

University of Pretoria launches Institutional Research Theme for Genomics

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From left are Prof Erich Buch, Dean of the Faculty Health Sciences, Prof Robin Crewe, Vice Principal, Prof Gerry Swan, Dean of the Faculty of Veterinary Sciences, Prof Don Cowan, Director of the Genomics IRT, Prof Yves van de Peer of Ghent University, Belgium, the Vice-Chancellor and Principal, Prof Cheryl de la Rey, Prof Stephanie Burton, Vice Principal and Prof Anton Stroh, Dean of the Faculty of Natural and Agricultural Sciences at the launch.

What was formerly science fiction is fast becoming reality at the University of Pretoria (UP) as more than 80 researchers explore how deeper genetic knowledge can be used for early detection of cancer, to fight disease-carrying organisms, and to address some of the world's other pressing social, environmental and economic challenges.

The Institutional Research Theme (IRT) for Genomics at UP was launched on the Hatfield Campus this week. UP is at the forefront of the current genomics revolution and the IRT, under directorship of Prof Don Cowan, has a core membership of 28 academic staff and over 50 research staff across the faculties of Natural and Agricultural Sciences, Health Sciences and Veterinary Sciences. Genomics is a rapidly evolving discipline in molecular biology that focuses on the genetic information (the DNA) contained within an organism.

A vast array of combinations of DNA bases give rise to the huge diversity of life on earth. The human genome, for example, has more than three billion pairs of DNA bases, providing the exact instructions required to create a particular individual with his or her own unique traits. "Two decades ago, it took a large group of scientists ten years and many millions of dollars to unravel the human genome. Today, with the revolutionary technology we have available at UP, the human genome can be re-sequenced over a weekend," explains Prof Cowan.

A deeper understanding of genomics is of considerable medical, economic and environmental importance, and around the world researchers are involved in genomic studies as diverse as detecting a person's genetic predisposition to disease, better matching organ donors with recipients in transplant programmes, growing disease- and drought-resistant crops, and safely cleaning up toxic waste.

At UP, the Genomics IRT is focused on four main areas: human health, the study of pathogenic organisms (infectious agents that cause diseases), the genome sequencing of a range economically important tree species, and environmental genomics.

"For example, in the field of human health members of the IRT are sequencing of the breast cancer exome (the coding portion of the genomic DNA) from South African women to build a greater understanding of genetic predisposition to cancer, as well as other factors that trigger the transformation of healthy cells into cancer cells," says Prof Cowan.

"Current research suggests that scientists eventually will be able to use genomic information to predict what diseases a person may get in the future and attempt to either minimise the impact of that disease or prevent it all together through the implementation of personalised, preventative medicine."

Such advances in genomics have been largely driven by new technologies such as DNA sequencing, which allows researchers to derive large amounts of data from genetic material. UP hosts some of the most advanced genomics analysis equipment in South Africa and, with its new Ion Torrent DNA Sequencer, researchers are capable of generating up to one billion bases of highly accurate DNA sequence in less than two hours. Ten years ago, that same process could have taken several years and hundreds of millions of

dollars to complete.

“The current revolution in genomics – where sequencing capacity is increasing and cost is decreasing at astonishing rates – is as exciting to science as the rise of computing power and speed. The true challenge, now that full genome sequencing has become more technically and financially accessible, is to effectively use the vast amounts of DNA sequence data generated to help prevent disease, improve health and generally contribute to a better planet,” says Prof Cowan

“The University of Pretoria stands at the forefront of this revolution through the establishment of the Genomics IRT. The University’s strategic investments in state-of-the-art technology and in acquiring and retaining key academic and research staff provide a superb basis for collaborative projects across faculties and between institutions, and will strongly contribute to its rapidly growing national and international status.”

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