

## A pain in your joints

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Expatriate returns to lead a bold approach for fighting joint diseases.

At ANY one time, a significant number of Australians are concerned about their joints. Younger and more active people are busy preparing their joints to withstand the rigours of recreational activities, the elderly and the more restricted are worried about arthritis and falls. And everyone wants to know what is going on with Brett Lee's shoulder and Nathan Buckley's knee.

In fact, joints represent a serious medical and economic problem. More than three million Australians suffer from some form of joint disease according to the Arthritis Foundation of Australia, and this costs the nation about \$2.2 billion a year. Each year about one in three Australians over the age of 65 has a serious fall, resulting in another \$200 million expended in hospital care in Victoria alone.

**We do not know nearly enough about how joints function to reduce this cost to society, said VESKI Fellow and Melbourne University Professor of Mechanical and Biomedical Engineering, Marcus Pandy. He is busy setting up a series of collaborative projects to plug that gap in understanding and improve the prevention and treatment of joint disease.**

Professor Pandy's aim is to develop the technology and expertise required to model the intricate movement and interplay of forces within individual joints allowing doctors to quickly diagnose prevent and treat problems.

His vision is of a unique diagnostic centre, where it would be possible to 'screen' people for joint diseases. And the data produced could also be used for research – to design better prosthetic devices and better therapies, in terms of surgery, exercise programs, and pain management.

Joint disease costs the Australian economy billions of dollars, in lost days at work and medical treatment. And there is a vast market for commercial products worldwide.

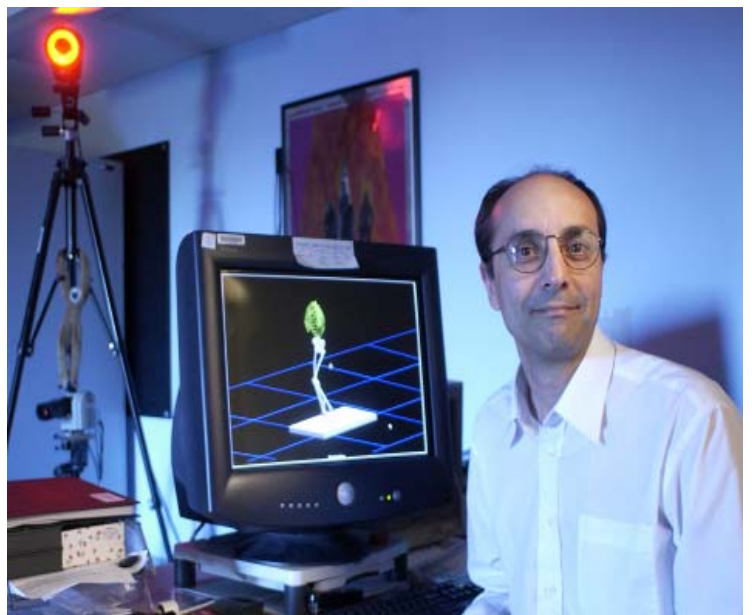
Pandy, who grew up in Melbourne, has been drawn back from the University of Texas at Austin to spearhead this research. He went to the US more than 20 years ago as a PhD student in mechanical engineering. Professor Pandy began his work in robotics but found human movement more interesting, and completed his doctorate in human walking.

He said, "The University of Melbourne is one of the very few places in the world where all this technology can be developed and tested because it offers a unique interdisciplinary setting that integrates world-class resources in engineering and clinical medicine with the brand new BIO21 Institute for Molecular Science and Biotechnology. "Melbourne is also the only city in the world with four internationally known clinical gait laboratories presenting an opportunity to examine a range

of joint disabilities in children, adolescents, adults and elderly people," he said

His research program will involve designing and developing a new, portable, x-ray machine to record normal bone movements to within less than a millimetre in three dimensions; generating anatomical models of muscles, bones, ligaments and joints from MRI scans; and building computer models to link molecular and cellular events with overall body movement.

The key to the program's success is the portable x-ray fluoroscope. It will allow doctors to study the motion of bones accurately in three dimensions whole world do animation and special effects for movies, forensic science and anthropology, to say nothing of the insight into the comparative



physiology of other animals.”

The present x-ray fluoroscopes are too bulky to be used for study on normal movement in this way, but Prof Pandy has applied to the Australian Research Council for funds to support a post-doctoral fellow in developing the necessary portable equipment. In the meantime, a second post-doc is working on the task of generating the software “tools” to develop models of individual working joints by integrating information from MRI scans, the fluoroscope and other instruments. Already, a PhD student from Prof Pandy’s former institution, the University of Texas at Austin, has been working on the problem of how to calculate the forces involved in the movement of the skeleton, muscles and ligaments around joints.

As regards the problem of balance and falls in the elderly, the National Health and Medical Research Council has awarded funding of \$2 million over five years to establish a Centre for Clinical Research Excellence in Gait Analysis and Rehabilitation. With Prof Pandy as a chief investigator, studies at the centre will involve colleagues from the Royal Children’s Hospital, the Kingston Centre and La Trobe University.

Although most of the research mentioned involves the lower limbs—knee, hip and ankle joints—much of this technology is clearly applicable to investigating other areas of the body, such as arms, shoulders and necks. Prof Pandy has already worked on developing computer models for the analysis of neck injuries, such as whiplash. The initial work on car accidents was funded by the US National Highway Transport and Safety Authority but, with colleagues from Wisconsin, Texas and Virginia.

Pandy has submitted a proposal for further funding from the US Navy. “Military personnel are suffering injuries and neck muscle fatigue as a result of wearing head-mounted equipment such as night goggles and helmets.”

Pandy is also collaborating with surgeons in Florida to develop computer models for studying a new shoulder joint replacement which has shown an unacceptable failure rate when implanted. In addition, he is working with NASA on designing exercise equipment for use by astronauts on spaceflights.

And that’s not to mention all the other possible spin offs of modelling the movement of joints, such as in Pandy’s first area of interest, robot design.

He said that it is an exciting time in this field particularly in Victoria.

“Fundamentally I came home because I believe that Melbourne has the science, engineering and medical resources to bring my ideas to fruition – improving people’s quality of life and reducing health costs,” he said.

### **Expatriates a valuable resource**

Marcus Pandy is the latest catch in a concerted effort to identify leading Australian expatriate scientists and bring them home.

In Victoria, that effort is being driven by VESKI (Victorian Endowment for Science, Knowledge and Innovation). This is an initiative to identify outstanding individuals and bring them to Victoria for the benefit of the Australian economy.

Fellowships are worth up to A\$100,000 a year for up to five years with matched funding from a host organisation.

VESKI’s first catch was leading polymer chemist, Professor Andrew Holmes, who returned from Cambridge University in October 2004 to set up his research team at the Bio21 Institute at the University of Melbourne. His major research interests are in molecule design – from light emitting plastics, to solar panels, to drug design.

Professor Marcus Pandy, from the University of Texas, took up the Chair of Mechanical and Biomedical Engineering at the University of Melbourne. He is developing new tools to understand, prevent, and treat joint disease.

Dr Gareth Forde relocated from Cambridge University to join the Monash University Department of Chemical Engineering. He is working on the manufacturing technology needed for a new generation of DNA-based vaccines and gene therapy products

### **What brought Pandy back to Australia?**

“After 21 years overseas I wanted to return home to Melbourne, have my children grow up here, and be closer to family.”

“The University of Melbourne has made a bold decision to invest in biomedical engineering with a new faculty, new laboratories and a new course. It’s giving me a great opportunity to build on my research, and to make a real difference to

For further information [www.veski.org.au](http://www.veski.org.au)