AIMS@JCU NEWSLETTER

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Yui Sato

Asia Pacific Coral Reef Symposium Report

The second Asia Pacific Coral Reef Symposium (APCRS) was held on Phuket Island, Thailand, between 20th and 24th June, 2010, hosted by Ramkhamhaeng University. Researchers, students and organization delegates from the Asia Pacific regions gathered together to discuss and identify the current status and the future of coral reefs of the regions.

At the APCRS Symposium

The conference comprised of 12 keynote addresses and 23 mini-symposia, with 250 talks and 150 posters covering the whole range of coral reef studies, including monitoring and assessing reef disturbances, reef resilience, connectivity, marine protected areas, reef management and restoration strategies, oceanography, and biology of reef organisms. Special emphasis was laid on "collaboration for coral reef conservation in a changing climate" as the subtitle of the conference stated.

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About the AIMS@JCU Newsletter:

This newsletter is produced quarterly and distributed by e mail to all AIMS and JCU staff.

If you'd like to be added to our mailing list, or have a query regarding this newsletter, please contact:

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Keynote addresses highlighted the current status of coral reefs in Southeast Asia areas and improvement in science and awareness of reef management in these areas during the last decade. However, it was stated that reef degradation rates still exceed increasing management efforts, despite the importance of Southeast Asian coral reefs as the centre of reef ecosystem biodiversity, known as the 'Coral Triangle'. The conference highlighted the need for better practices in ecosystem based reef management in Southeast Asia, as changing climates predict that ocean warming and ocean acidification will have further adverse effects on the future of coral reefs.

During this conference, it was notable that much effort was made on studying the possibility of reef restoration throughout the Asia Pacific regions. These studies included habitat improvement, coral transplant of sexually reproduced juveniles and unintentionally produced coral fragments (so called "corals of opportunity"), and nursery systems for coral juveniles using floating platforms. Potential of these techniques appeared promising if these are applied based on profound ecological concepts, although there are still many questions to be addressed such as identifying which parent coral species (or combinations of them) are suitable for transplanting, how many fragments are required, and cost of the practice.

Yui Sato, as a student member of AIMS@JCU, attended the 2nd APCRS and presented a talk about his PhD study on a coral disease, called black-band-disease (BBD). BBD played significant roles in declines in Caribbean coral reefs and altered these reef ecosystems in the last few decades. Yui reported his monitoring study of the first outbreak of BBD in the GBR region, which showed summer recurring patterns of BBD outbreaks linked to annual cycles of sea water temperature and ambient light levels. He also demonstrated successional changes in bacterial communities responsible for the pathogenesis of this coral disease using molecular techniques for the first time. The Best Student Oral Presentation Prize was awarded to Yui's presentation.

Yui with a Thai dancer at the last night banquet for the APCRS Symposium

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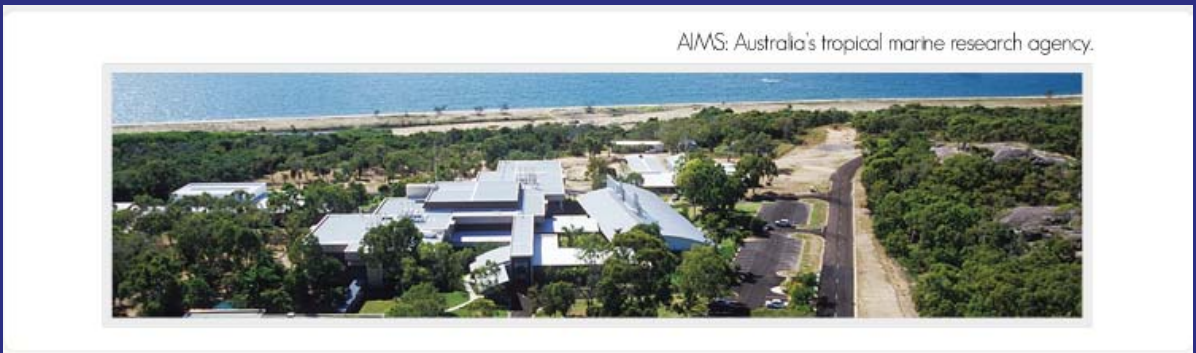
AIMS@JCU Student Seminar Day 2011

It's time again for our annual Student Seminar Day, which will be held 7th April 2011 at AIMS. Transport will be arranged to take participating students as well as colleagues who wish to come along to support students and learn more about the high quality research being carried out by the students of the AIMS@JCU joint venture. Currently, this stands as a half day event, beginning at 9am and ending at around 1.30pm which will include a tour of the AIMS facility.

Please note that as part of the AIMS@JCU re-structuring, the student support travel awards have been discontinued; therefore, the prize money associated with seminar day will be the only travel awards available to AIMS@JCU students. With impressive prizes available, two $2,500 awards towards conference travel, we look forward to some very competitive presentations.



For your information:

- Awards will be based on both the quality of the abstract and the talk presented.
- Talks will be 12 minutes with 3 minutes of questions.
- Non-scholarship student members are eligible to present and compete for all prizes; however, you must be an enrolled student to participate.
- Criteria for judging of talks is available from the office if you would like to see that information for preparation of your talk.
- Video recordings of talks will be acceptable if students are unable to attend the event in person.

If you wish to attend this event as a spectator, please advise the AIMS@JCU office as soon as possible in order for us to arrange transport and catering.

Any students who wish to participate and have not yet RSVP'd must send an abstract to the AIMS@JCU office immediately.

We look forward to this event being a success as per previous years. The event will provide an excellent opportunity to highlight AIMS@JCU student research as well as to offer access to travel funding to student members. We hope to see you there.

Contact: aims@jcu.edu.au or by telephone on: 4781 4074

AIMS@JCU Future Directions

As some of you will be aware, the federal allocation that supported this group is drawing to a close. We are very pleased to say that AIMS and JCU have agreed to continue to support the joint venture beyond this point, however there will be some changes to the structure of the group. Most significantly the AIMS@JCU management committee has decided to remove the research program areas to broaden the group and be inclusive of everyone who collaborates between the two partner institutions. This change will also allow AIMS@JCU to focus on emerging areas of marine science that may not be captured in our current structure.

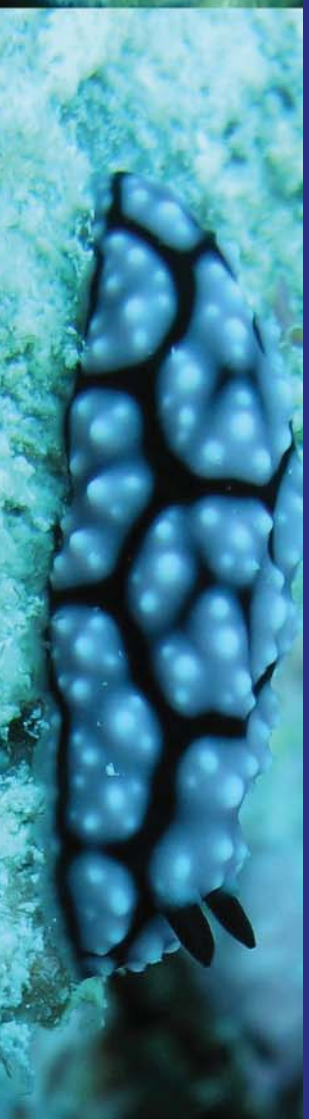
The group will continue to support student scholarships and travel funding will be provided in conjunction with seminar day to those students that are scored the highest based on their abstracts and talks. Additionally, the commuter vehicle will continue to help provide transport between AIMS and JCU.

Due to the re-structuring of the group we are asking that all members complete an Expression of Interest form and send us a one page version of their CV in order to remain a member of the joint venture. Please take special note that if you wish to be a driver in the commuter vehicle we request a copy of both sides of your valid driving license for our records. Non-members are also encouraged to apply for membership, please contact the office for an Expression of Interest form.

Our core business is the training of high quality postgraduate students. In short we try to help support/facilitate postgraduate projects that are jointly supported by the two partner institutions (i.e. having a supervisor from each). To that end we offer postgraduate scholarships, conference funding and logistical support to students where possible. The major benefits to most staff are therefore via student support. Our scholarships are competitive with an additional allowance of $5,000 per year to be used as a top up or toward research costs and this allows us to support high quality applicants. Each year, a student seminar day is hosted to help students interact with and learn about their colleagues and to award prize money to be used to travel to a national or international conference. We also have facilities available to all of our members including a commuter vehicle (mainly utilised by student members) to travel between JCU and AIMS free of charge. In addition, in the past AIMS@JCU has invested in infrastructure on both campuses such as MARFU and the controlled environment facility at AIMS. Those investments were to help improve research infrastructure for our members. You can find more information about the joint venture on our website (http://aims.jcu.edu.au/).

The benefits of AIMS@JCU membership include:

- access to infrastructure support, facilities and equipment through the joint venture partners
- access to a network of research/academic personnel with a world-class knowledge-base
- inclusion in AIMS@JCU member email lists for updates and information
- access to full or supplementary Scholarship Funding
- access to Honours Student Support Funding
- access to Student Travel Support Funding



Honours Student Support Funding:

We are pleased to announce that funding is available again this year through AIMS@JCU for competitive Honours students. $1,000 per student is available and students must provide a budget for the $1,000, an explanation of how they're linked to AIMS and JCU along with their project proposal. Please advise the AIMS@JCU office of any appropriate students you may be aware of, as the deadline for applicants is 25th March 2011.

New AIMS@JCU PhD Scholarship students to begin in 2011:

Welcome to the five successful applicants of this year's AIMS@JCU scholarships: Samantha Munroe, Joleah Lamb, Abdul Wahab, Thomas Camus and Leanne Currey. Each student has been awarded a JCU Postgraduate Research Scholarship and an additional stipend top-up or operational expenses award of $5,000 per year for up to four years. Look out for their profiles in future newsletters.

Thank you's:

As AIMS@JCU takes on a new structure, we would like to recognise all of those involved in making it such a success up to this point. In particular Dr Michelle Heupel who has been a wonderful Research Director and has worked extremely hard to enhance the outputs of the group, streamline procedures and be a positive point of contact for the student and staff members. Michelle has been awarded an ARC Future Fellowship which will continue her work with both AIMS and JCU into the future.

Also, thank you to the program leaders who have shaped this group and given so much support to students within the three preceding AIMS@JCU programs:

Scott Smithers (JCU) & Richard Brinkman (AIMS) for the Coastal Processes and Modelling program;

Bette Willis (JCU) & Madeleine van Oppen (AIMS) for the Stress in Tropical Marine Systems program;

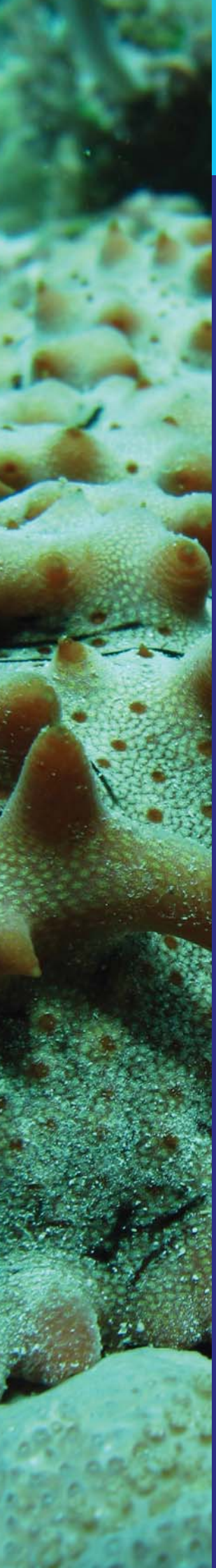
Chaoshu Zeng (JCU) & Mike Hall (AIMS) for the Tropical Aquaculture program.

We would also like to acknowledge recent program leaders Mark McCormick, Michael Ridd, Craig Steinberg and Paul Southgate.

Finally, to the past and present Management Committee members who have successfully lead AIMS@JCU to its current position:

Helene Marsh, Jeff Loughran, Chris Cocklin and Michael Kingsford for JCU and Julian Caley, David Mead, Lyndon Llewellyn and Chris Battershill for AIMS.

The management structure will now consist of a Management Committee (Helene Marsh of JCU and Lyndon Llewellyn of AIMS) and a Scientific Advisory Committee, which includes the Management Committee along with Rocky de Nys of JCU and Peter Doherty of AIMS. We look forward to seeing where all of these exciting changes will take us in the future.

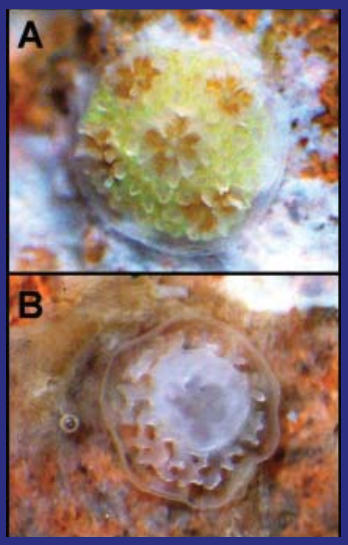


Emily Howells

Euro ISRS symposium 2010: Reefs in a changing environment Wageningen, the Netherlands

European conferences of the International Society for Reef Studies (ISRS) are held once every four years in between the society's larger international coral reef symposiums, the next of which will take place in Cairns in 2012. Held under snowy conditions in the Netherlands, the conference had a strong European turn-out but was also attended by a number of prominent scientists and PhD students from Australia, Japan, Singapore, Israel, the USA and Mexico. Session topics discussed over four days of oral and poster presentations included ecology, physiology, connectivity, genomics and climate change impacts on coral reefs. I gave a talk on adaptive variation in thermal tolerance between populations of coral symbionts and attended talks on research investigating mechanisms of adaptation and acclimatization that corals may use to respond to changes in their environment.

I presented results from my PhD experiments showing that *Symbiodinium* (=dinoflagellate endosymbionts of corals) populations belonging to strain C1 from 'warm' and 'cool' locations on the Great Barrier Reef are adapted to their local thermal environment. Following a period of acclimation to a common aquarium environment, *Symbiodinium* populations differed in their photo-physiology, growth and mortality at different temperatures (27 to 32°C) where each population had optimal performance under conditions that reflected their native thermal environment. These adaptive responses strongly influenced the thermal tolerance of the coral host where corals inoculated with heat tolerant *Symbiodinium* C1 resisted bleaching and maintained rapid growth at high temperatures whereas corals inoculated with thermally sensitive *Symbiodinium* C1 which severely bleached and stopped growing.



Adaptive variation of Symbiodinium C1 populations in symbiosis with juvenile corals. At high temperature, healthy symbioses were maintained with Symbiodinium C1 from a warm reef, but severe bleaching and with tissue loss was observed in symbioses with Symbiodinium C1 from a cooler reef (B).

Local adaptation in coral-*Symbiodinium* partnerships was also illustrated with genotyping of coral populations and their associated *Symbiodinium* strains. In *Seriatopora hystrix* (Bongearts *et al.*) and *Madracis pharensis* (Frade *et al.*), genetic diversity of host and symbiont was found to partition with habitat type. Functional variation among *Symbiodinium* strains, potentially specialised to different habitats, was suggested as a driving force of the divergence of coral genotypes in these species which acquire *Symbiodinium* maternally (Frade *et al.*). However, coral host functional variation may be equally important in shaping habitat partitioning of genetic diversity. Coral-specific adaptation was discussed in investigations of the thermal tolerance of larval populations of *Montastraea faveolata* from comparatively warm and cool locations in the Caribbean (Baums and Polato).

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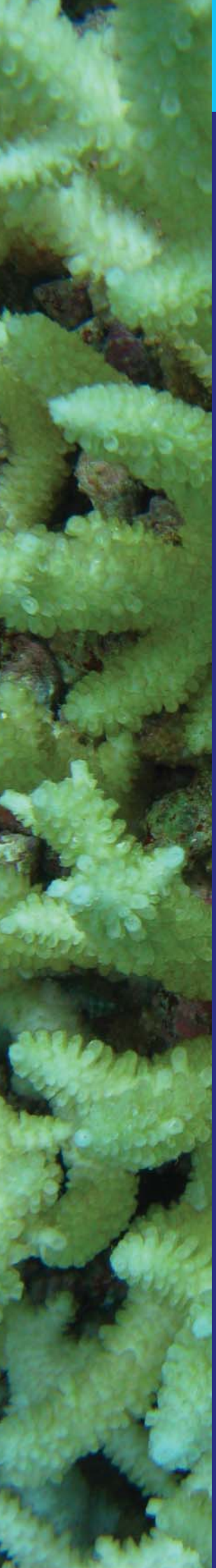

Coral larvae from the warmer location exhibited greater thermal tolerance than larvae from the cooler location based on the degree of malformation at high temperature and differences in the expression of functional genes. Further support for adaptation in corals was presented in an analysis of the available transcriptomic data for *Acropora millepora* and *A. palmata* which found that a number of coral-specific functional genes are under positive selection potentially enabling them to respond to future changes in environmental conditions (Voolstra *et al.*). Further investigations into adaptation in coral symbioses will be aided by high throughput DNA sequencing projects currently being undertaken on a number of coral species (*Acropora palmata*, Baums and Polato; *Montastraea faveolata*, Baums and Polato; *Stylophora pistillata*, Karako-Lampert *et al*; and *Pocillopora damicornis*, Traylor-Knowles *et al*.) as well as *Symbiodinium* strains belonging to clades C and D (Bayer *et al*.).

Research presented on the acclimatization of corals to environmental change focussed on sea temperature rise and the physiological trade-offs associated with shifts in *Symbiodinium* within coral tissues from heat sensitive to heat tolerant clades. High resolution genotyping analysis of *Symbiodinium* found that multiple background clades (A – D) were commonplace in most coral species including those previously characterised as having partnerships specific to a single clade (Silverstein *et al.*). It was concluded that the capacity of corals to acclimatize to rising sea temperatures by changing *Symbiodinium* partners may be more widespread than previously thought. This was supported by long-term data sets (8-9 years) from the Eastern Pacific and Indian Ocean that demonstrated shifts to heat tolerant symbiotic partners in corals have been maintained across many years at sites that experience persistently warmer temperatures (Baker *et al.*). It was predicted that heat tolerant symbionts will be observed more frequently in corals and will persist for longer periods of time as sea temperatures continue to rise. The cost of long-term shifts to heat tolerant *Symbiodinium* communities was addressed by experiments showing reduced calcification in coral (*Montastraea faveolata*) fragments hosting 'heat tolerant' *Symbiodinium* clade D which was less than half of the rate of calcification in fragments hosting clades A, B and C (Smith and Iglesias-Prieto). This data supports previous findings from Great Barrier Reef corals (Little *et al.* 2004, Cantin *et al.* 2009). A field survey from the South Pacific was undertaken into the diversity of *Symbiodinium* strains within coral species identified as 'winners' and 'losers' (Loya *et al.* 2001) in their vulnerability to mortality from bleaching stress (Putnam *et al.*). 'Winning' corals tended to have *Symbiodinium* associations specific to a single strain, whereas 'losing' corals mostly had *Symbiodinium* associations flexible to multiple strains. This finding questions the long term benefits of flexibility in coral-*Symbiodinium* associations at the level of coral communities.

The conference concluded with a fantastic dinner at Burgers' Zoo where we could meet the local residents and network with conference participants. Greece is the venue for the next European ISRS symposium to be held in 2014. Thank you to AIMS@JCU and the Graduate Research School at JCU who provided generous funding to support my conference travel.

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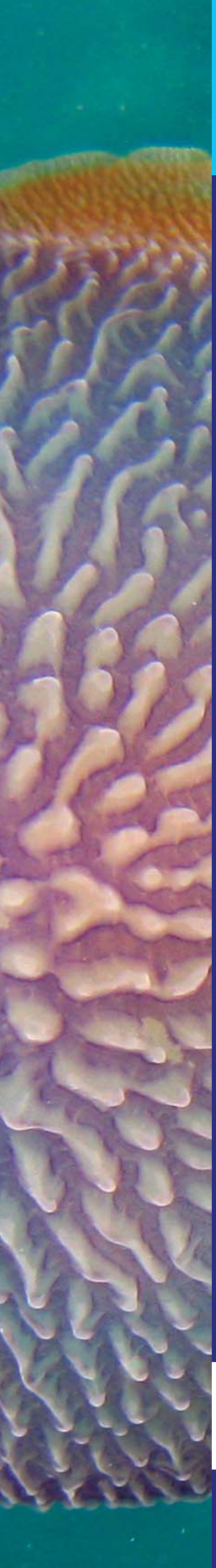

Research Director's Report

I am pleased to report that 2011 has started off well for AIMS@JCU with five new scholarship students joining our ranks. Congratulations to all of our scholarship recipients. Competition was tough with a number of high quality applicants and it is always nice to see the calibre of students AIMS@JCU attracts.

This year will see a lot of changes to the group and we are hoping that these changes will make integration of research between the partner institutions smooth and productive and streamline the running of the office. One of these changes is the removal of research theme areas to broaden the scope of the group and allow wider participation. As a result we will no longer have Program Leaders, but I would like to take a moment to thank the various Program Leaders over the years for all of the time and effort they put into helping AIMS@JCU become a successful entity. Their participation was instrumental in getting and keeping AIMS@JCU going and I appreciate their time and input very much. As part of this change in structure we will be completely renewing our membership, so if you haven't already returned an expression of interest for membership please contact the office to ensure you are included.

Another big change for 2011 is my departure from AIMS@JCU. In November I was awarded an ARC Future Fellowship which will be undertaken jointly between AIMS and JCU. So although I will be leaving my current position I will be among the AIMS@JCU membership helping to strengthen linkages between the two institutions. I would like to take this last opportunity to say how much I have enjoyed working for AIMS@JCU and with all of you. It has been a good three years and I have enjoyed seeing the progress and outputs of our outstanding student members and look forward to seeing more from all of you in the future. Thanks to the Program Leaders and Management Committee for all of their support and effort to help continue and extend the Joint Venture. Finally, thanks to Lauren and Vanessa for all of their hard work in the office to ensure things run smoothly. Until the new Research Director is appointed they will be your first point of contact.

Best of luck with all of your research, Michelle.

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Photographs in this publication were submitted by AIMS@JCU students/staff or have been sourced from the AIMS Long Term Monitoring Team.