SIMON GROSE

DATA

The chief executive officer of the Australian Research Council spent last month hosing down hassles caused by federal ministers. In the first week of October, Professor Margaret Sheil defended the integrity of council-funded research after the Minister for Workplace Relations, Joe Hockey, questioned the evenhandedness of a study that endorsed several criticisms of the WorkChoices legislation. Then last week she asserted the council's commitment to protecting the confidentiality of grant applicants. This was triggered by a Freedom of Information request being considered by the Administrative Appeals Tribunal for access to documents relating to funding decisions made in 2004 and 2005. Sheil pointed out that the former minister for education, Dr Brendan Nelson, had exercised his right to override funding recommendations during his tenure while the current (and now caretaker) minister, Julie Bishop, "has accepted all ARC funding recommendations since taking up her position".

www.arc.gov.au

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Researchers at France's Institute of Molecular Genetics have reported promising results for a new approach to treating the HIV virus. Led by Jamal Tazi, they report in the journal *Public Library of Science Pathogens* that a molecule called IDC16 suppresses the mechanism whereby the virus uses hijacked immune cells to create more copies of itself. They found that IDC16 interferes with a human protein called SF2/ASF that is essential to the production of messenger ribonucleic acid, which mediates the process. "These findings may serve as the basis for a new strategy to develop a new class of anti-HIV drugs, the splicing inhibitors and even of antiviral drugs in general, since any virus needing to splice its RNAs may be targeted," the researchers wrote.

http://tinyurl.com/2fffz8

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Analysis of a 3000-year-old burial site in Vanuatu has revealed funerary customs and other evidence of the way of life of prehistoric Pacific islanders. Sixty skeletons were buried next to decorated ceramic pots, some in carefully laid out south-facing graves. In one case, a head was inside an adjacent pot, in another three heads had been laid on a dead person's chest. The findings, published in *American Antiquity*, include strontium, carbon and oxygen isotope signatures of the teeth of many skeletons, providing information about their origins, diet and sources of drinking water. "This is the first really decent sample of this early migratory group – the Lapita people – who were the first to move beyond the main Solomons group and initially colonise across Fiji, Tonga and Samoa," said team member Dr Stuart Bedford of the ANU.

http://tinyurl.com/27fyfy

Cricket's fine edge

Sports science is playing an increasing role in shaping the performance of players, from fitness to wellbeing, **Marc West** writes

A cricket season barely goes by without the introduction of a new technological method for analysing the game. Recently we have seen the introduction of microphones to detect the finest of edges, and now even heat sensors to see how the batsman sweats.

But such advances are not limited to television companies, with science playing an ever-increasing role in shaping the performance of players, from their fitness to their mental wellbeing.

It is with science that countries are finding the competitive edge.

A number of countries now have dedicated centres for scientific input into cricket, with Cricket Australia's sports science program, employing the expertise of the Australian Institute of Sport, arguably the standard setter.

Carl Petersen tracks the workload of cricketers using global positioning system technology, and says that Cricket Australia has offered two PhD scholarships in physiology and performance analysis.

"The first scholarship focuses on utilising in-house-developed GPS devices combined with micro-sensors to accurately define workload in cricketers. With a better understanding of cricket workload and demands, our strength and conditioning coaches will be able to design more effective training programs, and monitor recovery more precisely to have the cricket athletes peaking on game day(s). The second PhD is focusing on the developmental training pathways of fast bowlers."

Cricket Australia also has a research program investigating the biomechanics of cricketing skills. Wayne Spratford runs a number of tests for Cricket Australia. "Over the past two years we have developed skill-based tests for batsmen, bowlers and fielders which we have implemented on all levels of cricketers in Australia from the Test team to state under-17 level," he says.

Both men say that much of their work is kept in-house to maintain a "competitive advantage".

And the research is not limited to studies of cricket's physicality. According to folklore, cricket is 90 per cent a mental game, and independent studies by Allistair McRobert from Liverpool John Moores University in Britain, and Dr Sean Muller from RMIT University in Australia, have both concluded that the very best batsmen can predict the sort of ball they will receive even before the ball leaves the bowler's hand.

The programs, conducted for the English Cricket Board by McRobert and published in the *Quarterly Journal of Experimental Psychology* by Müller, found that mediocre batsmen do not pick up on the subtle clues given off by a bowler.

While a lesser batsman will only make his decisions once the ball is in flight, or will perhaps make an early faulty call, an experienced player can start this decision-making process earlier, giving him more time for shot selection – very important if you're facing Brett Lee. The tests focused on the batsman's eye movements using head-mounted optics and high-speed cameras to understand the batsman's subconscious decision making.

McRobert suggests that experience against all types of bowlers is important. "Our research revealed that a batsman uses different search strategies when facing fast and spin bowlers. It is important that information relating to potential visual cues is specific to the type of bowler."

His work also suggests that match context determines how a batsman makes his decisions, and so coaching sessions could be designed to focus on the aspects of the game that play with the mind, rather than aspects of a batsman's technique.

Sports psychology is also playing an increasing role in cricket to master the aspects of the game that cannot be solved through tinkering with technique.

According to Justin Langer's blog, sports psychology is "the least studied of all cricket skills, even if it is widely accepted as being the most important ingredient of success", but this is starting to change, with most teams having associated psychologists.

Dr Wil James has worked with English national coaches to "foster development of a strong mental game by consulting upon, rather than taking over, player development".

"The aim is to develop the coaching environment," he says.

James says that eventually the aim is to have sports psychologists associated with English county level teams on a full-time basis with a strategic outlook on player development. "Psychology is not a quick fix. We want to challenge players, and take them out of their comfort zones."

This is important when viewing the way that many junior players find their way to the top, with many unprepared for the mental game.

"Sports psychology helps coaches select players, not just on technical ability, but also mental characteristics. It helps the coach nurture natural talent. Some players may have tonnes of natural talent but never have been challenged, whilst others might have shown that they can bounce back from a setback."

> Mediocre batsmen do not pick up on the subtle clues given off by a bowler – very important if you're facing Brett Lee.

Some players have the ability to maintain their confidence throughout a period of misfortune, and being able to identify this helps coaches work with those who may not have this ability.

Another aspect of cricket that is subject to scientific examination is physical fitness. If you've watched the likes of David Boon strut the international stage, you might believe that you really do not need to be that fit to play cricket. And you would be about half correct.

Studies conducted by Dr Rob Duffield, from Charles Sturt University, and Dr Marc Portus, the sports science manager of Cricket Australia, have found that indeed you really do not need to be as physically fit to play cricket as many other sports. This does not mean, however, that you can be completely unfit and compete at the highest level. The fitter you are, the less likely you are to succumb to injury, and the quicker you recover from fatigue.

To score a test century, which takes on average 3½ hours, a batsman will stand still for two hours, walk for an hour, jog for 10 minutes, spend only five minutes running hard, and about 1½ minutes sprinting.

It seems the key to being a good cricketer is lots of net practice to keep the skill base high, natural talent – something perhaps with which you are born – and the ability to tackle the psychological aspects of the game.

So where to now for science and cricket? While some countries are embracing the concept, developing cricketing nations do not have the resources for scientific cricket analysis.

However, it has been suggested by Shri. V. Srivata, a former chief sports editor for *The Times of India*, that courses in the science of cricket become mandatory for all cricket coaches! Whoever said cricket was a simple game?

■ www.cricket.com.au

Forget the airline hype, get the speed going and cut the long haul

ROGER BECKMANN

There has been much hype about the introduction into service of the latest and largest passenger aircraft, the Airbus A380. The double-decker plane, operated by Singapore Airlines, landed in Sydney last week to much acclaim and journalistic gushing.

But what's really new? It's big, yes, and it has much more wiring than its predecessors in order to give passengers more electronic entertainment. The use of composite materials lowers weight while keeping strength, which reduces fuel consumption. In addition, putting lots of people in one aircraft (with a mighty 15,000km non-stop range) produces economies of scale – thereby further enhancing fuel use per capita, but only if the plane is operated at reasonable capacity.

But what else is new? Not much. A journey to the other side of the world is still long and tiring for those of us in "economy class". If you can afford a private cabin with a bed, you may arrive at your destination slightly less grumpy. But, apart from electronic entertainment and a decrease in real-term costs, the aviation experience for the passenger hasn't improved much in 30 years.

Crucially, there's been no increase in speed. At mach 0.85, the new offering from Airbus travels at much the same speed as the Boeing 707 in the 1960s. The mach number means that it cruises at 85 per cent of the speed of sound. Its maximum recommended speed is mach 0.89. Concorde could travel 2½ times faster, but it is now retired. Supersonic travel, it seems, is passé and oh so '70s. There are no longer any supersonic commercial aircraft. So we are actually moving backwards – at least, in terms of speed.

There's nothing wrong with going slowly and enjoying the journey. That's what luxury ocean liners do. But notice the word luxury. If we want to take our time to get somewhere in the sky, let's bring back the luxury.

Why do we not have routine supersonic passenger travel? There are three main objections: the noise of the sonic boom, pollution in the upper atmosphere, and cost.

Contrary to popular belief, a sonic boom doesn't just happen when an aircraft passes through the speed of sound. It happens the whole time the aircraft is supersonic. And flying higher doesn't help. Booms can still be heard under the flight path of supersonic aircraft at 70,000 feet (today's aircraft cruise between 35,000 and 40,000 feet). A sonic boom has nothing to do with engine noise, but is caused by sound waves produced by the movement through air of the aircraft itself.

To people on the ground, sonic booms are much more disturbing than the faint engine noise of a subsonic jet at cruising altitude passing overheard. (If you've never heard a sonic boom from an aircraft, just imagine thunder or the crack of a whip.)

Booms did not prove popular with people living under flight paths, and so Concorde was only allowed to be supersonic over the sea – a big restriction. Many military aircraft are supersonic, but they are smaller than a passenger aircraft – reducing the volume of the boom – and tend not to fly constantly from city to city. Research shows that the intensity and character of the boom depends on the size of the aircraft and factors such as the shape, angling and positioning of the wings. It seems it might be possible to design a supersonic transport that has almost no boom.

But then there is cost. Designing a whole new "small boom" aircraft concept – rather than tweaking an existing one – is pricey. And to fly faster costs more. Meanwhile, consumers want cheaper travel. They might be prepared to pay more for faster travel – as Concorde's patrons did – even without the luxury.

Concorde was ridiculously expensive not just because it used so much fuel and was costly to maintain, but because it offered a high level of luxury and "specialness". It was marketed as such. That was, perhaps, its mistake. People can put up with less comfort – and go without the smoked salmon or plush seats – if the journey time is shorter.

And, finally, there is the problem of stratospheric pollution. Concorde cruised in the stratosphere, a layer of the atmosphere that is stable, and above the weather. Pollutants put into it tend to remain there. The possibility that certain components in aircraft engine exhaust could contribute to ozone depletion in the stratosphere has caused supersonic flight to be questioned. Civilian aircraft operate in the upper troposphere, which is just below the stratosphere. (The height at which the stratosphere begins varies around the globe. Above the poles it is low enough for commercial aircraft to fly within it.)

So where does this leave us? With the same old cramped slow aircraft we have always had. The new plane is not very different.

It is theoretically possible to travel about 10-20 per cent faster before hitting supersonic speeds. Boeing planned to do this with an innovative design called the sonic cruiser, which was going to be pitted against the giant Airbus 380.

It would have used about 20 per cent more fuel than a similarly sized aircraft but, given its concomitant increase in speed, plenty of punters would have been tempted. It would have carried only about 250 passengers – just under half the number of the A380 in its current seating configuration. But, based on feedback from customers, Boeing decided that the sonic cruiser would not be a commercial success. It dreamed up the Dreamliner instead. This will be coming into service shortly.

Detecting that economy class customers are increasingly fed up, Boeing is again promising a major break with past airliners. Scared off from trying to sell increased speed, the company is instead offering improved onboard conditions – more humid air being at the top of the list, followed by nicer lighting and décor. A great idea, and I welcome it. But, even so, speed is still important. People can put up with dry air if the journey is shorter.

Meanwhile, in Europe and Japan, trains go ever faster and now compete with aircraft for fast efficient service over distances of 1000km or less.

But to shorten the long haul, it seems we will have to wait for sub-orbital craft or scramjets, which will lift us across half the world in an hour or less. Australian scientists are working on the options. Watch this space for a very long time!

■ Roger Beckmann doesn't much like long flights.

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Stronger seedlings

BY NERISSA HANNINK

A gene for wood strength in eucalyptus trees has been discovered by scientists at the University of Melbourne and the CSIRO's forestry joint venture Ensis. Wood strength is a prime factor for Australia's forest and wood products industry, which has an $18 billion yearly turnover. The discovery means that saplings with the gene can be selected for higher quality timber. Forest growers will now be able to develop diagnostics for assessing which seedlings will produce higher quality timber.

The work was reported in the international publication *The Plant Journal*. A collaboration between the university and Ensis, the project was also supported by the South African forest products company Sappi. Research team member Dr Antanas Spokevicius, of the university's school of forest and ecosystem science, says that like other plants, trees have two cell wall layers – a thin primary wall that holds the contents of the cell, and a thick secondary wall that provides strength. In trunks and branches, the secondary wall is crucial for supporting the trees immense height and weight, while providing the flexibility to allow them to withstand high winds.

He says the identified gene determines how cellulose fibres – microfibrils – are arranged in the second wall, much like steel cables add strength to concrete structures. By influencing the orientation of these microfibrils, the gene confers different strength properties on the wood. Expression levels of the gene – called beta-tubulin – were found to be critical in the orientation of cellulose microfibrils.

"These findings shed light on how trees have modified their cell walls to enable them to grow to great heights and dominate terrestrial ecosystems," says Dr Simon Southerton from Ensis.

The method used to study the gene was unique, as wood development is difficult to study and trees have a long life cycle. The researchers studied the impact of the gene in small sectors of stem tissue directly in living trees and saw large changes in orientation of cellulose microfibrils.

■ http://tinyurl.com/yodyld

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1) What mineral is the main source of aluminium?
2) True or false? Australia's Great Dividing Range is one of the top five longest mountain ranges in the world?
3) What is a candela?
4) What is the simplest and lightest element?
5) True or false? Allergies are on the increase due to global warming.

Answers: **1)** Bauxite. **2)** More than 3500km, it is the fourth longest. **3)** A unit of light intensity. Originally based on the brightness of a standard candle, it is now more precise. **4)** Hydrogen. **5)** Spring is a bad time if you suffer from hay fever. Pollen from flowering plants, like the ragweed plant, causes sniffles, sneezes, asthma and itchy eyes. Thanks to global warming, things could get worse due to the increase in carbon dioxide gas in our atmosphere. Scientists in the United States have discovered the more carbon dioxide there is in the air, the faster the ragweed plant grows and the more pollen it makes.