

Profile of the Institute for Molecular Bioscience, University of Queensland

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Background

The establishment of an advanced research institute in molecular biology was first proposed by Professor John Mattick AO (Director, Centre for Molecular and Cellular Biology) in 1993. The concept of the Institute for Molecular Bioscience was developed in informal discussions during 1994-95 between Professor Mattick and Professor Peter Andrews (Director, Centre for Drug Design and Development), supported by others, notably Dr. Ken Reed (Director, QDPI Agricultural Biotechnology Centre) and Professor Ian Mackinnon (Director, Centre for Microscopy and Microanalysis).

Although supported by the University, the idea did not progress until the arrival of Vice-Chancellor John Hay, whose representations to the State Government resulted in Cabinet support for the preparation of a Business Case for the establishment of the Institute. A binding formal agreement was reached between the Government and the University to establish: the manner in which the intellectual property from the Institute will be commercialised; the basis for a Government equity interest in the commercialisation vehicle; and the manner in which the Government will realise that interest. The first two of these conditions were met in mid-1998 when the Commonwealth Government agreed to contribute \$15m under the Celebration of the Centenary of Federation Program, and a further \$10m was pledged by an anonymous donor. In

January 1999, a joint University of Queensland/State Government working party, advised by independent consultant Acuity Technology Management, agreed on mechanisms to meet the third of Cabinet's conditions, and a formal agreement was signed between the State of Queensland and University of Queensland on 16 February 1999. This agreement quantifies the scientific, commercial and economic benefits that will follow from the operation of the IMB, and defines a series of key performance targets in each of these areas. Following the achievement of these targets, the State will forego any further claims under the agreement.

In May 1999, following further representations from Professor Mattick and Professor Hay, and as part of a major thrust to develop Queensland's biotechnology research base, Premier Peter Beattie announced that the State Government would contribute a total of \$77.5 million to the operating costs of the new Institute, beginning with \$2 million in 2000 and increasing to \$10 million/annum in 2004. In late 1999, the Institute was awarded a Special Research Centre Grant from the Australian Research Council to establish the Special Research Centre for Functional and Applied Genomics (\$9.6 million over 9 years from 2000 – 2008).

Abbreviations used in this paper: CSIRO, Commonwealth Scientific and Industrial Research Organization; IMB, Institute for Molecular Bioscience.

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Note: A.O. represents officer of the Order of Australia, awarded on this occasion in recognition of distinguished service to scientific research (Ed.)

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(Left) The present stage of construction of the complex which will house the IMB, as well as various divisions of the CSIRO. (Right) Simulated view of the proposed finished complex.



In parallel with these developments, discussions were held during 1998-99 to explore the possibility that CSIRO might join the initiative. Agreement was subsequently reached with CSIRO in 1999 to redevelop the Cunningham Laboratory site (adjacent to Anatomical Sciences) to house both IMB and CSIRO research groups (the Division of Tropical Agriculture and components of other CSIRO Divisions) in a joint building complex whose construction cost will be around \$105 million (\$55 million IMB, \$50 million CSIRO) and which will ultimately house approximately 800 research and support staff. This joint development will be the largest biotechnology research centre in Australia (35,000 m²).

Organisational Structure

The IMB was formed by the amalgamation of the Centre for Molecular and Cellular Biology and the Centre for Drug Design and Development, together with elements of the Centre for Microscopy and Microanalysis, the Advanced Computational Modelling Centre and other laboratories at the University. The IMB also hosts the Australian Research Council Special Research Centre for Functional and Applied Genomics, the headquarters and the Brisbane division of the Australian Genome Research Facility (a major national research facility funded with a \$10 million capital grant by the Australian Government) as well as research groups from other organisations, and will be the core of a major \$105 million research complex being constructed on the Cunningham site in conjunction with CSIRO. It will be a large organisational unit with over 400 staff and research students and an annual budget predicted to rise to over \$30 million by 2004. The budget of the Institute in 2000 is almost \$17 million.

Research

The Institute for Molecular Bioscience is committed to being a major contributor to world knowledge of human and animal biology, health and medicine through excellence in fundamental research, research applications and postgraduate training. As one of Australasia's leading research institutes, the IMB is a major centre for molecular bioscience research. It links leading edge genomic discovery and bioinformatic facilities with state-of-the-art research

in developmental biology, cellular biology, structural biology and chemistry to better understand human and animal biology and to develop new pharmaceuticals, diagnostics, nanotechnologies and disease therapies.

Creating operational synergies between research, industry and government, the IMB provides for an integrated environment of excellence that capitalises on a spectrum of intellectual and physical resources, a multi-disciplinary approach and effective links between groups involved in discovery and those involved in developing practical applications. A commercialisation arm, IMBcom Pty Ltd, was established to drive the development and commercialisation of the Institute's research programs.

Genomics and Bioinformatics Division headed by Professor Mark Ragan

With the rapid advancement in genomics, the benefits of multidisciplinary links between biology and the mathematical and information sciences are becoming increasingly apparent. Not only is the IMB capitalising from its high performance computing facilities assisting in the processing and extraction of information from genomic, protein, chemical and bibliographic databases, but elements of mathematics and information science are also providing significant insights into the nature of genetic and cellular operating systems.

Given the sophistication of these systems, it is also likely they will reciprocally provide new insights into data storage and processing with an impact on the future development of information technology. It is also likely that biologically derived chemistries will begin to replace metal and silicon-based chemistries in the hardware of computers and other nanotechnologies.

The IMB currently has projects in:

- Pseudomonas aeruginosa* genomics and pathogenesis,
Group Leader Professor John Mattick
- Comparative and computational genomics,
Group Leader Professor Mark Ragan
- Modelling of cell networks,
Group Leader Dr Jennifer Hallinan

Bioinformatic discovery of endosomal proteins,
 Group Leader Dr Rohan Teasdale
 RNA regulation,
 Group Leader Professor John Mattick

Cellular and Developmental Biology Division headed by Professor Brandon Wainwright

Research in this division, encompasses the intricacy of embryonic development, as well as understanding the symphony of complex molecular mechanisms occurring in a cell to make complex organisms such as vertebrates.

This IMB research program features molecular genetics, development and disease in humans and animal models. Researchers within the IMB have isolated genes involved in cystic fibrosis, basal cell carcinoma and melanoma. Model systems are used to investigate the development of the central nervous system, muscle, kidney and gonads. IMB researchers have discovered genes for vascular development and sex determination. The program also focuses on understanding cellular differentiation, molecular signalling within and between cells, and the targeting and trafficking of proteins to specific cellular compartments. Researchers in cellular biology have significant programs in diabetes and cancer, as well as the investigation of novel subcompartments and structures within the cell.

Projects include:

Molecular genetics of organ development,
 Group Leader Professor Peter Koopman
 Kidney development and disease,
 Group Leader Dr Melissa Little
 Molecular genetics of pigmentation,
 Group Leader Dr Rick Sturm
 Molecular genetics of human disease,
 Group Leader Professor Brandon Wainwright
 Developmental genes in human disease,
 Group Leader Dr Carol Wicking
 Microarray expression profiling,
 Group Leader Dr Sean Grimmond
 Macrophages and osteoclasts,
 Group Leader Professor David Hume
 Muscle and nuclear hormone receptors,
 Group Leader Dr George Muscat
 Cell biology of the plasma membrane,
 Group Leader Professor Rob Parton
 Protein trafficking,
 Group Leader Dr Jenny Stow
 Molecular physiology of growth hormone,
 Group Leader Professor Mike Waters
 Cell adhesion and morphogenesis,
 Group Leader Dr Alpha Yap
 Molecular genetics and cell biology of keratinocytes,
 Group Leader Dr. Joe Rothnagel

Structural Biology and Chemistry Division headed by Professor Paul Alewood

Structural biology and molecular design contribute to the understanding of how biological locks and keys work. Information about the structures and important components of these locks and keys enables design and synthesis of new molecules that either mimic or block such interactions. New leads in such studies at the IMB may lead to new drugs or pharmacological tools.

Opportunities for discovery of novel lead compounds require integration of research skills and facilities across the research spectrum. IMB provides state-of-the-art facilities for medicinal chemistry with technology platforms in organic, peptide and synthetic chemistry, carbohydrate chemistry, combinatorial chemistry, mass spectrometry, high throughput screening, and molecular design. Projects in this division include:

NMR in drug design,
 Group Leader Professor David Craik
 Structural basis of protein interactions,
 Group Leader Dr Bostjan Kobe
 Protein structure and drug design,
 Group Leader Dr Jenny Martin
 Bioactive peptides and proteins,
 Group Leader Professor Paul Alewood
 Chemistry and human therapeutics,
 Group Leader Professor David Fairlie
 Venom peptides to drugs,
 Group Leader Dr Richard Lewis
 Combinatorial chemistry and molecular design,
 Group Leader Dr Mark Smythe

The IMB was officially established in 2000 and incorporates the Centre for Molecular and Cellular Biology, Centre for Drug Design and Development, ARC Special Research Centre for Functional and Applied Genomics, the headquarters and Brisbane node of the Australian Genome Research Facility, and significant components of the Advanced Computational Modelling Centre and the Centre for Microscopy and Microanalysis.

From 2002, the IMB will be housed in a new state-of-the-art research complex currently under construction at The University of Queensland, together with the CSIRO and other research organisations, enabling greater scientific interaction and collaboration. More than 700 research scientists, support staff and research students, from the IMB, CSIRO and Queensland Department of Primary Industries, will be working in the new complex making it one of the largest and most innovative biological research centres in the Southern Hemisphere.

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