

Great Expectations

Science and Creativity Beyond the Nullabor

Our series continues in which scientists provide their views on professional and personal development, and the world at large.

Miranda Grounds describes how her broad research endeavours in Western Australia have led to a unique coupling of science and art.

From my office in the School of Anatomy and Human Biology, looking out over the beautiful Swan River, it is interesting to reflect upon how I arrived here. My story is not one of a master plan with a clear ambition and end point driving my activities. Rather, it is the result of following the things that one really enjoys doing, hopefully doing them well and taking full advantage of various opportunities that come one's way.

I feel very privileged to be a Professor at the University of Western Australia. My central research is Cell Biology based around skeletal muscle regeneration, muscle transplantation and developing therapies for diseases such as Duchenne Muscular Dystrophy. This extends into the exciting and challenging fields of stem cells and Tissue Engineering, and the amazing world of SymbioticA which is a unique Art and Science collaboration. Life in Perth is certainly rather interesting.

The winding path

This brief synopsis of my career outlines some experiences that have influenced me. When contemplating my future many moons ago, I was tempted to take up painting or some form of art as a career. However, I felt art alone might not be intellectually challenging enough, so I instead decided to study science with a view to perhaps combining these two interests. Beyond a vague desire to become a Marine Biologist, I really had no particular direction when I enrolled in Science at UWA in 1965. I majored in Zoology and Biochemistry and graduated with Honours in Biochemistry. It was really only during Honours that I started to feel the challenge and excitement of scientific study.

I extended the work of my Honours thesis on gene regulation during tadpole metamorphosis into a PhD in the Department of Biochemistry. However, after about 18 months later I dropped out and started a job in the Soil Science Department in Agriculture working on nitrogen fixation in legumes which was fascinating. While it is difficult to switch fields, I highly recommend it, as exposure to new areas gives a breadth of vision and enables you to approach things in different ways. I have found that unravelling the mystery of how biological systems work to be a most stimulating and satisfying occupation. One constantly marvels at the beauty and complexity of such cellular organisation.

After working for a while, I set off adventuring with my husband on a big overland trip to London in 1973. We travelled through WA to Darwin, onto Portuguese Timor and through Indonesia, Malaya and Thailand, spending most time in Indonesia. It often seems that in life you either have the time or the money to do things, but often not both. At this stage, we had the time to wander, and we



Miranda Grounds

experienced an invaluable journey. We settled in London in 1975 and I took a job that involved studying the transplantation of skeletal muscle cells. This was another change of direction that marked the start of my main research career, which turned into my PhD. In 1978, I returned to Perth to a job

evaluating new research strategies for Duchenne Muscular Dystrophy and focused attention on chromosome X-linked genes and cytogenetics. During this time, I was persuaded by a colleague to apply for funding to continue some of the muscle transplantation research that I had started in London. I did this although I had no real desire to become an independent researcher, preferring instead the idea of being part of a large group. However, in 1980, I was awarded a small grant for one year from NHMRC to work on cell movement in muscle regeneration. Thus I became a lone investigator. It is a great joy to be able to think about a problem, come up with ideas and be able to test them yourself.

In 1980 my first child was born and so I worked part time for many years since I wished to enjoy the early years with my two young sons. I was impressed that the NHMRC was always so supportive of this approach. As a part-time independent researcher, you can have more free time for letting the mind roam and do intensive thinking (for example while watching children play in a park), but you have to become highly efficient at work as time is so very precious. My husband is a self-employed architect and this backdrop of relative insecurity made the life of a research scientist look really very secure and therefore, unlike many others, I was never too concerned about living from one grant to the next. I felt fortunate to be funded to indulge in the research that I wanted to do.

In 1994, I became a Senior Research Fellow with NHMRC which facilitated the ideal conditions to enable me to balance the various components of my life. I was not motivated by any great personal ambition but was content to be able to pursue the things that I wanted to. I therefore initially had little interest when it was suggested that I apply for a new Professorial Chair in the Department of Anatomy and Human Biology. However, I was persuaded to apply and was appointed in 1994. This represented a major change in Departments, exposure to undergraduate teaching and many new challenges and responsibilities, but the aspect that appealed was the chance to do "good things for science in WA." The Professorial position has certainly assisted with this.

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Why Western Australia?

The geographical position of Perth can clearly be a huge disadvantage, but there are actually some advantages. In order to simply meet with colleagues in other states one is faced with the daunting prospect of a very long drive across the Nullabor or the alternative high cost of air travel. But this same isolation also gives a greater freedom and space for original strong independent research to emerge. This is reflected in the numerous small but outstandingly high quality individual research groups in Perth. To nurture such top researchers here, the ideal approach would seem to have flexible funding that recognises and supports such individual groups and strongly facilitates collaborations. The alternative emphasis on institution-based research (which may suit the larger cities on the other side of the rabbit proof fence) seems far less appropriate for Perth in light of the smaller research population here. Innovation is a key strength.

“Do Science and travel the world” is a great slogan for Science education since great travel opportunities are a reality for many scientific researchers. When travelling overseas most Australians face long international flights. However, Perth has a major advantage (as has Darwin) in being much closer to South East Asia: this proximity offers many exciting opportunities that we have yet to take full advantage of. Another virtue of WA is the huge relatively unoccupied landmass and oceans in the north west, with extraordinary plant biodiversity and a rich indigenous culture, and these present many unique scientific opportunities and collaborations that, again, barely seem to have been touched upon.

I am passionate about living in Western Australia. It is a beautiful environment with wonderful facilities and the ease of a great lifestyle. There are many highly creative and energetic individuals in Perth, but the Biomedical research community is relatively small. There is therefore a great need for researchers here to cooperate, generate more opportunities and foster new initiatives.

How it all comes together

My research has been mainly motivated by pure scientific curiosity. I also consider that research is more productive if it is enjoyable and sometimes I have taken a new direction in order to facilitate collaboration with a particularly congenial talented colleague. In addition, a major influence for our research into myoblast transfer therapy has been the very inspiring group of parents who established the international Duchenne Parent project. The presentation of your results at a conference attended by several hundred parents of young boys with this lethal muscle disease, who are vitally interested in any research progress, is a very powerful and moving experience that serves as a great impetus to increase the research effort.

A feature of specialised research groups within Australia is that their activities are sometimes more widely recognised internationally than nationally. This certainly presents interesting opportunities for international collaborations and also overseas funding. It is great to have colleagues fly to visit here and, moreover, many scientists welcome the opportunity to come to sunny Perth. This



The Grounds Research Group relaxing on Cottesloe beach, from left: Dr Stuart Hodgetts, Helga Moch, Professor Miranda Grounds, Peter Hamer, Marilyn Davies and Dr Jason White

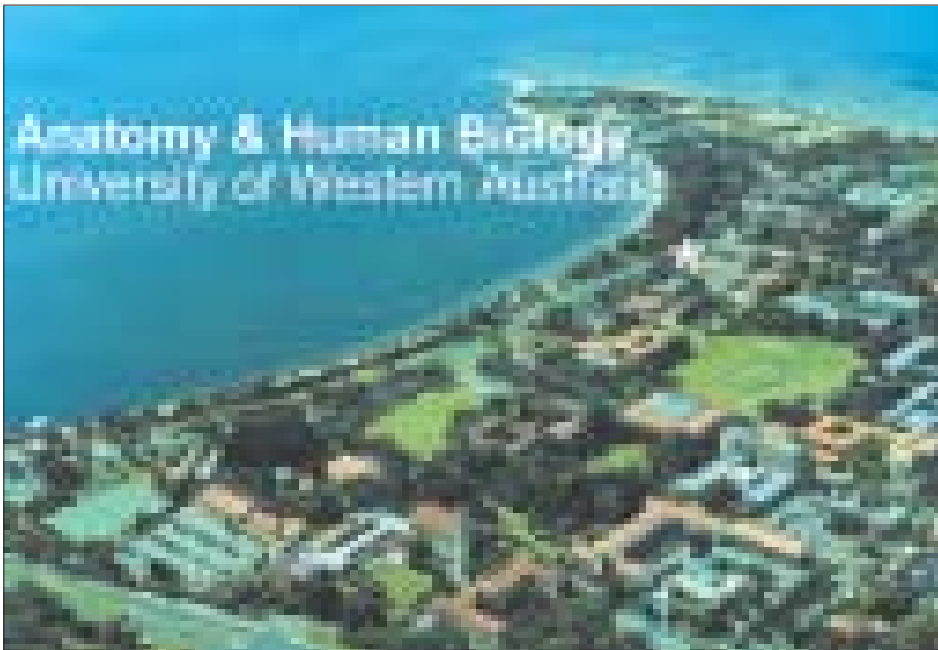
benefits not only the immediate research group but also the wider community and, fortunately, is happening increasingly with some new funding initiatives. Additionally, overseas collaborations can offer visits for many in the laboratory to exotic faraway places. The ability to acquire international funding has the added advantage that it brings new money into the system rather than competing for the very limited resources available within Australia. Ideally, all of these activities lead to a wider research base and more opportunities for jobs and solid careers within Australia for local scientists.

My research is based upon the molecular and cellular events that occur in the very complex *in vivo* situation in regenerating muscles. Such observations make one conscious of the interaction of many factors and systems in the living body and lead to a broad-based approach. The challenge is to take this relatively limited knowledge and use it to construct *ex vivo* tissues and whole organs in the process known as tissue engineering, designed to therapeutically replace living tissues. While clearly ambitious, this challenge deserves to be undertaken. Only in this way can we start to determine what might be possible and further extend our knowledge of the critical factors controlling cellular interactions. To facilitate this, the Tissue Engineering Research Centre (TERC) was formed in 1999 to foster collaborations in this area. We also have a long-standing interest in stem cells (especially those derived from adult sources rather than from embryonic tissues) for applications in tissue engineering, as well as for cell based therapies for skeletal and cardiac muscle. These combined approaches push the boundaries and are very exciting at a scientific level. They also raise many challenging ethical issues. In part these are explored through activities of artists associated with SymbioticA

Art and Science

My research approach uses many techniques of histology and microscopy and this exposes one to the great visual beauty of cellular organisation. I had a great desire to share this wondrous microscopic world with a wider audience.

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Background with anatomy. An aerial photograph of the University of Western Australia with the School of Anatomy and Human Biology marked.

numerous invitations to various international and national meetings. It has been an unprecedented success. The core artists are wet biology art practitioners who are producing the world's first semi-living art works, and their unusual activities greatly enhance our research interests in tissue engineering. SymbioticA is making the specialised procedures of science visible and accessible through art at the same time as questioning the social implications of biological experimentation.

In conclusion, I would like to think that the scientific environment that is evolving in WA will allow young researchers to have many secure and varied funding opportunities so that they can fearlessly explore and fully realise their creative potential.

The analogy of someone looking at the surface of the ocean and the contrast with what is revealed when they put on goggles and go beneath the waves to view the amazing world below, seems to parallel the previously unseen detail exposed by microscopy. Additional wonder comes from realising that your own body is made up of these exquisite arrangements of cells. Such visual delight leads one to ask "how does it all work?" and can be a great catalyst for turning people onto science. For many years I had been struck by the general absence of Art from the world of Science, as though it were considered that scientists did not have sensibilities to such things. I wished to try and reconcile these different disciplines.

Initially, was involved in organising a major public art exhibition of large digital images of stunning histological photomicrographs in 1998. This was a huge success. It was made possible by the activities of the Image Acquisition and Analysis Facility that we had established and by the energies of various artists associated with the Department of Anatomy and Human Biology. There are huge benefits from collaborative activities between diverse disciplines such as art and science and we wished to fully facilitate this and harness innovative approaches. In addition to the more traditional access by artists to human anatomical materials, we wanted to provide the opportunity for creative artists to share the use of expensive microscopes including live cell imaging and to have access to specialised molecular biology and tissue culture facilities. This was achieved through the establishment of SymbioticA, a unique collaborative Art and Science studio/laboratory that was constructed within the Anatomy and Human Biology premises in 2000.

Many artists have already worked with SymbioticA and we would like to extend this to more indigenous artists. SymbioticA has led to an extraordinary array of activities and novel work with great international acclaim and



"Sharp" – Muscle tissue grown over a miniaturised replica of an ancient stone tool, 2000.

A montage of further art of this type is located on the inside back cover of this issue of the Australian Biochemist.