. Regulating the amount of sodium salt in the body are two groups of hormones, one produced in the pituitary and the other in the adrenal glands. These hormones retain sodium and do their work in the kidneys where excess sodium is taken out of the body and passed into the urine. So hypertension also means the kidneys could break down through overwork.

HORMONES FOUND

Hypertension can come about either because there is too much of the hormone present controlling retention of sodium – say because of a tumor on one of the two adrenal glands – or because the kidneys are too sensitive to normal levels of the hormones.

But recently researchers have found another set of hormones in the kidneys and adrenals that cause a loss of sodium and a drop of blood pressure. Investigators are now wondering if it is a drop in the amount of these hormones that brings on hypertension.

The laboratory of Prof. Sydney Friedman, head of the Anatomy Department, was the first to show that the ionic gradients regulate vascular smooth muscle in much the same way as they were known to operate in skeletal muscle. He was also responsible for demonstrating that constriction can occur in steps in smooth muscles lining the arterial walls and did much of the early work on the role of the adrenal and pituitary glands in regulating sodium levels in the body. His lab is now also studying the unknown role of magnesium ions in cell contraction.

These are only some of the research projects at UBC concerning cardiovascular disease. Other scientists are active in the basic medical science departments of the medical school as well as in the clinical departments off campus.

And cardiovascular research doesn't end with the Faculty of Medicine. Researchers are also active in other faculties and departments on campus, with many of their projects funded by medical and heart research agencies.

NON-CREDIT PROGRAMS LISTED

"PARTICIPATE NOW," recommends the UBC Center for Continuing Education, in 148 evening and daytime non-credit courses for adults being offered this spring in Vancouver.

Most classes begin the first week in February.

Thirty-seven courses are being offered at locations throughout the Greater Vancouver area including: the Vancouver Public Library, Kitsilano Library, University Women's Club, Vancouver Centennial Museum, Maritime Museum, Vancouver Public Aquarium, on the North Shore and in Richmond. Other courses are held on the UBC campus.

Following is a partial listing of humanities, arts, science and public affairs programs.

Continuing professional and technical education programs being offered by the Center this spring include courses in education, engineering, law, forestry, social work, agriculture, fisheries and criminology.

Copies of the Center's 1971 spring brochure are available from the Center, 228–2187, or at Public Libraries in Vancouver, North Vancouver and West Vancouver.

MONDAYS

* figure in brackets is number of sessions

** second fee is special husband and wife rate

The Rise of French Canadian Nationalism – 8-10 p.m., UBC, Feb. (8*) $15, $22.50**

The Crucial Beginning: Pre-School Centers in Child Development – 8-10 p.m., Downtown Library, Feb. 15 (3) $4, $8

West Coast Poets Speak – Informal discussions with seven West Coast poets. 8-10 p.m., Arts Club, Feb. 1 (6) $20, $32

"By the Author of Lolita" Novels of Vladimir Nabokov – 8-9 p.m., UBC, Feb. 1 (8) $15, $24

Living and Working with the Deaf and Hard of Hearing – 7:30-9:30 p.m., Institute for the Deaf, Feb. 1 (6) $12, $18

Man and the Primates – 8-9:30 p.m., UBC, Feb. 1 (8) $17, $28

Lost People and Mysterious Languages – 8-9:30 p.m., Centennial Museum, Feb. 8 (8) $17, $28

TUESDAYS

The Chinese Reality – A look at present-day China; an event in the series The China Program. 8-10 p.m., UBC, Mar. 16 (12) $25, $35

Perspectives in the Study of Man: Human Biology and Human Ecology – An event in the new Humanities and Life Sciences series. 8-9:30 p.m., UBC, Feb. 2 (8) $15, $24

The Screen as an Expression of Change – Film and discussion. 1-3 p.m., Downtown Library, Feb. 2 (5) $20

Ivan Illich on Education – Five seminars on Illich's controversial views. 8-9:30 p.m., UBC, Feb. 2 (5) $12, $20, students $8

Propaganda Canada: 1971 – 7:30-9 p.m., Kitsilano Library, Feb. 2 (8) $17, $28

WEDNESDAYS

Racism and Sexism Considered – 8-9:30 p.m., UBC, Feb. 3 (8) $17, $28

The Americanization of Canada – 8-9:30 p.m., Feb. 10 (8) $17, $28

Marriage, the Family and Creative Living – A study-discussion course based on the book *The Family in Search of a Future*. 9:30-11:30 a.m., UBC, Feb. 17 (5) $15

Laboratory in Interpersonal Communications – 7:30-10:30 p.m., UBC, Feb. 3 (8) $55

Leadership and Communication – 10 a.m.-noon, Hycroft, Feb. 3 (6) $15

The World of Surrealism – 8-9:30 p.m., UBC, Feb. 10 (8) $15, $24

The Age of Constantine – 1:30-3 p.m., Hycroft, Feb. 3 (8) $15

Race and Racial Consciousness in Modern Literature: Cowboys and Indians – 8-9:30 p.m., UBC, Feb. 3 (8) $15, $24

THURSDAYS

On the Study of Whales – Illustrated lectures at the Aquarium. 8-9:30 p.m., Vancouver Public Aquarium. Feb. 11 (6) $12, $19

Dr. Julian Silverman – Mores, Mysticism and Madness – An Explorations in the Human Potential event. 8:30-10 p.m., UBC, March 18 (1) $3, students $2

The Haida and Their Art – 8-9:30 p.m., Centennial Museum, Feb. 4 (8) $15, $24; students and museum members $10

Communicating with Children – 1:30-3 p.m., Kitsilano Library, Feb. 18 (6) $10

Later Maturity: Fulfilment or Frustration – 12-1:15 p.m., Downtown Library, Feb. 4 (5) $7, $10; senior citizens $2

Centemporary Thought – Offered day and evening. 2-3:30 p.m., Downtown Library, Feb. 11 (6) $10, $16. 8-9:30 p.m., Downtown Library, Feb. 4 (6) $10, $16

The Human Sexual Revolution: Fact and Fancy – 8-9:30 p.m., Downtown Library, April 1 (6) $13, $21

WEEKENDS

Conference on The Report of the Royal Commission on the Status of Women – Guest speaker: Mrs. John Bird, Chairman of the Commission. 9 a.m.-4 p.m., Hycroft, Sat. Jan. 30 (1) $10, incl. lunch

Man in His City – An intensive exploration of issues relating to the contemporary city. 10 a.m.-2 p.m., UBC, Sat., Feb. 20 (4) $30, $48; students $20

Dr. Stanley Krippner on Dreams, ESP and Altered States of Consciousness – An Explorations in the Human Potential event. 8:30-10 p.m., UBC, Fri., Jan. 29 (1) $3; students $2

A Short Weekend with Alex Comfort on The New Sensibility: "What Rough Beast . . .?" – An event in the new Humanities and Life Science series. Fri., Apr. 2, 8:30-10 p.m., UBC. Sat., Apr. 3, 9:30 a.m.-noon, UBC. $5; students $3; single admission $3, students $2

An Introductory Look at Different Applications of Experiential Learning – 9 a.m.-noon, Sat., Apr. 17 (3) $10

Studio Workshop in Color Printmaking – 10 a.m.-3 p.m., Horseshoe Bay, Sat., Jan. 30 (8) $85

Effective Study – 10 a.m.-noon, Downtown Library, Feb. 13 (4) $10

OTHER PROGRAMS OF INTEREST

Educational Travel Programs 1971 – Planned programs include: The People's Republic of China; Japan; Central America; Shakespeare in England; Fisheries in Japan; Geographical Field Studies in England; Classical Greece; seminars at C.I.D.O.C., Cuernavaca, Mexico; Archaeology of the Ancient Near East; Art of the Renaissance in Florence, Italy.

Reading and Study Skills Center – Reading improvement courses for adults and students begin the week of Jan. 25 and again May 3 at UBC. Classes meet one or two times a week for six weeks. Adults $60, students $30. For details call: 228-2181, local 223.

UBC NEWS IN BRIEF

A COLUMN FOR UBC GRADUATES ROUNDING UP THE TOP NEWS ITEMS OF RECENT WEEKS. THE MATERIAL BELOW APPEARED IN MORE EXTENDED FORM IN CAMPUS EDITIONS OF 'UBC REPORTS.' READERS WHO WISH COPIES OF CAMPUS EDITIONS CAN OBTAIN THEM BY WRITING TO THE INFORMATION OFFICE, UBC, VANCOUVER 8, B.C.

'AGE OF GAGE'

President Walter H. Gage has begun his fiftieth year of association with the University of British Columbia.

President Gage, who was a student at UBC from 1921 to 1926, was a mathematics teacher and registrar at the University of Victoria, then an affiliate of UBC, from 1927 to 1933 before returning to the Point Grey campus as an assistant professor of mathematics.

He has personified UBC to succeeding generations of students for decades and as Dean of Administrative and Inter-Faculty Affairs since 1948 has supervised the distribution of fellowships, scholarships, bursaries and prizes to thousands of students.

President Gage served as acting president of the University on numerous occasions before his appointment as president in 1969. He was named UBC's first Master Teacher in 1969.

Among the first to congratulate President Gage on his fiftieth year of association with UBC was the Alma Mater Society. AMS President Tony Hodge wrote to President Gage offering congratulations "on behalf of all the students at UBC."

He added: "The respect that you have earned from students as an extraordinary teacher, able administrator, but most important, warm friend, is indeed without equal. It has appropriately been suggested that here at UBC we live and learn in the 'Age of Gage'."

TEACHING AWARDS

UBC's Master Teacher Award Committee has received 31 nominations for the 1971 awards – one more than last year – despite the refusal of two student groups to name representatives to the committee.

This year 26 of the nominations were submitted by students and five by alumni and faculty members.

The controversy over the Master Teacher Awards began in October, 1970, when the Graduate Student Association wrote to President Gage to decline an invitation to name two representatives to the awards committee, which screens nominations for the awards established in 1968 by Dr. Walter Koerner, a member of UBC's Board of Governors.

The Association claimed that the awards mask a system that rewards those who have neglected teaching for research. Students' Council, at a meeting late in October, voted to endorse the GSA letter to President Gage and similarly declined to name two representatives to the Master Teacher Awards Committee.

Prof. Robert M. Clark, UBC's Academic Planner and chairman of the awards committee, appeared before Council at the invitation of that body in early December and made a spirited defence of the awards.

He told Council that the donor, in establishing the awards, wished to recognize and honor outstanding teachers of undergraduates and to encourage good teaching. He added that he would not recommend that the Master Teacher Awards be cancelled in 1971 and that he felt the committee could discharge its responsibilities without student representation on it.

The awards committee, at a meeting late in December, decided that it would judge candidates in 1971 as in previous years and expressed regret at the decision of the two student groups not to name representatives to the committee.

The two Master Teachers chosen by the committee in 1971 will divide a $5,000 prize which goes with the award. (Editions of Dec. 10, 1970, and Jan. 14, 1971).

REPORT ON LANDS

An advisory committee on the University Endowment Lands established by President Gage was expected to submit an interim report before the end of January.

The committee, chaired by Dean Philip White, head of the Faculty of Commerce, was asked to review the present status of the Lands and make recommendations regarding possible development, keeping in mind the interest of the University in the Endowment Lands.

The 2,470-acre Endowment Lands between the City of Vancouver and the UBC campus, are owned by the provincial government and not, as is so often mistakenly assumed, by the University.

Dean White said the committee was considering the preferred form of local government for the Lands if they were incorporated municipally, the question of which agency could best carry out the development of the Lands and the priority of land use in the area that would best serve the interests of the University.

The study is purely an internal one to develop for the president's consideration a University viewpoint about possible future development. (Edition of Jan. 14, 1971).

AIESEC PROGRAM

BY NEIL H. MacIVOR
Second-year Arts, UBC

Why would any student go out to find someone else a summer job? Why would any company hire a foreign student for a short training period? Why would a group of professors and businessmen attend a student-run conference in Italy? Why? Because they're all part of the AIESEC program.

AIESEC is the French acronym for the International Association of Commerce and Economics Students. (C'est vraiment l'Association Internationale des Etudiants en Sciences Economiques et Commerciales). The Association, which exists in 51 countries on six continents, operates for the benefit of students, academics and business. The students gain foreign business experience through a reciprocal traineeship exchange. Local students solicit short term positions for foreign students and then have the opportunity to apply for similar training in any of the 51 countries. These traineeships, which usually last from eight to 12 weeks, may require the students to do a special project or be part of the regular training program or perhaps receive a rotational overview of the company.

The "AIESEC experience," however, is not all work. Each local committee provides a summer reception program which exposes and guides foreign trainees in local culture. This involvement includes social events with local students and businessmen, economic seminars, weekend trips, and so on.

If these are some of the benefits to the student, how does the businessman gain from the program? Simply, AIESEC is training future managers to be adaptable in any environment. Canadian business is extending internationally. Management, even within a company, is required to have more international mobility. By sending students around the world to gain experience, AIESEC is showing the future executive that working productively in a different socio-economic and cultural environment is quite possible. The bridge between the pure theory of the university and the sometimes cold facts and figures of business is being erected by the AIESEC experience.

An important concept AIESEC has developed in recent years is the Summer Seminars Traineeships Program. An SSTP gives students the opportunity to learn about an industry or economic field through experience and theory simultaneously. This is done by coordinating, with the help of the participating firms, the traineeship with a series of seminars at the university level. SSTP's which involve six to 12 students from different countries were given in 25 cities last summer on subjects as diverse as "Finance in the British Economy" in London, "The World Shipping Industry" in Oslo, and "Marketing" in Paris.

Every company that has participated in AIESEC-British Columbia has been pleased with the trainees. The companies are: MacMillan-Bloedel, B.C. Telephone Company, Kelly-Douglas, Eurocan, Pacific Great Eastern Railway and Dunwoody and Company.

If you are interested in AIESEC, international business, working overseas, SSTP, or have questions, write to AIESEC-British Columbia, Box 4, Student Union Building, UBC, Vancouver 8, B.C.

POLLUTION OFFICER

UBC now has a pollution control officer. He is Mr. William Rachuk, who has been the campus radiation protection officer since 1966.

In his new position Mr. Rachuk will be responsible for seeing that UBC disposes of chemically or biologically dangerous materials safely and lawfully in accordance with laws and regulations passed by various levels of government.

Mr. Rachuk's appointment resulted from recommendations made by a committee on the disposal of dangerous chemicals established by President Gage.

The committee, chaired by Prof. Basil Dunnell of the Department of Chemistry, made an inventory of dangerous substances at UBC and recommended that a pollution control officer be appointed. (Edition of Jan. 14, 1971).

SENATE DEBATES

In recent debates UBC's Senate has voted to establish a committee to study the role of marks, examinations and alternatives to exams, and defeated a motion to create a summer term of 13 weeks and phase out the present seven-week Summer Session within five years.

The investigation of the role of examinations and marks and their alternatives was suggested by Prof. Robert M. Clark, who also agreed to chair the committee which will investigate these questions.

Senate turned down the suggestion for a 13-week summer term after hearing arguments that operating the University on a year-round basis would result in only minimal savings and that every university which has tried to operate on a three-semester system has suffered financially.

MUSSOC CELEBRATES

UBC's Musical Society – Mussoc to generations of students – will celebrate its 55th anniversary in 1971 with an ambitious production of the famed Broadway musical "West Side Story."

The production, which includes a cast of more than 100 students, opens in Victoria at the MacPherson Playhouse on Jan. 28 for a three-day run. Campus performances will be held in the Old Auditorium Feb. 4-6 and 11-13. Tickets are available at the Vancouver Ticket Centre in the Queen Elizabeth Theatre and at all Eaton stores.

* * *

PROF. C.W.J. ELIOT, of UBC's classics department, has resigned to accept a post as professor of archaeology in residence at the American School of Classical Studies in Athens. He will take up his new post on July 1. The post is one of the most important appointments for the teaching of graduate students in the fields of archaeology, topography and existing monuments of ancient Greece. (Edition of Dec. 10, 1970) . . .**PROF. FRANK BUCK**, professor of horticulture at UBC from 1920 to 1949 and the man responsible for landscaping much of the UBC campus, died Dec. 12, 1970, at the age of 95. Dr. Buck was one of the founders of the Agricultural Institute of Canada and was honored by the AIC for his contributions to that organization at its 50th annual meeting in July last year . . .**MR. KENJI OGAWA**, associate professor of Asian studies at UBC, died Dec. 15, 1970, at the age of 53. Mr. Ogawa joined the UBC faculty in 1963 and was a highly regarded teacher. He was awarded a certificate of merit in the Master Teacher Award competition in 1969. . . .**DEAN IAN McTAGGART COWAN**, head of the Faculty of Graduate Studies, has been awarded the Medal of Service of the Order of Canada by the federal government for his contributions to science in Canada.

UBC REPORTS

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UBC ALUMNI Contact

Forest Recreation Studied

By PETER LADNER

Getting a UBC degree in a professional faculty used to mean simply setting your sights on graduation day and burning the midnight oil to learn all you could about, say, law, engineering or forestry by that day.

Today it's not quite the same. What makes it different is the current trend toward "social consciousness," a trend which is changing both the outlook of students and the orientation of academic programs.

Socially conscious law students, for example, have, under the guidance of qualified lawyers, set up a neighborhood legal aid program. Applied science students for the first time held noon-hour seminars last year on the social responsibility of engineers.

The desperate alienation of many UBC students stimulated social work students to help out by providing a quiet office and a sympathetic ear for troubled students in the Student Union Building. It's called "Speak Easy." A grant from a major foundation enabled UBC to bring together some ecologically-minded biologists and zoologists to set up the Institute of Animal Resource Ecology.

The Faculty of Forestry, too, has become more aware of its social obligations in the last five years. They are no longer looking at forests simply as timber supply centres for the forest industry. Now the Faculty is emphasizing the "multiple use" of forest resources, which leads them into studies of wildlife, fisheries, water production, parks and recreation. As the foresters like to say, their Faculty is becoming a "land-use training institution."

One area of land use receiving particular attention is forestry recreation. UBC's forestry faculty is the only one in Canada with a full-time professor teaching and researching forestry recreation.

The professor, Peter Dooling, came to UBC 2½ years ago and now has eight graduate students working on outdoor recreation. Some of them are watching the effects of human intrusions on the delicate ecology of alpine areas, while others pore over aerial survey photographs to discover how they might be used to find potential new forest recreation areas.

CUT CITY NOISE

They've analyzed the management of Stanley Park and Canadian National Park policy, and are presently studying the recreational potential of municipal water-supply areas (such as the Capilano watershed).

One study is even looking at how trees can be used in cities to cut down noise. Using information gained from the study, planners may be able to build residential areas beside a highway and keep them virtually free of traffic noises. The studies are too new to reveal any dramatic findings, but Prof. Dooling says several engineering firms already are very eager to see information about the sound attenuation properties of different trees.

Many of the forest recreation studies are done in collaboration with the B.C. Parks Branch which, interestingly, lacks its own research facilities. Prof. Dooling also anticipates some liaison with the B.C. Forest Service, which controls 95 per cent of forest land in B.C. To date the BCFS hasn't undertaken or supported forest recreation research, but Prof. Dooling says public pressure is forcing them to start looking at forest uses other than for timber.

The Canadian National Parks Service is co-operating with the Faculty in a study of the rehabilitation of over-used camp grounds and trails in Glacier and Jasper National Parks.

Foresters increasingly feel that our forests are for use by the public as well as the forest companies. They are very aware of the potential tourist dollars that could be attracted to B.C. by developing more forests for recreational uses.

One 1968 study found that at least 21 per cent of holiday travellers were likely to use and be influenced by forest-based activities in B.C. A year earlier, a report by Prof. J.H.G. Smith of UBC's forestry faculty had already pointed out the implications: "The recreational features of B.C. are largely undeveloped, yet tourism already brings more than $200 million annually to the province. Formal UBC interest in this topic is well justified economically now and is likely to become increasingly necessary in the future."

LARGE INDUSTRY

As Prof. Dooling points out, tourism is already the largest industry in the world and the third largest in B.C. Conceivably, in a short time, B.C.'s forests could provide the province with its two main sources of income – tourism and timber.

Obviously there is a need for proper planning to develop this potential. A very recent report of a committee of the Science Council of Canada came to the same conclusion. (The committee included UBC forestry dean Dr. J.A.F. Gardner and relied heavily on the studies of Dr. Smith). "Scientists must provide the analytical tools to permit evaluation so that potential future values of all forest amenities, including recreation, may be taken fully into account in planning future use of Canada's forest resources," the report said.

The report found that "continuing increases in discretionary income and leisure time, combined with man's greater mobility, are leading to rapid expansion in the demands made on both public and private forest recreation facilities." The subjects it found in need of most urgent attention were forest land recreation, environmental quality and urban forestry.

Although UBC's forestry faculty has made a strong start, it will "inevitably" – in Prof. Dooling's words – expand its recreation studies. Prof. Dooling also thinks the B.C. Forest Service and private companies should start doing more work in recreation studies.

"I think every forest company should in the future be required to hire a recreational planner and plan forests for recreational use as well as wood production," Prof. Dooling says.

Looking to the future at UBC, Dr. Smith says the next step could be to study the sociology of natural resources, the role that a natural resource plays in social change.

For example, a professor could look at how much the social structure of a province like B.C., its life styles, social mobility, eagerness for social change, is determined by its heavy reliance on the forest industry.

"We are likely to head into urban forestry first," he noted. "But what both these fields have in common is that they are people-oriented rather than production-oriented."

Deans Tour B.C. Interior

The University of B.C. today is not the one most alumni remember. It has changed; and it is still changing.

Over the past few months the UBC Alumni Association has been helping to inform people about how the University is changing to meet new conditions. This has been done through an information program involving the *Chronicle* magazine, special articles (like the one adjacent) on this page and a series of FYI bulletins sent to MLAs, municipal councillors, school trustees and other key decision-makers in the province.

Next month the program, which has been focussing particularly on the Health Sciences and Forestry, swings into a new phase. An attempt to take the University to the people will be made through Alumni Association-sponsored speaking tours. In the first one, Dr. J.F. McCreary, dean of Medicine, and Dr. J.A. Gardner, dean of Forestry, will address public meetings and service club luncheons and participate in radio and television discussions in several interior communities. They will describe the quiet evolution that is underway in professional education in their respective fields. Meetings will be held Feb. 23 in **Penticton**, Feb. 24 in **Kelowna**, Feb. 25 in **Vernon** and Feb. 26 in **Kamloops**.

Earlier in the month, as part of the regular alumni branches program, President Walter Gage will travel to eastern Canada to speak to graduates about new developments at UBC. The president will meet alumni in **Toronto** on Feb. 18, in **Ottawa** on Feb. 19 and in **Montreal** on Feb. 20.

Alumni in these regions are invited to attend the meeting in their nearest community.

Mussoc Celebrates 55th Anniversary

Mussoc – UBC's Musical Theatre Society – is celebrating its 55th anniversary this year with the presentation of the Broadway musical, *West Side Story*. Current Mussoc members have cordially invited UBC alumni to attend an anniversary reception after the performance on opening night at UBC on Thursday, Feb. 4.

Performances of *West Side Story* in the UBC Auditorium have been set for Feb. 4, 5, 6, 11, 12, 13, at 8:30 p.m. Tickets for the public are $2.50 and $3.00 and may be obtained through the Vancouver Ticket Centre.

Alumni are urged to attend a performance. Former Mussoc members are particularly urged to attend the anniversary reception. Former members or anyone knowing the whereabouts of former Mussoc members are asked to write Len Lifchus, Box 57, Student Union Building, University of B.C., Vancouver 8, B.C.

Give us his Nom de Plume, or his Nom de Guerre, But give us his Nom!

Nominations are now being received for the Alumni Association's highest honors, the Alumni Award of Merit and the Honorary Life Membership.

So send us the nom (or name, if you prefer) of the person you feel deserves the –

Alumni Award of Merit: conferred on a UBC graduate who has distinguished himself/herself in his/her field of endeavour.

Honorary Life Membership: awarded to a person who has made an outstanding service to education.

Deadline is February 21, so rush your nominations to Alumni Awards Committee, UBC Alumni Association, 6251 N.W. Marine Drive, Vancouver 8, B.C.