About 450 million years ago, a chain of volcanic islands, similar to a north-south reversed profile of the Andaman basin today (above), extended from central-northern NSW into north-eastern Victoria. Picture (right): a 3-dimensional impression of the ancient "island arc". (Inset): Dr Ray Cas, who conducted the research.

Photo: Rick Crompton

The way we were — 450 m years ago

DURING the late Ordovician period, about 450 million years ago, when the first vertebrates appeared on Earth, south-eastern Australia was a deep ocean basin.

From central-northern NSW southwards into north-eastern Victoria there was a chain of volcanic islands, an island arc, along which coral reefs were growing.

Antarctica lay adjacent to south-eastern Australia and remained that way until about 55 million years ago when the two continents started to move apart.

Tasmania, in the late Ordovician, was a broad shallow marine shelf with localised reef masses.

This picture of south-eastern Australia from 466 million years ago to 446 million years ago — a "time slice" of 20 million years in the Earth's geological history — emerges from research by Monash geologist Dr Ray Cas, Dr Keith Crook, of the Australian National University, and Dr Chris Powell, of Macquarie University.

Cas has been attempting to reconstruct the geography of the region from about 600 million years ago to about 300 million years ago. The research stops at 300 million years when south-eastern Australia had evolved into a geologically stable continent.

In their attempt to construct a palaeo-geographic history of the south-eastern Australian region, Cas and his colleagues have examined exposed rocks and sediments and other geological data, and compared the emerging picture with the geography of various regions today. This analogue approach not only provides an important scale perspective, but highlights similarities and differences important in deciphering the evolution of the region's early history.

They examined the three main groups of exposed rock — sedimentary rock (compacted sediments, such as beach sands, river sands, or deep ocean sands), volcanic rocks, which have erupted from ancient volcanic centres either continental or under the sea, and metamorphic rocks, "cooked" and pressurised sedimentary and volcanic rocks.

"When you piece all this information together you start getting a reasonable idea of what the geography of a region was in the past," Cas says.

The Ordovician picture of south-eastern Australia is very similar to a north-south reversed profile of the Andaman basin today, Cas says.

The Andaman basin in the north-east Indian Ocean includes the Andaman and Nicobar Islands, formed from submerged mountain ranges which extend from Burma through Sumatra and Java to the Little Sunda islands.

"What we have in the Andaman basin system," Cas says, "is a line of islands fringed by prolific coral reef systems.

"Behind the line of islands — the Andaman and Nicobar islands — we have a line of submarine volcanoes, and either side there are deep marine environments grading laterally into shallow marine continental shelves.

"If you use a bit of sleight of hand and transpose north and south and compare the picture with that of south-eastern Australia in Ordovician times, you will see that the two regions are essentially equivalent.

"In both systems, we have, to the left, an inferred continental mass. Adjacent to that there is a shallow marine continental shelf with coarse shallow-water sediments, and to the right, a broad deep-water basin which lies behind a line of islands.

"These islands are accumulating volcanic rock and also limestone materials, both modern and ancient.

"On the seaward side of the islands is an area of deep ocean sedimentation, and to the south of both systems there is a broad continental shelf, fed, in the case of the An-
New lead on bleeding disorder

RESEARCHERS in the Monash department of medicine at the Alfred Hospital have made important progress in understanding the cause of bleeding which occurs in some patients treated with the drugs quinine and quinidine.

Quinine is used mainly in the treatment of malaria and nocturnal leg cramps, and quinidine in the treatment of a number of conditions, including cardiac arrhythmias (disturbances in heart rhythm).

Both are effective drugs, but a small proportion of patients given the drugs develop antibodies which attack and damage platelets, the tiny blood corpuscles involved in blood clotting.

The antibody attack results in bleeding, both internal and external. The degree of severity varies from one patient to another, but in some cases it can be life threatening.

Significant advance

The Monash researchers, Dr Sharron Pfueller, a senior research officer, Pari Hosseinazedeh, a Ph.D student, and Professor Barry G. Finkin, have made a significant advance in unravelling the causal mechanism involved in this antibody attack.

They have found that von Willebrand's factor, a large glyco-protein which is essential "for the very first step in normal blood clotting" seems to be involved in forming the antigen which stimulates production of the destructive antibodies.

The von Willebrand factor is essential for normal blood clotting because it enables the platelet to adhere to the damaged blood vessel wall. Absence of it causes a severe bleeding disorder called von Willebrand's syndrome.

The likely link between the von Willebrand factor and the bleeding which occurs in susceptible patients given quinine and quinidine was unsuspected until the Monash work, in spite of much research directly on the von Willebrand factor by many other researchers.

The Monash results will be published later this year.

The Monash team hope that now progress has been made in understanding how the antigen is formed further research will enable them to predict the type of patient who is likely to develop the antibodies.

In their attempt to determine the nature of the antigen that stimulated production of the antibody in the presence of quinine or quinidine, Pfueller and Hosseinazedeh found that both antibody synthesis and platelet damage occurred only if there was an interaction between some factor in blood plasma, specific platelet membrane components and the drug.

Hosseinazedeh conducted biological tests on blood sera from 12 patients with quinine or quinidine-induced bleeding, and compared the results with those from people whose clotting was normal, and from some with non-drug-induced bleeding disorders.

She studied the transformation of lymphocytes (white blood cells) in the presence of the drug, using as a measure the incorporation of thymidine into the lymphocyte's DNA (its genetic material).

"Significant transformation of the lymphocytes occurred when patients' lymphocytes were cultured for seven days in the presence of plasma and therapeutic concentrations of the drugs," Pfueller says.

"The presence of the von Willebrand factor was essential.

"It seems that lymphocytes of patients with drug-induced bleeding are transformed by an antigen which forms after the interaction of the von Willebrand factor, specific platelet membrane components and the drug."

Using other biochemical tests which measure platelet damage, the researchers also showed that the von Willebrand factor was involved in platelet destruction by the antibodies in the presence of the drugs.

"We hope that further research will lead to a way of identifying people susceptible to these drugs," Pfueller says. "It should also lead to a better understanding of how the von Willebrand factor and the platelets participate in the clotting process itself."

Ordovician ‘time slice’ Continued from Page 1

daman basin, from a large sediment load from the Irrawaddy delta, and in the case of south-eastern Australia, from Antarctica and South Australia, then distributed northwards."

The results of the research by Cas and his colleagues point clearly to an "island arc" episode in the geological history of south-eastern Australia.

Cas and his colleagues have published the results of their research into the Ordovician "time slice" in a joint paper in the journal of the Geological Society of Australia and presented a paper on the work at the International Geological Congress last July.

Cas has just returned from London where he presented a preliminary picture of the total evolutionary story from 600 million years ago to 300 million years ago to a specialist congress there.

He hopes to continue his work on the broader picture for the rest of this year and present his final findings to a conference of sedimentologists in Canberra in December.
LAND vertebrates could have originated in Australia in Devonian times, 390 million years ago, according to visiting zoologist Dr Alec Panchen.

"It is conceivable that they did, though not necessarily true," he says. Panchen, reader in vertebrate zoology at Newcastle University in the U.K., is an expert on the origin of land vertebrates and land reptiles.

His other main interests are in the genetics and ecology of butterflies and the role of biology in the philosophy of science, but much of his research has been devoted to the distribution of the earliest tetrapods — four-legged vertebrates — relative to continental drift.

His view that the amphibian vertebrates may have first emerged from an aquatic environment in Australia is based on the discovery nine years ago of fossil footprints in Upper Devonian sandstone rock in the Genoa River area of eastern Victoria, and the recent discovery in NSW of the lower jaw of an amphibian. The Genoa fossil — the tracks of an amphibian with five digits on each of its four feet — was found by Professor Jim Warren, of the Monash zoology department, and the late Mr Norman Wakefield, then head of biology at Monash Teachers' College.

Fossil jaw

There is only one other area where tetrapods with digits have been found in Devonian rocks — in East Greenland. Skeletal remains of Ichthyostega have been found there in Upper Devonian sandstones. The lower jaw fossil found in NSW — also of Devonian origin — could possibly pre-date the Greenland find, Panchen says.

He initially developed a theory that land vertebrates originated in East Greenland in the late Devonian period and radiated from there through the Carboniferous and early Permian periods — from 395 million to 280 million years ago.

The area of East Greenland in which they originated, according to this theory, and the area to which they radiated, which includes sites in Scotland, Nova Scotia and parts of the U.S., were then equatorial. At that time the continents of Europe and North America had not yet separated as a result of continental drift.

By the end of the Carboniferous period — about 280 million years ago — fauna and amphibian reptiles had spread westwards and eastwards — to middle Europe and the American south-west.

"The Australian discoverers," he says, "meant that I had to look at the position of Australia in the Devonian and Carboniferous periods to see if it was as far away from the Euro-American centre as it appeared to be.

"The interesting thing is that the latitude of Australia in the Devonian period was also equatorial.

"It is conceivable," he says, "that tetrapods originated in Australia but were wiped out by the great glaciations that affected the southern continents at the end of the Carboniferous period. The continent was re-populated later."

Panchen, who will be lecturing at Monash until December, hopes to join Monash colleagues in investigating Devonian sites in Victoria.

In the meantime, he has been conducting research in another area of interest — butterfly mimicry. He has been studying a genus of Queensland butterflies which is related to an American genus of butterfly which is capable of retaining poison ingested from plants which it eats during its caterpillar stage.

Members of the whole family act as models for other unrelated species, which have evolved to mimic them.

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Solving the pulsar puzzle

MONASH Professor of astronomy, Professor Kevin Westfold, in collaboration with Professor Leon Mestel of Sussex University, is attempting to resolve anomalies in the behavior of pulsars — the strange "ticking" stars that were accidentally discovered 13 years ago.

Unlike other known radio sources like quasars or radio galaxies, which emit their radiation continuously, pulsars emit radio signals in short, sharp bursts. Lasting only a fraction of a second, the pulses are repeated at precisely regular intervals.

It is now widely accepted that pulsars are rotating neutron stars, the highly dense, shrunken end-products of the gravitational collapse of a massive star, which at some past epoch blew off a bright shell in a giant supernova explosion.

About 400 pulsars have now been detected by radioastronomers, all in our galaxy and concentrated about the galactic plane. Two of them, perhaps because of their high rotation rate and high radio brightness, have been observed optically as well.

One, first observed with the Anglo-Australian telescope, is in the constellation Vela, the other in the middle of the Crab Nebula. The Crab Nebula, with its associated pulsar, is believed to be the remnant of the supernova explosion which Chinese astronomers observed nearly 1000 years ago.

Westfold says a neutron star is a star which has shrunk to a radius of something of the order of 10km, yet has a mass comparable to that of the sun.

Instead of being made up of separate atoms, it is made up almost entirely of neutrons, the building blocks of atomic nuclei. A matchbox full of such material would weigh some ten thousand million tonnes.

Locked to the neutron star is a powerful magnetic field which rotates rapidly with it, bearing with it an atmosphere of charged particles — ions and electrons — called a plasma.

As the plasma, coupled to the magnetic field, rotates rapidly with the star, the star, he says, charged particles in it spiral along the magnetic lines of force and, by some processes as yet uncertain, emit radio energy, concentrated in a very narrow beam.

As the star rotates, the beam sweeps around like a lighthouse, and every time it passes in the direction of the earth we can detect a radio pulse.

Unfortunately, Westfold points out, the theory of magneto-hydrodynamics, which can explain the neutron star's magnetosphere (the coupling of the plasma and the magnetic field), breaks down when its equations are used in their usual form to describe the magnetosphere's rotation and the associated electromagnetic field.

"The usual theory of magneto-hydrodynamics tells us that as the star rotates the particles making up its magnetosphere are attached to the magnetic field lines like beads on wires," he says.

Contradictions

"But as long as the magnetosphere rotates with the star, the velocity in its outer regions gets bigger and bigger in proportion to the radius, and at a distance of about 50,000 km from the rotation axis of the star (some eight earth radii) it would reach the velocity of light. Here at the 'light cylinder' we encounter contradictions.

"According to Einstein's Theory of Relativity, it is not possible for material particles to travel at the speed of light.

"Also, in their usual form, the equations tell us that the mass-acceleration terms can be neglected in comparison with the electromagnetic forces acting in the plasma — 'force-free' conditions. A consequence of
**Voyager to test moon theory**

MONASH mathematician Andrew Prentice believes that the inner moons of the planet Saturn may be irregular in shape as well as rocky in composition.

The extensions to his theory of the origin of the solar system, published in Monash Review last year, stem from theoretical considerations and recent astronomical discoveries.

His extended theory has been submitted to the U.S. journal Science for publication.

Prentice's theory will be tested in November when Voyager 1 sweeps past Saturn.

If all goes well, remote controlled cameras on Voyager will be able to measure the shapes and sizes of Saturn's moons and, indirectly, their density and likely composition.

**Density**

If Prentice is correct, the density of Saturn's moons increases in a uniform way the closer the moon is to the planet, and the four inner moons, Mimas, Enceladus, Tethys and Dione are rocky in composition, consisting largely of hydrated magnesium silicates. The two outer moons, Rhea and Titan should be icy.

Prentice left Melbourne last month for Pasadena, California, where he will work with the Theory Division of the Jet Propulsion Laboratory for the next few months assessing data beamed back to earth by Voyager.

Prentice's theory is not the only one that will be subjected to test by Voyager in November.

An alternative theory to Prentice's, based on gravitational tidal effects, has been developed by a team of American astrophysicists led by Dr Stan Peale, of the NASA-Ames Research Centre.

According to Peale's theory, Saturn's inner moons vary in their density and composition in a non-uniform way. For example, Mimas, the innermost moon, is probably rocky, the next two, icy, and the fourth, Dione, rocky again.

This theory, if correct, rules out a nebula-type origin of the solar system for Saturn's family of moons, as proposed by Prentice.

Prentice's theory, which is based partly on the ideas of the famous French mathematician Laplace, has been rejected by some theorists because of its use of the concept of "supersonic turbulence" suggested in 1948 by ter Haar. Despite this opposition, the Prentice-ter Haar theory has been gaining ground as a result of recent discoveries in astrophysics.

"My present theory can be reconciled with the existing observational data if Saturn's moons are irregular in shape," Prentice says.

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**Pulsar puzzle**

Continued from Page 4

The research, which in Westfold's case began during periods of study leave, first at the Sussex University Astronomy Centre and more recently at Mount Stromlo where he was visiting fellow for six months, is an attempt to relate magneto-hydrodynamic theory to relativistic mechanics.

Westfold has devised "a more formal means of developing the governing equations", and is in the process of writing up an account of the work for publication.

The research, he believes, offers "a most promising approach" to the solution of this very complicated problem.

MONASH REVIEW
Both Hektor and Amalthea have a mass and size similar to that of the moons of Saturn. Until Voyager discovered its irregular shape last year, it was thought that Amalthea was spherical.

There is further support for the view that Saturn's moons are irregular in shape from Dione's "light curve" and the apparent discrepency in astronomical measurements between Dione's diameter when furthermore from Saturn and when it is seen "end on", between us and Saturn.

Prentice says the discovery by astrophysicists earlier this year that there may be a "faint stream of moonlets orbiting Saturn halfway between the planet's rings and Mimas, its innermost moon," supports his theory, which permits the existence of an extra gaseous ring in that location.

The discovery by scientists that Saturn has a possibly dusty 'E' ring which "decreases in intensity rapidly outwards away from Saturn" also lends support.

"The masses of Saturn's moons decrease inwardly just as rapidly," Prentice says. "This suggests that the 'E' ring is made up of that material that failed to be incorporated into the moons. That, I think, is a remarkable result.

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Folklore beliefs affect heart recovery

RESUMPTION of work after a heart attack is not an adequate criterion of recovery, according to a study by Dr Marian Worcester, a Ph.D student in the Monash department of social and preventive medicine.

"Although they cannot be easily measured, an inventory of occupational adjustment and psychological well-being are more appropriate indices of successful rehabilitation," she says in her Ph.D thesis, which was based on the study.

Worcester conducted 353 interviews with 43 patients and their wives during the first year after the heart attack. The patients were married men who had been in the workforce prior to their illness. All had attended the Cardiac Rehabilitation Unit at Caulfield Hospital.

Thirty of the 42 survivors returned to work, although only 24 were still working full-time after 12 months. A further eight men retired and four men remained unemployed during the year.

Adjustment was particularly difficult for unemployed patients and the 15 men who resumed modified jobs. Retired patients usually adapted well, despite residual physical disability in most cases.

Worcester found that severity of the heart attack was an important factor inhibiting recovery. But also important in some cases were the folklore beliefs of the patients, their families or friends in relation to the illness. These mistaken beliefs often affected the patient's attitude to treatment.

"It is important," she says, "that perceptions and actions of the patients and their wives are fully investigated by the doctor so that his advice is not disregarded because of misconceptions about the disease, nor his authority undermined by the influence of people with whom the patient mixes."

Doctors and others involved in the patient's rehabilitation also need to encourage an optimistic outlook in the patient, she believes. Even if the patient himself is not influenced by negative attitudes, his employers, workmates, families or friends may be, she points out.

One example she cites of a misconception which may affect recovery is the apparently widely-held belief that stress at work is the cause of heart attacks. There is no support for this belief from epidemiological studies (studies of the pattern of disease), she says. "Beliefs such as these may engender a sense of concern or danger among those returning to work," she warns. "Furthermore," she adds, "many employers and workmates, knowing of these beliefs and perhaps sharing them, may act in ways that further handicap cardiac patients."

Despite difficulties of diagnosis and measurement, she found in her study "sufficient indication of anxiety or depression in both patients and wives to confirm previous findings of widespread psychological disturbance after a heart attack."

Worcester found, too, that several patients who appeared to have made a satisfactory psychological adjustment early in the year became significantly depressed some months later.

Depression was common among patients who failed to comply with advice. Over one-third of all patients were defined as non-compliers. These men were more likely to have wives with negative expectations regarding compliance or wives who did not participate in the rehabilitation programme.

Contrary to many previous findings, the poor psychological functioning found in her study was not simply the result of pre-existing anxiety, stress, or depression.

Psychological difficulties present during the initial stages of the illness were often made worse by interpersonal relations, particularly marital conflict. In many cases, marital conflict was present before the heart attack, but it was often exacerbated by the illness.

"Although clinicians and researchers are aware that the wife's difficulties of adjustment may equal those of the patient," she says, "most previous research has not examined the extent to which the marital relationship is affected by the illness. Its role in determining successful outcome for the patient has also been largely overlooked."

Worcester says that some doctors and researchers believe that the patient's psychological attitude to his illness during the first weeks may be the crucial determinant of successful recovery.

This view and her own findings that the first few weeks were so stressful for more than half the patients in her study underlines the urgent need, she says, for earlier rehabilitation and more effective support for the patient and his family during convalescence.

The existence of long-term physical, occupational, psychological and social problems in a significant number of patients, she says, also indicates the need for more long-term support. She recommends that the "latter phases of the recovery process should be the major focus of future research."
Pool cover extends swimming season

MONASH research has shown that you can extend the swimming season in your backyard pool as long as you like, simply by using a plastic pool blanket.

Provided, of course, that air temperatures are reasonable — around 20 degrees C.

Plastic blankets — thin plastic sheets welded together by heat or ultra-sound techniques and containing air bubbles — are used to extend the swimming season, he says.

Francey and postgraduate physics student Peter Golding have been testing the tensile strength and heat retention properties of various blankets at the request of manufacturers.

The research began about three years ago following reports that some polyethylene blankets had begun to disintegrate within a year of use. Francey was asked to find out why these blankets were failing.

"The manufacturers were naturally concerned," he says.

"Disintegration, as well as affecting the blanket's efficiency, could be dangerous. Tiny bits could flake off into the pool. As they could be fairly transparent there was the danger that someone might swallow them."

Since then the Monash team has subjected pool blankets of various makes to extensive theoretical and experimental testing of strength and heat retention properties.

To measure degradation caused by ultraviolet radiation from the sun, they "borrowed" Telecom's weatherometer, a machine which accelerates the degradation process.

"By using Telecom's weatherometer, we were able in one year to measure the effect on the blanket of three or four years exposure to sunlight," Francey says.

Equipment in the Monash engineering faculty was used also to measure the tensile strength of the blanket materials at various stages of exposure.

Francey and Golding have found that degradation caused by ultraviolet radiation can be lessened by the addition of mineral dyes during manufacture. These act as stabilising agents and strengthen the fabric's resistance to radiation damage.

They have found also that the best material for a pool blanket is PVC (polyvinyl chloride), which has a life of five to 10 years compared to two years for polyethylene.

"A PVC blanket tends to be a little bit more expensive than polyethylene, the most commonly used material, but it is almost indestructible," Francey says.

The Monash researchers suspect that an important reason for damage to pool blankets is over-chlorination of the pool by the user. "This can result in fairly high concentrations of free chlorine gas becoming trapped under the blanket," Francey says.

"There is evidence that this chlorine attack can decrease the strength of the blanket, causing it to become slightly porous.

"There is certainly evidence," he says, "that chlorine molecules can get into the blanket material."

"We suspect that high chlorine concentrations together with elevated temperatures cause a structural change in the plastic material."

"One can see that there is a change in the chemical structure from the infrared spectrographs that we take. But we don't know what it is yet."

Chlorine

Francey says normal chlorination is about one to 1½ parts chlorine per million parts water.

"If you put in 10 parts per million you're probably going to destroy your blanket very quickly," he says.

The Monash team has been testing blankets under various concentrations of chlorine to find out how long a blanket will last with normal chlorination of a pool.

To do this they are using scale model pools, with a wind generating machine to mimic in-use conditions. But the project will take some years to complete.

"It is not just something that can be speeded up," Francey points out.

The team is also testing blankets in various concentrations of Bacquacil, the new pool disinfectant now on the market.

Some of the Monash results have already been published in the U.S. journal Solar Energy. Other aspects of the research are either in press or will be submitted later this year.
Putting road design on a sound basis

VICTORIAN motorists, on average, are much faster on the brake in an emergency than many people think.

But their reaction times do not appear to be fast enough to justify an easing of road design standards, according to research by a Monash psychologist, Dr Tom Triggs, and research assistant, Mr Wal Harris.

The research does suggest, however, that any attempt to tighten the standards — a course advocated by some critics of current road design — could involve unnecessary roadmaking expense.

For more than 12 months, Triggs and Harris have been measuring the response of motorists on rural roads to emergency situations, such as level crossings, and to other “eliciting stimuli”, such as road work signs, cars and motor cycles angled on the side of the road, aphometers, and police cars parked over the crest of a hill.

They have found that unalerted response times differ according to the type of stimulus. Fastest responses, which were obtained at railway crossings, were typically about one second. This is considerably less than the average responses of two seconds or more suggested by earlier on-the-road research.

In Australia, at present, roadmaking authorities use a road design value of 2.5 seconds, adapted from the U.S. standard, worked out by the American Association of State Highway Organisations.

Given this “unalerted reaction time” and the design speed of the road, or, in some cases, the operational speed since many motorists don’t stick to the design speed, roadmakers are able to work out how far ahead a motorist must be able to see to avoid obstructions and safely handle emergency situations.

A significant reduction in the reaction time value used in road design could mean savings of millions of dollars in roadmaking costs. Conversely, a significant increase could add millions of dollars to the cost in terms of “dips that have to be filled” and “hill crests that have to be levelled”.

However, Triggs points out, roadmaking authorities are interested not so much in the average driver’s response, but in the distribution of responses.

“Typically, traffic engineers talk about an 85th percentile, which means that 85 per cent of drivers would have a response time less than the particular value chosen,” he says.

“The particular value in the Australian case is 2.5 seconds.

“We’ve found that the value of the 85th percentile varies from a value of less than a second up to close to three seconds. There are widely differing values, depending on the nature of the stimulus that elicits the response.

“We believe, as a result of our research, that some of the previous results, suggesting average response times of more than two seconds, need to be taken with a grain of salt.

“People who believe that the present design standard of 2.5 seconds is far too low are really speaking of field laboratory situations in which response times are much slower.”

Artificial situation

Triggs says that until recently there had been relatively little research done on the unalerted reaction times of drivers. Most of the work that had been done involved artificial situations in which a person sat in an experimental car and responded to stimuli such as tones or lights.

This laboratory-type situation does not represent the sort of thing that would happen on the road, Triggs points out. For one thing, he says, the driver is already motivated by the experimental situation. He knows what is expected of him. For another, the stimulus is artificial. It is not the type of thing that a driver would have to respond to on the road.

Triggs and Harris injected reality into the research by contriving a range of “real-life” situations which motorists had to respond to while unaware that they were taking part in an experiment.

With the co-operation of police, Triggs and Harris set up cars and motor cycles angled on the side of the road for use as alerting stimuli, used aphometers, set up roadwork signs with evidence of roadwork over the crest of the hill, stationed police cars in strategic positions, and observed motorists’ reactions at railway crossings.

The drivers’ responses to these situations were recorded by hidden video cameras. Activation of stop lights was the cue that the driver had applied his brakes.

Monash psychologist Dr Tom Triggs and research assistant Mr Wal Harris investigated the braking response of Victorian motorists to various emergency situations. They found that motorists, on average, are faster on the brake than many people think, but they do not appear to be fast enough to justify an easing of road design standards.

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