

THE TIME OF OUR LIVES

Sleep expert Associate Professor Gerard Kennedy has spent almost 30 years studying why and how our bodies react to time. **KAMINI RAJARETHNAM** reports.

THE FASCINATION STARTED in the mid 1980s with marsupials: fat-tailed dunnarts, bandicoots and native cats. Third-year behavioural science student Gerard Kennedy was working as a research assistant at La Trobe University for one of the first chronobiologists in Australia, Professor Stuart Armstrong.

Captivated by their investigations into the biological rhythms of the animals, as soon as Kennedy had completed his honours he approached Armstrong to see if he could pursue a PhD doing further research.

For the next five years, Kennedy's research covered a much broader area of what is commonly known as circadian rhythms. In Latin, *circa* means 'around' or 'approximately'; and *diem* means 'day'. Hence a circadian rhythm refers to an inbuilt biological process or 'rhythm' that has a daily cycle.

The science of circadian rhythms (also known as chronobiology) is only half a century old. To the layperson it's an organism's 'body clock' that basically helps synchronise sleep and wake patterns with the Earth's day-night cycle. Called the suprachiasmatic nucleus, it's the size of a grain of rice that is located deep in the brain in the hypothalamus.

All vertebrate brains contain a hypothalamus, located just above the brain stem, to regulate basic vital life functions such as body temperature, hunger, thirst, fatigue and sleep, as well as circadian cycles.

Fly from Melbourne to London and you'll experience firsthand the effects of your body's circadian cycles. Being exposed to sunlight adjusts your clock so it stays aligned with day and night. But crossing several time zones throws off the body's biological clock resulting in desynchronosis, more commonly known as jet lag, with its well-known symptoms of irritability, disorientation, interrupted sleep and stomach problems.

Jet lag, insomnia and mid-afternoon drowsiness prove that our body clock is a powerful thing. Although American inventor Thomas Edison famously denounced sleep as a waste of time, research has shown that disregarding your body clock can lead to serious disorders including diabetes, heart disease, high blood pressure and obesity, as well as mental health problems such as depression and mood disorders.

Kennedy's early research showed that changes in an animal's feeding schedules affected its biological rhythms, and that the body functions of all living organisms are regulated to take place at specific times during Earth's 24-hour rotational cycle. He chose to study marsupials because there was also little known then about their circadian rhythms.

Today, Kennedy holds down a full-time teaching role at Victoria University's St Albans Campus, as well as co-ordinating fourth-year Honours courses, supervising several PhD students and conducting ongoing research into circadian rhythms.

Now a world-renowned chronobiologist and psychologist, Kennedy only decided to go to university at the age of 27. His first jobs out of high school were as an animal husbandry technician at the Melbourne and Werribee Open Range Zoos.

This experience came in handy when he started exploring chronobiology at La Trobe. Marsupials are not your typical lab animals, so Kennedy went about breeding his own – by altering their internal clocks and fertility cycles.

Kennedy's associated interest in sleep disorders and how they related to the human mind led to training in clinical psychology at the Austin Hospital and the subsequent treatment of patients with sleep-related problems.

Apart from his VU work, Kennedy is a senior consultant psychologist to the departments of respiratory and sleep medicine at the Austin hospital and Monash Medical Centre, where he runs weekly half-day insomnia clinics.

SIESTA TIME

CONTRARY to what you may think, most of us have a natural lull in the early afternoon which is controlled by our body clock (not by how much we eat at lunch). Having a 20–40 minute nap in the early afternoon can combat drowsiness for the rest of the day.



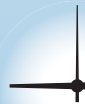
7AM

Want to grow a family? Now is the time to sow because hormone levels are at their highest and sperm counts at their peak.



2PM

Visit the dentist or endure a personal training session because your pain tolerance is at its highest. Or take a nap – your metabolism slows between 2pm and 3pm and the body is programmed for a short sleep.



9AM

Schedule a surgical procedure because medical staff are likely to be less fatigued.



6PM

Exercise. Lung capacity is at its maximum, and strength and stamina at their peak.



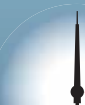
10AM

Run your errands or sit for an exam because your concentration levels are at their highest and the brain is most rested.



7PM

Eat, drink and be merry. Your digestive system is at full capacity (your liver can metabolise alcohol faster).



12PM

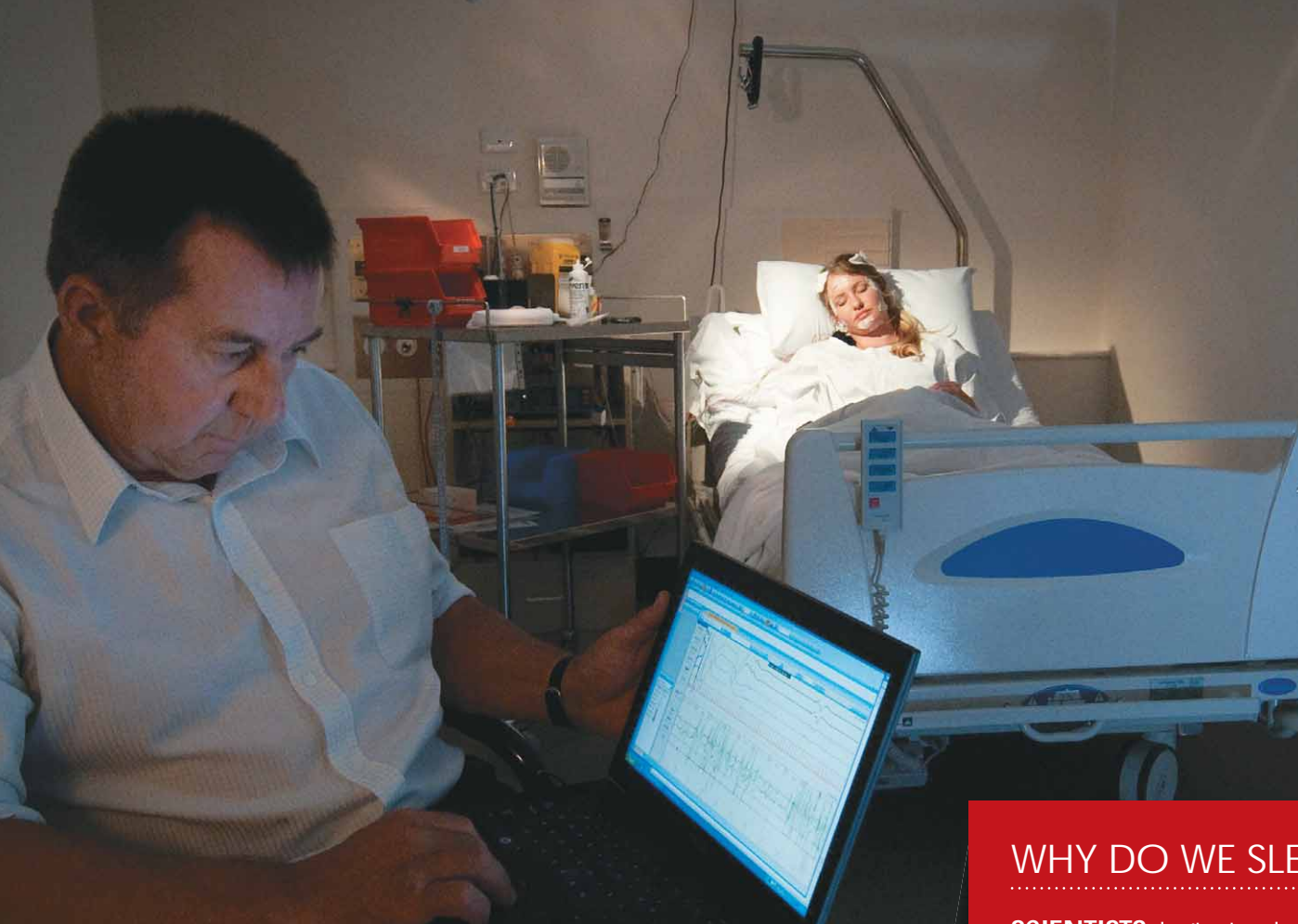
Negotiate a tricky deal or ask for a pay rise because verbal reasoning skills are at their peak around midday.



10PM

Do it. Libidos are at their highest in the late evening.

● Associate Professor Gerard Kennedy is one of Australia's most renowned psychologists in the treatment of sleep disorders.



● Associate Professor Gerard Kennedy treats sleep disorders at the insomnia clinic at Melbourne's Austin Hospital and Monash Medical Centre.

WHY DO WE SLEEP?

SCIENTISTS don't yet understand exactly why we need sleep. They believe it restores us physically and helps us organise our brains. We do know, however, that we can't live without it.



With his broad experience as one of Australia's most renowned psychologists in the treatment of all manner of sleep disorders, Kennedy is often referred to as the 'Dr House' of sleep ailments. Patients with obscure maladies – such as a 14-year-old-girl who fell asleep whenever she laughed vigorously – are usually referred on to him.

In 2010 he presented a case study at the Australasian Sleep Conference in New Zealand on sexsomnia, the bizarre act of having sex while asleep. This received international media attention, and two years later he still receives queries from people claiming to suffer from the problem. He is currently waiting to testify as an expert witness for the defence in a sexual assault trial where the defendant will plead not guilty on the grounds that his transgression occurred while he was asleep.

Kennedy maintains a strong research program in sleep disorders and circadian rhythms. He is one of the chief investigators in the Sleep Health in Quadriplegia research program being carried out at the Austin Hospital. Funded with \$5 million from the Transport Accident Commission, the collaborative five-year research project between the hospital's Respiratory and Sleep Medicine unit and the Victorian Spinal Cord Service is now in its third year investigating the effects of melatonin treatment on quadriplegics.

Melatonin, a key marker for measuring the timing of a mammal's circadian rhythm, is a hormone

secreted by the pineal gland at the base of the brain and is linked to how our body gets ready for sleep. Normally its production is reduced in bright light, so levels increase at night. In people with complete quadriplegia (spinal cord injuries), melatonin secretion does not occur because the nerve connected to the gland is damaged. Kennedy believes this strongly suggests that the absence of melatonin is the cause of disturbed sleep patterns of quadriplegics.

"Most people with quadriplegia have poor sleep quality, which impacts on their daily functioning, quality of life and recovery from injury," says Kennedy. "Good sleep is an integral component of a healthy and productive life. Melatonin acts as a signal that it's night time, but because quadriplegics cannot produce melatonin, many suffer from sleep apnoea and poor sleep patterns."

"We have found convincing evidence that melatonin therapy should be used for quadriplegia," says Kennedy. "This application of chronobiology definitely improves the quality of life of those with brain and spinal injuries, and those with sleep disorders."

The positive results in the clinical trials undertaken so far have resulted in an extra \$2 million granted by the TAC to the program and an additional \$1.3 million to establish a new spinal cord research centre at Austin Health in Heidelberg.

Kennedy is also undertaking research on the effects of bright light therapy on melatonin production. Bright light therapy exposes a patient to an artificial light source for regulated periods of time.

Working in 2011 with Dr Greg Willis of the Bronowski Institute of Behavioural Neuroscience, Kennedy made a promising discovery in the treatment of Parkinson's disease using bright light therapy. The researchers discovered that the therapy can slow or halt the progress of the disease by decreasing or blocking melatonin activity in the brain.

"With no solid progress over the last 20 years in using dopamine and stem-cell research to treat Parkinson's disease, we found that light therapy can significantly reduce Parkinsonian symptoms such as tremors, stiff muscles and depression."

Kennedy says this has the potential to further improve the quality of life of Parkinson's sufferers by reducing their long-term reliance on drug treatments.

Kennedy has spent most of his life studying body clocks, and few would know more about the workings of circadian rhythms. Nevertheless, he knows that living in complete sync with our clocks is practically impossible given the demands of modern life. "I try and have a healthy clock life, although I have a tendency to stay up too late," he says. "Some habits are tough to break." ∞

COUNTDOWN

WE NEED different amounts of sleep each day depending on our age:

Infants: 13–16 hours

Children: 8–12 hours

Adults: 6–9 hours

Elderly: 5–8 hours