



Review of the School of Biological Sciences and Biotechnology

Panel Report

October 2008

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Abbreviations

ARC	Australian Research Council
ARWA	Agricultural Research Western Australia
CGS	Commonwealth Grant Scheme
DAFWA	Department of Agriculture and Food, Western Australia
DEEWR	Department of Education, Employment and Workplace Relations
GREAT	Graduate Research Education and Training
HEEF	Higher Education Endowment Fund
ISC	Independent Study Contract
LIEF	Linkage Infrastructure, Equipment and Facilities
LMG	Leadership Management Group
OSP	Outside Study Program
RIAS	Recognising and Investing in Areas of Strength
SABC	State Agricultural Biotechnology Centre
TTC	Tertiary Teaching Course
UWA	University of Western Australia

Executive Summary

The review of the School of Biological Sciences and Biotechnology was conducted from 30th September to 2nd October 2008.

The Panel met at the South Street campus of the University where they toured the School's teaching and research facilities. During the course of the review the Panel talked with members of the Leadership Management Group and interviewed a wide range of internal and external stakeholders.

The review was conducted in line with the *Academic Organisational Unit Reviews Policy* (January 2008), using the Terms of Reference for school reviews.

Commendations, Affirmations and Recommendations of the Review Panel are listed below, and developed further in the body of the report.

Commendations

Commendation 1: The Panel commends the School for its friendly and collegiate atmosphere and notes that it has been led with distinction by the Dean.

Commendation 2: The Panel commends the School for the high quality of its staff, many of who are both successful researchers and well regarded teachers.

Commendation 3: The Panel commends the School on the flexible nature of its courses, which students highly value.

Commendation 4: The Panel commends the School for its responsiveness to market demand, with the forensic program and triple majors, for example, being very attractive to students.

Commendation 5: The Panel commends the School on its postgraduate coursework offerings which are proving highly successful.

Commendation 6: The Panel commends the School for being proactive in attracting international students into its undergraduate and postgraduate programs.

Commendation 7: The Panel commends the School for the quality of support provided to its students, particularly the approachability of academic staff who readily provide one on one advice to students.

Commendation 8: The Panel commends the School on the quality of its undergraduate laboratory and fieldwork classes, which are highly valued by students for their "hands-on" nature.

Commendation 9: The Panel commends the School for encouraging the uptake of ISCs, which are considered exceptionally valuable to students.

Commendation 10: The Panel commends the School for its research success, noting that the major research areas enjoy strong national and international reputations and have been successful in attracting significant funds from industry and government.

Commendation 11: The Panel commends the School and the University for supporting the WA State Agricultural Biotechnology Centre and linking it with their research programs.

Commendation 12: The Panel commends the School on the rewarding and interesting research projects available to postgraduate research students.

Commendation 13: The Panel commends the School for its clinical honours program associated with the major hospitals, which is particularly well regarded by students.

Affirmations

Affirmation 1: The Panel affirms the School's intention to establish an Employer Advisory Group within the School.

Affirmation 2: The Panel affirms the School's intention to enhance the number of enrolments in their Postgraduate by Coursework degrees.

Affirmation 3: The Panel affirms the School's intention to increase further the number of international fee-paying students enrolled in courses offered by the School.

Affirmation 4: The Panel affirms the School's intention to increase efficiency of teaching in an attempt to diminish the teaching workloads of academic staff, including the discontinuation of units with low enrolments.

Affirmation 5: The Panel affirms the School's intention to improve Retention Rates and diminish Drop-Out Rates, particularly with regards to identification of "at risk" students.

Affirmation 6: The Panel affirms the School's intention to increase research grant income.

Affirmation 7: The Panel affirms the School's intention to attract external sources of income to appoint key academic staff, particularly those working in areas of research strength.

Affirmation 8: The Panel affirms the School's intention to improve the research facilities available to the School, particularly those utilised by the School's four Research Centres.

Recommendations

Recommendation 1: The Panel recommends that the Faculty establish a users group to assess the quality of services purchased from the University, thereby providing the Faculty Dean with the requisite information for his deliberations with the LMG.

Recommendation 2: The Panel recommends that the School consider introducing an entomological stream in the research and teaching programs.

Recommendation 3: The Panel recommends that the School ensure that future international articulations are supported by a marketing plan which should be regularly reviewed.

Recommendation 4: The Panel recommends that the School designate a staff member to be responsible for international articulations and courses.

Recommendation 5: The Panel recommends that the School develop a postgraduate coursework degree in biotechnology for international students.

Recommendation 6: The Panel recommends that teaching loads for individual research active staff be concentrated into a single semester where possible.

Recommendation 7: The Panel recommends that a rationalisation of units taught by the School be undertaken.

Recommendation 8: The Panel recommends that strategies to increase first-year retention rates be devised and implemented.

Recommendation 9: The Panel recommends that the School investigate the possibility of joint teaching some courses with other universities.

Recommendation 10: The Panel recommends that the School ensure that sufficient and adequately trained staff are available for running the teaching laboratories.

Recommendation 11: The Panel recommends that the School formally identify its high quality research staff (including research-only staff) and ensure that they are supported.

Recommendation 12: The Panel recommends that the School make every effort to attract strategic research funds to facilitate teaching buyouts for highly active researchers.

Recommendation 13: The Panel recommends that the School, through the Office of Development, pursue the possibility of obtaining endowed chairs (five years) from the resources and mining industry in the area of conservation and wildlife biology.

Recommendation 14: The Panel recommends that the School examine the feasibility of joint appointments with DAFWA.

Recommendation 15: The Panel recommends that the School consider topping up postgraduate scholarships where appropriate.

Recommendation 16: The Panel recommends that the School review the level of maintenance support provided to honours and PhD students.

Recommendation 17: The Panel recommends that attendance of postgraduate research students at the training workshops in time management and thesis writing be made compulsory.

Recommendation 18: The Panel recommends that the School introduce regular (eg weekly) journal clubs for honours and postgraduate research students in all research areas.

Recommendation 19: The Panel recommends that the School provide students carrying out their honours or postgraduate research off campus with opportunities to re-engage with the School.

Recommendation 20: The Panel recommends that the coursework component of the honours program include workshops in scientific writing and oral communication.

Recommendation 21: The Panel recommends that the School run information sessions for prospective honours students no later than September each year.

Recommendation 22: The Panel recommends that the School consider bringing the honours submission date into line with that of other universities so as not to disadvantage students in applications for scholarships and employment.

Recommendation 23: The Panel recommends that, in light of Recommendations 18, 19, 20 and 22, the School should undertake a full review of its honours programs.

Recommendation 24: The Panel recommends that the Faculty identify ways in which adequate statistics support can be provided to researchers and postgraduate students.

Recommendation 25: The Panel recommends that should the HEEF application for the new Biological Sciences building be unsuccessful, the School put a proposal to the Office of Development to seek State Government funding for the project.

Recommendations to the University

University Recommendation 1: The Panel recommends that the University identify ways in which the process by which international students are recruited be simplified and streamlined.

University Recommendation 2: The Panel recommends that a teaching-only staff scheme be introduced across the University, with commensurate recognition of the role played by such staff.

University Recommendation 3: The Panel recommends that a science stream be developed within the Tertiary Teaching Course.

University Recommendation 4: The Panel recommends that the University consider co-locating the areas of Separation Science, Metabolomics and Bioinformatics and placing them under single management.

University Recommendation 5: The Panel recommends that the University review the provision of OSP to research-only and teaching-only staff.

University Recommendation 6: The Panel recommends that the University give consideration to increasing the value (topping up) of postgraduate scholarships in relevant areas.

University Recommendation 7: The Panel recommends that the University reassess the current level of funds provided for the maintenance and upgrade of major equipment.

University Recommendation 8: The Panel recommends that the University examine the co-funding mechanisms for supporting small to medium equipment purchases.

University Recommendation 9: The Panel recommends that if no external funds can be obtained for a new Biological Sciences building, the University undertake an upgrading of the existing building as a matter of urgency.

Findings of the Report

Introduction

The review of the School of Biological Sciences and Biotechnology was conducted from 30th September to 2nd October 2008. Terms of Reference for the review were taken from the *Academic Organisational Unit Reviews Policy* (January 2008). The review is part of the University's five-yearly cycle of academic reviews conducted under the auspices of Academic Council. The School of Biological Sciences and Biotechnology was last reviewed in 2002.

The Panel met with a number of undergraduate students and recent graduates. They also met with postgraduate coursework students and research students completing honours and PhD programs. In the course of the review, a range of academic and general staff from the School were also interviewed, including research supervisors, research staff from various Centres, postdoctoral fellows and Emeritus Professors. A group of employers and external research supervisors also met with the Panel. A selection of staff from other cognate Schools was also interviewed.

Review Panel

The Review Panel consisted of three members. Professor Roger Parish, Head of the School of Life Sciences at La Trobe University, chaired the Panel. Dr Peter Mawson, Principal Zoologist of the Species and Communities Branch of the WA Department of Environment and Conservation, was the other external Panel member. Dr Cassandra James, Professor of Immunology in the School of Veterinary and Biomedical Sciences, was the Murdoch University Panel member.

Dr Lucy Jarzabkowski, Manager Quality Assurance, with the assistance of Ms Kay Wright from Legal and Governance, provided Panel support.

Report Findings

Overview

The Panel's overall impression of the School was a positive one. The teaching programs are strong and flexible, the teaching is generally of good quality and the courses designed to meet market demand. The research performance has remained strong although retirements and the loss of some younger staff to other institutions have left serious gaps. The School has obvious national and international strengths in three or four research areas and staff will be integrated into four of the new Research Institutes. Some of the research facilities, in particular the Biological Science building, badly need upgrading or replacing if the School is to sustain its research effort, including attracting honours and postgraduate (international as well as local) students and collaborators.

The budget situation has become precarious for a variety of reasons and the School feels itself in survival mode. Replacement staff appointments have recently tended to reflect the demands of teaching rather than research priorities. The Research

Institutes will increase the visibility of the University's research performance and should help the School attract high quality staff and postgraduate students. Building critical mass in key research areas will be essential and strategies to retain the leading researchers are required.

The School has been relatively successful in attracting international students but significant increases will be required to boost School funds. Some postgraduate coursework programs have been trialled and three are proving successful. However, additional programs are necessary to increase enrolments. Sufficient funds are needed to retain existing staff and allow the replacement of some of the staff who have been lost.

The space charges will be significant for the School and since space levels usually correlate with high research productivity in the sciences, any funding model will need to take this into account.

The Panel has been mindful of all these issues in formulating its recommendations. As set out in the *Academic Organisational Unit Reviews Policy*, the findings of this report include consecutively numbered commendations, affirmations and recommendations, followed by text to set each statement into context. They are grouped within the broad sub-headings of Strategic Management of the School, Teaching, Research, Research Training and Infrastructure.

It should be noted that the first sub-heading below addresses the Strategic Management of the University. It is set out here to capture the current environment within which the School of Biological Sciences and Biotechnology finds itself. It outlines the Panels' perspective on the financial pressures under which the School is operating at present and how they have influenced the review report itself.

In the course of the review of the School of Biological Sciences and Biotechnology the Panel was drawn to issues wider than the School itself. The Panel has therefore made some recommendations directly to the University. These university-wide recommendations are interspersed within the sub-headings below so as to explain the context under which they were developed. They are also listed sequentially under the sub-heading, University-Wide Issues, at the end of the report as the Panel realises that such recommendations are not the responsibility of the School itself and the process for reporting and monitoring these recommendations differ to those of the recommendations to the School.

Strategic Management of the University

The Panel noted that there was considerable concern about the mechanisms and outcomes of the Murdoch 2010 and allied projects. Comments such as "information void" and "over-governance" were frequent and morale is clearly eroding. Hence, there is a real danger that high quality staff will look elsewhere. The Panel understands that the information flow will increase significantly in the near future. However, many research active staff are seeking a strong declaration that the University wishes to remain "research intensive".

A major difficulty is foreseen in that the new Research Institutes will be funded solely from the block grant, whereas in the past teaching funds have, of necessity,

also been used to support research. (This is a university-wide phenomenon, acknowledged by the Cutler Report). The cost of space is a prime example, since these costs are not covered by research grants and research active staff, particularly in the sciences, require research and teaching laboratories. Space charges should not act as a disincentive for building strong cohorts of postgraduate (research) students. It would be useful if the University explicitly recognised that research does not pay for itself and cross subsidisation is imperative if high quality research is to be maintained and expanded. A source of this cross-subsidization might, for example, be a tax on CGS funds. This may well be the University's intention, and if so, the Panel believes that information needs to be propagated with some urgency. (Monash University, for example, provides researchers with 39c for every C1 NCR research dollar earned).

An issue related to the above is the deficit situation occurring in the School of Biological Sciences and Biotechnology and presumably in other research intensive Schools. These Schools need to be reassured that such debt is acceptable and the University is prepared to manage it. If this issue is not clarified, the question of how long the subsidies will be tolerated remains a source of concern which can rapidly destabilise areas essential to the University's research performance. Consequently, the Panel believes it imperative for the University to identify the proportion of teaching funds to be made available to support research.

Strategic Management of the School

Commendation 1: The Panel commends the School for its friendly and collegiate atmosphere and notes that it has been led with distinction by the Dean.

Commendation 2: The Panel commends the School for the high quality of its staff, many of who are both successful researchers and well regarded teachers.

Students praised staff for their advice on course options, the in-person consultation before and after enrolment, for addressing the students' best interests, the open door policy, excellent teaching, approachability and support. The flexibility of the courses and the way a passion for research feeds into the teaching were highly commended. Many staff have significant international and national research profiles, making the School one of the most successful contributors to Murdoch University's research reputation.

Affirmation 1: The Panel affirms the School's intention to establish an Employer Advisory Group within the School.

The School is well aware that prospective students are particularly concerned about future job opportunities when selecting courses. The School has been proactive in building relationships with employers by introducing the Forensic Science Experience Program, the full semester unit taken in biotechnology companies and the industry practitioner research projects. The establishment of an Employer Advisory Group will help maintain and improve the existing programs and introduce new ones. Importantly, the relevance of course content to employer expectations can be regularly assessed.

Recommendation 1: The Panel recommends that the Faculty establish a users group to assess the quality of services purchased from the University, thereby providing the Faculty Dean with the requisite information for his deliberations with the LMG.

Since the Schools will in future be purchasing services from the University, mechanisms to provide feedback on the quality of those services will be needed. The tension between administration and "core business" is a common and unproductive feature of universities and a regular dialogue between the two areas is essential, particularly during times of change. An effective "users group" system will provide academic and general staff with an opportunity to be heard and to participate directly in the development and implementation of new initiatives.

Commendation 3: The Panel commends the School on the flexible nature of its courses, which students highly value.

Commendation 4: The Panel commends the School for its responsiveness to market demand, with the forensic program and triple majors, for example, being very attractive to students.

Although there was a significant decline in students enrolled in the Biological Science course (2002-2007) this reflects a shift to the Conservation Biology and Wildlife and the Molecular Biology degrees. The Forensic Biology and Toxicology degree introduced in 2004 has proved exceptionally popular and students are encouraged to undertake a double degree with Molecular Biology or Biomedical Science as a second major. This combination has been proven successful and greatly expands the job opportunities for the graduates. The five degrees offered by the School generally provide a rich palette for the students and a variety of unit combinations are possible within the courses. The School has managed to position itself well in a very competitive market and buffer itself to a large degree against shifts in student demand.

Commendation 5: The Panel commends the School on its postgraduate coursework offerings which are proving highly successful.

Affirmation 2: The Panel affirms the School's intention to enhance the number of enrolments in their Postgraduate by Coursework degrees.

The School has recently sought to introduce attractive postgraduate by coursework offerings, although the Certificates in Applied Molecular Biology Techniques and Agricultural Biotechnology failed to attract many students. However, the two new Postgraduate Certificates in Criminal Investigation and Forensic Science (Courtroom Practice) plus the Postgraduate Diploma in Forensic Science (Courtroom Practice) are proving popular, in particular with qualified lawyers. The School will continue to seek market niches in accordance with staff expertise. The students interviewed found the courses "challenging and rewarding" and the teaching excellent.

Recommendation 2: The Panel recommends that the School consider introducing an entomological stream in the research and teaching programs.

Such a stream could be readily accommodated in the Institute for Crops and Plants and would have links to Biosecurity. Currently, there is a dearth of entomology teaching Australia-wide and a shortage of graduates in this area. The possibility of a joint position with DAFWA could be explored.

Commendation 6: The Panel commends the School for being proactive in attracting international students into its undergraduate and postgraduate programs.

Affirmation 3: The Panel affirms the School's intention to increase further the number of international fee-paying students enrolled in courses offered by the School.

The School has targeted polytechnics in Singapore and universities in Malaysia and Germany and is building effective relationships with the selected institutions. Total funds have increased approximately 15% since 2002, although the direct allocation to the School of funds earned has progressively declined.

Recommendation 3: The Panel recommends that the School ensure that future international articulations are supported by a marketing plan which should be regularly reviewed.

Recommendation 4: The Panel recommends that the School designate a staff member to be responsible for international articulations and courses.

The School's articulation with international institutions is proving a valuable source of income (see above). However, resource (time and money) limitations in the past 12 months have meant the School has been unable to send staff to visit the relevant institutions. Maintaining direct contact is important for the success of such programs and resources do need to be specifically allocated.

Recommendation 5: The Panel recommends that the School explore a postgraduate coursework degree in biotechnology for international students.

The Panel was informed of the strong demand on the Indian Subcontinent for a postgraduate coursework degree in biotechnology. The program could consist of a one year graduate diploma and a two year masters program with a research or coursework stream, admission requiring a 3 year undergraduate degree. It should be noted, however, that recent changes in the visa requirements for students from India may affect the ability to attract large numbers of international students from that country if such courses are offered onshore.

University Recommendation 1: The Panel recommends that the University identify ways in which the process by which international students are recruited be simplified and streamlined.

The Panel was told that potential postgraduate students had been lost due to procedural delays. The competition for such students is vigorous and delays can result both in the loss of students and damaged reputation.

Teaching

Commendation 7: The Panel commends the School for the quality of support provided to its students, particularly the approachability of academic staff who readily provide one on one advice to students.

Students praised individual staff for the academic advice they provide. Staff were commended for their efforts in determining student interests prior to recommending specific units. Moreover, staff are concerned to ensure students complete degrees that will optimise their attractiveness to employers.

Commendation 8: The Panel commends the School on the quality of its undergraduate laboratory and fieldwork classes, which are highly valued by students for their “hands-on” nature.

Commendation 9: The Panel commends the School for encouraging the uptake of ISCs, which are considered exceptionally valuable to students.

The School has actively encouraged students to participate in Independent Study Contracts (ISCs) and those who have done so found it "exceptionally helpful" in developing their study skills and deepening their understanding of specific areas.

University Recommendation 2: The Panel recommends that the University strengthen the recognition opportunities for promotion of staff primarily engaged in teaching and administrative support activities.

The Panel believes it is essential for the quality researchers to have maximum time to dedicate to their research projects if they are to remain competitive. However, teaching excellence is also imperative and this must be formally recognised and valued, in particular via promotion criteria. Some universities, for example, have promotion through to Level E for teaching excellence.

Recommendation 6: The Panel recommends that teaching loads for individual research-active staff be concentrated into a single semester where possible.

This recommendation applies particularly to those staff who are research active and have the potential to become leading researchers. Such staff would have sufficient time to build their research reputations and participate in the OSP program if their teaching could be concentrated into certain periods of the year. Nonetheless, the opportunity for research-only staff to participate in a minor way, for example, in final year units, should not be denied to them. Such teaching may be needed to attract students into the honours streams.

Affirmation 4: The Panel affirms the School's intention to increase efficiency of teaching in an attempt to diminish the teaching workloads of academic staff, including the discontinuation of units with low enrolments.

Recommendation 7: The Panel recommends that a rationalisation of units taught by the School be undertaken.

The unit load should be reduced wherever possible. In doing so, care should be taken to retain electives which are attractive to students and feed into the research

programs (to ensure teaching informed by research). Such electives might be integrated into units currently taught in the core program.

Affirmation 5: The Panel affirms the School's intention to improve Retention Rates and diminish Drop-Out Rates, particularly with regards to identification of "at risk" students.

Recommendation 8: The Panel recommends that strategies to increase first-year retention rates be devised and implemented.

The Panel was told that some of the first year units were not particularly challenging and this may reflect the diversity of background and preparedness of first year students. The Panel suggests that the Flinders University model for teaching first year biology be considered for introduction. The model involves a weekly lecture introducing specific concepts and two subsequent lectures building on these concepts. Students who have already studied biology in Year 12 would not need to attend the introductory lecture. A fourth hour in the week involves the students in problem solving exercises related to the material taught in the previous three lectures.

Recommendation 9: The Panel recommends that the School investigate the possibility of joint teaching some courses with other universities.

Although competition between Australian Universities can be fierce, there are gaps and areas of strength in teaching and research programs that lend themselves to fruitful collaboration. The consequent staff and student interactions, access to facilities and enrichment of courses are valuable outcomes. For example, the School could participate in the agricultural sciences course at UWA and the marine biologists collaborate with the Oceanography Centre at UWA. The Panel envisions that the relevant units would be taught on the Murdoch campus.

Recommendation 10: The Panel recommends that the School ensure that sufficient and adequately trained staff are available for running the teaching laboratories.

One of the teaching strengths consistently alluded to was the "hands on" nature of the courses (laboratories and field work). Hence it is essential that these programs continue to be well run. Currently, should a technician be unavailable there is little or no suitable backup and the teaching suffers accordingly.

University Recommendation 3: The Panel recommends that a science stream be developed within the Tertiary Teaching Course.

The Panel was told that the TTC provided for new staff through the Teaching and Learning Centre is not considered appropriate or sufficient for academic staff in this School. The course needs to be reviewed and a specific science stream developed. The Panel believes that teaching staff should be required to attend similar courses once every three years to update and reassess their skills and again, courses relevant to the science stream should be offered.

Research

Commendation 10: The Panel commends the School for its research success, noting that the major research areas enjoy strong national and international reputations and have been successful in attracting significant funds from industry and government.

Affirmation 6: The Panel affirms the School's intention to increase research grant income.

Recommendation 11: The Panel recommends that the School formally identify its high quality research staff (including research-only staff) and ensure that they are supported.

In supporting the “winners” the necessity for critical mass in specific research areas should be taken into account. New appointments should be aimed at strengthening the research areas identified. In general, staff must be supported to achieve their full potential. An exit strategy needs to be developed for staff who do not qualify as research intensive or are inadequate teachers.

Recommendation 12: The Panel recommends that the School make every effort to attract strategic research funds to facilitate teaching buyouts for highly active researchers.

Reducing the teaching levels of the best researchers is essential to increase the overall research productivity. The extra teaching load can be taken on to some extent by other academic staff, however, providing funds for teaching buyouts would avoid creating a teaching shortfall.

University Recommendation 4: The Panel recommends that the University consider co-locating the research areas of Biotechnology, Separation Science/Metabolomics and Bioinformatics and placing them under single management.

The three areas involve technologies critical to many aspects of research in the University and their effectiveness would be greatly enhanced if co-location were possible. The Panel understands that there may be some problems with moving Bioinformatics, but at least co-locating Separation Sciences/Metabolomics with Biotechnology would provide the former with a more interdisciplinary focus.

University Recommendation 5: The Panel recommends that the University review the provision of OSP to research-only and teaching-only staff.

Researchers should be encouraged to take OSP but on the condition that it is used to build significant research collaborations. Strong national and international research collaborations are essential to build reputation and increase research funding. Teaching methods have diversified greatly in recent years and OSP for teaching-only staff in the progressive teaching institutions would allow more rapid and efficient introduction of new ideas.

Affirmation 7: The Panel affirms the School's intention to attract external sources of income to appoint key academic staff, particularly those working in areas of research strength.

Recommendation 13: The Panel recommends that the School, through the Office of Development, pursue the possibility of obtaining endowed chairs (five years) from the resources and mining industry in the area of conservation and wildlife biology.

Recommendation 14: The Panel recommends that the School examine the feasibility of joint appointments with DAFWA.

The School has a significant research reputation and it is essential that the major programs be focussed and strengthened by the appointment of high quality staff. Wherever possible, funding or part-funding of such appointments should be sought from industry and government. In a time of shrinking budgets, such support will both build collaborations and help ensure research strengths are maintained.

Commendation 11: The Panel commends the School and the University for supporting the WA State Agricultural Biotechnology Centre and linking it with their research programs.

The SABC provides state-of-the-art facilities and equipment, essential support for many of the research programs running in the School. The training of postgraduates in the latest technologies and the collaborations built with DAFWA scientists are important for the University's research reputation. The advent of the new DAFWA building will greatly expand these opportunities and should firmly establish Murdoch University as a national leader in the field.

Research Training

Commendation 12: The Panel commends the School on the rewarding and interesting research projects available to postgraduate research students.

The postgraduate students generally work in highly productive teams and on projects that are well integrated and with clearly defined, long term goals. Interactions between the various research groups are encouraged, avoiding the emergence of "research silos".

University Recommendation 6: The Panel recommends that the University give consideration to increasing the value (topping up) of postgraduate scholarships in relevant areas.

Recommendation 15: The Panel recommends that the School consider topping up postgraduate scholarships where appropriate.

Competition for postgraduate students is intense with some universities offering scholarships as high as \$33,000 per annum in specific areas. Some industry scholarships, eg Grains Research Development Council, have been awarding \$25,000 per annum scholarships for the past ten years. The Panel believes that the University will need to formulate a policy to deal with this issue.

Recommendation 16: The Panel recommends that the School review the level of maintenance support provided to honours and PhD students.

Although the sums provided for honours and PhD research (\$1,500 and \$2,000 per annum respectively) are, where possible, topped up within the School, this does not happen with students carrying out clinical honours and PhD projects in the hospitals. As a consequence the Panel was told that hospital supervisors are insisting Murdoch graduates who wish to pursue PhD studies with them enrol at UWA where they receive \$4000 per annum per student. The hospital supervisors praised the quality of the Murdoch honours students, many of whom subsequently go on to complete PhDs at UWA. Hence the School is losing a number of postgraduate students due to non-competitive research funding.

Recommendation 17: The Panel recommends that attendance of postgraduate research students at the training workshops in time management and thesis writing be made compulsory.

Postgraduate students who have participated in these workshops offered through the Graduate Centre have praised them highly. The writing skills of science students in Australian universities vary greatly and can cause problems in the postgraduate years. These skills should be fully developed in all postgraduate students, as they underpin clear and creative thinking.

Recommendation 18: The Panel recommends that the School introduce regular (eg weekly) journal clubs for honours and postgraduate research students in all research areas.

Some of the students interviewed expressed regret that this opportunity was not available to them. Interpreting and presenting the research of others is a key activity in any research team and all students should be exposed to it. A better understanding of research goals, planning, techniques and data interpretation is a consequence.

Recommendation 19: The Panel recommends that the School provide students carrying out their honours or postgraduate research off campus with opportunities to re-engage with the School.

Students and external supervisors would value interacting with their counterparts on campus. UWA, for example, organises honours breakfasts, and students could also participate in school seminars. The off-campus students expressed a feeling of isolation, having lost their sense of being Murdoch University students. They wish to participate in campus activities and meet with their peers. Apart from the educational value of such meetings, the School is losing important “ambassadors” if the links are lost.

Commendation 13: The Panel commends the School for its clinical honours program associated with the major hospitals, which is particularly well regarded by students.

The program provides access to quality medical research projects, facilities and staff, considerably increasing the attractiveness of the undergraduate degrees. In a university lacking a medical school, this is a rare opportunity. The supervisors praised the Murdoch students as among “the best” and a significant proportion go on to complete PhD programs.

Recommendation 20: The Panel recommends that the coursework component of the honours program include workshops in scientific writing and oral communication.

The employer group has criticised the oral presentation skills of Murdoch students, so intensive workshops incorporated into the honours program would be of value. The workshops are probably best run within the School where they will be presented in the context of the students' projects. The honours contingent will interact more closely in this environment than in a university-wide program. Networking within the group will also be facilitated.

Recommendation 21: The Panel recommends that the School run information sessions for prospective honours students no later than September each year.

Students were concerned that information about the honours program is currently obtained in an ad hoc manner leading to confusion during the enrolment period. September information sessions will provide the opportunity to attract additional students into the honours stream and save students time during the first weeks of their candidature.

Recommendation 22: The Panel recommends that the School consider bringing the honours submission date into line with that of other universities so as not to disadvantage students in applications for scholarships and employment.

The Panel was informed that the timing of the release of honours results could be disadvantaging some Murdoch students. It was noted that Murdoch honours students did not receive their results until later than those at other universities. This was preventing them from making timely applications to other universities for PhD scholarships and reduced the competitiveness of their employment applications.

Recommendation 23: The Panel recommends that, in light of Recommendations 18, 19, 20 and 22, the School should undertake a full review of its honours programs.

The series of recommendations made regarding honours training could best be addressed by a review which would allow the canvassing of additional comments and suggestions. A strong honours cohort is critical for the provision of quality post-graduate (research) students and so the programs need to be well-publicised, well managed and highly regarded.

Recommendation 24: The Panel recommends that the Faculty identify ways in which adequate statistics support can be provided to researchers and postgraduate students.

Statistical analyses are a key component of many areas of research and currently there is no adequate provision of this service. Postgraduate students expressed concern about the lack of support, particularly in the Biometrics area. Statistics is an essential tool across a broad range of disciplines within the biological sciences and all research staff should have access to a quality service.

Infrastructure

University Recommendation 7: The Panel recommends that the University reassess the current level of funds provided for the maintenance and upgrade of major equipment.

Much of the research carried out in the Research Institutes will require well maintained, state-of-the-art equipment if the programs are to be internationally competitive. The feasibility of participating with the State Government in procuring equipment for the new DAFWA building should be explored, thereby reducing costs to the University and ensuring university researchers have access to the equipment.

University Recommendation 8: The Panel recommends that the University examine co-funding mechanisms for supporting small to medium equipment purchases.

Currently there is no co-funding system to support the purchase of small to medium cost research equipment. A successful research program in the science areas is dependent on access to high quality and, in many cases, expensive equipment. Much of this equipment (for example, items costing \$30,000 to \$100,000) is not readily covered by the ARC LIEF program.

Affirmation 8: The Panel affirms the School's intention to improve the research facilities available to the School, particularly those utilised by the School's four Research Centres.

The Panel sees an urgent need to upgrade the School's facilities. It was reported to the Panel that the situation has become so severe that many researchers are loath to show interstate and international visitors around the School and Centres because of the poor impression that is created by the state of the facilities. It is noted that an application for a new Biological Sciences building has been made through HEEF.

Recommendation 25: The Panel recommends that should the HEEF application for the new Biological Sciences building be unsuccessful, the School put a proposal to the Office of Development to seek State Government funding for the project.

University Recommendation 9: The Panel recommends that if no external funds can be obtained for a new Biological Sciences building, the University undertake an upgrading of the existing building as a matter of urgency.

The new Biological Sciences building is critical for the research activities associated with at least two of the new research institutes. Links between ARWA and the new biological sciences building would provide a powerful means for building collaborations and attracting research funds. Due to the state of the current building, researchers are understandably loathe to host international and other visitors, the relevant buildings at the other universities being much superior.

University-Wide Issues

Below are the recommendations made specifically to the University. The context within which they were developed can be found in the section headings above. The panel acknowledges that the School of Biological Sciences and Biotechnology will not be responsible for implementing recommendations made to the University, as university-wide recommendations are processed in a different manner from others in this report.

University Recommendation 1: The Panel recommends that the University identify ways in which the process by which international students are recruited be simplified and streamlined.

University Recommendation 2: The Panel recommends that a teaching-only staff scheme be introduced across the University, with commensurate recognition of the role played by such staff.

University Recommendation 3: The Panel recommends that a science stream be developed within the Tertiary Teaching Course.

University Recommendation 4: The Panel recommends that the University consider co-locating the areas of Separation Science, Metabolomics and Bioinformatics and placing them under single management.

University Recommendation 5: The Panel recommends that the University review the provision of OSP to research-only and teaching-only staff.

University Recommendation 6: The Panel recommends that the University give consideration to increasing the value (topping up) of postgraduate scholarships in relevant areas.

University Recommendation 7: The Panel recommends that the University reassess the current level of funds provided for the maintenance and upgrade of major equipment.

University Recommendation 8: The Panel recommends that the University examine the co-funding mechanisms for supporting small to medium equipment purchases.

Recommendation 9: The Panel recommends that if no external funds can be obtained for a new Biological Sciences building, the University undertake an upgrading of the existing building as a matter of urgency.

Conclusion

The School has performed well in the past five years, increasing undergraduate load by 18.5%, achieving high levels of student satisfaction, growing the international intake via key articulations, housing four nationally recognised Research Centres and being awarded three Research Leadership Fellowships. However, the School's budget has declined significantly in the past two years with commensurate difficulties. Elements of the Murdoch 2010 project should bring clarity regarding funding priorities and the Panel anticipates the School will play a key role in research and teaching programs. Programs must be developed that provide longer term strategic advantages and the School has certainly been successful in doing so in the past. Critical mass is required in the research strengths selected and every effort should be made to retain the top researchers. The University may deem it prudent to provide some bridging support in 2009 to ensure the School retains its capacity to deliver on the new model.

Panel Visit Schedule

Day 1 Tuesday September 30, 2008

8.30 – 9.00 Panel Meeting

9.00 – 9.45 Leadership Management Group
Professor Jim Reynoldson – Deputy Vice Chancellor (Research)
Associate Professor Bev Thiele – President of Academic Council

To explain the context of the Review and any strategic issues, problem areas or parameters which warrant special attention.

9.45 – 10.30 Faculty Dean
Professor Stuart Bradley

To discuss the School's documentation and highlight any issues for special attention from the Faculty's perspective.

10.30 – 11:15 School Dean (including morning tea)
Associate Professor Max Cake

To discuss the leadership and organisation of the School and the self-review documentation.

11.15 – 12.15 Tour of School and SABC Facilities with
Associate Professor Max Cake and Dr David Berryman

12.15 – 1:00 Program Chairs
Associate Professor Judith Fordham
Dr Howard Gill
Ms Carolyn Jones
Associate Professor Robert Mead
Dr Mike van Keulen

For the School's Teaching Management team to inform the Panel of the School's organisational structure and to provide an opportunity to address specific management issues. This meeting should also focus on the School's self-evaluation of its recent performance.

1:00 – 1.45 Lunch and Panel Discussion – Nash Room, Club Murdoch

1.45 – 2.15 Heads of Discipline
Associate Professor Mike Calver
Professor Giles Hardy
Associate Professor Robert Mead

For the School's senior academics to address issues relating to the management of teaching and research within the School and academic staff development.

2.15 – 3:15 Lecturers, Levels B, C
Dr Lambert Bräu (Cell Biology, Biochemistry)
Dr Michael Bunce (Forensic DNA Analysis, Genetic Engineering)
Dr Barbara Bowen (Environmental Biology, Plant Biotechnology)
Dr Jennie Chaplin (Marine Biology, Genetics)
Dr Wayne Reeve (Cell Biology, Microbiology, Honours Chair)
Dr Mike van Keulen (Marine & Estuarine Biology, Plant Diversity)

To provide the Panel with an opportunity to discuss teaching and research issues with B- and C-level academics, including some recently appointed staff (Note: D- and E-level academic staff are covered under other interview categories).

3:15 – 3:30 Afternoon Tea and Panel Discussion

3:30 – 4:05 Technical Staff

Mr Gordon Thomson – Technical Supervisor
Ms Rhonda Loxley – Senior Technician
Mr Ian McKernan – Technician
Ms Claudia Mueller – Senior Technician
Ms Rhiannon Curry – Technician
Ms Debra O’Mahoney - Technician

To appreciate the operation and effectiveness of the School from the perspective of the Technical staff members.

4:05 – 4:25 Administrative Staff

Ms Maria Waters – School Administrative Assistant
Mr Robert Treadgold – School Manager

To understand, from an administrative viewpoint, the School’s management practices.

4:25 – 4:45 Deputy Vice Chancellor (Corporate)

Mr Ian Callahan

To talk about the proposed funding model for 2009.

4:45 – 5:15 School Dean

Associate Professor Max Cake

Continuation of previous meeting.

Day 2 Wednesday October 1, 2008

8.30 – 9.00 Panel Meeting

9.00 – 9.30 Undergraduates

Ms Artemis Louyakis –BSc Biological Sciences
Mr Mark King – BSc Biotech/Mol Biol
Mr Michael Stutz – B Forensics/BSc FBT/Mol Biol/Biomed
Ms Samara Rogers – BSc Cons & Wildlife Biol/Marine Sci
Ms Carolyn Howard – BSc Mol Bio/Biomed
Ms Lynne Jeffares - B Forensics/BSc FBT/Mol Biol/Biomed

To provide an opportunity for the Panel to discuss teaching issues with undergraduate students enrolled in the various courses offered by the School.

9.30 – 10.00 Honours Students

Ms Erin Biggs – Hons – Conservation & Wildlife
Ms Alison Louw – Hons – Mol Bio (Clinical Hons)
Mr Patrick Candy – Hons - Biotech
Ms Emma McLay – Hons – Mol Bol
Mr Ibrahim Fleyfel – Hons – Mol Biol
Ms Renae Larsen – Hons – Marine Science

- 10.00 – 10.30 Postgraduate Research Students**
Mr William Lee – Rhizobium Studies
Ms Patsy Stasikowski - Plant Pathology
Ms Shiela Mortimer –Jones – Biol Sciences - SABC
Mr Peter Coulson – Biol Sciences - Fisheries
Ms Sharon Fox - Rhizobium Studies

To discuss with both Honours and Ph.D. students whether the level of supervision and the facilities are appropriate for the research activities within the School.

- 10.30 – 11.00 Morning Tea and Panel Discussion**

- 11.00 – 11.30 Postdoctoral Fellows**
Dr Alex Hesp (Fish & Fisheries Research)
Dr Kemanthi Nandasena (*Rhizobium* Studies)
Dr Katinka Ruthrof (*Phytophthora* Research)
Dr Jennifer Verduin (Marine Science)
Dr Stephen Wylie (Agricultural Research)

To ascertain the research culture within the School as perceived by Postdoctoral Fellows.

- 11.30 – 12.00 Research Fellows**
Dr Kirsty Bayliss (National Plant Biosecurity CRC)
Dr Mehmet Cakir (SABC)
Dr Treena Burgess (Plant Pathology)

To gain insight into the School's research culture from Postdoctoral Fellows that have been identified as potential research leaders.

- 12.00 – 12.45 Research Supervisors**
Associate Professor Mike Calver
Dr Ralf Cord-Ruwisch
Professor Mike Borowitzka
Dr Fiona Valesini

To ascertain the viewpoint of some of the academic staff engaged in research and postgraduate supervision.

- 12.45 – 1.30 Lunch and Panel Discussion – Nash Room, Club Murdoch**

- 1.30 – 2.15 Emeritus/Research Professors**
Professor John Howieson
Professor Jen McComb
Professor Ian Potter

To seek the perspective of senior staff members now holding emeritus positions and still active in research.

- 2.15 – 3.00 Chair, School Research Committee**
Professor Bernie Dell
Centre Directors
Professor Mike Jones (State Agricultural Biotechnology Centre)
Associate Professor Giles Hardy (Centre for *Phytophthora* Science and Mgt)
Professor Peter Rogers (Centre for Fish and Fisheries Research)
Associate Professor Graham O'Hara (Centre for Rhizobium Studies)

To engage in wide-ranging discussion of the School's research culture. In particular, to be made aware of the various Research Centres within the School.

- 3.00 – 3.30 Afternoon Tea**
- 3.30 – 4.30 Panel Discussion**
- 4.30 – 5.00 Employers/External Supervisors**
 Dr Michael Francki - DAFWA
 Dr Daniel Gaughan - Supervising Scientist – Dept Fisheries WA
 Associate Professor Prue Hart – Telethon Institute for Child Health, UWA
 Dr Jacky Bentel – Department of Pathology – Royal Perth Hospital

To gain insight into the value of the School's programs through discussion with "outside" people who have either employed or externally supervised several graduates from the School.

- 5.00 – 6.00 Happy Hour with Employers/External Supervisors and School Staff**

Day 3
Thursday October 2, 2008

- 8.30 – 9.00 Panel Meeting**

- 9.00 – 9.30 Graduates**
 Dr David Fairclough – BSc Biol Sci, Hons: PhD (2005)
 Ms Amy Sinagra – BSc Biol Sciences/FB&T (2005)
 Mr Ben Smith – BSc Biotechnology (2007)
 Ms Amy Prosser – BSc Biotechnology (2006)
 Mr Daniel Sharland – BSc Mol Biol, Cons Biol & Bio Sci (2007)
 Mr Andrew Pomfret- BSc Forensics (2007)

To ascertain the suitability of the School's programs from the perspective of some of our graduates now in employment.

- 9.30 – 10.00 Postgraduate Coursework Students**
 Ms Jenine Wenn – PG Cert in Forensic Science
 Ms Laura Christian – PG Diploma in Forensic Science
 Ms Julia Grimes - PG Cert in Forensic Science
 Mr Peter McGee - PG Cert in Forensic Science

To appreciate the perspective of external graduates who are now undertaking a Postgraduate Certificate/Diploma offered by the School.

- 10.00 – 10.30 Academic Staff from Cognate Schools**
 Professor Richard Bell (School of Environmental Science)
 Professor Peter May (Dean, School of Chemistry & Mathematical Science)
 Associate Professor Brad Pettitt (School of Sustainability)
 Professor John Pluske (Director, Animal Research Institute)

To provide an opportunity for the panel to discuss relevant issues with key staff from closely affiliated Schools and Divisions.

- 10.30 – 11.00 Morning Tea and Panel Discussion**

- 11.00 – 11.30 School Marketing Committee**
 Dr Mike van Keulen (Committee Chair)
 Associate Professor Max Cake
 Dr Ravi Tiwari
 Ms Joanne Hulme (Faculty Marketing and PR Coordinator)
Murdoch International
 Ms Holly Croft
 Ms Gillian Ajayi

To discuss issues relating to recruitment of students into programs offered by the School, both at a local and International level.

11.30 – 12.30 Open and/or Call back Session
Associate Professor Max Cake

To meeting with individuals or to call back previous interviewees, if required.

12.30 – 1:30 Lunch – Nash Room, Club Murdoch with
President of Academic Council, Associate Professor Bev Thiele, and
DVC (Research), Professor Jim Reynoldson

To discuss tentative recommendations and, if required, to seek additional information.

1:30 – 4.00 Panel discussion (including afternoon tea at 3:15pm)

To develop a set of draft commendations, affirmations and recommendations.

4.00 – 5.00 Closing Meeting
Professor Stuart Bradley – Faculty Dean
Professor Jim Reynoldson – Deputy Vice Chancellor (Research)
Associate Professor Bev Thiele – President of Academic Council

To discuss the draft recommendations and thrust of the report.

Day 4
Friday September 3, 2008

9.00 – 4.30 Draft Panel Report (including tea breaks and lunch)
Chair, Review Panel
Panel Secretary

To formulate the draft panel report.

Documentation for the Review

Formal Documentation

Prior to the Review Panel visit to Murdoch University, the School of Biological Sciences and Biotechnology supplied the panel members with their Self Assessment Report. Appendices to this document included:

- Community Service Activities of School Academic Staff
- Previous School Review Report - 2002
- School Response to Previous School Review Recommendations
- Report on the School Development Process
- Report on Employer Focus Group Discussions
- BS&B Annual Research Reports 2003-2007

The University supplied the Review Panel with the following documents to guide the review process:

- Academic Organisational Unit (AOU) Reviews Policy (January 2008)
- Code of Conduct for AOU Reviews
- Murdoch University Strategic Plan (2007 – 2010)
- Murdoch University Handbook 2008
- Murdoch University Operating Budget 2008
- Guidelines for Writing a Panel Review Report

The Review Panel requested the following information during their visit

- Recognising and Investing in Areas of Strength KPI Definitions
- Murdoch Research Institutes Discussion Paper
- Response to Research Budget Allocations for the School of BS&B
- Research Quality Framework documents for research clusters related to the School of BS&B
- Distribution of Research Scholarships across the University 2006-2008

Additional Supporting Materials

The School of Biological Sciences and Biotechnology provided the following information to the Panel during their site visit:

- Research Centre Information as follows:
 - CRC Plant Biosecurity – Strategic Plan
 - CRC Plant Biosecurity – Postgraduate study in Plant Biosecurity
 - Centre for Fish & Fisheries Research – 2007 Annual Report
 - Centre for *Rhizobium* Studies - 2005/6 Annual Report
 - Centre for *Phytophthora* Science & Management Tuart Decline Research Findings and Associated Research

- Advertising Brochures for the following courses:
 - Biological Sciences
 - Biotechnology/Biotechnology & Commerce
 - Conservation & Wildlife Biology
 - Forensic Biology & Toxicology
 - Marine Science
 - Molecular Biology
 - DNA in Court
 - Forensic Science (Courtroom Practice)
 - Tropical Marine Biology
 - Life Sciences
- Assorted Unit Materials for the following units:
 - BIO103
 - BIO215
 - BIO261
 - BIO263
 - BIO152
 - BIO270
 - BIO314
 - BIO317
 - BIO369
 - BIO384
 - BIO533

Submissions

Eleven written submissions were received during the course of the review, five from staff members and six from students.

