Zoologist Dr George Ettershank freezing insect specimens in liquid nitrogen before extracting lipofuscin pigments from the insect’s cells. He is using lipofuscin levels to determine the age of animals as diverse as flies and the tiny Antarctic crustacean, krill (inset). Photo: Rick Crompton.

‘Age’ pigments may aid pest control

MONASH zoologist Dr George Ettershank has developed a promising new method for determining the age of animals as diverse as flies and shrimps.

His method, which involves measuring the level of fluorescent pigments, called lipofuscins, which gradually accumulate in cells as a by-product of metabolic processes, could be of enormous ecological importance when perfected.

Ettershank points out that entomologists, at present, are handicapped in their attempts to control insect pests, such as the blowfly, because they have no satisfactory way of determining the insect’s age.

CSIRO scientists estimate the age of the female insect by studying changes in the ovaries, he says. But this method of age determination is of value only for the female.

The reason for this gap in our knowledge, Ettershank says, is that, unlike humans, insects do not live their lives at a relatively constant rate.

Because of our relatively constant internal environment, metabolic changes in our cells (a measure of physiological ageing) can be related to a chronological time-scale.

This is difficult to do with insects (and many other animals for that matter) because their metabolism fluctuates with changes in body temperature. They live their lives at different rates, depending on the environment.

Ettershank believes he has solved the problem of age determination in the insects by using the level of lipofuscins as a metabolic marker. This cellular “garbage”-, which consists of granules composed of oxidized proteins and lipids (fat), accumulates gradually in the cells of all organisms as they grow older. As the lipofuscin in tissue is easily extracted using a solvent system, and quantified in a spectrophotometer, it should be a good indicator of physiological age.

Ettershank and honours student Ian McDonnell have studied lipofuscin levels in the imported flesh fly which they reared in the laboratory under essentially constant environmental conditions.

They found a clear-cut, almost linear, relationship between lipofuscin levels and chronological age in the larvae of the insect, and a similar, though rather more complicated relationship in the adult fly.

The experiment demonstrates that lipofuscin levels can be measured and they increase with age.

This year, Ettershank and another honours student, Roger Croft, will study lipofuscin levels in the Australian sheep blowfly. The flies will be reared under different conditions in the laboratory and will be studied in field conditions to see what effect varying temperatures have on the ageing process.

“If our technique works, as we think it will, CSIRO will have a fairly easy method of measuring the age of the blowfly or any other insect,” Ettershank says.

This cellular “garbage” also is throwing light on a quite unrelated environmental problem — the growth cycle of krill, the tiny crustacean found in the Antarctic.

Krill, the world’s largest untapped source of protein, are being harvested on the assumption that they live for several years, growing larger each year. The larger the krill, the older it is, according to this growth model. But in fact very little is known about this tiny organism as a great part of its life is spent under the Antarctic ice during winter.

Recent research by Ettershank using lipofuscins as an indicator of physiological age suggests that the current growth model for krill could be wrong. In his experiments, he found two distinct age classes and, possibly, a third. Among the krill, the older it is, according to this growth model. But in fact very little is known about this tiny organism as a great part of its life is spent under the Antarctic ice during winter.

The Monash findings give some theoretical support to a rather startling theory by Japanese researcher Dr T. Ikeda.

Ikeda, whose work is supported by the Antarctic Division of the Department of Science, is conducting research on krill at the Australian Institute of Marine Science at Townsville.

Continued overleaf...
'Age' pigments

Continued from Page 1

"If Dr Ikeda is right," Ettershank says, "krill caught late in the season should be smaller than those caught earlier, but their lipofuscin levels should be much the same."

He expects to have some definite results by early next year.

Until we have reliable knowledge about the krill's growth pattern, he points out, we cannot know its reproductive potential. And until we know that we don't know much of it we can harvest safely.

"Surely, we have learnt enough from the whale to appreciate the dangers of abusing a resource that we know nothing about," he says.

Ettershank's work on the krill is being done in cooperation with Dr Dick Williams, of the Antarctic Division. The blowfly work is being done in conjunction with Dr Lindsay Barton-Browne, of CSIRO's Division of Entomology.

Victims of the Pol Pot regime photographed before being tortured. Monash Ph.D candidate Benedict Kiernan has obtained documentary evidence that supports the claim that many thousands of people were murdered in Kampuchea by the Pol Pot regime for divergent views. (Right): Pol Pot at a political meeting.

He admitted also that a sheet listing Hu Nim's murder appeared to be authentic. The sheet was entitled "Prisoners crushed to bits: 6 July, 1977". Sary's admission followed publication of the documents in the "New Statesman" by Kiernan and his wife.

Until he began his Ph.D research in 1978, Kiernan had viewed the violence as initiated primarily by Khmer Rouge soldiers, or by local factors such as the settling of scores and post-war revenge. However, he agrees that this was a misjudgment and has decided that most of the killing was "ordered from the top, by the Pol Pot leadership".

"Violence was used as a means of political control," he says. "The torture and murder at Tuol Sleng was not spontaneous and it was not initiated at lower levels of the Khmer Rouge."

One of the difficulties of writing a history of the Pol Pot regime, Kiernan says, is to make sense of the extraordinary events which took place under his rule.

In an apparent attempt to isolate the country and rebuild it in the image of Cambodia of the Angkor Wat period when Khmer culture had reached its peak, Pol Pot attempted to eliminate all signs of non-Khmer influence, Western or Asian.

Western science and medicine were banned. Education, where it existed, was restricted to second grade.

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Hundreds of thousands of people were herded out of the cities into the provinces to work in the paddy fields on rations which were barely enough to keep them alive.

The condition of the Khmer people grew worse under the regime and by 1977 many "were not eating enough to keep them alive." Rice was being produced but the people weren’t allowed to eat it. Some of it was being exported for guns and some was being stored in the mountains in preparation for the war with Vietnam which Pol Pot launched in 1977.

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Every aspect of Khmer life, including marriage and eating (Khmers had to eat communally), was strictly controlled, Kiernan says. Communication was controlled. No one was permitted to visit a village more than three to five kilometres from their own, and no Khmer was permitted to search for missing relatives or friends — a restriction which was immediately removed when the regime was over.

Lifting of this restriction was one of the reasons why the Vietnamese and their allies were supported by the local population, Kiernan says.

Although the Khmer Rouge was communist in name, he says, its rule was socialist only in the sense of strict state control. There was no social welfare of any kind. The Khmers received no wages. There were no holidays or festivals. "All free time and folk culture was swept away."

The Pol Pot regime appeared to be attempting to do the impossible, he says: to rebuild a powerful ancient civilisation in a 20th century setting.

Their policies were dominated by "strong racist, chauvinist ideas which incorporated the Maoist concept of rapid radical revolution and the Stelisin principles of tight monolithic control and collectivisation."

The infamous prison of Tuol Sleng in Phnom Penh — a former schoolhouse where false confessions are alleged to have been extracted by the Pol Pot regime. Benedict Kiernan (right) has obtained documentary evidence of the confessions. (Inset: "Deuch").

no Khmer was permitted to search for missing relatives or friends — a restriction attempting to do the impossible. he says: to rebuild a powerful ancient civilisation in a 20th century setting.

The regime, he says, accused the whole population of the eastern zone of Kampuchea of having "Khmer bodies with Vietnamese minds." In 1978 it set about massacring hundreds of thousands of them.

Ironically, although Western science was banned, some aspects of Western technology were retained by the regime as apparatus for repression.

Tractors were banned on the farms but the Army had tanks and modern weapons. There were no telephones in Kampuchea except for a switchboard with 32 lines in the torture chamber at Tuol Sleng prison. This enabled the torturers to keep in touch with the various departments of the regime.

There was also a photocopying machine in the torture chamber, apparently the only one in the country. It was used to copy confessions which were later sent out to the provinces, leading to more arrests of "traitors" named in them.

Many people probably died, Kiernan says, as a result of this technique of "terror by mail."
Variable stars give up their secrets

ONE of the great interests of astronomers is to try to understand all the processes involved in a star’s life cycle.

The ideal way of doing this would be to watch a star actually evolving, but unfortunately, because most stars do not change much over periods of hundreds of millions of years, the chances of doing this are very small.

However, there is a class of variable stars called pulsating variables which provides astronomers with one of the few opportunities for observing a star change its measurable properties with age.

A pulsating variable expands and contracts at a steady rate of up to a few times per day, changing its light output at the same rate. In keeping with the slow evolution of stars, this behaviour changes over a very long time, in response to changes of density and chemical composition of the star.

The changes in period are always very small and need subtle techniques to detect them at all.

In the case of a variable star observed recently at the Monash Observatory near Emerald by Dr Denis Coates and Dr Keith Thompson, of the physics department, and research students Ian Halprin, John Robinson and Michael Dale, the period changed by five thousandths of a second in 20 years, which is extremely small compared with the star’s actual period of some 80 minutes.

At this rate of change, Coates points out, it will take about 10 million years for the period to change by a factor of two.

The technique used by the Monash team to measure such a short change is very similar to measuring the cumulative error in a clock which is running fast or slow and, hence, determining the error in each individual tick of the clock.

Imagine a clock which instead of ticking seconds is ticking constant intervals one millionth of a second too long. After one million ticks (about 12 days) the clock will have gained one second, which is an easily measurable amount. After two million ticks the clock will have gained two seconds, and so on, the discrepancy increasing linearly with time as long as the clock’s rate remains constant.

“In the case of a pulsating variable star,” Coates says, “one can determine the pulsation period as accurately as possible and then predict into the future the times that the star will attain maximum brightness as it goes through its cyclic variations.”

The variable star observed by the Monash team, code-named SX Phe, is in the southern constellation Phoenix. The Monash observers collated other astronomers’ data with some 75 results of their own taken with the 40cm reflecting telescope at the Monash Observatory to produce the graph. Fig. 1 shown on this page.

The data are consistent with a sudden change in the star’s period at about 1960, or a gradual change in period which has been continuing for at least 30 years.

There is some controversy about the exact chemical composition and mass of SX Phe. Coates says the results of the Monash research will contribute to resolving this controversy because the way the period changes is related to the constitution of the star.

Using the 40cm telescope, Coates, Thompson and students, Halprin, Gillian Heintze and Peter Sartori have been studying also another type of variable star, an eclipsing binary system, code named HD 5303, which is in our galaxy at a distance of about 80 parsecs — just under 200 light years away.

The binary system consists of two stars, gravitationally liked together, a large dim one and a smaller bright star about the size of our sun, which eclipse each other, causing variations in the binary’s “light curve” as they pass behind each other.

But this eclipse pattern is not the whole story. When this and known physical parameters such as the stars’ size, temperature and reflection co-efficient (the extent to which light from one star heats the other and is reflected off) are taken into account, there remains an unexplained variation in the binary’s light pattern.

The most popular explanation for the variation in light pattern of this type of binary is the existence of one or more dark spots on the surface of the star.

From the present data, Thompson says, it is not possible to determine whether there is one large spot or a number of smaller ones on the cooler component of the HD 5303 binary system.

The spots may be like our own sun spots, only bigger, but it is not possible to determine this from the data either.

“They certainly undergo cycles over many years like the sunspot cycle,” Thompson says.

From a careful analysis of the light curve obtained at Monash, however, and using published data of their velocities obtained by spectroscopic techniques at other universities, a considerable amount can be deduced about the two stars that make up the binary HD 5303.

The cooler, slightly more massive star, has a temperature estimated at about 4000 degrees C. The smaller star has a temperature of about 6000 degrees C, similar to our sun. The temperature “guessimate” for the dark spot or spots on the larger star is about 3000 degrees C.

Coates and Thompson believe the small star can be fitted along the luminosity-temperature band termed the main sequence. Most stars can be classified as main sequence stars. The larger dimmer star is believed to be at the stage where it swells up in size to become a red giant.

The Monash findings will be published in the monthly notices of the Royal Astronomical Society. The Monash Observatory observations on the variable star SX Phe have already been published in several papers in Monthly Notices of the Royal Astronomical Society and in the International Bulletin on Variable Stars.
Stepping up the fight against diabetes

Associate Professor Paul Zimmet, of the Royal Southern Memorial Hospital, which is affiliated with Monash, has received a US National Institutes of Health award of more than $630,000, over three years, for research into diabetes amongst Pacific islanders.

The work will be done in collaboration with Professor A. W. Limnane and Dr M. Gould, of the Monash biochemistry department.

Zimmet will study risk factors and possible genetic "markers" among certain Pacific Island populations who are unusually susceptible to "non-insulin-dependent" diabetes, a form of diabetes which occurs later in life.

Major cause of death

Diabetes is a major cause of death in Australia and is the most rapidly increasing cause of blindness. It occurs in two forms. "Non-insulin-dependent" diabetes, which Zimmet is studying, is the most prevalent form of the disease, accounting for about 85 per cent of cases.

Unlike "insulin-dependent" diabetes which strikes the young and is caused by lack of insulin, the mature onset form of the disease appears to be caused either by a deficiency of insulin, or the insulin which is produced by the pancreas doesn't work properly.

"Non-insulin-dependent" diabetes can usually be controlled by weight reduction, diet, or tablet therapy, but the complications in untreated cases are just as serious as in "insulin-dependent" diabetes.

Zimmet hopes that the research will lead to a method of identifying people who are genetically susceptible to this mature onset form of the disease.

The normal prevalence among adults of this type of diabetes is about two or three per cent, he says. But some population groups — for example, urbanised Aborigines, North American Indians and Polynesians — have an unusually high incidence of the disease.

40 per cent of adults in some American Indian Reserves have the disease and the incidence among Westernised Polynesian groups is as high as 35 per cent.

In contrast, the incidence among Melanesians is about two to three per cent — similar to that of the White Australian population.

Melanesians, he points out, tend to be lean. Polynesians, on the other hand, tend to become obese when they adopt a Western life-style. Obesity is a known risk factor in "non-insulin-dependent" diabetes.

Zimmet will conduct a longitudinal inter-island comparative study in an attempt to unravel the environmental and genetic factors in the disease. A similar study will be conducted in the US on North American Indians.

Centre of excellence for Monash

The Monash Centre of Policy Studies, which recently received a Commonwealth Special Research Centre grant of $1.2 million for the triennium, 1982-84, has just completed a 400-page report on "Energy Pricing Issues in Victoria."

The report was commissioned by the Victorian Government for consideration by its Long Range Policy Planning Committee. It reviews electricity, gas and coal pricing issues in Victoria and analyses the role of public and private organisations in energy production and distribution.

The centre staff responsible for the study were assisted by two distinguished visiting fellows, Professor Peter Hartley of Princeton University and Dr Jonathan Pincus of ANU.

The Centre of Policy Studies, directed by Professor Michael Porter, was established at Monash in October 1979 to study key economic, social and political issues facing Australia.

Oil company funds coal-to-oil project

Monash University and British Petroleum Company Ltd., parent of BP Australia, have embarked on a major collaborative research project aimed at exploring a promising alternative method of converting brown coal into liquid fuels.

The $415,000 project, which will be funded by British Petroleum as part of its Extra Mural Research Scheme, will be conducted by Professor Roy Jackson and Dr Frank Larkins, of the Monash chemistry department.

They will investigate the technical and commercial feasibility of a conversion process involving the use of synthesis gas — a mixture of carbon monoxide and hydrogen — as a reactant.

Their aim is to develop new catalysts which will enable the reaction to be carried out at lower pressures and temperatures, making it much more attractive commercially.

Synthesis gas

Their use of synthesis gas instead of pure hydrogen as a reactant is designed to exploit both the high oxygen and high water content of brown coal.

Conventional hydrogenation, which uses pure hydrogen as a reactant, requires that the brown coal go through a drying process first. By using synthesis gas, they hope they will be able to treat the moisture-laden coal directly and substantially or totally bypass the drying stage.

The Monash group is being supported also in its general coal conversion research by the Victorian Brown Coal Council and the National Energy Research Demonstration and Development Council.

Jackson and Larkins believe that research into the use of both hydrogen and synthesis gas as reactants should be pursued vigorously over the next few years and the results studied before a decision is taken on which process should be applied commercially.
Laser technique aids fluid research

A SIMPLE, inexpensive form of photography, called laser speckle-pattern photography, developed by Monash physicists, is assisting chemical engineers in a theoretical understanding of how polymers, such as plastics, behave in a fluid form.

The research, which is being done in the Monash chemical engineering department, puts Monash in the forefront of research in the field and underlines the importance of pure research in the solving of theoretical and practical problems.

It involves the development of two research tools of outstanding importance.

One is the use of the speckle-pattern photographic technique to determine the velocity and direction of flow of molten plastics. Dr David Boger, reader in chemical engineering at Monash, has made the fluid mechanics research possible. Boger is to take up a chair of chemical engineering at the University of Melbourne.

According to Boger, the materials, in a fluid form, are unlike the so-called Newtonian fluids which are inelastic and have a constant viscosity irrespective of flow rate. They differ also from non-Newtonian fluids which are elastic and have a viscosity which varies with flow rate.

The Monash materials are elastic like non-Newtonian fluids but are constant in their flow viscosity.

This elimination of variable viscosity enables engineers to study the elastic behavior of the material in isolation.

The Monash materials make possible also the testing and development of a satisfactory theory of the behavior of non-Newtonian fluids.

There is no problem with Newtonian fluid theory, Boger says, because the mathematics underlying the theory is reliable. This is not so with non-Newtonian theory, which contains certain equations, called constitutive equations (related to stress and strains in the material), which are no more than "educated guesses".

Boger says that in developing their theory for non-Newtonian fluids the theoreticians worked out the equations for a "simple elastic fluid of constant viscosity which some people believed might not even exist."

It did, in fact, exist. Boger's group invented it by the trick of adding a polyacrylamide to a viscous Newtonian fluid.

"We developed highly elastic fluids, of constant viscosity, which enabled us to do the experiments needed to check the accuracy of the theory for non-Newtonian fluids," he says. "The materials we developed were optically clear and we were able to do the flow visualisation experiments at room temperature."

To do the experiment, Boger and his team, Hang Nguyen and professional officer Rod Binnington needed a photographic technique which would enable them to determine the velocity and direction of the fluid flow.

One possibility was laser doppler spectroscopy, but this was too costly, requiring complex electronic equipment, and was not suitable for the very slow flows involved in the work.

While at a conference in Belgium, Boger was told of a speckle-pattern photographic technique, using a low-power helium-neon laser, which a group of Monash physicists, Dr Gordon Trroup, Mr Robin Turner, Dr Fred Ninio, honours student Paul Baker and departmental photographer Luke Bryant had developed for biological studies of plants.

The technique had been used successfully to study protoplasmic streaming (the movement of protoplasm) in cells of two plant species, Nitella and Elodea. The slow flow of protoplasm in these plant cells was similar in principle to the slow flow of non-Newtonian fluids.

On his return to Monash, Boger contacted Trroup. Experiments with the technique showed that it was just what the chemical engineering group needed.

The theory of speckle-pattern photography is simple. A rough surface illuminated with laser light yields, in transmission or reflection, a complex diffraction pattern — the so-called "speckle pattern".

If the surface is moved transversely with respect to the laser beam, the speckle-pattern will also be displaced. Photographs are taken of both patterns on the same film. The multiple-exposed negatives are then illuminated by a laser beam and the diffraction pattern that results is examined.

Corresponding pairs of speckles act as "apertures" to give interference fringes.

The velocity of the fluid can be calculated.
Cancer surgery offers new hope

RECENT advances in restorative surgery have dramatically changed the outlook for patients with cancer of the rectum.

In the 1950s and 1960s most patients with rectal cancer were treated by total excision of the rectum and a colostomy. A colostomy is a loop of bowel brought through the abdominal wall to form an artificial anus which a bag is attached.

Having to live with a colostomy is personally and socially disabling for many patients. But now, as a result of surgical advances pioneered by Monash Professor of Surgery, Sir Edward Hughes, more than 90 per cent of patients at Alfred Hospital with rectal cancer are managed by restorative surgery which permits the patient to live a normal life. The exceptions are those where the tumour is very close to the anus.

The new technique avoids a colostomy. Instead, the upper part of the bowel is joined to the rectum just above the anal canal. Other new surgical techniques have led to a sharp reduction in wound infection rates. Whereas previously one in three patients developed wound infection, rates as low as three per cent are now obtained.

A large-scale computer analysis by the Monash department of surgery, involving more than 2000 patients with colorectal cancer (cancers of the colon and rectum) treated by Hughes over a 30-year period (from 1950 to 1980), shows that survival rates are just as good with restorative surgery as with total excision and permanent colostomy.

Results

The survey — the largest single personal series reported in world literature — was conducted by Clinical Associate Professor Frank McDermott.

A puzzling aspect of the findings is the fact that while survival rates for patients with cancer of the colon have been static since 1970, there has been a statistically significant worsening in survival rates for patients with cancer of the rectum which is not related to changes in surgical techniques or other identifiable factors.

(About 40 per cent of patients with colorectal cancer have cancer of the rectum.)

The researchers believe that this worsening in survival rates for rectal cancer, as well as its increased incidence, may be related to some environmental factor — perhaps some change in diet or drinking habits — which leads to the production of biologically more aggressive tumours.

The study found that there was no relation between the duration of symptoms before diagnosis and the stage of the tumour. The symptoms in more than 80 per cent of cases are a recent change in bowel habit (either constipation, diarrhoea, or a combination of both) or bleeding through the back passage.

A small group of colon cancer patients present as an emergency due to bowel obstruction.

"It seems that tumour stage (the extent to which it has spread) is largely determined before the onset of symptoms by the nature of the tumour and host resistance," McDermott says.

The results of the study, he says, underline the need to develop methods of diagnosis before symptoms develop and the need for a National Cancer Registry, which would

Fluid research

Continued from Page 6

because the spacing between fringes is a measure of the spacing between speckle patterns — in other words, how far the fluid has moved in the time between exposures. The direction of the velocity is always at right angles to the interference fringe.

The speckle-pattern technique uses comparatively inexpensive and simple apparatus: a low-power helium-neon laser, some lenses, a 35 mm film camera, and a chopper (a rotating disc with holes in it which gives the multiple exposures necessary for one speckle pattern to be superimposed on another).

Using this technique and the "Boger" fluids as research tools, Boger and Binnington have, for the first time, compared experimental and theoretical interest. They have implications for flows of commercial significance, such as fibre spinning, polymer extrusion, injection moulding and flow through porous media.

Development of the "Boger" materials was supported by an ARGC grant. The laser speckle-pattern photographic technique was developed in the physics department without outside funding — "a string and sealing wax job", to quote Troup.
A better way to recycle waste oil

EACH year Australian motorists use about 250,000 tonnes of lubricating oil.

This oil becomes contaminated during use, particularly with lead, and, if not recovered or properly disposed of, can cause serious environmental problems. Its loss is also a serious drain on oil supplies because it is refined from imported crude, as Australian crude is not suitable for lube oil.

Theoretically, about 150,000 tonnes of waste lube oil could be recovered each year for recycling, either by mixing with fuel oil, or by re-refining to yield a lube oil blendstock.

In fact, only 60,000 tonnes (less than half) is being recovered at the present time. This is mixed with fuel oil and burnt.

One of the problems which has held back large-scale recycling of waste lube oil has been the difficulty and cost of removing contaminants. High lead content, for example, limits the use of waste oil as a fuel oil blendstock.

John A. Brodie medal

The contaminant problem now appears to have been largely overcome by Monash chemical engineers Associate Professor John Agnew and research assistant Mrs Viyada Tirtaatmadja, who have developed a process, which in conjunction with other refining steps, can be used, they say, to "totally reprocess waste oil."

A paper describing the process has won for Agnew and Tirtaatmadja the 1981 John A. Brodie Medal, which is awarded by the Institution of Engineers, Australia for the best chemical engineering paper published in Australia during the preceding year.

Agnew and Tirtaatmadja have applied for a patent for the process, which uses a mixture of an organic solvent and a small amount of an aqueous electrolyte to remove suspended particulates.

"We have found a particular solvent combination which works extremely well in causing flocculation of these very fine particulates, including lead," Agnew says. "We can obtain a high-yield product which is suitable for blending into fuel oil at high concentrations because of its low lead content.

"Alternatively, it can be further re-refined to make it suitable for re-use as a lubricating oil blendstock."

In recent years, he says, satisfactory re-refining of waste oil by conventional sulphuric acid and clay treatments has become difficult to achieve.

Cost

Agnew estimates that it would cost about $125 per tonne by his method to yield 13,000 tonnes of high quality product oil per annum from 20,000 tonnes per annum of collected waste oil, which includes water and other contaminants.

Apart from technical difficulties, he says, one reason why oil companies have been reluctant to reprocess waste oil is that at present there is an excess of lube oil production capacity in Australia.

However, in the chronically uncertain political climate that exists in the Middle East, that situation could change quite suddenly.

We might then have to follow the example of countries like West Germany and South Africa and force oil companies by law to reprocess waste oil.

The Monash process, he believes, could provide the incentive to reprocess waste oil, rather than await a crisis.

The Monash research has been funded by an NERDDC grant.

Cancer surgery

provide a central data bank and "allow working parties to investigate epidemiological features relevant to etiology and prevention."

He points out that it is difficult to pinpoint the possible causes of cancer unless data related to incidence is available. Present national data relates only to mortality and State registries are also incomplete. Victoria has recorded the statewide incidence since cancer was made a notifiable disease in 1981.

Results of the study, he says, point also to the desirability of checking high risk groups for early signs of colo-rectal cancer.

High risk groups can be checked for early signs by means of the hemoccult test — a simple, inexpensive test in which the patient takes samples of faeces for three days. The samples are later examined for bleeding.

People in high risk groups include those with a family history of colo-rectal cancer, or those who suffer from conditions such as polyposis coli, ulcerative colitis, Crohn's disease, or polyps of the large bowel.

The fact that these people are in a high risk group during the preceding year that they will develop colo-rectal cancer, McDermott says. But for reasons which are unclear they have a greater chance of developing the disease. Early detection — before the cancer has started to spread — would greatly improve the patient's chances of a permanent cure.