Researchers in the Monash department of Pathology and Immunology have developed a promising new method of screening patients for cancer. They hope, with further research, to develop the test into an effective means of diagnosing early cancer.

At this stage, the test is non-specific. It shows that cancer is present but not where the tumour is located.

The diagnostic test, established by Professor Richie Nairn and Dr Jennifer Rolland, in association with Associate Professor E. A. V. Pihi and Ph.D. student Glen Hocking, is quick and simple.

It involves the use of a polarisation spectrofluorimeter to detect subtle changes in the polarisation (direction) of fluorescent light emitted by lymphocytes (white blood cells) isolated from the patient's blood and labelled with a fluorescent cell probe.

The changes in polarisation, when they occur, indicate that the lymphocytes have been exposed to cancerous cells in the body.

The test is now being used at the Alfred Hospital to diagnose and monitor the progress of patients with cancers of the colon and rectum. It is also being used as a diagnostic aid in cases of breast and skin cancer.

The researchers have found that the changes in polarisation, which indicate the presence of cancer, disappear within 24 hours of the tumour being removed.

Rolland says that all that is needed for the test is 20mls of the patient's blood. Lymphocytes are isolated from the blood and separated into two fractions. The cells are then stimulated by a mitogen (a non-specific stimulus), in this case, the substance PHA (phytohaemagglutinin), and labelled with a fluorescent dye, fluorescein, for measurement of polarisation changes.

The lymphocyte fractions from the blood of people who do not have cancer respond in the polarisation test. “We find that in people who do not have cancer one lymphocyte fraction responds in the polarisation test,” she says. “The other does not. In cancer, the pattern is reversed.”

“The test is quick. The changes in polarisation can be detected after stimulation of the lymphocyte fractions with PHA for 45 minutes.”

A positive response in the polarisation test indicates the presence of cancer, but it does not indicate where the cancer is located. Because of that, the test, at this stage, is of limited diagnostic value.

But where the location of the tumour is known, Rolland points out, it is “an exciting, simple method of screening for a recurrence of cancer.”

“We think it will be particularly valuable to surgeons in following up patients after tumour removal,” she says.

Nairn and Rolland hope to develop the test so that it will be able to pinpoint the location of the tumour as well as indicate its presence.

The reason for the altered response by the two lymphocyte fractions after exposure to cancer is unknown. Rolland suggests that cancer cells release substances which directly or indirectly alter lymphocyte reactivity as detected by the polarisation test.

A paper discussing the biological basis of this method is currently being prepared for publication.
this cancer diagnostic test will be presented by Rolland to an international conference at Niagara Falls this month. Nairn will also present a paper at the conference on the general use of fluorescent cell probes in detection of lymphocyte reactivity. The papers will be published in the Annals of the New York Academy of Science. A report on the work has already been published in the Journal of the National Cancer Institute.

Using similar fluorescent cell probe techniques, the Monash team has developed an easy method which promises speedier cross-matching of potential donors and recipients for organ transplants.

In the tissue matching assay, lymphocytes from the donor and recipient are labelled with a fluorescent dye, and mixed together for half an hour. Their fluorescence intensity is then measured by a photometer attached to a fluorescence microscope.

As the fluorescence intensity is affected by the response of each lymphocyte to the foreign antigens on the other, the change in fluorescence intensity level is a guide to genetic compatibility.

Nairn and Rolland have found that when lymphocytes from two people are mixed the fluorescence intensity level decreases. The extent of the decrease is a measure of the genetic difference between the two.

Mouse studies

Rolland says mouse studies by her Ph.D. student, Maureen Pallett, have shown clearly that the antigenic difference between two mouse strains can be correlated with the size of the fluorescence change. It also correlates with the survival of skin grafts between the two strains of mice.

The experiments have shown, she says, that the fluorescence intensity test is a good assay method for predicting tissue compatibility.

The Alfred Hospital team, in association with Professor Vernon Marshall and Dr Napier Thomson, at Prince Henry's Hospital is at present conducting studies on renal transplant patients who are being tissue typed by the lymphocyte method before and after a kidney transplant.

Aims of the study are to predict genetic compatibility between donor and recipient and the likelihood of graft rejection.

At present the team is working on living related donors. But it is also exploring the possibility of using spleen cells for tissue typing as most transplant work is done using cadaver kidneys which have to be rapidly typed. Donor blood or spleen cells can be frozen in liquid nitrogen and stored until needed for post-transplant monitoring.

Another important application of the mixed lymphocyte reaction test is its use in a study of the mother's immune response to paternal antigens in pregnancy.

"The foetus bears the father's antigens and should be rejected as foreign tissue by the mother's immune system," Rolland points out.

"Various protective mechanisms have been proposed to account for the fact that it is not. One explanation is that the mother's immune response is somehow suppressed. It may be suppressed by factors released by the foetus, or by proteins and hormones in the mother's blood.

"We want to monitor pregnant women to see whether the mixed lymphocyte reaction between her lymphocytes and her husband's changes during pregnancy: whether there is suppression of the reaction: and whether we can detect substances in the mother's serum or foetal fluids which may have a suppressive role."

Rolland believes that the lymphocyte test, which takes only a few hours compared with several days for conventional tests, could provide clues to the cause of several disorders of pregnancy, such as recurrent abortion, eclampsia and toxemia of pregnancy, which require urgent study.

These conditions are believed to be linked to the mother's immune system in some cases.

The team's pregnancy research is being done in association with Professor Carl Wood, Monash Professor of Obstetrics and Gynaecology at the Queen Victoria Medical Centre.

The transplant work is being supported in part by the Australian Kidney Foundation and Monash Special Research grants. The cancer diagnostic test is being funded by the Anti-Cancer Council of Victoria.

**Foetal mucin link with colo-rectal cancer?**

A RESEARCH team at Royal Southern Memorial Hospital in Caulfield, which is affiliated with Monash University, has detected an abnormal mucin in the gastro-intestinal tract of patients with cancers of the colon, stomach and gall bladder.

The researchers believe the discovery could lead to the development of an 'early warning' test for gastro-intestinal cancer.

"What is needed," de Boer says, "is a simple technique — such as examination of the blood or stools — which will detect cancer in the very early or presymptomatic stages before it has started to spread.

"We believe that our work on the different types of mucins produced by the gastro-intestinal tract can be developed to produce such a test. But to do so we need funding.

"We already have evidence that the foetal mucin can be detected in the circulation by simple immunofluorescent techniques.

"What we don't know is whether it is produced continuously, in 'bursts', or how long it takes to be broken down by the body."

Major papers on the Royal Southern Memorial research have been published in several international journals, including Cancer and the British Journal of Cancer.

Details of the research will be presented to the International Defined Immunofluorescence Conference at Niagara Falls in June and to the International Cancer Congress in Vancouver in September.

The Royal Southern Memorial Group is currently engaged in a collaborative study with the Primate Research Centre at Oregon, in the United States.
Predicting problems in dam behavior

A MATHEMATICAL model developed by a post-doctoral fellow at Monash is taking much of the guesswork out of attempts to predict the behavior of large earth and rockfill dams.

It has been used successfully to predict the deformation and strain behavior of the Talbingo Dam in the Snowy Mountains.

And in a study just completed it has been applied to Victoria's giant Dartmouth Dam - the largest dam of its type in the southern hemisphere.

The model will assist engineers in predicting problems in construction, and, in the event of such occurrences, will provide a theoretical framework for their understanding and correction.

The model was developed as a Ph.D project by Dr Gamini Adikari in the Monash department of civil engineering.

Adikari, now a design engineer with the Snowy Mountains Engineering Corporation, undertook a detailed examination of Snowy design data and field performance records for Talbingo Dam, from which he developed his analytical programs. The available data was supplemented by his own testing of soil and rockfill samples at Monash.

Dartmouth Dam

Now, in a project funded jointly by the Snowy Mountains Engineering Corporation, the River Murray Commission, the State Rivers and Water Supply Commission and Monash University, he has completed a similar study of the Dartmouth Dam.

The Dartmouth Dam was designed by the Snowy Mountains Engineering Corporation and built for the River Murray Commission by the State Rivers and Water Supply Commission of Victoria.

It is constructed on the Mitta Mitta River, about 24 km from the township of Mitta Mitta, and when full (it is at present 60 per cent full) will hold four million megalitres of water. A 150 megawatt hydro-electric power station is being built by the State Electricity Commission of Victoria at the foot of the dam.

The Dartmouth Dam embankment is a zoned earth and rockfill structure 180 metres high from the lowest part of the foundation to the roadway over the top of the dam. It contains 10 million cubic metres of quarried rock, 0.8 million cubic metres of filter material and 2.8 million cubic metres of earth core.

Adikari had to establish representative properties for this enormous amount of soil and rock and then integrate these properties to produce a simplified, yet realistic, model of their response to changes in stress, which he then used to study the behavior of the dam as a whole.

Using his computer model, he made theoretical predictions of the stresses and deformations likely to occur at various stages of construction and filling and compared his predictions with the voluminous field measurements.

Associate Professor Ian Donald, who supervised the project with Dr Alan Parkin, says the model's theoretical predictions "fit pretty well the observed behavior of the dam so far."

In his report to the funding bodies, Adikari also predicts the future behavior of the embankment and makes recommendations for safe monitoring procedures.

His theoretical work was supported by laboratory testing of rockfill from the dam. The testing was done in the civil engineering department with large triaxial and compression testing equipment designed specially for the job by the Monash team. This equipment is among the largest available in Australia.

Donald says the model should be a great help to dam engineers, both in problem solving and in developing better designs for the future.

Tension zones

The most difficult problem confronting design engineers, he points out, is the possible occurrence of tension zones in certain parts of the dam structure as it settles or deforms under water loads. It is possible that cracks may occur in such zones, with disastrous consequences, and this is thought to have been involved in the catastrophic failure of Teton Dam in the US.

"There is always the possibility of unusual behavior in a dam," Donald says. "But if it is monitored and evaluated against a theoretical model such as Adikari's, then you have a background to explain, analyse and work out what steps should be taken."

Results of the research will be presented at the 4th International Conference on Numerical Methods in Geomechanics, which will be held this month at Edmonton, in Canada.

Dr Adikari (left), Dr Alan Parkin and senior technical officer Mr. H. J. Puszka examine triaxial and compression testing equipment designed by the Monash team for laboratory testing of rockfill from the Dartmouth Dam.

Photo: David Holmes.
Portuguese link with Sumatran music

Much of the music of the coastal region of West Sumatra is a unique synthesis of Portuguese and Malay styles, dating from the 16th century, according to research by Monash musicologist Dr Margaret Kartomi.

The music, called kapri music, is either purely instrumental or is used as an accompaniment to a solo voice.

A typical kapri ensemble consists of a biola (violin) and two or four gandang (frame drums).

Kartomi says the violin and frame drum, together with 16th century Portuguese music and dance styles, appear to have been brought to Southeast Asia by Portuguese sailing ships which carried on a flourishing trade there.

Her research findings and those of graduate students in the Monash music department were presented to a recent international conference on Sumatra at the University of Hamburg, West Germany.

Her paper was presented in memory of Professor Lode F. Brakel, a former senior lecturer in the Monash department of Indonesian and Malay who died in Germany in May last year. At the time of his death he was Professor of Austronesian Languages and Culture at the University of Hamburg.

Kartomi says the synthesis of Portuguese and Malay music and dance forms may have first taken root in Malacca, which the Portuguese had conquered in 1511.

"The so-called Portuguese — freed Indian, African and other slaves of the Portuguese who had been given Portuguese nationality after having embraced Christianity — established settlements in certain coastal areas of Malaya, Java, Sumatra and elsewhere," she says.

"They spoke a Portuguese-Malay patois and practised a Portuguese-Malay culture, music and dance. Some words in the Malay language can be traced back to the lingua franca spoken by Mediterranean sailors in the 16th century."

Kapri music, she says, is a sub-category of a key musical style on the Sumatran west coast known as sikambang.

Sikambang music, in both its kapri and non-kapri form, is performed at the two main west coast ceremonies: baby thanksgivings, which are held when a baby reaches the 44th day after birth, and weddings, which may involve three or more days of music and dancing in which almost all the west coast music and dance genres are performed. The wedding music includes the famous talibun songs.

The talibun songs, unaccompanied story or "advice" songs, are set to text in the gurindam poetic metre, a poetic style which consists of long lines with paired rhymes of final syllables.

Like the lullabies or cradle songs which are sung at baby thanksgiving ceremonies, talibun songs contain few or no elements of Portuguese, Muslim or other foreign musical influences and are reputed to be very old. In Kartomi's view, they certainly predate kapri music.

The texts of the melodically florid, unmetred, rhythmically complex lullaby songs are not in strict verse form but are repetitions of terms of endearment and words to induce sleep. These unaccompanied songs, which are an important part of baby thanksgiving ceremonies, are sung by gifted or professional singers.

In some cases, Kartomi says, the lullabies are set to verse and, accompanied in kapri style, are performed as a stylised dance version of the baby thanksgiving ceremony near the end of a wedding, as a symbol of the couple's future role as parents. The dance is traditionally performed at the bride's house as the couple sit in their decorated throne-like pelaminan.

The sikambang repertoire, she says, also includes fishermen's songs and magic songs. The latter are performed by shamans skilled in the "arts" of "black" and "white" magic for a variety of purposes — for example, to drive the wind at sea, or to catch a tiger or a crocodile.

Shamanistic songs expressing the depressed feelings of the fisherman as he sails back home with only a small catch or battles an angry sea are still frequently performed.

A typical West Sumatran wedding ceremony. Kapri music, a unique synthesis of Portuguese and Malay styles dating back to the 16th century, is performed at the ceremony, which may involve three or more days of music and dancing. (Inset) Dr Margaret Kartomi.

Photo: H. Kartomi.
These classical songs, with their non-kapri sikambang vocal style, are sung not only along the coast but far inland, Kartomi says. As in other Malay areas, she says, the west coast of Sumatra has had a long history of adherence to Islam and an even longer period of contact with Arabic culture. For centuries, men in the region have practised Islamic exercises associated with music and dance.

Along the entire west coast, music and dance has become exalted over the centuries as a means of achieving mystical union with God, and, in some art forms, Kartomi points out, as a means of seeking after a state of mystical ecstasy.

This religious music and dance is called ratib, she says. It includes songs of praise to the prophet Mohammed in both Arabic and local language.

"The rituals," she says, "are based on repeating holy phrases until one forgets God. and, in some art forms, Kartomi points out, as a means of achieving mystical union with oneself and enters a state of what local informants term 'religious concentration.'

"The state resembles a state of trance in that it can banish physical pain, but it may not be called trance because of the association of this term with pre-Muslim religious rituals.

"It is explained by the doctrine of fana, or the passing away of consciousness in mystical union with God."

Dabus ceremony.

Kartomi says the similarity to pre-Muslim trance practices and spirit possession is shown clearly in the dabus ceremony performed at weddings and other festivities in which male dancers reach a state of religious concentration through communal chanting and dancing.

In this state, they can perform abnormal feats. They can stab themselves with awls or knuckles without apparent pain and withstand hot-hat chains placed on their necks.

The dabus is led by a syaik, an aged spiritual guide, who helps participants "reach a state of ecstatic union with God," but can also call a halt to the proceedings if things look as though they’re getting out of hand.

Kartomi says the political province of West Sumatra can be divided into three major music areas — the coastal region influenced by the Portuguese and Arabs, the largely mountainous interior to the east, and the Mentawai islands off the coast.

There is a good deal of overlap in the musical styles and forms of the coastal and interior regions, she says, but the Mentawai islands, which are separated from the mainland by — at times — treacherous seas, retains a unique, isolated culture, almost entirely unrelated to that of the mainland.

A study of West Sumatran music is one of a number of research projects on Sumatra backed by an ARGC grant, which are being undertaken by Kartomi and her students in the Monash department of music.

The continuing research will eventually provide the material for a book on Sumatran music — an area of musicology in which Monash is in the forefront.

MONASH REVIEW
Monash launches large-scale skin cancer survey

Dr Robin Marks, who has been appointed to the Edward Wilson Lectureship in Dermatology recently created by Monash — the first of its type in Australia — is conducting a large-scale study of skin cancer in Victoria.

The study is concerned with two common types of skin cancer — squamous cell carcinoma and basal cell carcinoma, which usually arise from premalignant scaly lesions, solar keratoses, commonly known as "sunspots", which occur on the face and back of the hands of many Australians after the age of 50.

Unlike malignant melanoma, the dangerous blue-black skin cancer, often associated with flat moles, squamous cell and basal cell carcinomas tend to be localised, easily removed and as a rule are not life-threatening.

An occasional squamous cell carcinoma is malignant, spreading internally, but it appears to arise from a cause other than a "sunspot".

Although these skin cancers are not life-threatening, Marks says, a recent survey of Victorian dermatologists which he conducted, showed that "probably a thousand patients a week go to their doctor with 'sunspots' for treatment or reassurance. "That's an enormous cost not only to the patient but also to the community," he says.

"It may be that we are over-treating people. Not all 'sunspots' develop into true cancer. Some clear up spontaneously, and the tumour, when it occurs, is usually easily removed and is non-lethal. "We want to find out the prevalence of these cancers in the community, the frequency with which 'sunspots' regress, and what premalignant conditions we should be treating."

Surveys

To do this, Marks, honours student Michael Ponsford and dermatology trainee registrar Greg Goodman are conducting a survey of up to 2000 patients at the Alfred Hospital and a study of 4000 or 5000 people in an isolated town. Malignant melanoma will be excluded from the study because its frequency and pathology are well-documented.

The hospital and urban surveys will be backed up by clinical and pathology examination of 'sunspot' specimens. People taking part in the survey will be followed up for several years. Emphasis will be on determining the frequency of 'sunspot' regression.

Marks expects the study to provide the first accurate picture of the prevalence of skin cancer in Victoria. Previous studies, he says, have been flawed by questionable diagnostic methods and the failure to confirm diagnosis by pathology tests.

Marks, Mr John Barlow, a steroid bio-chemist at the Alfred Hospital, and research assistant Margaret Sawyer, supported by an NH & MRC grant, are also investigating the mode of action of cortisone creams, which are widely used by dermatologists for inflammatory skin conditions.

Subjective assessment

He estimates that in 1978-79 alone the public spent at least $10 million on cortisone creams for the treatment of various skin conditions. Yet the usefulness of these preparations, he says, is based simply on subjective assessment — the extent to which they cause blanching of the skin (an indication of blood vessel constriction).

By simultaneously applying cortisone cream and a cortisone-receptor blocker to the skin, the Monash team has established that cortisone creams act by binding with steroid receptors in the skin. The next step is to determine at what tissue level the binding takes place.

Marks hopes to measure the clinical value of a particular cortisone preparation by its readiness to bind with the steroid receptors.
Monitoring the pool’s energy efficiency

THE long-awaited Monash swimming pool, which is expected to open next month, will keep researchers in the physics and mechanical engineering departments busy for several years.

Embedded in the ground beneath the solar-heated pool, and at strategic points in the building structure which houses it, are temperature sensors which will monitor heat throughout the building day and night.

There are six kilometres of thermocouple cable alone in the ground beneath the 25 metre pool, with sensors, as well, in the pool’s concrete surrounds, in the building’s cavity walls, between the double glazing, and in the roof and ceiling. The sensors, in each case, are duplicated, in case one is damaged.

Heat measurements recorded by the sensors will be analysed by a computer, which will also analyse other energy flows, such as the amount of solar energy falling on the roof, the amount absorbed by the solar collector, the amount of energy that goes into the gas boiler heating system which acts as a backup to the solar collector, and the volume of water that flows into the pool.

The automated monitoring system will take measurements once every half hour during the day and once an hour at night.

Monash physicist Dr Logan Francey, who is conducting the research, believes it will take about three or four years to evaluate the pool’s “energy” efficiency and build up a “thermal map” which will take into account variations in climatic conditions.

The information, he says, should be invaluable to architects and others concerned with the “thermal design” of swimming pools and large buildings.

Of particular interest is the extent of energy loss through the ground. The only data available at present on ground energy loss is from work done on buildings in Canada. But Canadian and Australian climatic conditions are not comparable. The Monash research should provide the first reliable information on ground energy loss in Australian conditions.

One of several novel features in the design of the new pool complex is the type of solar collector which will be used to heat the water to a comfortable 25 degrees C during the winter months.

Solar collectors are usually made of metal. The Monash collector is constructed basically of a synthetic rubber material called EPDM (ethylene propylene diene monomer), imported from the US, which is bonded directly to the roof, connected to pipes and covered with glass.

It is designed to fit a standard roof and is used widely in the US for solar collectors. But it has not been used to any extent here.

Francey says the material is cheaper than conventional solar energy materials and is easy to install. It is guaranteed for 10 years. It has not been used to any extent here.

Francey expects that during February and March the solar collectors will provide all the pool heating needed, and, overall, will supply about 60 per cent of water heating. The balance will be provided by a gas boiler backup system.

He says the efficiency of the solar energy system could be improved by using a more extensive array of solar collectors. But that would mean that during summer months there would be more heat than needed. The excess heat would have to be stored. Storage devices could have been installed, he says, but they would have cost too much.

He says a pool blanket will be used at night to prevent evaporation and condensation. The usual way of preventing condensation is to run the heating system at night. But that, he points out, is costly and a waste of energy. The pool blanket, which floats on the surface of the water, is just as efficient in preventing condensation.

Another novel feature of the Monash pool is a “heat wheel” (a heat exchanger) developed by Mr Charles Ambrose, of the mechanical engineering department. This is expected to recover 80 per cent of heat from recycled air.

Ventilation is crucial in a swimming pool. Francey says. Air has to be recycled regularly for health reasons and to cut down condensation. The usual practice in recycling air is to “throw out all the hot air”.

The “heat wheel”, which looks like an old fashioned water wheel, two metres in diameter, “captures” the heat from the exhaust air and transfers it to the fresh incoming air. Performance of the system will be monitored along with other energy flows in the pool complex.

Monash professor of physics, Professor Fred Smith, chairman of the pool building sub-committee, says provision has been made in the pool plan for a second heat exchanger, which could be installed when funds are available for summer cooling.

This type of heat exchanger system should not be confused with air conditioning, he
Laser improves vibration testing

Researchers in the Monash departments of physics and mechanical engineering have developed a promising new method for vibration testing of aircraft and other structural components.

Uncontrolled vibration can lead to metal fatigue, which can be a serious problem, particularly in the aircraft industry.

The Monash technique involves the use of a pulsed laser beam to vaporise a portion of a small target of bismuth attached to the structure under test.

The rapid ejection of the vapourised bismuth sets up an impulse reaction which is transmitted to the structure, causing it to vibrate. Conventional transducers such as resistance strain gauges and accelerometers are used to detect the vibration.

The complex vibration pattern that results is unravelled by a spectrum analyser.

Using a neodymium-in-glass laser, the researchers Dr Rod Tobin, of the physics department, and Dr Len Koss, of the mechanical engineering department, have successfully tested the technique on a structural section of an aircraft and on structures as massive as a 1.14cm (½ inch) thick steel plate.

Keith Edwards, a B.Sc. honours student, is performing the experiments.

The Monash researchers have shown that their method works. Their aim now is to develop it to the stage where it is commercially viable.

Koss says the laser method has a number of advantages over existing methods of testing structures for vibration.

As it is now, structures are tested by one of two methods.

One involves the use of a shaker — a massive device which operates in a similar way to a loudspeaker diaphragm. It pushes against the structure, causing it to vibrate.

The other involves the use of an impulse hammer which strikes the structure, causing it to vibrate. Attached to the hammer is a force-measuring transducer.

Both methods have disadvantages. Koss says. The shaker device "tends to change the natural vibration frequencies", making it more difficult to extract the answers you want. The impulse hammer can deform a structure, making it unusable.

In contrast, the laser method is "a non-contact method, with no mechanical attachments to disturb the system."

For that reason alone, Koss and Tobin believe their laser system is ideally suited for vibration testing of aircraft frames. But the laser technique has another important advantage over existing methods of vibration testing. It is possible to split the laser beam and impinge the structure at several points.

Koss says aircraft have to be inspected regularly for signs of metal fatigue which result from vibration in the structure. Two tests that are done initially involve determining the "vibration shapes" of the structure under test and how much "damping" there is.

"Damping is the ability of the structure to dissipate energy internally," he says.

"If there is not enough damping the metal structure could fatigue and crack in due course if noise levels are high enough, unless artificial damping treatments are used.

"By exciting the structure with our laser system, we can determine how much damping there is without having to use either a hammer or a shaker."

The laser method of vibration testing has the added advantage that it can be used complex, compact and normally inaccessible structures. Koss and Tobin are confident also that it can be used successfully to test vibrations in turbine blades when they are actually in motion. Turbine blades also are subject to metal fatigue.

This type of vibration testing cannot be done with conventional techniques.

"What we plan to do," Koss says, "is to put a target on the turbine blade and shoot the laser at it while the blade is actually turning. This way we should be able to analyse the blade's vibrations while it is in motion."

The Monash team hopes also to scale up its testing program with tests later this year on an aircraft wing.

A progress report on the research was presented to the recent Applied Physics Conference in Melbourne, and a paper has been accepted by the Journal of Sound and Vibration.

The research so far has been done with existing university facilities.

---

Sensors monitor pool

Explain. It is quite different. The heat exchanger (the "heat wheel") extracts moisture from the air, and, in so doing, cools the incoming air.

Smith believes the "heat transfer" system has great potential as an alternative to air conditioning.

"If you could put this sort of heat exchanger in a large office block," he says, "you would have much better control over the office environment at much lower cost, than Monash Review.

Continued from Page 7

if you put in air conditioning."

The pool project has already been funded to the extent of more than $50,000 by the National Energy Research Development and Demonstration Council. But the researchers need additional funds to complete the research project.

If funds are forthcoming, the Monash pool could have an innovative cooling system as well as first class facilities for swimming and leisure.

---

Printed by Standard Newspapers for, Monash University JUNE 1982