Teaching dossier
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Note: Raw data from teaching evaluations is provided in the resources file only.

Philosophy and professional goals:

Teaching is a pivotal aspect of human culture which facilitates the transfer of concepts, understanding and knowledge between individuals. It is and has been key to human history, communication and cultural development, and its significance in the changing world around us might be argued as one of the most important. My aspirations as a teacher stem from a desire to be part of this important process and have been fortunate enough to be involved with university teaching since 1983. Since that time I have undergone many changes in the techniques that I have used to facilitate the learning of students. Several simple "philosophical" tenets, however, have remained with me. The first is that teaching is less about rote learning and more about communication and leadership in learning. In this way, the ideal teacher is more an experienced guide to further knowledge and conceptual understanding than a strict task-master of the rote. I believe for this reason that lectures should be more like a conversations as opposed to formal dictations of knowledge. The second is that engendering interest and excitement in a subject area is essential to student receptivity to learning. This is one of the more enjoyable yet challenging aspects of teaching. The ideal situation in this case is the teacher that inspires the will for life-long learning in the student. The third is that effective teaching involves a two-way dialogue between student and teacher. A related issue here is that teachers must have an understanding of how students might see a subject area prior to being to teach them. Without this knowledge, one risks becoming ineffective at avoiding the ruts and potholes that might hinder the road to understanding. The fourth is that student confidence is important to the potential ability of students to master an area of conceptual understanding. This latter point obviously has its subtleties, with trends toward overconfidence to be avoided. However, enabling students to be confident while being competent is major step toward life-long learning skills.

In addition to my "philosophical" tenets, I also put much credence on (a) comfortable learning atmospheres in lectures and laboratories, (b) providing exciting and interesting oral deliveries and (c) encouraging student participation. As an example of my interest in the latter, I have invented a simple quiz game (BioQuest) in the large classes I teach in second year (Biology 2) that functions to increase participation as well confidence in students in their own abilities at answering biological questions in front of their peers. The resulting increase in dialogue has had a dramatic impact on the learning atmosphere in these particular lectures. Whereas few students would have originally wanted to ask questions of a lecturer in front a group of 150, the period "post-quiz" is typified by a dialogue between the students, and between the students and myself. This dialogue is crucial to the success of the learning goals in this class. By achieving a dialogue in a lecture, I gain crucial insight into how learning is proceeding during a lecture and hence if I need to modify or re-explain subject material. Relevant stories and humour can also function in a similar way to break down the student-lecturer barrier. I also use both these devices to foster the development of rapport, understanding and communication between myself and my students.

No discussion of modern teaching ideas would be complete without consideration of the impact of new teaching technologies that has occurred within the past three years. In short, these new technologies have opened up great new opportunities of the university educator. While I am an enthusiastic advocate of these new technologies, I believe they are not solutions unto themselves. Rather, they are useful accessories that will extend the capabilities of the effective teacher. My enthusiasm for the new technologies could hardly be greater. Since January 1995, all my lectures have been given electronically using slide presentation programs like MS Powerpoint©. I have also

combined digitised video, sound and graphics to create a learning environment (please see a selection of the slides from my lectures, Appendix 2) with which I am able to interact with students. The ease with which one can create a tailor-made presentation environment has and will have tremendous impacts on the facilitation of learning and on the types of experiences that one can bring into the lecturing environment. I have for example brought the coral reef ecosystem into the classroom during second year zoology courses via a series of video segments called "Lectures from a reef crest". This exercise stemmed from the humbling exercise of setting up a camera and giving 10 minutes of lectures during my echinoderm course (literally) from a reef crest in French Polynesia. This has an positive and electrifying effect on the students for two reasons. Firstly, the video segment extends the lecture room out onto the reef crest, and secondly, the pace and delivery of lecture can vary as I am one minute in front of them and the next, knee-deep in water lecturing and capturing the very animals about which I am talking. Another example of how effective the new technologies can be comes from a lecture I teach on the El Nino Southern Oscillation event. Prior to 1995, I used a series of static graphs (as overheads) to convey how oceanic circulations stall during El Nino years. The whole process took at least half an hour and was complex and difficult for students to grasp. In 1995, however, I found a small digitised video segment at the NASA WWW site that showed a sequence of monthly satellite global isotherms and chlorophyll emissions from 1983 to 1989. I incorporated this into my lectures with tremendous results. The embedded video segment in this case allowed students to integrate the various information sets (vector graphics and charts of temperature and currents) and to finally comprehend the complex relationship between temperature, global circulation and oceanic productivity. This single teaching aid more than doubled student understanding.

Finally, my professional goals as a teacher might be summarised as follows. As a teacher, it has been my goal to (1) develop effective means by which to communicate the excitement of biology, (2) craft a dynamic and relevant educational environment whereby students learn under their own volition and, most important of all, (3) develop teaching methods that promote life-long skills in learning by students. Hopefully this document will outline some of the ways that I have been approaching these goals.

1. Teaching responsibilities and initiatives.

A. Current and recent teaching responsibilities and activities.

I have had a higher than average teaching load since arriving at the University of Sydney. I registered 313 and 248 undergraduate contact hours in 1994 and 1995 respectively. I have also been heavily involved with teaching administration as a member of the Honours executive committee in 1993 and as the Executive officer for Biology 3 since 1993. I have also listed my educational activities in the public arena. This has been generated by my strong belief that universities have an important role to play in providing educational resources to the wider community. I have been actively involved in public lectures, the development of Internet resources, public exhibits, radio, television and public print media (Appendix 2).

(i) Undergraduate courses taught (1995)

Contact Hours (undergraduate only, 1994)		313 hours
Contact Hours (undergraduate only, 1995)		248 hours
1st year		
Biology 1 Advanced	3 students, project supervision	
2nd year		
Biology 2 (animals)	16 lectures, 48 hours of laboratory	
Introductory Marine Science	10 lectures, 6 hours of laboratory	
3rd year		
Ecophysiology	3 lectures, 36 hours (field course)	
Marine Zoology	6 lectures, 20 hours of laboratory	
Animal physiology	20 lectures, 60 hours of laboratory	
4th year		
Honours study unit (2)	3 lectures, 20 hours of laboratory	

(ii) Course administration

Course Executive Officer, Biology 3 1993 - present

- As course executive officer, I have been responsible for the smooth running of all 3rd year course options in Biology 3. This includes the distribution and coordination of teaching related information (from Head of School, Faculty and University), coordinating the preparation of examination scripts and pursuing other examination related matters, solving student related problems and participating in the re-design of course material among other things. In 1994, I was involved in a the re-design of Biology 3 as part of a Head of School's special committee. This resulted in a major re-organisation of Biology 3 in 1995. The latter involved a re-write of the current handbook for third year which I organised and did.

Course coordinator, Marine Zoology 1993, 1995

- Being course coordinator for Marine Zoology has involved the general management and organisation of course materials, coordination of lecturing staff and preparation of examination scripts. This also involves student consultation over course matters.

Course coordinator, Introductory Marine Science(Biology semester) 1992, 1994, 1996

- Introductory Marine Science (IMS) is a large second year course that is run through the Marine Studies Centre. Being course coordinator for IMS has involved the general management and organisation of course materials, coordination of lecturing staff, preparation of examination scripts, and organisation of the field trips to NSW Fisheries.

Honours executive committee 1993

- As a member of this committee, I was responsible for the smooth running of the Honours program which involved the writing and distribution of the honours handbook at the beginning of each year (20pp); the introduction of students to the course and facilities they will need to use during the year (e.g. computer laboratory, libraries, workshops, darkrooms); constructing student seminar timetables (at the beginning and end of the year); collating marks from course work units and theses; acting as chairperson for the Honours executive committee (4 members), the Honours studies committee (all academic staff of the School) and Honours examiners meetings. I also met regularly with students who were having difficulties with projects and, on occasions, an awkward relationship with their supervisors.

(iii) Other teaching initiatives and activities

Universities have a great potential to influence the educational opportunities in the broader community. I also feel a strong motivation to communicate the excitement of the biological sciences to the community beyond the gates of the University. I have listed here some of the teaching innovations that relate to this aspect of University education.

Recent public lectures (1996 only; see letter from A. Jerram, Science Faculty, Appendix 1):

"The biggest, the oldest and the weirdest"
Seimens Summer School (January 17, 1996)

"The secret lives of corals: when dots are not just dots"
1996 Sydney Science Forum (March 27, 1996; Appendix 1)

"The secret life of the coral polyp.",
Powerhouse Museum, (August 14, 1996; Appendix 1).

Development of Internet resources.

School of Biological Sciences World Wide Web site
The development and rapid expansion of the World Wide Web caught my imagination in late 1994 after a demonstration by Mr. Rob MacKay-Wood, and Drs. Diane Chambers and Mary Peat (1st year Biology). I was intrigued immediately by the new realm of possibilities open to Universities for enhancing their learning and teaching capabilities, particularly with respect to the wider community. Since that time, I have developed considerable skills in creating and maintaining WWW resources. Since my initial exposure to the World Wide Web in late 1994, I reorganised and developed the current School of Biological Sciences World Wide Site at URL: http://www.bio.usyd.edu.au/SOBS/) and trained two staff members (Ms. Brigid McKay and Mr. Mick Finn) to facilitate entries to the School World Wide Web site. This has spawned a large number of projects by other staff members (e.g. teaching development in Biology 2).

Other Internet projects that I have initiated include the Coral Reef Research Institute WWW site (http://www.bio.usyd.edu.au/CRRI/) and associated resources.

Microsoft Network Kidz'n'Teens Learning Centre Projects
As part of my interests in education and the Internet, I am involved in a primary/secondary school learning centre on the world wide web. As part of this, I am the resident biologist and am contracted to prepare a project each month for publishing at the web site which is run by MicroSoft Network (MSN). This site functions to provide on-line educational projects for children (8-12 years of age) to do. So far I have completed two projects and am currently committed to 10 other MSN projects. The two completed projects are

1. **"Apples and oranges, and butterflies?"**
   This project is centred on the biology of the Lepidoptera with a special segment on the common Orchid Butterfly *Papillio argeus*. It profiles indirect lifestyles, metamorphosis, crypsis, courtship and sexual dimorphism.

2. **"Hey ant sister!"**
   This project focuses on ants and involved an infants/lower secondary level exploration of the basic biology of ants. Several activities were included for children to do including building of an ant colony and looking at video of Bull Ants (a basic outline of this site is included in Appendix 7).

Articles and projects for the general public.

I have encouraged and have collaborated on two articles that have been accepted for publication in the popular press. As part of this exercise, I have been supervising a young science writer (S. Grieg) and helping her develop as a popular science writer. This has come from the desire to contribute to the development of people that are science communicators, given the potentially important role these people play in linking scientists with the rest of the community. These are:

Newman, L. and Hoegh-Guldberg, O. (1995) "ENCORE, ENCORE", Australian Wildlife, Winter issue, Appendix 4).

Grieg, S. and Hoegh-Guldberg, O. (1996). "Are our reefs turning white with fright?" Sport Diver Magazine (in press, July 1996 issue)

Public Exhibits and the proposed Marine Educational Centre.

Educational exhibit on coral reefs and nutrient pollution (Sydney Aquarium)
I designed and directed the creation of an educational display at the Sydney Aquarium. Display opened by the then Chief Scientist of Australia, Professor M. Pitman on February 11th, 1994 (see attached Administration Bulletin detailing the opening of the display, Appendix 5). This display was located in the main entrance, was highly successful and was kept open for one year.

Marine Educational Centre in Darling Harbour (proposal in final stages of review)
My interest in the potential for the University to play a strong educational roles in the wider community lead to a proposal for an Educational Centre to be built in association with Darling Harbour. The proposal I have written is currently in the final phases of being considered for

funding and will involve the creation of a center for marine research and education (8 staff). Funded at five million dollars, and encompassing (potentially) 11 million visitors each year by the year 2000, this is a major educational initiative. Please refer to Professor Underwood or Professor Helen Beh for details of this proposal which is currently confidential due to its association with a larger commercial development. The larger project has been reviewed and approved by the highest levels of the NSW government. This project has enormous implications for the role that the University of Sydney will play in community education. The official announcement for the centre is expected in the next 30 days. A copy of my original proposal is available on request.

Related educational initiatives

I have been involved in a number of other educational initiatives and projects which are listed below and more fully described in Appendix 3.

1. Interactive CD-ROM: "One Tree Island: Research in action".
2. Interactive CD-ROM: Antarctica: a virtual experience (demonstration)
3. Documentary (Quantum: Question of Survival series).
4. Educational video: "One Tree Island: The key to saving the Great Barrier Reef "
5. NSW Scratchies: "Reef Treasures" series
6. Involvement in print, television and radio media

B. Teaching practices and new courses planned and taught.

(i) Key teaching practices

I have put a lot of thought (both at the University of Sydney and while a lecturer at UCLA, Los Angeles) into how biology should be taught. Some of teaching practices that I feel are important concerns within a course are:

The use of conceptual trees as opposed to facts.

I believe that by establishing the conceptual understanding or basis for learning, three important objectives can be achieved. Firstly, student interest can be maintained (this cannot be under-rated: factual discourses can be tedious and can be disastrous for student learning; textbooks exist for factual reference). Secondly, by establishing conceptual "trees", further long-term student learning is assisted above and beyond the confines of the lecture hall. This is very valuable and is a major objective of teaching. A third important outcome of this approach is practice with the use of concepts. This leads to the important outcomes of improved student problem-solving and application of learning skills to new situations. This, in the rapidly changing landscape of modern biology, is an essential skill for the competitive biology graduate.

The need to combine 'current' and 'classical' themes.

I endeavour to provide both current and classic themes and examples to illustrate points made during lectures. This is a very important part of ensuring that students are made aware of the dynamic and changing nature of the biological sciences, while also becoming aware of the history behind a body of knowledge.

The role of multmedia in illustrating providing new ways to illustrate key issues and concepts.

Today's university's teachers have increased opportunities with respect to the diversity of media they have available to them. However, they face greater challenges in attempting to harness these new technologies to the task of creating better learning environments and encouraging long-term learning in students. Although these challenges are substantial, the possibilities in expanding how and who we teach make this one of the most exciting educational eras. I have spent considerable efforts to comprehend how these new media might aid and abet our mission as teachers.

Biology can be an exciting and visual subject. From very early on I have endeavoured to bring slides and video media into lectures wherever possible (and appropriate). Video photography have allowed huge advances in the ability of obtaining images to support lecture material. I have already described (in the opening statement to this dossier) how I have had success with concepts like "Lectures from a Reef crest". Another recent example occurred when I was able to film sequences of the organisms (reef-building corals, anemones and zoanthids) while I was doing field work at One Tree Island Research Station. This, after editing, became an extraordinary tool to transport a student sitting in a lecture hall at the University right out onto a living reef and into an appreciation of where and how an organisms may live. Over my lecturing and research career, I have collected a library of video footage and slides that are invaluable in illustrating points made during the lectures. This has proved to be very valuable in maintaining student attention (see teaching evaluations for examples of student comments in regard to this).

Since 1994, all my lectures have been delivered using digital multimedia (see examples of my slides taken from the computer screens in Appendix 2). Recent developments in the digital multimedia have allowed still images and digital video to be edited and rendered with ease to suit the learning objectives. This has allowed me to craft specific "backdrops" or learning environments. Working within these tailor made environments as meant new possibilities for leading students in learning biology. Computer display systems provide many other opportunities aside from creating ideal learning environments. One of these is the interactivity that is now possible between the display and the teacher. I have used this element successfully for example to teach biophysics within the course "Cell, molecular and systems physiology". By showing calculations in MS Excel© (projected as part of the lecture) I am able to demonstrate the impact of particular constants within complex equations dynamically and in ways not previously possible. This combined with dynamically linked graphics is a substantial improvement over trying to teach similar material using chalk and a blackboard. In short, I am a firm believer in the idea that the combination of digital multimedia and effective human delivery (performance) is ushering in new age of teaching/learning possibilities. It should be notes at this point, however, that a precise measure of how these technologies have impacted learning still remains to be explored in biology.

The crucial role of career orientated material and skills in learning.

My teaching practices often extend to developing skills in students that are often not regular parts of curricula yet are often vitally skills for success in the industry. For example, the ability to work in groups is an important skill that students need if they are to be properly prepared for a career in biology. With this in mind, I use one particular opportunity during a field course I teach in the School of Biological Sciences (together with Dr. M. B. Thompson and Dr. S. Morris). In this course, I teach students how to build and using electronics in biology. I deliberately build this

around groups of students who are required to come up with projects, assign tasks within the group, analyse data as a group and writing up a posters describing their projects. At a closing meeting at the excursion, the student groups organise the presentation of their projects to the group. By bringing practical career-orientated elements into a course wherever appropriate we are able to provide important steps in advancing a student's career 'readiness'. Exposure to key industry people is another way that I have provoke students to think about where they are headed. During Introductory Marine Science, for example, I have key individuals from industry come in and give talks targeted to educate students on the more practical and career-orientated parts of a field. Last year, I arranged for Dr. Steven Kennelly (Fisheries Research Institute), Dr. Klaus Koop (Manager, EPA NSW) and Dr. Judi Hansen (Sydney Waterboard) come in an talk to the students. These lectures were also in addition to the excursion we held at NSW Fisheries. During the latter, students were lectured to by six workers in the marine sciences.

The need to expose students to current technologies and techniques.

I feel it is important to also expose students to the latest technology in a particular discipline. Computers and data acquisition devices, for example, are playing an increasing role in biological research. One of the roles that has a direct impact on physiology has been the increasing use of computer technology in data acquisition. I have introduced computer data acquisition (using analogue to digital convertors) into Animal Physiology laboratory sessions in third year, and teach a special module in computer data acquisition and electronics for biologists during the second semester field trip. The principles of computer data acquisition are also taught in a successful Honours special course unit that I developed. Prior to my arrival at the University of Sydney, computer data acquisition (and associated electronics) was not taught.

The importance of field experiences.

I am involved in the running of 4 separate field trips in second and third years. Given the importance of practical experience in biology, I try to involve field trips in as many relevant courses as possible. In second year, I have been involved in 4 day trips to Bundeena (1993). In third year, I am an integral part of the running of two animal physiology trips (4 days in length to Smith Lakes, 1st and 2nd semester), and a marine zoology field trip to Jervis Bay (3 days). Although field trips involves a considerable amount of hard work (14 hour days), they are a key component in student learning. By immersing students in a subject in the field, a greater level of understanding and competence in biology is attained. These trips also contribute to promoting a better staff-student communication.

(ii) Participation in course design.

I have been actively involved the design and redesign of courses in Biological Sciences. During my first three years of being in the School of Biological Sciences, I was discontent with the course structure of the third year Biology course due to its lack of structure and direction. I felt that we needed to provide students with a wider variety of skills within a more rational and modern format. After becoming the executive officer for Biology 3, and due to the initiatives and leadership by the Head of School, I was able to participate in a select working party that lead to a major restructuring of Biology 3 course design and objectives. This lead to a new, more structure Biology 3 course in 1995. Though this new course structure has had some scheduling problems, the overall opinion of

the Biology 3 student body is that it is satisfying their desires (detected in course assessments I put out in 1993) for more structure and relevance.

At the individual course level, I have been involved in the introduction of a number of teaching innovations. I have already the role of multimedia to course structure and delivery and wont discuss it here. I have been involved in a number of other innovations in teaching. For example, I was the first person to introduce data acquisition and analysis equipment into the teaching of physiology. This segment of the course "Cellular, molecular and systems physiology" has been a wide-ranging success and has lead to the adoption of similar components in other courses. I have also introduced a small course called "Electronics for Biologists" to the second semester Smith Lake field trip. This has been a challenge but has been greeted with enthusiasm by the students.

I am also currently a recipient (together with Dr. M. B. Thompson) of a teaching development grant ("**Raising the Dead: interactive solutions to the teaching of comparative zoology",** CAUT teaching development grant, $49,650) which aims to devise improved methods for teaching comparative zoology. This project has been running for 6 months so far and is aiming to solve two problems in teaching comparative zoology: (1) students have difficulty relating observations made in the laboratory to the underlying theoretical concepts, and (2) key animal groups often are unavailable due to their rarity. To overcome these problems, we aim are developing virtual dissections using interactive CD ROM technology to accompany a reduced set of "live" dissections. For this project, we are focusing on production of two CDs, one focusing on the comparative anatomy of marine invertebrates called echinoderms and the other featuring "primitive" mammals such as the echidna. The CD ROM material will eventually allow students to interactively link between dissections and subject areas, and thus provide them with a thorough, integrated understanding of the diversity of the Animal Kingdom and how that diversity occurred. For example, students can dissect a starfish and link to the equivalent stage of the virtual dissection of the related organisms sea urchin and sea cucumbers. The students would also be eventually able to explore information about the reproductive biology, ecology and evolution of these related animals. By focusing on echinoderms and primitive mammals, we are developing templates for future extension of this project to other animal groups. The CD ROM technology will also enable students to proceed at their own pace and will contain interactive self-assessment features that will enable students to monitor their progress and receive valuable feedback on how to improve their understanding of the subject areas involved. During the final phase of this project (later this year) we will develop an Internet "open learning centre" for comparative zoology that will enable wide access by students and educators, and will enable us to receive critical feedback from a broad audience. We plan to employ Shockwave to develop the Internet interactivity necessary.

I am also currently exploring how I can use the Internet for teaching. One aspect I am exploring currently is how to provide materials (and links to other relevant material) from lecture so that students review all lecture resources (slides, video, URLs) and involve themselves in self-learning (see URL: www.bio.usyd.edu.au/LEARN/). Although the School of Biological Sciences does currently have the capacity to provide Internet access to second year students, current planning in the School suggests that this must be only year or two away.

C. Description of, and rationale for, material developed and used for teaching.

I teach using a range techniques and devices. The major themes of my approach to teaching have been described in the previous sections. A short description of the approach to individual courses is included here. Individual techniques are dependent on the objectives of the course, the students involved and the type of learning experiences being targeted. I have already described my use of electronic media in lecture and laboratory presentation (e.g. see beginning statement and teaching initiatives section). In this section, I will briefly give an overview of the material and approach developed for these specific undergraduate courses.

I have been active in applying for funds to improve the resources available to undergraduate lecturing staff. In addition to the CAUT teaching development grant (see previous section for description of this project) my interest in the use of digital multimedia has lead to several successful grants to get computer projection equipment and such tools as a high powered Pentium computer, scanner and CD ROM writer. Grants that I have written and been successful with (together with Drs. M. J. Kingsford and M. Thompson) are:

1994 University teaching development grant for new technology in 2nd and 3rd year teaching (1994). Pentium computer and software, colour scanner, video frame-grabbing equipment

1995 New technology for 2nd and 3rd year Biology Teaching (1995). Large screen displays for undergraduate teaching.

Biology 2 (Animals)

This course represents part of a course designed to introduce students to the diversity of the animal kingdom. One of the greatest challenges in teaching this course is to cover the diversity required while challenging the students to think of the underlying themes in animal design and function. I do this by using functional explanations as a linkage between animal groups (e.g. feeding patterns across the classes of the Echinodermata etc.). Because diversity is a key issue in this course, I endeavour to enliven my lectures with video and slides (analogue as well as digital) from my own extensive collection. Students also receive a complete handout of all material presented (see examples of slides and handouts, Appendix 2). I have done this in order to reduce the tendency for lectures to become a "writing competition" as opposed to a dialogue between lecturer and student. As described above, I am currently involved in developing interactive CD ROM virtual dissections for use in my section of the course. One of the major objectives of this project is to create a better link between lectures on diversity and laboratory experiences in structure and function.

Introductory Marine Science

Introductory marine science is a challenging course to teach in that it is a non-specialist course, which includes biology students and some have never done biology at the university level. My approach to teaching marine biology in this course is to develop an understanding of marine life by beginning with the question, "what is different between land and sea environments, and how do these differences effect animals in the sea". This leads me to draw on simple physical and chemical principles to describe the differences between land and sea, and to relate biology to this understanding. The effect is that I capture the attention of the non-biologists (by relating to their disciplines) while teaching the biology students some interesting principles about the physical and chemical environment of the sea. I use questions to focus and raise attention levels. During this

course, I repeatedly ask the students questions like "Why are there no transparent animals on land?" and "Why don't animals hunt using electrical detection on land?". These questions focus the interest of the student and allow a buildup to cathartic changes in the level of insight and understanding further into the course. With respect to these questions, the revelation (and moment of learning) comes when, for example, the lack of transparency on land is related to massive differences in the density of the two media, and when the electrical conductivity of sea water is compared to that of air (10^{14} times less). In the latter case, it becomes extremely clear why electrical detection is absent from the residents of the land. These "wondering why" questions and answers allow me the necessary student interest for me to teach them important bio-physical notions of life in the oceans.

Biology 3 (Marine Zoology)

This is another course in which I rely heaving on images and video to convey conceptual understandings of particular concepts (see examples of slides and handouts; Appendix 2). These facilities can be extremely efficient in communicating complex ideas, as discussed (beginning statement) with respect to the *El Nino* example in the opening statement to dossier. Much of the material has already been introduced (above). An emphasis in this course is on providing a series of lined learning experiences that lead to more "global" or ecosystem level understandings of marine animals and their habitat. An important part of this course is a field trip we run down to Jervis Bay. During this field trip, students get exposed to techniques of marine biology (seine nets, plankton hauls, snorkeling for samples etc.) and are asked to complete a study as a group of the diel changes in plankton abundance. An important part of this trip is the exposure and access that students have to lecturers (Dr. M. J. Kingsford and myself) and postgraduate students (attending as tutors) of the course. This functions to allow students to learn in a non-structured way as well as allowing them exposure to people who have made their career in marine biology. Discussion during dinner and around the campfire have an important place in rounding out this course.

Biology 3 (Cell, molecular and systems physiology)

This is a challenging course to teach. Biology students tend to shy away from mathematics and physics. I feel, however, that some of the most elegant biology can be deduced from physio-chemical principles. With this in mind, I have set out to introduce this element into the physiology courses running as part of Biology 3. I have some considerable success, as indicated by student responses to my section of the course (see below). I teach using Park Nobel's book Biophysical Plant Ecology due to its excellent treatment of biophysics. I was also Professor Nobel's teaching assistant at UCLA for a number of years on the two courses he teaches from these books (see Appendix 6). In addition to using this excellent text, I have included animations and models that I have built to demonstrate these physio-chemical principles. I have included a few examples in Appendix 2.

A major part of this course is the Smith Lake field trip. I also attend the Smith Lake field trip in semester 1, which students is also taken by most of the students appearing on the second semester trip. Students that attend these trips are exposed to the problems of applying the complex physiological measurements they have learnt in lectures and laboratory to the field. I teach an electronics for Biologist course which allows to build simple devices that the students then use on a project that each group (there are usually 8 groups) devises. These projects are written up as posters and then presented to the course at the final field trip discussion. The idea here in getting students to build, use the instruments they build, and then present their findings is designed so that

students get a better impression of all the aspects of doing field science. A second goal is to reduce the anxiety that biology students tend to have when it comes to electronic circuits. By building a simple circuit they develop greater confidence in facing "what's in the black box" if it malfunctions. This exercise also functions to demonstrate how careful students need to be with instrumentation. Invariably some bad circuits are built and spurious data generated. In having these problems (and identifying them) students have the concept that you shouldn't trust the electronics you are doing your measurements with blindly, firmly brought home.

2. Student supervision

A. Number of current and recent research students supervised at undergraduate, Honours, Master and Ph.D. levels.

(i) Undergraduate students.

I have been regularly involve undergraduate students in research training. So far I have supervised 12 undergraduates in projects up at One Tree Island. I developed this program in response to very positive experiences I had as an undergraduate. Students receive travel and bench fee costs and are assigned to help on post-graduate projects. As part of this training, they gain crucial exposure to a field-based research project and to research students. This is, I believe, central to students being inspired to further their education. In many cases this has lead directly to undergraduate students taking Honours and postgraduate studies in biological sciences. Feedback following these research trips has indicated that the program has been highly successful. In addition to my research training program for undergraduates, I have been involved in supervising Advanced Biology students in their special interest projects over two years.

(ii) Honours/Graduate diploma students (past 5 years)

Over the past 4 years, I have supervised 6 Honours students and am currently supervising two Honours/Graduate Diploma students. My Honours student have achieved very high standards while in my lab as indicated by their results. It was great moment of pride when Sarah Matthews took best student paper at the American Society of Zoologists meeting in Los Angeles in 1994 for her Honours work. The students involved and their results are:

1. Ms Cathy King	2.1 Honours
2. Ms Sarah Matthews Best student paper, ASZ	1 class Honours
3. Mr. Anthony Baker	1 class Honours
4. Mr. Scott Herring	1 class Honours
5. Ms Misaki Takabayashi	1 class Honours
6. Ms Rebecca Davidson	1 class Honours
7. Ms Gigi Beretta	(current)
8. Ms Merideth Peach	(current)

(iii) Post-graduate supervision

I have supervised two students to completion and am currently supervising11 MSc./Ph.D students. Three of my post-graduate students have taken out 1st prize for best student papers at major conferences (e.g. AMSA or the Australian Marine Sciences Association). In keeping with the University's stated desire to pursue international links and to be leader in international education, I have also developed a postgraduate program that has been typified by a high proportion of international scholars. This has also come about by the international nature of one of my subject areas (biology of coral reefs).

1. Dr. Ambariyanto	Ph.D. (finished)
2. Ms. Misaki Takabayashi	MSc. (finished)

	Honorable mention in best student paper awards, ACRS, 1995	
	Ms. Cathy King	Ph.D. (finishing, Dec 1996
	Best student paper, AMSA 1994	
	Best student paper, Ecotoxicology conference, 1995	
3.	Mr. Guillermo Moreno	Ph.D., finishing, Oct 1996
	Best student paper, AMSA 1995	
4.	Mr. John Stewart	Ph.D.
5.	Mr. Affendi bin Yang Amri	M.Sc./Ph.D.
6.	Mr. Mauricio Rodriguez	M.Sc./Ph.D.
7.	Ms Jo Rush	M.Sc./Ph.D. (part-time, full-time in 1997)
8.	Ms Anya Salih	M.Sc./Ph.D. (part-time)
9.	Mr. Mark Bradley	M.Sc. (part-time)
12.	Ms Paulina Selvakumaraswamy	M.Sc./Ph.D., joint with Medicine
	Best student poster, AMSA 1995	
13.	Mr. Francis Chee	M.Sc./Ph.D., joint with Medicine

B. Involvement in supervision of student's clinical, laboratory and field work.

I prefer what might be referred to as a hands on approach to the supervision of student projects. I feel that supervisors must be very familiar with student projects if they are to be able to anticipate and effectively guide students in their development as research scholars. On the other hand, I also feel student supervision has to evolve towards the situation where the student is an independent creative thinker by the end of his/her degree. This is a fine balancing act that includes a consideration of the student and the type of project involved.

Providing resources for post-graduate projects is another way I involved in post-graduate projects. Biological research is expensive and finding funding for projects is usually beyond the bounds of the incoming postgraduate student. A second major commitment to postgraduate clinical, laboratory and fieldwork that I have is in the provision of funding for postgraduate research projects. I fund the majority of the postgraduate student projects through the acquisition of competitive grants (1,013,000 for teaching and research, 1992-96, see Appendix 8 for full details of grants obtained that have supported postgraduate training). As part of these endeavours, I have also created scholarships to support student (e.g. Ph.D. Scholarship in Coral Biology, $18,000 per annum for 4 years).

C. Approach to supervision and comments from former students.

Being supportive while promoting independence in postgraduate projects

Good postgraduate supervision represents a balance between close involvement with student projects and a need to allow students independence as their research projects develop. I start postgraduate supervision with a period of active participation in student projects (6-12 months) followed by a period in which I reduce the extent to which I work "elbow to elbow" with the students. I also operate my laboratory open (office) door policy with students, with the idea being that they should meet with me and discuss exciting ideas as they come up, no matter when this occurs. I am also a firm believer (and I actively engender this attitude among my postgraduate

students) that there is no place for hierarchy in my research laboratory. This attitude in our laboratory is important to the idea of a research group being a dynamic learning and research environment for all its members (including me).

Encouraging students to publish papers and present at national and international conferences.

Publishing papers and presenting research at conferences is central to the success of post-graduate students after they have finished their studies. I active support (with funding and guidance) my postgraduate students so that they able to attend and present to national and international conferences (at least once a year in their later years). The results of encouraging students to present at conferences has had some extremely encouraging results. In the past three years, students from my laboratory have received 4 best student papers and one best student poster awards at national and international meetings. This type of outside reference and confirmation has been instrumental in building the confidence of my postgraduate students as they head to careers in biology. I also encourage my students to publish their own work as senior author. The results of this program is clearly seen by the considerable number of first author papers that have stemmed from the efforts of my students (Appendix 9).

Exposing students to international scholars

Exposing students to world-class researchers has an important role to play. For example, Dr. Richard Emlet (Oregon Institute of Marine Biology) and workers from the laboratory of Dr. Rudi Raff has been a visiting researcher in my laboratory every year for the past three years. The impact of having such a world-class researchers in my laboratory has had many benefits for my postgraduate research students, leading to many challenging discussions and exposure to scientific points of view and expertise other than my own. Early this year, I also had the world famous Professor Leonard Muscatine (UCLA) and Dr. Claire Goriam as visitors in my laboratory. I plan to keep up this program and expect it continue to have very positive influences on the development of my post-graduate students.

The Head of School has asked postgraduate members of my laboratory that have finished their degrees to comment on the characteristics of my post-graduate supervision. I have deliberately not polled current postgraduate students in my laboratory as requested by the application of this award (Appendix 1).

3. Student evaluation of teaching.

I have always seen student evaluation of teaching as central to attempts to maintain dynamic and effective teaching. I have used input in my teaching from student evaluations since my first years as a teacher at UCLA. During this period I was regularly evaluated by students during the period that I was a teaching assistant (1983-85), teaching associate (1985-87) and lecturer (1989,1991; these evaluations are available on request). Because of the value of this type of feedback, I continued the practice when I arrived at the University of Sydney. I have evaluated student responses to every course that I have taught at the University of Sydney. A version of the basic instrument I have used is found in Appendix 10. I have used the same instrument with few modifications since beginning as a teacher at UCLA, primarily to be able to compare between years and hence to track positive or negative trends. I have added instruments as new issues have come along (e.g. evaluations used after I introduced electronic lecture slides and video in 1994; Appendices 11 and 12).

A. Summary of teaching evaluations.

I have sought evaluations on every course I have taught at the University of Sydney from July 1992 onwards. I am both pleased and proud of the feedback that I have received so far (see attached teaching evaluations and summary notes, below). Most students see my teaching extremely positively and rate me one of the best teachers they have had while at the University of Sydney. Note that the percent of students delivering category 4 (Good, high or frequently) or 5 (Excellent, very high or almost always) verdicts on all questions ranged between 92 and 99%. In answer to the question "How do you rate lecturer among those you have experienced so far in your university career?" 84 % of all students that I have taught put me in the top category (Excellent etc.) with range of course averages of 74 % to 91 %. I will present the analysis of the most recent year's evaluations here but I have included and analysis of some earlier sets of teaching evaluations in Appendix 13 (1992 and 1993).

The evaluations reviewed on the next pages were compiled by Ms Sylvia Warren (x 12438) for objectivity's sake and are complete (i.e. positive, negative and indifferent are included). In the following pages a summary of the responses to the evaluation instrument are included. I have also included a second evaluation of Marine Zoology as I could collect data from 1996 prior to the deadline for handing in this proposal. A copy of the raw data is included with this application.

BIOLOGY 2 (1995)
STUDENT EVALUATION OF TEACHING
DR O. HOEGH-GULDBERG

July-August 1995

Rating on scale 1-5:

- **1 Poor, very low or never**
- **2 Below average, low or infrequently**
- **3 Average**
- **4 Good, high or frequently**
- **5 Excellent, very high or almost always**

No. of Student Evaluations received: 80
1 not completed for this set of questions

Question No.	Statement	Rating on Scale				
		1	**2**	**3**	**4**	**5 (%4,5 of total)**
1	The lecturer was concerned about student learning			2	15	62 (98 %)
2	Lectures were well-prepared and organised			1	6	72 (99 %)
3	The lecturer provided clear handouts to accompany his lectures			3	18	57 (97 %)
4	The lecturer went out of his way to enliven the subject with supporting material (slides, films)			1	3	75 (99 %)
5	The lecturer made students feel welcome to ask questions and to seek help at times outside the lecture hours (e.g. during laboratories)			6	24	46 (92 %)
6	The lecturer increased your interest in the subject	1	1	6	28	43 (90 %)
7	The lecturer has good communication and teaching skills			2	6	71 (98 %)
8	How do you rate this lecturer among those you have experienced so far in your university career			2	9	59* (97 %)

GENERAL RATING: Average for all questions of the percent of category 4 (good, high or frequently) and 5 (excellent etc.) combined is 96 % of all students

*9 replies did not give ratings but comments were as follows:
"The best!", "Excellent", "Very good", "Bit confused at the moment", "One of the most enthusiastic and innovating", "The Best", "Very good", "Way up the Top with 1 or 2 others".

Question 9:
Please add any other comments about the course and the lecturer in the space below. In this space you may wish to indicate added strengths and weaknesses of the lecturer, and any ways that you could see this part of the course being improved:

Comments to the above questions were as follows:

"BIOQUEST was good. It encouraged us to learn and enlivened the lectures. It helped with the Quiz too."
'BIOQUEST was a great idea, very original. It was good to have a teacher who wanted to be friends with the students and not put himself above us."
"Lecturer is the best I have had."
"What a dude! Very interesting. It really stimulates interest in the subject when the lecturer is enthusiastic about teaching the subject material And when the lecturer and students don't have a 'us' - 'them' relationship."

"Excellent."
"He was very approachable, I loved BIOQUIZ. Definatly the best lecturer I've had at uni so far."
"His sense of humour made lectures interesting. BIOQUEST was a good idea."
"A good lecturer is one that is interesting yet informative and a person you can respect - Ove is one!"
"Good idea with the slides and handout co-ordination."
"Best this year."
"Ove was very funny and made the lectures interesting and entertaining which made you listen all the time."
"Ove is a dead-set legend. The bioquest idea was really good, and because we had it, the real quiz questions were alright as we kept on revising everything."
"Strengths - good communication with added strength in expression. Weakness - relying on handouts too much."
"Weakness - tended to gloss over some areas. Strengths - Funniest, Liveliest lecturer ever!!!"
"Unreal, share with other lecturers your techniques."
"Dead-set legend. the bioquest was excellent & helped with the quiz."
"Good the way Ove moved around, & visited the back ⇒ kept us interested, aware & made people toward back quieten down."
"Enthusiasm in the lecturer always helps to enthuse the students. You definitely succeeded here, Ove."
"Bloody good lecturer!"
"On lecture notes it would be better if the background wasn't black (its hard to draw in estra labels etc.).
"Terrific, superb, excellent, fun, humourous. Your great ."
“Strengths: Good sense of humour; Weaknesses: Just kidding. Great, very interesting espcially 'BIOBRAIN' gives interesting information stuff we can relate to, things we've seen, local species, etc."
"Copies of screens on the handouts are often too small to read and pictures to small to distinguish. (Otherwise OK!!)"
"Got on very well with the students. No improvement necessary."
"Maintained control of the class. Use of video material added variety & iinterest too the course (better than last Semester)."
"Throw noisy people out! Use of video, bioquest was fantastic. Video really put work on context and was 1000 times more interesting than lectures without slides, films etc. If you do Bioquest again, please repeat the answers given by the contestants. They spoke far too quietly to be understood. I really appreciated the effort put in, and it inspired me to do more work."
"Good lecturer. Interesting."
"The biggest problem was the lack of discipline of students with talking etc. Some early action over this would have been better than late remedies."
"Course is too difficult, labs too hard to follow. Lecturer is very competent. Lectures are not interesting, and the lab tutors should make things easier to understand."
"Very fun entertaining (and educational!) lectures. Handouts were great and the videos were good support material.
"Excellent!"
"Whilst the video on Tahiti was informative, I don't think Sir David Attenbourgh has anything to worry about!"
"You Rule."
"Great."
"Go the BioBrain."
"Ove is a legend."
"We love Ove We love Ove We love Ove Ove is Very Excellent."
"It is always a pleasure to attend Ove's lectures."
"These were the most enjoyable lectures in Bio 2 animals without a doubt."
"IT WAS REALLY GOOD!"
"At the end give a handout of all BioBrain questions (with answers) for study help."
"His spelling and Bald spot."
"The lecturer made everything interesting, the handouts helped us greatly by allowing us to listen to what he was saying instead of just rote writing whatever is on the boards & 'Bioquest' was a great idea, greatly reinforced what we learnt."
"Ove was a well organised lecturer and the handouts were v. good."

BIOLOGY 3
MARINE BIOLOGY MODULE
STUDENT EVALUATION OF TEACHING
DR O. HOEGH-GULDBERG

May 1995

Rating on scale 1-5:

- **1 Poor, very low or never**
- **2 Below average, low or infrequently**
- **3 Average**
- **4 Good, high or frequently**
- **5 Excellent, very high or almost always**

No. of Student Evaluations received: 25

Question No.	Statement	No. of Ratings on Scale				
		1	**2**	**3**	**4**	**5 (%4+5 of total)**
1	The lecturer was concerned about student learning			1	9	15 (96 %)
2	Lectures were well-prepared and organised				1	24 (100 %)
3	The lecturer provided clear handouts to accompany his lectures				7	18 (100 %)
4	The lecturer went out of his way to enliven the subject with supporting material (slides, films)				4	21 (100 %)
5	The lecturer made students feel welcome to ask questions and to seek help at times outside the lecture hours (e.d. during laboratories)			3	6	16 (88 %)
6	The lecturer increased your interest in the subject			1	8	16 (96 %)
7	The lecturer has good communication and teaching skills				4	21 (100 %)
8	How do you rate this lecturer among those you have experienced so far in your university career				4	21 (100 %)

GENERAL RATING: Average for all questions of the percent of category 4 (good, high or frequently) and 5 (excellent etc.) combined is 98 % of all students

Question 9

8 students did not answer this question

Please add any other comments about the course and the lecturer in the space below. In this space you may wish to indicate added strengths and weaknesses of the lecturer, and any ways that you could see the part of the course being improved.

"Ove's lecturing style is excellent - very enjoyable & easy to follow. Having all the slides as handouts means that you can really listen & not have to frantically write everything down."
"Handouts were excellent but some were a bit difficult to read."
"Handouts are great → can concentrate on what you are saying B not getting notes written down. You're a legend, Ove! (and a movie Star)."
"The end of each lecture was *always* very rushed →maybe less info. per lecture would fix this."
"Not all slides reproduced well on handout sheets."
"Your great Ove!"

"Computer presentation of slides and handouts were very helpful. - Most interesting subject matter from the last 3 yrs!!"
"Great having all notes, slides handed out so we could really listen to Ove."
"The lectures, topic and lecturer were all excellent! However, he should be provided with a lightweight pointer, to prevent him mennacing students."
"Need more time to look at this subject matter i.e. less time for algae →due to interest in animal biology, → Need to be able to choose between zoo & algae section."
"We should have longer than 3 weeks to do the animals part of the aquatic option, or be able to choose just animals and not do any plants. I's unfare to have done 6 weeks of algae and only 3 weeks of animals when most of the class are animals students and much more interested in zoology."
"After being interested by these lectures it's a pity we couldn't study it in a bit more detail."
"Can (unlike most) relate to us + has a sense of humour."
"Sensational."
"This course is the most interesting so far - Ove's bit; it's just so well organized!!"
"At least he is prepared to play football with the students at particular University field trips."
"Spend more time on this elective in course over others."

BIOLOGY 3
MARINE BIOLOGY
STUDENT EVALUATION OF TEACHING
DR O. HOEGH-GULDBERG

May 1996

Rating on scale 1-5:

1	**Poor, very low or never**
2	**Below average, low or infrequently**
3	**Average**
4	**Good, high or frequently**
5	**Excellent, very high or almost always**

No. of Student Evaluations received: 24

Question No.	Statement	No. of Ratings on Scale				
		1	**2**	**3**	**4**	**5 (%4,5 of total)**
1*	The lecturer was concerned about student learning				2	21 (100 %)
2*	Lectures were well-prepared and organised				1	22 (100 %)
3*	The lecturer provided clear handouts to accompany his lectures				1	22 (100 %)
4*	The lecturer went out of his way to enliven the subject with supporting material (slides, films)				2	21 (100 %)
5*	The lecturer made students feel welcome to ask questions and to seek help at times outside the lecture hours (e.d. during laboratories)			1	2	20 (97 %)
6*	The lecturer increased your interest in the subject			1	4	18 (97 %)
7*	The lecturer has good communication and teaching skills				3	20 (100 %)
8†	How do you rate this lecturer among those you have experienced so far in your university career				2	20 (100 %)

* 1 reply did not give a rating
† 2 replies did not give ratings

GENERAL RATING: Average for all questions of the percent of category 4 (good, high or frequently) and 5 (excellent etc.) combined is 99 % of all students

Question 9

8 students did not reply to any part of this question.

Please add any other comments about the course and the lecturer in the space below. In this space you may wish to indicate added strengths and weaknesses of the lecturer, and any ways that you could see this part of the course being improved.

Lectures	Field Trip	Laboratory/Excursion
Really I enjoyed Ove's teaching & sense of humor.	It was a lot of fun!	
Excellent	More crumpets	Much better than algae
Desk lamps	Fun	Good

Interesting	Good	Good idea to go to Oceanworld
Always enjoyable	It was very interesting and fun.	
Photocopied notes were good,, however in some cases the pictures in the notes were too small, so did not complement the notes as intended.	Great fun	
Not too bad!! (ex. for the mobile phone)	Jervis Bay Great Fun	
Excellent	Very Good but could be a little earlier in the year	
	Excellent. Could have been longer	Was good for a change
	Excellent	Excellent

BIOLOGY 3
CELLULAR, MOLECULAR & SYSTEMS PHYSIOLOGY
CORE AND ANIMAL PHYSIOLOGY MODULE
STUDENT EVALUATION OF TEACHING
DR O. HOEGH-GULDBERG

Semester 2, September 1995

Rating on scale 1-5:

1	**Poor, very low or never**
2	**Below average, low or infrequently**
3	**Average**
4	**Good, high or frequently**
5	**Excellent, very high or almost always**

No. of Student Evaluations received: 28

Question No.	Statement	No. of Ratings on Scale				
		1	**2**	**3**	**4**	**5 (%4,5 of total)**
1	The lecturer was concerned about student learning		1	1	6	20 (93 %)
2	Lectures were well-prepared and organised				7	21 (100 %)
3	The lecturer provided clear handouts to accompany his lectures				2	26 (100 %)
4†	The lecturer went out of his way to enliven the subject with supporting material (slides, films)			4	8	15 (86 %)
5	The lecturer made students feel welcome to ask questions and to seek help at times outside the lecture hours (e.d. during laboratories)				11	17 (100 %)
6	The lecturer increased your interest in the subject		1	9	14	4 (64 %)
7	The lecturer has good communication and teaching skills			2	8	18 (93 %)
8†	How do you rate this lecturer among those you have experienced so far in your university career				7	20 (100 %)

†1 reply did not give a rating

GENERAL RATING: Average for all questions of the percent of category 4 (good, high or frequently) and 5 (excellent etc.) combined is 92 % of all students

Question 9

Please add any other comments about the course and the lecturer in the space below. In this space you may wish to indicate added strengths and weaknesses of the lecturer, and any ways that you could see this part of the course being improved.
15 students did not reply to this question.

"One of the most approachable lecturers. Quite willing to help with any problems."
"More videos, esp about Antartica!"
"Ove is always approachable and human".
"It is refreshing to be taught by someone who not only cares for the students but also has such a vast knowledge of the material he is teaching."
"Using overhead computer type "thingies" is a useful method of teaching but does provide more restricted potential for explanations, i.e.may only be explained in one way".

"Ove has a bright personality which makes him good to deal with and to be taught by . Other lecturers appear to take great pleasure in pointing out the shortcomings of some students in front of their peers. Ove does not do this."
"Spoke at the right speed. Good notes for the lectures were given out."
"You're a legend Ove."
"It isn't broken so don't fix it."
"Lecturer is approachable, and lectures well"

I have received other forms of feedback on my teaching from other colleagues and from the staff-student liaison committee meeting. I have been commended by students and staff in several of these meetings (see example in Appendix 14).

B. Reflection on the results of student evaluation

Student evaluations are essential to effective teaching and as stated above, I place a lot of importance to finding out how students view an area of study prior to and during the teaching of a course. The feedback from the teaching evaluations has been also been useful in assessing the effectiveness of my teaching practice. In response to my evaluations, I have modified my techniques and approaches to teaching many times. The number of examples and the extent of the process is very long and cannot be recanted here. I shall give the example of how my handouts have evolved in response to student evaluations. One of the practices that I bought from the USA was that of handing out all diagrams used in a lecture as handouts. This was primarily done so that students would not be distracted by the effort to draw diagrams given in lecture. Originally, I deliberately left all labeling off the diagrams so that students would have to think about the handout material and add the necessary labels themselves. However, I received the comment so regularly from students that they would prefer to have the handout diagrams labeled that I now hand out labeled diagrams. Students had consistently complained that this practice led to a greater confusion and anxiety rather than learning. Further feedback from students also lead to a new approach to handouts. Students comments lead me to understand the importance of reducing the amount of transcribing that needs to occur within a lecture. I now give out all material that I present during lectures (including visuals except video). I leave space around each handout slide (see example in Appendix 2) so that students can record short notes to remind themselves of relevant comments that I might have made. This type of handout has been received favorably by the students and I believe that student comprehension based on inspecting exam results between years has improved dramatically. My next step is to improve on the access of students to all lecture materials (including video) and am currently exploring ways to use the WWW for delivering all materials and in promoting further learning through WWW links (see: www.bio.usyd.edu.au/LEARN/).

In addition to the formal collection instrument at the end of a course, I also monitor student responses a course proceeds. This is essential if one is to respond to student needs during a course. Although some students may "say what you want to hear", I pretext all of these discussions with the plea for complete honesty as ultimately this type of answer will ultimately benefit the student etc. Given that I have developed the usual level of trust with the students, I tend (I believe) to accurate feedback (i.e. it is not favourable on some issues). This, when the "say what you want to hear" factor is accounted for, is one of the most valuable types of input that I know for monitoring student understanding and allowing one to respond to student learning progress. I feel it is an absolute requirement of serious attempt to teach.

C. Comment from Head of Department

Please see attached letter and comments from Professor D. J. Patterson.

D. Availability to students for consultation, advice and feedback.

I teach with both an open door policy with students in addition to having with scheduled office hours each week. The "drop in when you can" idea breaks down the student-staff barrier,

improves student confidence and promotes the idea that learning has dimensions above and beyond the lecture hall. In planning a course, I feel that student contact during laboratory and discussion sections is essential for encouraging student-staff dialogue. Discussion sections are especially important in helping break down the barrier between lecturer and student, and tend to promote exchanges that lead to the development of the student's understanding. Advice and consultation does get left at the door of the lecture hall. I stress during lectures that lectures should be more like conversations as opposed to monologues and actively encourage students to interrupt a lecture at any point and engage me in questions concerning the topic. I find this a very successful way of drawing students into the process of learning.

4. Scholarship in teaching.

A. Participation in professional development activities

Teaching course (UCLA, Los Angeles, 1983-85)

During my post-graduate training at UCLA, I was both a teaching assistant (1985-87) and teaching associate (1987-89). To qualify for teaching at UCLA in these capacities, I was required to attend a semester-long workshop/course on teaching methods (1983). This course involved instruction by world-class experts in teaching methods and was extremely useful in developing my current teaching style. I was invited (and accepted) to help teach the workshop/course on teaching methods in 1984 and 1985 (as a teaching assistant).

Seminars and workshops on the use of Multimedia in teaching.

My interest in the use of multimedia in teaching has attracted invitations to participate in workshops and courses in the use of new technologies in teaching. Three examples of lectures or presentations that I have given are listed below:

"Multimedia in teaching: Bringing life to Biology."
Faculty's Information Technology and Science Teaching
Day for high school teachers (Mar 12, 1996)

"Light, colour and sound: new avenues for teaching senior biology."
Uniserve.science Information Technology Fest (Jun 11, 1996)

"Using the Web for teaching: experiences from the coal face"
School of Biological Sciences, initiatives in teaching seminar (Jun 17, 1996)

Training staff in the writing and publishing on the World Wide Web

As stated before, I am very interested in developing aspects like the Internet for use in teaching. Since my initial exposure to the World Wide Web in late 1994, I reorganised and have been instrumental in developing the current School of Biological Sciences URL: http://www.bio.usyd.edu.au/SOBS/). As part of this exercise, I trained two staff members (Ms. Brigid McKay and Mr. Mick Finn) to facilitate entries to the School World Wide Web site. This has spawned large numbers of projects by other staff members (e.g. teaching development in Biology 2).

I have a number of teaching development projects underway at the URL: www.bio.usyd.edu.au/LEARN.

B. Contribution to the literature on teaching

Reviews of CD ROMs intended for use in Biology education

I have contributed to literature on teaching in a number of ways. As a reviewer of biological software for Uniserve.science based at the University of Sydney, I have contributed four reviews of interactive CD ROMs intended for educational use. These are:

1. Review for exploring lake Illuca (Article, "Lake ecology while keeping your feet dry", Volume 1, Uniserve.science)

2. Review of Coral Kingdom, by Digital Suite (Uniserve.science review for database)

3. Review of "Jean-Michel Cousteau's World: Cities Under the Sea" by Enteractive (Uniserve.science review for database)

4. I have also contributed a 2 page review of the potential educational value of the "Oceans" CD ROM by Microsoft. This was published in the Autumn issue of Communique' (1995).

I have also contributed an abstract (**"Light, colour and sound: new avenues for teaching senior biology."**) for the Uniserve.science Information Technology Fest (Jun 11, 1996)

I have also been involved in the production of a book used in teaching (P. S. Nobel, Physico-Chemical Plant Ecology). I was a proof reader and contributed some of the biophysics problems that appear in the latest edition (Appendix 6).

C. Impact of research activities on teaching.

My research program plays an important part of teaching at all levels. I deliberately bring examples and research directions into my undergraduate courses. Primarily this is to provide relevance and interest, but also functions to demonstrate the changing nature of knowledge in the biological sciences. I find that undergraduates often have a mistaken sense that the information found in biology textbooks is immutable. One has to gently change this, with the obviously caution that students don't end up mistrusting all information. Examples from my research program serve well to guide students to a balanced view of current biological concepts and knowledge.

Research plays a obvious key role in postgraduate education in the biological sciences. My research program and postgraduate research training are intertwined. Postgraduate training opportunities have arisen either directly as a result of my fund raising efforts (e.g. I was wrote a successful application for a APRA, Industry scholarship) or indirectly, via my ARC grants. I have been directly responsible for raising 1 million dollars ($1,013,000) for teaching and research since arriving at the University of Sydney in 1992,. In addition to funding primary research, this funding has been used to develop new teaching modules, to establish teaching facilities (e.g. biochemistry building on One Tree Island; I have been the director of this important postgraduate

research facility since 1992) and has been used to support postgraduate students research training. The details of this funding is listed in Appendix 8.

I have been seriously involved in developing opportunities for postgraduate research training at a national level. Early in 1995, I instigated and developed of the Coral Reef Research Institute (CRRI) whose function is to promote the importance of research training (see early brochure, Appendix 15). This institute was launched nationally at the Australian Marine Sciences Association meeting in July 1995 (see newspaper articles, Appendix 15). The CRRI now involves all the major universities and museums involved in coral reef research (University of Sydney, University of Queensland, James Cook University of North Queensland, Central Queensland University, Australian Museum) and has major links to the Great Barrier Reef Marine Park Authority and the Australian Institute of Marine Science.

Since being launched, the Coral Reef Research Institute has developed a strategic plan for developing postgraduate research opportunities in reef sciences through partnerships with government, public and private corporations. I am currently the Director of the institute. The CRRI also includes prominent scientists and scholars, among which are Sir David Attenborough and Robyn Williams. Professor Frank Talbot, ex-head of the Smithsonian Museum of Natural History and chairman of the steering committee for the new institute. The research stations that are located up and down the Great Barrier Reef are key elements in the effort to understand how to successfully manage coral reef habitats, both in Australia and overseas. These research stations are vital parts of the infrastructure needed to do research and to train the next generation of reef scientists. The CRRI currently represents all the major research stations on the Great Barrier Reef (Lizard, Orpheus, Heron and One Tree Islands). The CRRI currently has four more stations designated for development as part of its strategic plan.

The CRRI has already been successful in attracting Ph.D. scholarships to the achieve its aims. In May, this year, I got word that Mazda Australia was willing to put $60,000 into postgraduate scholarships for the CRRI (Appendix 16). This was based on a proposal I wrote late last year. The expected impact of the Coral Reef Research Institute on opportunities for postgraduate research opportunities is enormous.

D. Invitations to teach at other institutions

I have been invited to teach lectures and courses at a number of other institutions. In addition to more than 60 research orientated seminars I have given nationally and internationally, I have been invited to teach over the past 4 years in the following situations:

1. University of New South Wales (1994): Lecture on Australian tropical marine resources to Korean science teachers (UNSW)

2. Manly Oceanworld (1994): Short course (4 lectures) on marine organisms.

I have been invited to teach next year (July 1997) for three weeks in the summer program at the Oregon Institute of Marine Biology by Professor Richard Emlet. Professor Howard Choat (Head of Marine Biology at James Cook University) has also invited me to teach a postgraduate course on respirometry. The date for this course has yet to be set.

5. Peer evaluation

A. The Head of School, Professor Patterson, has collected comments and letters from a variety of sources (Appendix 1). Among these are several of my colleagues.

B. Referees:
See attached form.

6. Appendices

Appendix 1: Letters of support and peer evaluation of teaching.

Appendix 2: **Example of slides and handouts for the courses:** Biology 2, Marine Zoology (Biology 3) and Cell, molecular and systems physiology (Biology 3).

Appendix 3: **Additional teaching related initiatives.**

Details of other educational initiatives that I have been involved in while teaching at the University of Sydney.

1. Video: "One Tree Island: The key to saving the Great Barrier Reef "

This project represents a collaboration between the director-producer Mr. Soren Jensen, a script writer Matt Sullivan and myself (released in 1994; Copy in resources file).

2. Interactive CD-ROM: "One Tree Island: Research in action".

I have been involved in a project with a post-graduate student in science communication from Central Queensland University (Mr. Oliver Kern). This project is on-going and is planned for final production by the end of 1996. My role in this project has been in the design and provision of the resources necessary for the project. (Copy of project so far is available for inspection; Note: Professors Roger Tanner and Helen Beh have inspected a copy of the CD ROM, copy of CD ROM in resources files).

3. Antarctica: a virtual experience

This project is an extension of a film project I was involved with in Antarctica in 1990 and represents a team comprising film makers (Mr. John Weilley) , artists, technologists and scientists. It is aimed at bringing biological concepts about life in the polar regions into a virtual reality setting. (Project funding pending; see demonstration copy in resources file).

4. Documentary (Quantum: Question of Survival series).

The Quantum team (Director-Producer Dr. Richard Smith) came to One Tree Island and made a documentary on the ENCORE project. I was heavily involved in advising and providing material for the project (Copy not included but available for inspection).

5. NSW Scratchies: "Reef Treasures" series

*An addition public awareness program I developed was the **NSW Scratchies" ticket series "Reef Treasures".** I have instigated and wrote the proposal with Mr. Peter Stephenson for bringing education and awareness on a larger scale to the community. I did this via the provision of organising a series of photographs and captions for the NSW "Scratchies" ticket series in March 1996. This project saw the printing of **4 million tickets** and the distribution of information about the biology of coral reefs to a national audience (see examples of ticket in this Appendix). I am strong believer that universities must show this type of leadership in education with respect to the wider community (Copies in resource file).*

6. Involvement in print, television and radio media.

I have had considerable involvement in the general media. This is motivated by my desire for science education to be accessible to the general public. The following is list of some examples of my media involvement. I have run to campaigns (1994, 1995) on behalf of One Tree Island to raise public awareness of the importance of reef research. As part of the One Tree Island Appeal publicity campaign in 1994, for examples, I wrote press releases that appeared in 16 newspapers (including Sydney Morning Herald, Australian, Australian Magazine, Courier Mail, West Australian, Sun Herald Science Extra) and appeared in several television and Radio news and documentary programs.

The key radio and television programs from last 24 months are:

"Green and Practical": interview with Amanda Armstrong (Radio National)
4QR Brisbane: interview with Vicki Martin
5AD Adelaide: interview with Graham Guy
Today Show television: Interview with presenter
ABC television News: Interview with Alan Tate
ABC television Gladstone: Interview
ABC television Townsville: Interview
ABC television Rockhampton: Interview
ABC television Adelaide: Interview
ABC television Brisbane: Interview
Interview, ABC, Alan Williams
Sunshine coast television (7): Interview
"Totally Wild", television: Interview with Tim Bailey
Good Morning Australia: Interview
Talk to the Animals, documentary
Interview, ABC, Alan Williams
(Taped copies of television and radio interviews available if necessary)

I am currently running an public awareness campaign for the up-coming **First Internet Art Auction**. This is my latest idea for raising public awareness about coral reefs and the importance of basic research. The object of this media campaign is to raise awareness of the importance of research in contributing to our understanding of coral reef ecosystems.

Appendix 4: **Sample of article, contribution to public education.**
Newman, L. and Hoegh-Guldberg, O. (1995) "ENCORE, ENCORE", Australian Wildlife, Winter issue).

Appendix 5: **Educational exhibit on coral reefs and nutrient pollution** (Sydney Aquarium; from University news).

Appendix 6. **Indications from Nobel (1983, 87) of involvement in effective teaching of his book.**

Appendix 7: **Microsoft Network Kidz'n'Teens Learning Centre (sample of monthly contribution)**

Title: **Hey ant sister!**

Ever wondered about ants? Sure they get into the sugar bowl and some, like the "Bull-Joe" can hurt like crazy if they get to sting you. But do you know about their more fascinating side? Did you know for example that most ants are sisters and that the male ants are as rare as hen's teeth?

[Picture of hen with teeth]

Well, its true. Most (99%) of all the ants in an ant colony are sisters. What's more, female ants are more closely related to their sisters than their own children if they were to have them! This is quite the opposite to normal animals. You see, you (a normal type of animal) are more closely related to you parents (you have half your mother's or your father's genes) than to your brothers or sisters.

The reason for this situation are a bit complicated but the bottom line is that it makes sense for female ants to help their mothers produce more sisters than to produce their own children. This is why ant colonies exist. They are actually huge convents designed for the ants to keep producing more sisters! Only occasionally do they ever produce their own children and this is only if they are a queen ant.

The best way to understand ants is to get up close.

[magnifying glass then a picture of ant - detailing structure. Head, thorax, abdomen, jaws or mandibles, sting]

Ants are insects that are closely related to wasps. They have a head which is covered with sensory equipment (antennae), a thorax or middle segment and finally an abdomen. This is the part you need to be mindful of. It is here that some ants share a great similarity with the wasps. They have a sting!

[Picture of mandibles of ants - especially bull-joes - close up and fierce]
[Digitized footage of Bull ants are Jervis Bay]

Fortunately, most ants do not have a sting. It is probably best at this stage to treat them with caution. In fact, most ants are gentle animals that lead fascinating lifestyles. The best way to find out about ants is to make an ant city.

Making an ant city.

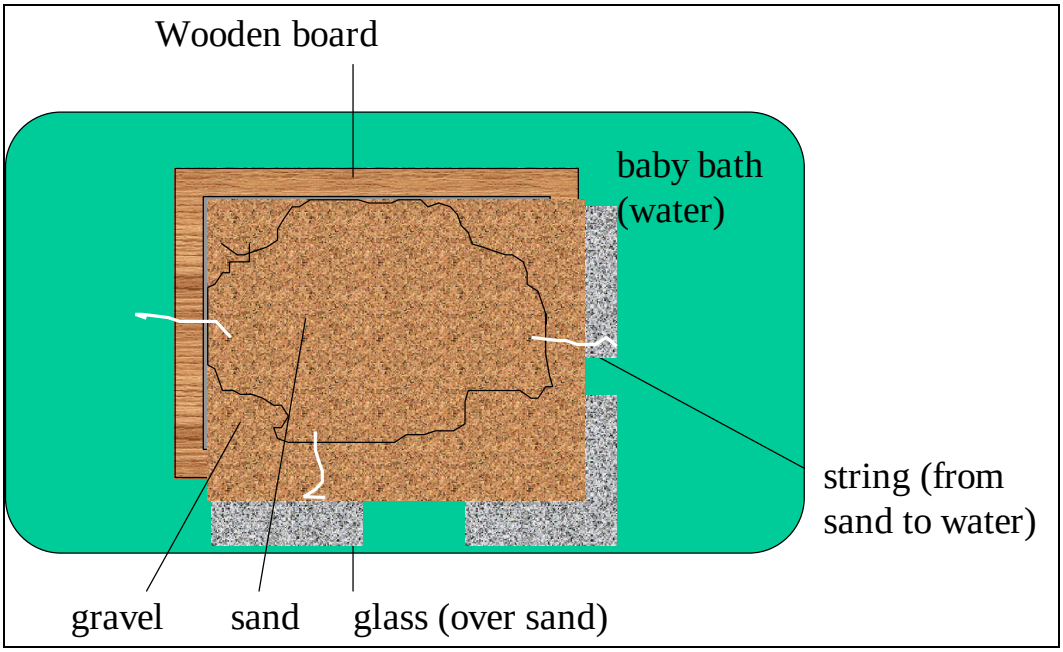
You can buy ant farms in the shops. However, it is much more fun to make your own which can be as simple or as complex as you wish. What you need are the following items:

An old baby bath or similar plastic tub
A piece of wooden board which just a bit smaller than the tub
A piece of thin glass that is 3 cm smaller in length and breadth as the

wooden board
A piece of black cloth that is also the same size as the board and the glass (= shade cloth).
A couple of bricks
A handful or two of clean fine sand
A handful of fine gravel (about 3 mm in diameter)
3 pieces of medium thickness string (3 x 20 cm long)

Fill the baby bath with a finger's depth of water. Place the two bricks in the water and place the wooden board on the bricks to make a small table surrounded by a mote of water. Make sure that the board is not touching the sides of the container. Add the fine sand to the middle of the board. Take the piece of glass and flatten the sand down until it is half a centimetre thick. Put the glass carefully aside and now place a small pile of the gravel in each corner. Use the glass to flatten the sand and gravel down until you have a sandwich of glass, sand/gravel and board. Leave a bit of a lip between the edge of the glass and the edge of the sand underneath. Now wet the pieces of string thoroughly and left up the edge of the glass and add the string so that connects the water to the sand. These will ensure that the sand remains moist over time. Now cover the glass with the shade cloth.

[Top view of ant city without the shade cloth]



Now to get some loyal subjects for your city. Ants live in colonies that may be found in a variety of locations. The location often depends in the species. Some ants such as the sugar ant like to live in moist sandy soils. Others like to live in rotting wood.

The best place to look for some ants for your colony is under and stones and logs that are in your garden. Put on some gardening gloves, and get mum or dad to go with you into the garden on an ant hunt. You will need to take a bottle (perhaps an old jar will do) and an old spoon. Carefully lift back a stone or log when you find it and see if you can find some ants. Look for the queen. This is the one you want. She will be double the size of the other ants and will usually be quick to disappear

back into the tunnels. Scoop the queen up and place her in your jar. Scoop about 20 or so workers and also place them in the jar. Now carefully return the stone to its original position. The colony that you have visited will produce a new queen (a special type of worker ant can do this) and will soon be back to normal (as long as you are gentle!).

Take your ants back to the ant city. Gently release them onto the edge of the board and let them wander about. Soon they will take cover under the edge of the glass. Within a few days, the ants will have begun to tunnel into the sand.

Right now you should add some food. Place a small piece of bread and some sugar solution (take some sugar and dissolve it into water) onto a bottle cap and place this on the edge of the piece of board supporting your colony. After a day or so, your ants will come out to feed. You should ensure that you keep the feeding bowl filled up. You can look at the secret like of your ants by lifting the edge of the black cloth. Be sure to put it back immediately afterwards.

You may have to leave your ant city alone for a few days while they get used to their new home. After a few weeks, the inhabitants of your ant city will have built extensive tunnels and will begin to lay eggs. To look for these, lift the shade cloth and look for tiny white specks in some of the chambers in the tunnels. These will develop into white ant-sized larvae and eventually pupae (the stage before the ant hatches out).

Always remember to put the shade cloth back into place, keep their food bowl full and to keep the mote full of water. I am pretty sure your dad and mum doesn't want to come home to your ants on the loose in the house!

(Ants on the loose picture - tell artist that I have done a draft)

Appendix 8: **List of grants that have contributed to postgraduate student education.**

1. **ARC (2 large combined, current):**
   The size and importance of intraspecific diversity in reef-building corals.
   Total budget over three years: $310,000
2. **ARC(small, current):**
   The biochemistry and physiology of the novel pigment pocilloporin.
   Total Budget $30,000 over three years
3. **CAUT (teaching development grant with Dr. M. B. Thompson, current**)
   Raising the dead: interactive solutions to teaching comparative zoology.
   (1996)
4. **APRA-I with the Sydney Waterboard (current)**
   APRA Funding for Ph.D. scholarship for Ms Cathy King.
   ($90,000, 4 years)
5. **Established Mazda doctoral scholarships (current).**
   ($60,000 for 1997-99)
6. **Established Ph.D. Scholarship in Coral Biology**
   ($48,000 for 1996 - 1998)
7. **ARC (large, finished):**
   The chemical identification of the translocation factor and exudation products of symbiotic zooxanthellae of a reef-building coral.
   Total Budget over three years: $150,000
8. **ARC (Mechanism C, finished):**
   The establishment of a biochemistry and postgraduate laboratory on One Tree Island
   Total Budget: $155,000
9. **ARC (small, finished):**
   The energetic cost of during embryonic and larval development in planktotrophic and lecithotrophic echinoids and asteroids.
   Total Budget over three years: $60,00
10. **Great Barrier Reef Marine Park Authority**
    ENCORE program: Three projects on clams and reef-building corals.
    Total budget over three years: $108,000

Appendix 9.**: List of recent publications and abstracts involving postgraduate and Honours students from Hoegh-Guldberg laboratory.**

1. Ambariyanto and Hoegh-Guldberg, O. (1996) The impact of elevated nutrient levels on the ultrastructure of zooxanthellae in the tissues of the giant clam *Tridacna maxima.* Mar. Biology 125:359-363.

2. Stewart, J. S. J. Kennelly and O. Hoegh-Guldberg (1996) Assessing reproductive maturity of the Balmain Bug Invert. Reproduction (in press).

3. Stewart, J., S.J. Kennelly, and O. Hoegh-Guldberg (1995) An optimal strategy for sampling oocytes in female Balmain Bugs (*Ibacus peronii*) (Decapoda: Scyllaridae). Invertebrate Reproduction and Development. 28: 7-11.

4. Takabayashi, M and Hoegh-Guldberg, O. (1995) Physiological and ecological differences between pink and brown genotypes of the reef-building coral, *Pocillopora damicornis.* Marine Biology 123:705-714

5. Gates, R. D., Hoegh-Guldberg, O., McFall-Ngai, M. N., K.L. Bil and Muscatine, L. (1995) Cnidarian "host factor" is a set of free amino acids. PNAS 92: 7430-7434

6. Dove, S., Takabayashi, M. and Hoegh-Guldberg, O. (1995) Isolation and partial characterisation of the pink and blue pigments of pocilloporid and acroporid corals. Biol. Bull. 189:288-297.

7. Moreno, G. and O. Hoegh-Guldberg (1993) The physiological effects of enrichment with phosphorus and nitrogen on the hermatypic coral *Pocillopora damicornis*. American Zoologist 33:21A (#87)

8. Matthews, S. and O. Hoegh-Guldberg, O. (1993) Host factor in the reef-building coral *Pocillopora damicornis*: fact or artefact? American Zoologist 33:21A (#86) King, C. K. and O. Hoegh-Guldberg (1993) The reproduction and development of the sea urchin *Centrostephanus rodgersii* - a potential bioassay organism. Proceedings of the Australian Marine Science Meetings (p 40), University of Melbourne.

9. King C.K., M. A. Byrne and O. Hoegh-Guldberg (1993) "Reproduction of *Centrostephanus rodgersii* in New South Wales." In: Echinoderms, Dijon, eds. B. David, J. P. Feral and M. Roux. A. A. Balcom, Rotterdam.

10. Ambariyanto and Hoegh-Guldberg O. 1995. Investigation on the long-term effect of inorganic nutrient enrichment in the field on giant clam. Australian Marine Sciences Association Annual Scientific Conference. University of Technology Sydney. 3rd-6th July 1995. Sydney NSW Australia.

11. Ambariyanto and Hoegh-Guldberg O. 1995. Impact of external inorganic nutrients on giant clams and their zooxanthellae under field conditions. Australian Coral Reef Society National Conference. Southern Cross University, Lismore. 8th-9th July 1995. Lismore. NSW Australia.

12. Ambariyanto and Hoegh-Guldberg O. 1996. Ultrastructural Responses of Symbiotic Zooxanthellae to Nutrient Enrichment. MicroCosmopolitan ACEM-14, IUMAS- 1 Conference. G. Cox (ed). Australian Society for Electron Microscopy Inc.5th- 9th February 1996. Sydney. NSW. Australia (poster).

13. King, C.K. (1995) Proceedings: The 2nd Annual Australasian Society for Ecotoxicology Conference Effects of copper on the early life history stages of the Sydney Rock Oyster, *Saccostrea commercialis*, and development of a routine larval toxicity test. Chapman, J.C. Australasian Society for Ecotoxicology 1995 p 20.

14. Moreno, G., Hoegh-Guldberg, O., Byrne, M. (1995) Energetics of development of asteroid larvae (*Patiriella*)^Invertebrate reproduction and development Santa Cruz, CA, USA

15. Moreno, G, Hoegh-Guldberg, O, Byrne, M (1995) Energetics of development of asteroid larvae (*Patiriella*), Larval Biology Meetings, Harbor Branch, FLA, USA

16. Moreno, G, Hoegh-Guldberg, O. Byrne, M (1995) Energetics of development of asteroid larvae (*Patiriella*), Hopkins Marine Station, CA, USA

17. Dove, S., M. Takabayashi and O. Hoegh-Guldberg (June,1995) Isolation and partial characterization of the pink and blue pigments of Pocilloporid and Acroporid corals, Australian Marine Sciences Association Annual Scientific Conference University of Technology, Sydney

18. Takabayashi, M. Dove, S. and Hoegh-Guldberg, O. (July 1995) Intermorphic variations between the two colour morphs of Pocillopora damicornis found at One Tree Island, Great Barrier Reef National Conference of Australian Coral Reef Society Southern Cross University

Appendix 10: **Example of teaching evaluation form.**

Introductory Marine Science
Student evaluation of teaching
Dr. O. Hoegh-Guldberg

Date: July-Aug 1995

Please indicate how true the following is on a scale of 1 to 5. Use the following as a guide:

1	Poor, very low or never
2	Below average, low or infrequently
3	Average
4	Good, high or frequently
5	Excellent, very high or almost always

1. The lecturer was concerned about student learning.

2. Lectures were well-prepared and organised.

3. The lecturer provided clear handouts to accompany his lectures.

4. The lecturer went out of his way to enliven the subject with supporting material (slides, films).

5. The lecturer made students feel welcome to ask questions and to seek help at times outside the lecture hours (e.g. during laboratories).

6. The lecturer increased your interest in the subject.

7. The lecturer has good communication and teaching skills.

8. How do you rate this lecturer among those you have experienced so far in your university career?

Please add any other comments about the course and the lecturer in the space below. In this space you may wish to indicate added strengths and weaknesses of the lecturer, and any ways that you could see this part of the course being improved:

Appendix 11: **Example of new technologies evaluation form (short version).**

And about this new teaching technology ...

Please provide input on the following questions. Use the following as a guide:

1	Disagree
2	Mildly disagree
3	Don't know
4	Agree
5	Strongly agree

1. Do you feel that your capacity to learn was increased by the inclusion of audio-visual and computer support during the lectures?

2. Were the handouts effective and did they help you follow and comprehend the lecture material?

3. Are images, video and computer graphics/animations important to the effectiveness of a lecture and would you recommend leaving these components in as part of the lecture series?

4. What component of these lectures did you particularly like?

5. Do you have any suggestions for improving this section of the course?

Appendix 12: Evaluations of the use of new technologies in Biology 2 and 3 (1995).

BIOLOGY 2
STUDENT EVALUATION OF NEW TECHNOLOGY
DR O. HOEGH-GULDBERG

July-August 1995

"And about this new teaching technology....."

Provide input on the following questions. Use the following as a guide:

1. **Disagree**
2. **Mildly disagree**
3. **Don't know**
4. **Agree**
5. **Strongly agree**

No. of Student Evaluations received: 80

Question No.	Statement	Rating on Scale				
		1	**2**	**3**	**4**	**5**
1*	Do you feel that your capacity to learn was increased by the inclusion of audio-visual and computer support during the lectures?		1	4	32	41
2§	Were the handouts effective and did they help you follow and comprehend the lecture material?			2	36	39
3†	Are images, video and computer graphics/animations important to the effectiveness of a lecture and would you recommend leaving these components in as part of a lecture series?	2		2	14	55

*2 Returns did not give any ratings for question 1
♣3 Returns did not give any ratings for question 2
†7 Returns did not give any ratings for question 3

Question 4: What component of these lectures did you particularly like?

Videos/films/movies (mentioned in 33 replies).
Biobrain/Bioquest (mentioned in 29 replies)
"I liked the filmed stuff in particular and the interaction with the lecturer through Bioquest - opportunity to ask questions. Also he's really funny. Like his personality."
"The Bioquest is good. Gives you ideas of the level of knowledge needed."
"Bioquest, videos, the lot." "Water camera." "Graphics, videos and visual aids."
"Ove and Bioquest." "All." "All of it." "Participation." "Emphasis on participation."
"The handouts were what appeared on the screen, with pictures and information to refer to."
"Incorporation of films (sex on the Reef was groovy!!) and graphics gives a better picture of difficult concepts on locomotion, feeding, etc."
"Bioquest was a thoughtful inclusion."
"Ove." "Ove's component." "Especially Ove in Tahiti." (mentioned twice.)
"Able to see it in real life." "Pretty pictures." "Enjoyed the Audio visuals, etc."

"The ability to display photographic images with text was very helpful. Accompanying handouts v. useful. Biobrain was a brilliant idea - esp. for maintaining interest. Home video was some classic light relief."
"Handouts were too wordy. Bioquest was excellent revision and gave a good indication of likely exam format - very useful."
"The use of pictures & photos to actually see what the organisms are. I think Bioquest gave an incentive for some to try and remember lecture content more."
"Use of videos amongst the stills to show living, moving organisms in their habitat."
"Computer support."
"Videos - although some went for only 30 s or so, they were much better than black white pictures. Notes that supported the computer graphics."
"Reproduction in the sea."
"Video material, clear synopsis of points, pictures of organisms."
"Actually breaking up the lecture - having time out for the bioquiz and film - adding variety."
"The videos and the fact that the lectures are given to us - so we have time to listen and comprehend."
"The prac work was OK. The discussion groups were BORING. BIOQUEST broke the monotony. Loved it."
"Videos, visuals, biobrain quiz - just something to break the monotony of phylogenetics."
"The handouts complemented with computer was very effective."
"Bioquest - amusing but educational."
"Bioquest: Jenni rules supreme."
"The hand-outs and audio-visual guides esp. "Bioquest" as well.
"Being able to see what was being talked about - helps to remember it."
"It was well organised - The only problem was the lecturer basically read out the notes - good if you wanted to tune out or not turn up - bad for learning. I did not like time wasted on the quiz."

Question 5. Do you have any suggestions for improving this section of the course?

24 replies received saying "No".
"This set of lectures was the best I've ever been to."
"Make sure that the colours used on the computer overheads, in the writing, are able to be reproduced on the handouts - in many of the handouts the writing did not turn out - otherwise everything was perfect."
"Sometimes the words/pictures on the handouts were not clear. This should be improved. Sometimes video etc. didn't work."
"Smaller classes." "Quite well presented." "It was a delight."
"Fine the way it is. Very effective."
"Excellent / Terrific."
"Minimising information that is too complex and unnecessary. Videos good idea. Quiet and interesting. You can concentrate. It was fine the way it was. Best lecturer (from any course) yet!!!
"It unreal."
"It was the best, of a bunch that consists solely of Invertebrates. Invertebrates are boring. These ones are, at least, a little interesting."
"Out of all parrot phyla learning, this was the best."
"Yeah, keep Ove for this series."
"Increase the "Ove" factor."
"Find a better way to copy the pictures onto the handouts (most were too dark)."
"Improve quality of handouts." "Use a dictionary."
"No, keep it as it is, it's great."
"Loose the bioquiz each lecture. It tended to waste at least 20 minutes were A.V. material could have been more widely used."

BIOLOGY 3
CELLULAR, MOLECULAR & SYSTEMS PHYSIOLOGY
CORE AND ANIMAL PHYSIOLOGY MODULE
STUDENT EVALUATION OF NEW TECHNOLOGY
DR O. HOEGH-GULDBERG

Semester 2, September 1995

And about this new teaching technology.....

Provide input on the following questions. Use the following as a guide:

1. **Disagree**
2. **Mildly disagree**
3. **Don't know**
4. **Agree**
5. **Strongly agree**

No. of Student Evaluations received: 28

Question No.	Statement	No. of Ratings on Scale				
		1	**2**	**3**	**4**	**5**
1	Do you feel that your capacity to learn was increased by the inclusion of audio-visual and computer support during the lectures?	2	1	1	13	11
2*	Were the handouts effective and did they help you follow and comprehend the lecture material?		1	1	10	14
3†	Are images, video and computer graphics/animations important to the effectiveness of a lecture and would you recommend leaving these components in as part of a lecture series?	1			13	10

* 2 replies did not give ratings for question 2
† 4 replies did not give ratings for question 3

Question 3 Are images, video and computer graphics/animations important to the effectiveness of a lecture and would you recommend leaving these components in as part of the lecture series?

The majority of students did not give a written answer to this question. Answers supplied were:

"This component was essential. Some of the concepts discussed were difficult to understand, sharing this technology increased learning."
"Many of the graphics/animations are good but the basic lecture stuff is better presented traditionally."
"Yes but as more of a supplement."
"Leave it in."
"Yes for sure. The inclusion of these things make the lecture more than a talking session. Also makes the lecturer seem more keen to bring important aspects across (HINT!!)."

Question 4 What component of these lectures did you particularly like?

10 students did not reply to this question.

"Antarctic video" mentioned twice.
"All really interesting".
"Not having to scribble notes but being able to concentrate on the material presented".
"Handouts of lecture material made following lectures that much easier."
"Frog muscle stimulus."
"Not much of the material interested me, it was far too much Maths & Physics but b/c of the lecturer and nice presentation of the material it was bearable but still mostly uninteresting to me personally."
"The fact that you did not waste time writing everything the lecturer said because of the handouts and for a change you get to *listen*. Not that writing everything they say down is not useful but you miss out on the understanding."
"The subject matter."
"Ove is good."
"I didn't really like the content of the lectures at first, but then gradually liked them as understanding of equation and stuff became more apparent."
"Not having to struggle to write and keep up - its good to be able to think about what's being said rather than concentrate on writing everything."
"All." "Lecture on Antarctica." "Handouts." mentioned twice.
"All of it." "Graphics, movies, etc."

Question 5.

Do you have any suggestions for improving this section of the course?

15 students did not reply to this question.

"More assessment or greater assessment on work throughout the year with reduced % allocated for exams."
"More examples of how processes relate to whole animal function."
"More emphasis should be given to an overview of all the physiological functions in the (whole) animal."
"Ove should have more prac's in his component."
"Reduce amt lecture material, it was rushed b/c it seemed that we had the lecture notes ∴ we could learn it later. Nature of the material needs more time and explanation to those who struggle with Maths/Physics."
"It's good."
"Maybe more detailed explanations in the lecture notes handed out."
"No not really. To understand physiology you need to know this information."
"Graphics are sometimes hard to see - sometimes photographic slides are better (i.e. through a projector)."
"No." "Proof read your lectures."
"Using the technology less. I think students tend to tune out when they have all the notes in front of them. A lecturer talking only makes you pay attention and concentrate more."
"Don't do as many equations etc."

Appendix 13. **Summary of teaching evaluations from 1992 and 1993 (raw data available on request).**

The statements (and the average response of all students from all courses) which students were asked to rate were as follows:

1. Statement (S:1, Table 1): ***The lecturer was concerned about student learning.***
   Average for 6 courses = 95% of students indicated frequently/always.

2. Statement (S:2, Table 1): ***The lectures were well-prepared and organized***
   Average for 6 courses = 96% of students indicated frequently/always.

3. Statement (S:3, Table 1): ***The lecturer provided clear handouts to accompany his lectures***.
   Average for 6 courses = 88% of students indicated frequently/always.

4. Statement (S:4, Table 1): ***The lecturer went out of his way to enliven the subject with supporting material (e.g. slides, films***)
   Average for 6 courses = 99% of students indicated frequently/always).

5. Statement (S:5, Table 1): ***Students feel welcome to ask questions and to seek help at times outside lecture hours***.
   Average for 6 courses = 90% of students indicated frequently/always.

6. Statement (S:6, Table 1): ***The lecturer increased your interest in the course subject area.***
   Average for 6 courses = 88% of students indicated frequently/always.

7. Statement (S:7, Table 1): ***The lecturer has good communication and teaching skills.***
   Average for 6 courses = 97% of students indicated very good/excellent

8. Statement (S:8, Table 1): ***How do you rate this lecturer among those you have experienced in your university career so far?***
   Average for 6 courses = 99% of students indicated very good/excellent.

Table 1: Individual course evaluation summaries. Percent of students that responded with answer that lecture or lecturer (Hoegh-Guldberg) rated above average (categories good, excellent). Please consult Appendix 2 for further details. Actual raw data (forms) available on request.

	Number of students	S:1	S:2	S:3	S:4	S:5	S:6	S:7	S:8
Biology 2 (animals)									
1992	94	94 %	98 %	82 %	98 %	89 %	89 %	95 %	96 %
1993	87	93 %	94 %	83 %	100 %	90 %	87 %	94 %	98 %
Introductory Marine Science (yr 2)									
1992	80	91 %	94 %	96 %	100 %	84 %	94 %	98 %	98 %
1993	94	90 %	93 %	84 %	95 %	82 %	86 %	97 %	100 %
Marine Zoology		S: 1	S: 2	S: 3	S: 4	S: 5	S: 6	S: 7	S: 8
1993	24	100 %	100 %	96 %	100 %	100 %	92 %	100 %	100 %
Animal Physiology									

1993	22	100 %	95 %	n/a	n/a	95 %	77 %	100 %	100 %

Biology 2 (animals): 1993

a. I can't think of anyone else that could make peanut worms and starfish interesting.
b. Keep up the good work.
c. Ove is one of the best of all the zoology lecturers. The others are not as enthusiastic as well.
d. The lecturer were easy to follow and well-organised. The only weakness was that the handouts should have been labeled before being handed out.
e. Excellent!
f. Above average
g. Much better than the other biology lecturers we've had. Didn't just spin off a whole lot of points regarding phyla, classes, orders, etc. Covering ecological importance was a good idea (no other lecturers did). Sometimes a little fast (lectures) but mostly at a good pace.
h. Basically the same as Marine Sciences ... you should think about being a television personality.
i. Keep making it funny and interesting.
j. Slow down a little
k. Remember to turn up lights when we're writing. More funny stories to liven up the lectures.
l. Interesting anecdotes and exciting visual aids illuminated an already stimulating and wonderful lecture series.
m. Up there with my first mathematics lecturer, one of the best. I wish the other lecturers could be as easy-going as yourself.
n. His lectures were always very energetic, he involved everyone in the lecture theatre, was interesting and easy to follow. I would love to have him again.
o. I extremely enjoyed his lectures.
p. The lecturer appeared to be very interested in what the students found difficult. He seemed to fit in well and appeared as someone you could talk to if you had any problems.
q. Something's in the handouts were not referred to in lectures. Otherwise everything was great.
r. Sometimes lost track because he lectured too fast.
s. Handouts needed labeling or it was needed to be made clearer what was where in lecture. A few more notes or definitions were needed to be written on the board.
t. He has the ability to make potentially boring lectures far more interesting.
u. Keep still when lecturing. It is very distracting when you pace up and down the lecture room.
v. Ove is a legend, best lecturer I've ever had for Biology, makes such a difference to this course. Ove, you are a great person all round. I'm glad you were our supervisor on the field trip!!
w. Fantastic! Great on field trip also!
x. He manages to make the lectures seem interesting.
y. Humourous, informative, not condescending, cool lecturer.
z. The guest speaker was an excellent idea.
aa. It was good to have a lecturer who knew his stuff and was able to communicate what he wanted us to know.
ab. The only decent lecturer so far.
ac. Good idea to have guest speaker.
ad. Very enthusiastic, encouraging.
ae. Not enough handouts printed.
af. More descriptive handouts.
ag. One of the best. This lecturers style emphasizes the relevance of subject matter (placed in context) is helpful by contrast with many lecturers listing of information in the precise form seen in the textbook. Inclusion of own and recent research shows that this is not simply a subject of textbooks but is continuing to be of interest.
ah. Overall a very good lecturer. Pracs tend to be boring at times.

ai. More structure and consistency of structure across lecturers, phyla and classes. Handouts with good labeling and an order that reflects the lecture.
aj. The only problem I see is the speed at which we go through information. Other tahn that, Ove was a good lecturer.
ak. He provided some very amusing anecdotes that increased student interest, and gave ideas to the practical-use our knowledge could be put towards.
al. The best lecturer we've had so far, makes boring topics e.g. sea cucumbers interesting.

Introductory Marine Science: 1993

a. Lecturer was very good, material made very interesting, very stimulating. Improve course by extending number of Ove's lectures.
b. Very energetic and enthusiastic, very easy to understand, I wish more lecturers tried as hard as he does to make sure students learn the proper material.
c. Great lecturing technique but a little difficult to take notes from.
d. He makes the course extremely interesting.
e. Fun, enjoyable
f. Good!
g. You are as good on the ABC as you are in lectures!!
h. Excellent
i. Ove makes his lectures very interesting and tells great stories!!!
j. Makes lectures interesting by stories etc.
k. If you could slow down a bit it would be good. Personality makes lectures more enjoyable.
l. More descriptive handouts.
m. Ove is great. We love Ove. Ove for PM.
n. Please add more lecturers like Ove.
n. Great lecturer especially in comparison to the two we had last semester. Ove is a legend.
o. Good lecturer, helps that material interesting cf 1st semester.
p. Lecturer was very dynamic and full of energy. His excitement over the work is contagious and I found myself compelled to interested.
q. Best surf science lecturer so far.
r. This part of the course is a bit dry, but Ove makes it the most interesting. Ove is the best lecturer in the whole entire world. Ove is a god.
s. Jolly good show.
t. Great handouts. Helpful for keeping notes in order. Great sea urchin slide!
u. Too much subject material covered in lectures.
v. Very entertaining - keeps students interested. Good voice. Well-organized, lectures easy to follow.
w. Extremely good. When talking keep still, stop pacing up and down lecture room. Makes it very difficult to keep watching you.
x. He is extremely enthusiastic.
y. Excellent!!

Appendix 14. Relevant excerpts from the minutes of student-staff liaison teaching

Appendix 15: Coral Reef Research Institute, brochure and University news article.

Appendix 16: Mazda Scholarships (text for poster)

MAZDA FOUNDATION DOCTORAL SCHOLARSHIP

Coral Reef Research Institute

Coral Reef Research Institute, in conjunction with the Mazda Foundation, is offering four three-year fellowship to Ph.D. students to support field work at One Tree Island, on the southern Great Barrier Reef.

Sponsorship

The Mazda Foundation sponsorship consists of four scholarships (Au$5000 per annum for three years) starting in 1997 and coinciding with the International Year of the Reef. The scholarships are intended to support students while at One Tree Island Research Station and will be for postgraduate research projects on the biology, geology and biochemistry of coral reefs. The sponsorship does not provide living expenses or salary.

Coral Reef Research Institute

The University of Sydney in association with Central Queensland University established the Coral Reef Research Institute (CRRI) in 1995. The vision of the CRRI is to enhance the conservation and good management of coral reefs through excellence in education and research.

One Tree Island

One Tree Island is located at the southern end of the Great Barrier Reef. The island and surrounding waters form a Scientific Zone within the Capricornia Section of the Great Barrier Reef Marine Park. One Tree Island Research Station has been supporting research into many aspects of biology, hydrology and geology of coral reef ecosystems since
its establishment in 1965.

The Station has recently upgraded its scientific research facilities and offers an air-conditioned biochemical laboratory space, a ‘wet’ laboratory with flow-through seawater aquaria, a ‘dry’ laboratory, boats, diving equipment and self-contained accommodation. These modern facilities and the special research only zoning of One

Tree Island and the associated reef system make One Tree Island Research Station a unique field station ideal for coral reef research.

Eligibility and Conditions of Award

The Mazda scholarships will be open to Ph.D. students studying at Australian Universities. Applicants will be judged entirely on their ability and the feasibility of their project. Consideration will be given to the quality of the supervision of their projects.

Successful recipient of the awards will make brief reports every 6 months (1 page) and more substantial reports at the end of each year as to their progress (6 pages).

Application

Application should include their Curriculum Vitae, proof of enrollment at an Australian university, a letter approving the project from the supervisor and signed by the head of department, names of two referees who may be contacted regarding the application and a research proposal. The research proposal should clearly outline the aims, methodology and budget. Six copies of the application should be sent to:

Dr. Ove Hoegh-Guldberg
the Director of Coral Reef Research Institute
Bldg A08 Biological Sciences
The University of Sydney NSW 2006

Closing Date: October 11 1996

Information

For further information regarding the details of the Mazda Foundation doctoral scholarships or the research facilities of One Tree Island Research Station, please contact the Director of Coral Reef Research Institute at the above address.