Secret weapons testing to be carried out in a joint operation involving the Australian and British Defence Departments and British Aerospace will make use of a virtually indestructible camera housing invented by a lecturer in photography from the Faculty of Art and Design.

Mr David Adermann who has a reputation in industry as one of the country's top imaging experts, was approached by officials of the Defence Department after they had heard of the camera housing which he had designed and made for the mining industry.

"Mining engineers have been divided for years about what actually happens when you set off a load of explosives in an underground mine. They know what happens in an open-cut mine but, naturally enough, they've never been able to see what goes on during an underground explosion. They approached me to see if I could come up with a camera that could withstand the blast and record its effects for the engineers to analyse," Mr Adermann explained.

"The difficulties were huge. Firstly, of course, you have to ensure the survival of the camera. You then have to devise a system whereby the vast amount of dust doesn't interfere with the pictures and you have to have effective lighting."

Mr Adermann succeeded. Enter the Defence Department.

"Representatives flew up from Canberra last year. They looked at the gear and some of the footage taken with it."
and they placed an order for three camera units to be made to military specifications," Mr Adermann said.

Those three units were subsequently used late last year in a naval operation 5km off the coast of Western Australia when they recorded a missile hit and numerous other explosive tests on HMAS Derwent. The ship was to be decommissioned and its final job was to become a missile target. It was hit with 30kg of military grade high explosives and the three cameras recorded the effects. The results are to be included in the Navy's Ship Survivability Enhancement Program to help with the design of stronger warships. The spin-off will be better construction methods for civilian vessels.

"There is no other camera system in the world," Mr Adermann said, "that can work as close to an explosion as these cameras can. In the WA tests the cameras were only three metres from impact. In a test at Mt Isa, the cameras, placed only seven metres away, recorded the effects of 640kg of explosives in a mine tunnel. The highest impact we know they can withstand is 90 G forces. These are multiplied forces which makes them even more dangerous but the cameras have come through with only a minimal amount of damage to the housing."

Mr Adermann's invention is a breakthrough not only for mining and defence. "The potential market will include research institutions, universities, large private companies such as car manufacturers and government departments, in fact anywhere where destructive testing is carried out," Mr Adermann said.

Although one of Mr Adermann's handmade units is very expensive (up to $175,000 for an underground mining unit which includes control systems, camera housing, high speed camera and lighting system) the pay-off to industry is higher returns, lower operating costs and improved safety.

Mr Adermann's invention is now being licensed through a holding company and he is in the middle of negotiations for worldwide manufacturing, sales and territorial rights.

As to the secret testing shortly to be carried out at Woomera by the Australians and the British, there is very little to go on.

"We don't know what they are doing. They can't tell us. All I know is that they will be using three of my camera housings. It will be interesting to see how they perform," Mr Adermann said.
Australia is one of the largest producers of black coal in the world. To maintain the fuel's viability, Australia must develop technologies which can export (or provide locally) along with the coal to its customers. In other words, as well as exporting coal, increasingly in the future, we will be exporting techniques for better coal utilisation.

Current research undertaken by Professor Peter Wall in the Faculty of Engineering is to find ways to replace coke, for example, in the blast furnace. That is, using coal rather than converting coal to coke, thus saving a costly process.

Professor Wall is a Chemical Engineer but this research is done under the aegis of a Co-operative Research Centre (CRC) for Black Coal Utilisation attached to the University and administered by Pacific Power's Advanced Technology Centre.

The technique is called pulverised coal injection and is done by injecting pulverised coal into the bottom of the blast furnace. It doesn't substitute for all of the coke but is a viable alternative for about half of it.

With competitive pressures forcing steel producers to find ways to shave costs, the use of pulverised coal injection is accelerating dramatically and thus it looks like a lot of Australian coal will be exported into these technologies. Professor Wall's research brief is to work out which coals are best for this approach and why.

Cost pressures, as well as environmental considerations, are behind the push for developing new technologies for power generation from coal.

There is demand to develop technologies which will use less coal per unit of energy while at the same time generating less carbon dioxide - the culprit in the greenhouse effect which leads to global warming - per unit of energy.

"Again, this requires different coals to perform best in the present way of generating power. So the thrust of the CRC is basically helping the coal exporters to understand which coals are going to be best in the future and why, and for what application." Professor Wall said.

The CRC is funded to the tune of $1.8 million by government and $1.2 million by industry annually over seven years. While the federal government is a major financial contributor, the participants include the industry: Pacific Power, BP/CRA et al. plus research bodies such as the Australian Coal Industry Research Laboratories, Universities of Newcastle, NSW and Queensland and the CSIRO.

The CRC is being set up as a consulting organisation to help both local producers as well as buyers of Australian coal. Coal research also goes on at the Institute of Coal Research which is on the University of Newcastle's campus and which conducts a course on coal technology for the University.

Unlike the CRC, the institute is a permanent establishment. It is financed entirely by subscription from coal producers and users and tends to research into areas left out by other coal research, according to head, Dr Donald Mickle.

Dr Mickle said that the Institute has done significant research into the effect of blasting techniques on the size of the coal being extracted and the effect of the size of the coal heading on the performance of machines and the efficiency of recoveries. He said the Institute was involved in a number of important projects including the development of new products and processes for the coal industry.
Dr Mark Read, a scientist at the Maternal Health Research Centre, connects a placenta to equipment used in research into the relationship between CRH and premature labour.

Premature labour and birth is the biggest cause of neonatal death in the western world. The financial and emotional cost is exorbitant and, although more premature babies survive due to advances in neonatal care, the number of premature births remains at about six percent of all deliveries. Medical science has been unable to prevent premature birth.

Until now no one has understood what determines the length of a normal pregnancy, what causes a woman to go into labour and give birth. Some scientists thought the baby secreted a hormone which triggered labour, others thought it was the mother.

But researchers from the Disciplines of Medicine and Reproductive Medicine within the Faculty of Medicine and Health Sciences have discovered a biological clock operating within the placenta which determines the length of pregnancy. The speed of the clock can be monitored by measuring a hormone, corticotrophin releasing hormone (CRH), made in the placenta and released into the woman’s blood.

“We found, in a study of 500 women, that as early as 16 weeks high levels of CRH were present in the women who delivered early and very low levels were present in women who delivered late,” explained endocrinologist Professor Roger Smith. “This indicates that a clock mechanism is operating and that the length of a pregnancy is determined early in pregnancy, perhaps as early as conception.”

In order to reach their results the researchers had to develop an extremely sensitive assay which could detect low levels of CRH. This test was developed using the accumulated experience of 15 years and $50,000 worth of purifying and tracing equipment. A simple blood test was the only input required of the expectant mother.

Now that the clock mechanism is understood, the scientific race will be on to discover ways of slowing down the clock when it is running too fast. Already the Newcastle team is conducting experiments using nitric oxide. The laboratory tests show that nitric oxide can reduce levels of CRH in cultured cells.

“Being able to predict early labour is an important discovery but understanding why puts us in a very powerful position. More than producing a diagnostic test we have gained an understanding of the mechanisms of labour,” Professor Smith said.

As in so many recent research successes, this project has been multidisciplinary. Endocrinology PhD student, Mark Mclean is first author on the paper published in the May issue of the international journal, Nature Medicine. Dr Andrew Bisits was the project’s obstetrician and statistician, and research assistant, Ms Joanne Davies conducted all the assays. Dr Phillip Lowry from the University of Reading, UK was an international collaborator supplying expertise on the binding protein for CRH. The research was conducted over a five year period at John Hunter Hospital.

Further information will be collected during the next two years to test the accuracy of the predictor on larger numbers of women while other researchers around the world explore the possibilities created by the Newcastle discovery.

“This finding has provoked intense international attention,” said Professor Smith. “It is significant for people everywhere because what happens at the very beginning of life affects the health of the community for years to come. It is logical to work on the beginning of life and make sure that new born babies are as healthy as possible.”
BUT WHICH ARE BEST?

There are many made from different countries have.
Environmentally degraded areas of the Hunter River estuary have become the focus of frenetic activity for some of Newcastle’s vastly disparate interest groups.

For many years now areas such as the western end of Kooragang Island have been cleared and grazed by cattle, affecting the growth of mangroves and other native plants. Culverts at road crossings and other structures have reduced tidal flow which is vital to biological diversity. Hundreds of hectares of tidal channels, mangrove swamps and saltmarsh have been reclaimed for industrial use and millions of mosquitoes have bred in the stagnant pools created by the lack of proper tidal flushing.

But the Kooragang Wetland Rehabilitation Project has brought together government bodies and local councils, industry, environmental and community groups, island licensees and the University of Newcastle to turn the island’s recent history around.

Together they will rejuvenate natural habitat on three separate sites which cover over 1,300 hectares of the estuary. The sites encompass areas of remnant rainforest, saltmarsh plains, mangrove swamps and wetlands which provide nursery habitat, crucial in the early development of fish, prawns, crabs, and roosting and feeding habitat for wading birds.

According to co-ordinator, Ms Peggy Svoboda, the project’s basis lies in the rehabilitation, restoration and creation of nursery and roosting habitat, but it has many other equally important aspects.

An integrated research program will develop and monitor the best techniques for this type of rehabilitation work and pass that information on to other similar projects, in Australia and overseas, she said.

School students will gain hands-on experience in estuarine field work by visiting the site as an extension of the work already done by the Awabakal Field Studies Centre at the Shortland Wetlands Centre. There will be recreation opportunities for visitors who enjoy fishing, cycling, walking and picnicking. Visitors’ centres on Ash Island will explain and interpret the island’s ecology and detail its social history, including the colourful lives of the people who lived there.
The Steering Committee, made up of representatives of the Hunter Catchment Management Trust, Newcastle City and Port Stephens Councils, NSW Parks and Wildlife, NSW Fisheries and the Department of Land and Water Conservation and was formed in 1992. This followed the observation that over 1,000 hectares of fisheries habitat had been lost in the Hunter estuary as a result of draining and filling.

Member organisations contribute financially to the project which in 1994-95 had an annual budget of about $400,000. Industry sponsors have committed funds for various parts of the project.

Last year the University of Newcastle came on board by jointly funding the position of Research Fellow in the Department of Biological Sciences to oversee the research aspects of the project.

Dr Bill Streever, formerly of the University of Florida, was appointed. He is an expert in wetland ecology and has done comparative studies of natural and rehabilitated wetlands in Florida. He believes that wetlands can be regenerated over a period of time, although they may not be identical to those that existed on the site before degradation occurred.

"The first stage of rehabilitation on Kooringang is to increase tidal flow which has been restricted by broken down culverts and levies. Increased flushing will encourage the establishment of more mangrove swamp and herbaceous vegetation," he said.

The research is multidisciplinary and is being undertaken by different groups. Ongoing research in the Department of Biological Sciences involves studies into controlling mosquito populations (funded by BHP) and the distribution of saltmarsh plants and crab species in relation to vegetation. The Department of Environmental Engineering is examining the physical factors affecting vegetation on the Tomago site with support from Tomago Aluminium.

NSW Fisheries and Port Waratah Coal Services have funded a fisheries research team headed by biologist Robert Williams to observe existing fish and crustacean populations; NSW National Parks and Wildlife started work in 1994 on a study to survey estuarine habitat for waterbirds and migratory wading birds; and the Hunter Valley Research Foundation surveys community attitudes towards the project every six months.

A project investigation zone has been set aside for rehabilitation, restoration and creation experiments and, according to Ms Svoboda, will enable researchers to replicate treatments and carry out ongoing manipulation of the estuarine environment.

"From its inception this project has linked rehabilitation work with on going research. We are not aware of this happening elsewhere and we look forward to passing on what we learn," she said.

"The research program has already established international links and experts working on many other projects will be interested in the outcomes."
ACTION RESEARCH
A MODEL

In the world of social welfare it is no longer possible for programs to be implemented and conducted without measuring their success. Funding bodies and groups wanting to replicate successful programs require proof that they are working.

In many instances traditional, empirical research is not able to provide this proof. How do you measure the success of a particular outcome? Real people and their lives are involved. It is not possible to mock up a situation in a laboratory and make observations.

The University of Newcastle's Family Action Centre has adopted a form of research which it is confident will solve this problem. The centre has been running successful programs for people living permanently in caravan parks for eight years through the Hunter Caravan Project and believes that Action Research is a promising method for measuring and documenting the success of its programs.

"We have developed a substantial body of information through our programs and we are starting to disseminate that information. But whenever we are out doing advocacy work on behalf of disadvantaged groups, we are asked for proof that our programs work. We have to devise better ways of sharing our information and conducting research which shows we are on the right path," said Senior Project Officer, Ms Gus Eddy.

"The model for Action Research has been accepted around the world as a legitimate and valuable research method and will provide us with documentation of outcomes and the evidence that our programs have achieved their aims."

This type of research involves the stakeholders in the research project - they are simultaneously the participants and the researchers. The stakeholders gather the information, analyse it and work together in documenting the outcomes. The method is sometimes called Action Learning because there are educational benefits for the participants.

The Family Action Centre will apply Action Research in a project presently in the planning stages which will involve caravan park managers. Project Officer, Ms Denise Hogarth, will survey park managers in New South Wales through face to face and telephone interviews. The results will be written up in a preliminary report and then disseminated to park managers for comment, thereby involving them in documenting the final results.

"Action Research is open-ended. It doesn't start with an experimental hypothesis and try to prove it. It starts with a question and tries to tease out an answer. It's a time consuming and arduous process because allowing people to identify their own issues, claims and concerns while keeping within the parameters of the study can be difficult," she said. "But it can also be an educational process because, in discussing the problems associated with being caravan park managers, the participants may gain a better understanding of all the issues involved."

It will also have other positive outcomes, according to Ms Eddy. "The project may start a course for caravan park managers on the basis that the market research has already been done. We may seek government funding for development of resource materials requested by the survey participants or we may go to government policy groups with the results of our studies," she said.

"Whatever the outcomes, the people who have been involved in the research and its documentation will certainly respond better to any initiatives that follow from the research."

Action Research can also work well in tandem with traditional empirical research. In April the Family Action Centre formed a consortium with members of other social research centres at universities in Queensland, Western Australia, South Australia and New South Wales to attract funding for a national survey of caravan park populations.

"Caravan park residents, before the 1991 census, were counted in with residents of gaols, hospitals, boarding houses and convents," explained Ms Eddy. "Household statistics are now available for caravan households because they are not counted as a separate group."

The national survey will link in with the National Health Survey being conducted by the Australian Bureau of Statistics. It has health issues, child protection, human rights, legal issues and management issues as its priorities - all with a particular focus on the child and the family.
School participation rates are also very low, but the Central Coast campus now has over 1500 students and the number is set to double next year. They are not all students of the University, however. Quite a few are studying at TAFE. Then added to that figure is another 1000 or more who come to the campus in any one week to study short vocational courses run by the Central Coast Community College. In fact, the University received a $100,000 endowment from Westfield (now known as the Westfield Grant) which gives $20,000 each year for five years to fund an academic position in business programs.

Camps currently offered by the University include Arts, Business, Commerce, Early Childhood Education, the MBA program and Science (Food Technology) as well as Newstep and the Open Foundation course. Fine Arts and Science (Sustainable Resource Management) are expected to be available next year.

The physical campus is likewise developing quickly. Stage 1 of the Philip Cox designed complex has now been completed at a cost of $25 million and a further $25 million has been promised for Stage 2 which will begin next year.

Facilities completed include teaching areas, academic offices, laboratories, library, a hospitality and tourism centre and spaces for various shops which will soon be let to private enterprise.

"We have a line of professional people such as doctors, physiotherapists and banks who want to rent space," Dr Eastcott said. "It will just be a matter of choosing the most appropriate for our needs."

Enterprise zones are also being established on the campus to allow private developers to build facilities which will be relevant to the work of the University and TAFE.

"For example we are presently negotiating with a company to build an office block on the campus and while that might sound odd at first, it's going to provide a great opportunity for our students. It's too early yet to name the company but the kind of work they do will mean that students will be able to carry out research proposals for them, find holiday and/or part-time employment with them and at the same time gain practical experience in areas they are studying. If it comes off, it will be quite a coup."

A precinct, where students could explore a range of educational opportunities, made perfect sense.
R
etrenchment, due to tariff reductions and the effects of recession, has introduced many Australians to what have become known as labour market programs - retraining schemes for retrenched workers. Research recently carried out in 10 labour markets across Australia has revealed that these programs can be successful and a wise investment of taxpayer's money.

In 1993, Dr O'Neill and his colleagues won the tender for an assessment of the LAP's success by arguing that the usual statistical or market research analysis of the outcomes for retrenched workers was inadequate. "These studies do little more than analyse the victim and give us no information about the processes which are successful in getting people back into the labour market. We felt that the geography of labour markets was critical in workers' re-entry into the workforce," he said.

The study, commissioned by the Department of Employment, Education and Training (DEET), began in 1993 with interviews involving 600 TCF workers who provided detailed work diaries for a five year period. The majority of TCF workers are women, many from non-English speaking backgrounds. Extraordinarily, of all those interviewed in 1993, only six could not be contacted for re-interview 12 months later. Dr O'Neill and his colleagues are confident that the 600 workers will continue their participation in the follow up research.

The report is yet to be released but, in general terms, the findings were positive. "The study will endorse the successfulness of effectively delivered labour market programs. These programs can make a big difference, both to the workers' self esteem and to their ability to find work," Dr O'Neill said.

Many of the people involved had little or no English and had always worked in noisy conditions. Just to learn the language in one of these programs was very uplifting for them. Retrenchment was not the devastating experience it could otherwise have been.

The second major finding concerned the definition of 'successful outcome'. Previous research of re-employment patterns has taken a snapshot of retrenched groups at a particular point in time but, according to Dr O'Neill, labour market conditions in the 1990s are much too complex for that approach.

"Workers can now experience a whole host of workforms simultaneously. They may be doing some personal sub-contracting, or working part time and casually. There may have been a shift in the work responsibilities between husband and wife. Many will combine several types of employment.

"This is an incomplete area of our research and the new grant will help us establish whether outcomes, such as skills accreditation and language retraining, are reflected in employment in the long term.

"We already know that the training programs are highly valued by the people themselves."
Modern medicine depends to a significant extent on drugs to control disease, but the truth is that we know very little about how and why many of these drugs work.

Researchers in the University's Neuroscience Group are investigating drugs, some of which are used in the treatment of schizophrenia and movement disorders, in order to understand how they work. Gaining an understanding of how these drugs work may lead to the development of better drugs with fewer side effects.

At a recent international conference, a member of the group, Dr Paul Brent, was overwhelmed by the interest shown in his work by other scientists. At a poster session he was mobbed by people eager to discuss the possibilities of the group's early results.

The research involves sigma receptors, receptor sites on nerve cells which are located in parts of the brain thought to be of importance in schizophrenia and in movement control. Drugs which bind with, or attach to, sigma receptors have been successful in treating these conditions. However, no-one has yet been able to determine the sequence of events which takes place inside brain cells after the drugs have been administered.

Dr Brent and Professor Peter Dunkley, however, believe they have discovered the basic mechanism of how these drugs work. Their research may soon be able to explain the many functional effects of such drugs.

Protein phosphorylation, the addition of a phosphate to a protein, which then alters the protein's activity, is recognised as one of the most important and fundamental molecular events in the body. This process is widely used to control cellular function. Nerve cell function is also entirely dependent on control by protein phosphorylation. For example, protein phosphorylation is important in the release of chemical messengers in the brain (known as neurotransmitters), which is critical for cell to cell communication.

Dr Brent said the research had already revealed that drugs which bind to sigma receptors act on two particular proteins: synapsins, which play a critical role in releasing neurotransmitters (exocytosis); and dynamins, which are very important in the process of recycling the structures which contain the neurotransmitters, called vesicles, so that they can be refilled with neurotransmitters (endocytosis).

"We have shown that drugs which act on sigma receptors affect the phosphorylation of synapsins and dynamin, altering their function and, as a consequence, likely to alter neurotransmitter release. Researchers who work on sigma receptors around the world are very excited by these findings," Dr Brent said.

"The focus of our current research is to identify the chemical messengers, particularly cell calcium levels, which might be producing the changes to protein phosphorylation we observe when we treat brain cells with the sigma receptor drugs."

(See diagram)

Dr Brent and Professor Dunkley received seeding funding for their project during 1993-94 from the University's Research Management Committee and have been successful in attracting an NH&MRC grant for 1995-98.

They have been invited to speak at forthcoming international meetings, and have entered into a collaboration with the National Institute of Health (NIH) in Washington, USA. The NIH has supplied a new experimental sigma drug for testing using techniques developed here in Newcastle.
Interpersonal skills are important in skill assessment but are not generally acknowledged.
Towards understanding JAPAN

Japan has been a country of alternating periods of isolation and periods in which foreign culture has been introduced and adapted. The Tokugawa period (1603-1867) was an era of isolation and the Meiji period (1868-1912) was one of openness. The event dividing these two eras, the Meiji Restoration of 1868, put in train a process of Westernisation and modernisation which led to the emergence of Japan as a world power.

Although the Tokugawa period was one of isolation, it was also an era in which Japan developed and refined its own intellectual traditions. As a consequence, when Japan once again opened itself up to contacts with foreign countries in the 1870s and 1880s, it was quickly able to import and adapt Western culture on its own purpose.

In fact, Japan's association with Western thought and technology in that period is one of the most outstanding events in world history. A task was carried out by a group of outstanding political leaders and intellectuals. One of these intellectuals, Yamaji Arai, was the subject of a doctoral dissertation submitted to the University of Newcastle last year. The thesis consisted of a translation and analysis of one of Arai's most important works, based on his history of the Meiji Japanese Church. The author, Dr. Squires, from the Department of Modern Languages, argues that the view that the history of Christianity in the Meiji era was an important new research area of research.

“Christianity was important not just in a religious sense but also because it was a symbol of the West. The popularity of Christianity ebbed and flowed with the popularity of Western culture,” he explained.

“In the Tokugawa period closing Christianity was a capital offence. Although the Meiji government allowed freedom of worship in 1871, towards the end of the Meiji era, that's when it's being founded with Western culture and in the face of increasing Western imperialism, it came to view Christianity as a threat.”

“As a result, the government sought to restrict Christianity and strengthen Japanese indigenous religion of Shinto through the cult centred on the Imperial Family. Yamaji’s study of Christianity is important because it’s a first-hand account of his more recognisable as a temporary observer.”

Dr. Squires’s thesis is the first of its kind to be submitted in the area of modern languages at a Australian university in that it combines both the translation and analysis of a historic text.

“Understanding a culture other than one’s own, it is often difficult to find a suitable perspective. It’s easy to fall into preconceptions of exoticism,” Dr. Squires said. “The relevance of translation is immediately understandable in that it makes available to a wide audience the work of an important Japanese intellectual. Also, through a detailed engagement with a text we can further explore the problems of cultural analysis and intellectual history.”

Dr. Squires, who has qualifications in both history and Japanese, believes that the development of Japanese studies is entering a new phase in Australia. “There has been a lot of rhetoric in this country about our relationship with Japan but little has been done to improve our basic understanding,” he said.

“It is important for Australia to develop its own perspective on Japan. The textbooks used in university courses are excellent, they are European or American language culture courses which correspond to the needs of the society in which they have to be taught. We need to develop a new conceptual framework in order to make the study of Japan meaningful from an Australian point of view.”

This is not an easy task. Dr. Squires conceded. “Most Australians have very stereotypical images of Japan - a land of mystery and contradiction - the cute little girl in her kimono going off to McDonalds sporting a Sony Walkman. We have to develop a point of view which transcends stereotypes and helps us to make Japan more understandable for Australians in a deeper sense.”

“How should we take this step is difficult to determine, but it is a step we have to take.”