Health News

VITAL SIGNS

Brainy view of health in body, mind

Dr Ian Weinberg is a Johannesburg neurosurgeon and SA's foremost expert in psychoneuroimmunology — the study of how mind states affect the functioning of the immune system. He tells **Mandy Collins** how it has changed the way he practises medicine

GREY MATTERS: Johannesburg neurosurgeon Dr Ian Weinberg, left, says his chosen career has come from his passion for the brain and consciousness. Weinberg, below, says he doesn't exercise as much as he should, but enjoys cycling to get his heart rate up. Pictures: PUXLEY MAKGATHO

Q **Did you always want to be a doctor when you were growing up?**
A Funnily enough, I wanted to do neurosurgery before I decided I wanted to be a doctor. I was interested in the brain and consciousness from a very early age, and was quite shocked when I heard I had to go to medical school first. I thought I could go straight to neurosurgery school. Being the boy at the back at class with no notes, I had to knuckle down for the exams. But eventually the end justified the means.

Why the interest in psychoneuroimmunology (PNI)?
My chosen career came from my passion for the brain and consciousness. PNI is about the mind-body connection, so it was almost inevitable that I would pursue it. But I went down two parallel paths — they weren't mixed. I only brought the two together in about 1992. When I started, PNI was unconventional — relative to long-standing recognised medical disciplines. It is definitely not controversial — research advances have validated the chemistry, pathways and effects.

How do you define psychoneuroimmunology?
The effects of mind-states on immune function. Currently, influences have been identified as far more widespread than on immune function alone. It is now referred to as psychoneuro-endocrinology.

What medical disciplines does it encompass?
Psychiatry, psychology, immunology, neurology, cardiology and genetics.

Has PNI changed the way you practise medicine?
Yes, of course. If you acknowledge that the mind influences the body — and there is sufficient evidence to show that it does — then it pays to encourage patients to be involved more actively in their treatment. And I have seen many results where PNI improved patients' outcomes. But it only works if you buy into it. And it really works. I've had cases that have absolutely floored me.

How do you define health?
Health is not just being free of disease. It's about a general wellness of mind and body, as well as being free of symptoms. It's a mind state of vitality that translates into motivation, productivity and creativity.

And healing?
Very simply, bringing a person to that state.

Who are your medical influences?
There are two: Dr Harvey Cushing, who was the first neurosurgeon, and who, for me, epitomises courage, perseverance and intelligence. And then there's my late chief, Dr Dirk Hagen, who was my personal teacher and mentor. And that's a very rare thing.

What's your idea of the perfect doctor?
Someone who genuinely establishes a rapport with their patient and communicates accurately to bring that person to genuine informed consent. Someone who commits to the wellbeing of the patient — and unfortunately that's becoming rare today. Consumerism has converted healthcare into the health industry.

And the perfect patient?
Someone who wants to get well and achieve a state of wellness — also a rare thing today.

What stresses do you face and how do you manage them?
It's the usual work stuff. I find the best antidote — especially for a Type A personality like me — is the Buddhist practice of mindfulness, where you crunch down to the present. You can only do what you can do; you can't control everything, so you make the best of where you are, and do one thing at a time. It's difficult, but that principle works best for me.

Have you ever had a health scare?
Yes, about 10 years ago, when I was under the very strange illusion — as are many doctors — that we don't have the same organs as our patients. I was overweight, and had high blood pressure — so high that my nose started bleeding while I was consulting a patient one day. When I took my blood pressure, I nearly had a stroke from the reading. In addition, my cholesterol was in the clouds, and my lifestyle was sedentary.

Did you make changes?
It was a bit of a klap, so I started reading up about it, and changed my lifestyle to a whole new approach. In about nine months I lost 17kg, and brought my blood pressure and cholesterol down without medication. I think the fear of slipping back there is what keeps me on the right track. You have to take an active stand or you will default into ill-health.

How do you look after your own brain?
For me wellness is very important, as is my approach to stress. One can descend very easily into the hopeless-helpless mind state, which can result in a subtle spiral into a bad place. And if you are in that state for too long, there's certain chemistry in the brain that can change and result in negative wellness and performance consequences. So I take stock regularly and try to ensure that I include things in my life that really interest me.

What's typically on your menu?
During the week I try to control things, so I have most of my carbs at breakfast, which is usually cereal, toast and egg. Then at lunch I try to divide my plate into the recommended one quarter protein, one quarter carbs and one half vegetables. I put the brakes on at supper. I eat as early as possible and I avoid carbs. But I probably eat too much red meat — it's a surgeon thing. On weekends I tend to let go a bit, and then I calm down during the week.

What do you do to keep fit?
I do the bare minimum recommended by the American Heart Association, which is getting your heart rate above 120 for 30 minutes five or six times a week. I cycle the hills around my house, and if I have time I do a bit of core strengthening.

What's the least healthy thing you do?
Probably overeating on weekends. And disrupting my hours of sleep. I mess around reading and watching TV until late, and then disrupt my night. Lack of sleep tends to trigger my migraines.

When are you most likely to lose track of time?
When I'm pursuing a concept on the internet — three or four hours can go by and I don't even notice. There's also a hike — the walk up Cathedral Peak — where I go into a different zone and I'm completely focused on what I'm doing. And then there's the Buddhist Retreat Centre in Ixopo, which is like a different world.

What's the best advice anyone ever gave you?
It's the Buddhist belief that every minute is unique and only comes once. If you don't engage with the present, you aren't living.

What advice do you have for others?
Be aware that if you don't engage with all aspects of wellness actively, you will default into ill health — and that goes for physical and mental wellness. You need to maintain a meaningful life, and not dwell in negative emotional states like envy, fear, anger and anxiety.

Have you ever done anything crazy in your life?
I've done some dangerous stuff. I used to be a microlight pilot, and nearly wiped myself out. Behind the façade of the conservative surgeon in practice is someone who appreciates a much broader picture of life.

Some say life begins at 40. Do you agree?
For me, life began at 50 — before that I was still learning some big lessons. I evolved into a full appreciation of much more at age 50.

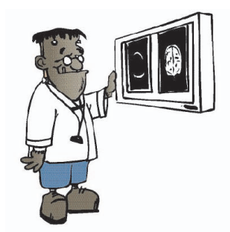
What's the one thing you'd like to do before you die?
I'd like to be involved in one of those team archaeological digs in some exotic place. I've always been intrigued by those.

Where is paradise?
It's within, when you get it all right and reach maximum gratification.

What are your hopes and dreams for the future?
Of course, I have personal goals I'd like to reach, and I'd like to see my family reach their full potential. But I'm also a very patriotic South African. I hope that somehow we will pull it all together, and get it right.

MEDICAL TECHNOLOGY

Science leapfrogs body forms for robots



These evolving robots were able to learn to walk more rapidly than ones with fixed body forms, and they developed a more robust gait

WANT to build a really tough robot? Forget about Terminator. Instead, watch a tadpole turn into a frog. That's not too far off from what a US scientist has discovered.

In a first-of-its-kind experiment, University of Vermont roboticist Dr Josh Bongard has created simulated and actual robots that change their body forms while learning how to walk — in the same way as tadpoles change into frogs. Over generations, his simulated robots have evolved, spending less time in "infant" tadpole-like forms and more time in "adult" four-legged forms.

These evolving populations of robots were able to learn to walk more rapidly than ones with fixed body forms. And, in their final form, the changing robots developed a more robust gait — better able to deal with, say, being knocked with a stick — than the ones that had learned to walk using upright legs from the beginning.

"This paper shows that body change, morphological change, actually helps us design better robots," Bongard says. "That's never been attempted before."

Bongard's research, supported by the National Science Foundation, is part of a wider venture called evolutionary robotics.

"We have an engineering goal to produce robots as quickly and consistently as possible.

"But we don't know how to programme robots very well," Bongard says.

That's because robots are complex systems, he says. In some ways they are too much like people for people to understand them easily.

"They have lots of moving parts. And their brains, like our brains, have lots of distributed materials: there are neurons, sensors and motors, and they're all turning on and off in parallel. The emergent behaviour from the complex system which is a robot is some useful task, like clearing up a construction site or laying pavement for a new road."

At least that's the goal.

But, so far, engineers have been largely unsuccessful at creating robots that can perform simple, yet adaptable, behaviour in unstructured or outdoor environments continually.

For this reason, Bongard, an assistant professor at the university's College of Engineering and Mathematical Sciences, and other robotics experts have turned to computer programmes to design robots and develop their behaviour, rather than trying to programme the robots' behaviour directly.

Bongard's research is published online in the Proceedings of the National Academy of Sciences. *Newswise* .

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A pacemaker is a small implanted device that helps to stabilise an irregular heartbeat. Refinements of the technology and new attitudes to its use have improved outcomes for patients. You may need to have an artificial pacemaker fitted if:

- You have a type of heart block — a delay in the electrical conduction through the heart that can make it beat too slowly;
- Your heart beats too fast — and the condition cannot be effectively controlled by medication; or
- You have heart failure, which may cause your heart to pump out of its normal rhythm.

Having a pacemaker can improve quality of life, and for some people it can be life-saving, according to the British Heart Foundation. Most pacemakers are reliable and comfortable. They're smaller than an average matchbox and weigh about 20g to 50g. They sit just under your collar bone and will have one or more leads that are placed into your heart through a vein.

The US National Heart, Lung, and Blood Institute says people with a pacemaker should avoid close and prolonged exposure to devices with strong magnetic fields. These devices have the potential to interfere with a pacemaker's operation. Examples include MP3 music players and cellphones; home appliances such as a microwave oven; high-tension electrical wires; electrical generators or metal detectors; and industrial welding machines. *HealthDay News © 2011 New York Times Partner Publications and Health News correspondent*

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Some disorders of the brain are obvious — the massive death of brain cells after a stroke, the explosion in the growth of cells that marks a tumour. Other disorders, such as autism, schizophrenia and mental retardation show no physical signs of damage and are believed to be caused by problems in how brain cells communicate with one another.

To understand the root of the problem of these diseases, visualising brain activity is the key. But even the best imaging devices available — MRIs and PET scans — can only give a coarse picture of brain activity.

Neuroscientists at the University of California, Los Angeles, have collaborated with physicists to develop a non-invasive, ultra high-speed microscope that can record in real time the firing of thousands of individual neurons in the brain as they communicate, or miscommunicate, with each other. "In our view this is the world's fastest two-photon excitation microscope for three-dimensional imaging in vivo," says physics professor Dr Katsushi Arisaka, who designed the new optical imaging system, with assistant professor of neurology and neurobiology Dr Carlos Portera-Cailliau and colleagues.

NO PRINCE? **The way a tadpole turns into a frog is not far off from what a US scientist has used to build tougher robots.** Picture: THINKSTOCK

Their research appears in a recent edition of the journal Nature Methods.

Because neuropsychiatric diseases like autism and mental retardation often display no physical brain damage, they are thought to be caused by conductivity problems — neurons not firing properly.

Normal cells have patterns of electrical activity, says Portera-Cailliau, but abnormal cell activity as a whole does not generate relevant information the brain can use.

"One of the greatest challenges for neuroscience in the 21st century is to understand how the billions of neurons that form the brain communicate with one another to produce complex behaviour," he says.

"The ultimate benefit will come from deciphering how dysfunctional patterns of activity among neurons lead to devastating symptoms in a variety of neuropsychiatric disorders."

For the past few years, Portera-Cailliau has been using calcium imaging, a technique that uses fluorescent dyes that are taken up by neurons

When the cells fire, they "blink like lights in a Christmas tree", he says.

The aim now is to decipher the code that neurons use, which is buried in those blinking light patterns.

The calcium imaging technique had its limitations, says Portera-Cailliau.

"The signal of the calcium-based fluorescent dye we used faded as we imaged deeper into the cortex. We couldn't image all the cells."

Another problem was speed. Portera-Cailliau and colleagues were concerned they were missing information because they couldn't image a large enough portion of the brain fast enough to measure the group-firing of individual neurons.

To overcome all that, the imaging technology they have developed is multifocal two-photon microscopy with spatio-temporal excitation-emission multiplexing — Stem for short. The researchers modified two-photon laser-scanning microscopes to image fluorescent calcium dyes inside the neurons, and found a way to split the main laser beam into four smaller beams. This allowed them to record four times as many brain cells as the earlier version, or four times faster.

They used a different beam to record neurons at different depths inside the brain, giving a 3-D effect for the first time. *Newswise*