Archives

Abstracts of the Papers Presented at the 18th Biennial Conference of the AABE

The 18th Biennial Conference of the AABE was held from the 1st to 5th of August, 2000, at the Hong Kong Polytechnic University, Hong Kong SRA. The conference was organized by Professor P. L. Tang of the Hong Kong Polytechnic University. The main theme of the conference was "Biology Education in the New Millennium." There were three plenary lectures given by Professor T. P. Leung, Vice President of the Hong Kong Polytechnic University, by Dr. K. C. Pang, Deputy Director of the Hong Kong Institute of Education, and by a representative from WWF Hong Kong SAR. The Forum "Biology Education in Secondary Schools" chaired by Professor Y. S. Wong, Vice President of City University of Hong Kong, was held at the first day of the conference. In addition to 32 oral presentations and 22 poster presentations, two introductory talks for the mid-conference tour entitled "Hong Kong Country Parks and Nature Education" and "Hong Kong Marine Parks and Marine Reserve" were given by the officers (Mr. Y. N. Ngar and Mr. A. Kwok) from the Agriculture, Fisheries and Conservation Department of Hong Kong. The abstracts of the presented papers are as follows:

<Plenary Lectures>

Challenges of Contemporary Educational Reforms on Teaching Biology in the New Millennium: A Hong Kong Case

Pang, K. C.
The Hong Kong Institute of Education, Hong Kong SAR

Moving into the new millennium, Hong Kong's education will experience a major reform for quality enhancement, brought about by the Education Commission in a large-scale, comprehensive review of the current system and practices. The Commission recommends new aims for the education system, emphasizing on development of enjoyment in learning, communicative abilities, commitment as well as creativity. A wide range of reform proposals is put forward to achieve the new goals. Apart from recommendations for changing the educational system and structures, recommendations were also made for reforms in the school curriculum, teaching and learning as well as assessment. In the plenary lecture, the speaker will examine the challenges of this reform to biology teaching to illustrate contemporary developments as a Hong Kong case, by first identifying the aspects of the reform which will affect biology education, followed by an analysis of their implications on biology teaching in Hong Kong in the new millennium. The changing needs of teacher education for biology teachers as a result of these changes will also be discussed.

<Oral Presentations>

BioEd 2000 Symposium, the Challenge of the Next Century: The Paris Experience

Angtuaco, S. P.
Ateneo de Manila University, Philippines

Paris last 15 – 18 May, 2000, served as the perfect setting for the BioEd 2000 International Symposium; and the venue, the Museum National d'Histoire Naturelle Grande Galerie de l'Evolution, really set the stage for a very lively and fruitful symposium. The venue was already reason enough to visit Paris. The museum sat inside a Jardin de Plantes, which was abloom in

May with all kinds of flowers. A menagerie also existed in the grounds of the museum. The museum itself housed all kinds of animals and plants, showcased as a story of evolution. Thus, the venue alone was by itself a total educational feast for the senses and mind. The Paris symposium presented a meeting of people interested in sharing experiences about biology education and in learning from each other. The major activities of the symposium included plenary lectures, plenary sessions, parallel sessions, workshops and posters that covered a wide range of topics. The topics ranged from simple monitoring of children's perceptions of biological situations of biotechnology, web-based learning, and museum displays. The conference truly covered the theme: "The Challenge of the Next Century."

A Quantitative Inquiry-based Module in the Investigation of the Growth Parameters and Metabolic Activity of *Saccharomyces cerevisiae* in Aerobic and Anaerobic Conditions

Quinto, E. A., Alejandro, G. D., Aimeon, E. C. and De Leon, E. P.
University of Santo Tomas, Philippines

This is a simple and student-friendly modular activity which investigates some of the most basic concepts in biology like growth and metabolism. This laboratory exercise uses the bakers' yeast: *Saccharomyces cerevisiae*, a microbe which is vey safe to handle being nonpathogenic and edible, easily seen at HPO due to its large cell size and rapid growth rate which will allow the exercise to be completed in a 3 hour laboratory period. Two cultures of *S. cerevisiae* obtained from active dry yeast granules are cultivated under aerobic and anaerobic conditions. The effect of each condition on the metabolism as either respiratory or fermentative will be determined colorimetrically (Iodoform Test) [1] by the production of alcohol. The conditions of the two cultures are then immediately reversed to observe the phenomenon known as the "Pasteur Effect." From each culture, 0.01 ml samples are evaluated for their cell count/ml using the direct microscopic counting (Breed Method) [2] at specific time intervals. The cell density of each culture is plotted on semi-log paper and the growth rate and slope are computed and compared. The cell count/ml of each culture in future time is calculated using model preparation and experimental results (predictability) [3]. This concept on growth rate can be extended to other disciplines like ecology and genetics.

1) Vogel, A. I. (1956) *A Textbook of Practical Organic Chemistry Including Qualitative Organic Analysis, 3rd ed.* pp. 1068-1069.
2) Tortora, G. J., Funke, B. and Case, C. (1998) *Microbiology, An Introduction, 6th ed.* Addison Wesley Longman, Inc. pp.175.
3) Cazzador, L. and Mariani, L. (1988) A simulation program based on a structured population model for biotechnological yeast processes. *Journal of Applied Microbiology and Biotechnology* **29**: 198-203.

A Module in Protoplast Fusion between Two *Allium* Species

Flores, J. G., Lamorena, M. B. and Marbella, R.
University of Santo Tomas, Philippines

Protoplast technology is still in its stage of infancy in our region but it is slowly gaining ground among biotechnology enthusiasts, despite the tedious and intricate techniques involved; not withstanding the expensive chemical reagent requirements. To help students develop and gain skills along this area, a module is designed using plant materials to introduce the technique.

The schedule was initially tested by the University of Santo Tomas graduate students enrolled in the Biotechnology II (Protoplast Technology) during the second semester of school year 1999 – 2000. Gleaned from the results of the laboratory work, the students were able to isolate protoplast from *Allium cepa* and *Allium sativum* by using mechanical and enzymatic techniques. Protoplast yield from both techniques were compared. Viable protoplasts were determined,

cultured and subsequent intra- and inter-specific fusion was induced with the application of polyethylene glycol (PEG) to form somatic hybrids.

The Virtual School of Biodiversity: the Development of IT-supported Teaching in the Department of Ecology and Biodiversity, the University of Hong Kong

Chan, B. K. K. and Hodgkiss, I. J.
The University of Hong Kong, Hong Kong SAR

The Virtual School of Biodiversity (VSB) is a joint venture between the Department of Ecology and Biodiversity, the University of Hong Kong and the School of Biological Sciences, the University of Nottingham, UK, under the auspices of *Universitas 21*. A 'Virtual School' is a location in the Internet to support resources sharing, distributed learning and collaborative teaching. The VSB, therefore, aims to produce distributed biodiversity learning materials and assess the potential use of the World Wide Web (WWW) in teaching developments. To make use of WWW in teaching developments, On-line Learning Support Centres (LSCs) have been developed to provide student access to existing Web-resources concerning biodiversity news, study skills, jobs and careers and virtual libraries that can provide high quality information and guidance on student learning. An individual module LSC has also been developed for all courses in the environmental Science curriculum to give students on-line assured' Web-sites. The 'Chat' function allows students to have Web-based discussion of the academic topics with their classmates and lecturers. Students' responses to LSCs were positive and 60% of them agreed that the learning resources and Web-sites were helpful to their learning and improved their performance. The VSB has also developed a delivery platform 'Scholar's Desktop' for producing CD-based multimedia courseware which enable students to learn in an interactive way including quizzes, scrapbooks, visits to virtual laboratories and simulations of virtual field trips. More than half of the students responded that the courseware units developed in the 'Scholar's Desktop' were interesting and they had learned a great deal of useful information. Based on the present study, the VSB has enhanced the teaching performance of the Department by making use of WWW and IT in teaching developments. The VSB can further expand this partnership in collaborative university teaching by sharing resources and providing distributed quality assured university education on a global basis. The VSB concept can also be applied to the tertiary – secondary educational interface in the future, thus extending biodiversity education in Hong Kong.

Flexible Learning Resources and Their Effects on Student Learning in the Tertiary Life Science Laboratory

Chan, T. Y.
The University of Hong Kong, Hong Kong SAR

The use of computer-based learning and web-based instructional resources have gained much popularity in the modern life science laboratory, either as supplement to or replacement for conventional wet laboratory practicals. These two modalities exemplify methods of flexible course delivery, which rest on the theoretical underpinnings of distance education. While much has been written on the educational technology aspect in this area, there is however a dearth of discussion on curriculum philosophy, impact on teaching and learning, and the effects of these two approaches on the learning experience of students. This paper tackles the issues mentioned by relating flexible learning to constructivism and highlights the changes brought about by these new approaches to the teaching and learning scene. The recognized advantages of flexible learning support systems over conventional approaches to teaching and learning are appraised by making comparisons at the level of the actual learning process. An analysis of student learning in different learning situations in

the laboratory is undertaken using the experiential model of learning as a basis for elaboration. While it is appreciated that the merit of flexible learning resources lies with their potential for enhancing learner's experience through active knowledge construction, threats of under-emphasis of the feature or sacrifice to narrow-objectivist information delivery function should be cautioned and avoided.

New Initiative in Teaching and Learning in Marine Conservation

Cheung, S. G. and Shin, P. K. S.
City University of Hong Kong, Hong Kong SAR

For biology graduates to become successful professionals in the field of marine conservation, they should possess the following generic skills: teamwork, dedication and flexibility. Equally important, they should have a wider knowledge and an appreciation of local marine ecology, and be aware of environmental issues. The present university curriculum in Hong Kong, however, cannot meet the challenge in nurturing such able graduates, owing to inherent problems associated with the current teaching and learning mode. Problems in teaching identified include insufficient inventory of the local fauna and difficulty in accessing to museum specimens. The use of preserved, instead of colourful, live, specimens, also deter students' interest in the subject. The didactic mode of teaching and time constraints in delivery of the course content also reduce the students' motivation in constructing their own knowledge. Moreover, they tend to adapt a rote and passive learning mode, be examination-oriented, and have inadequate background knowledge on animal classification techniques.

To improve teaching and learning in marine conservation, a combination of activities is introduced at the City University of Hong Kong. These include the production of a CD-ROM on local marine ecological habitats, design of web pages on common animal groups, introduction of problem-based learning initiatives, participation of learning in overseas, and co-operation in a group project. The focus of all these activities is to enhance the teaching and learning process proactively. We believe that graduates who are exposed to such a student-centred and self-learning culture will develop the necessary traits to take on future challenges in marine conservation.

Field Studies Centres in Hong Kong

Kan, K. Y.
Sai Kung Field Studies Centre, Hong Kong SAR

Environmental awareness has long become an issue of common concern. Concerted efforts are necessary in order to maintain a better living environment, hence much importance has been attached to environmental education. With a view to providing better opportunities and facilities for students to gain a first hand information about their own environment, and to impact skills and techniques in field studies, the Sai Kung Field Studies Centre – the first of its kind in Hong Kong – was established in 1979 and began to provide residential ecology and geography field studies courses for sixth form students as well as in-service courses for teachers of these two subjects.

Caritas Chan Chun Ha Field Study Centre: Its Service, Its Role in the Education Reform in Hong Kong, and Its Future Development

Ng, P. S.
Caritas Chan Chun Ha Field Study Centre, Hong Kong SAR

The Centre, established by Caritas Hong Kong in 1996, serves as an educational and resource centre. It aims at providing opportunities and adequate activities to students to gain firsthand information about their environment and to learn the skills and techniques in field studies. What we are doing in the centre materialized certain reform proposals by the Education Commission,

e.g., life-wide learning and project-based learning. Besides, ever since the establishment of the centre we promote environmental awareness through our courses, and in response to Section V - Making Hong Kong an Ideal Home in the Chief Executive's 1999 Policy Address, we will continue our effort. To acquire more resources, we have been successful in the past two years in the bid for Quality Education Fund for the production of two CD-ROMs on field studies, launching the Windmill Project, and sending teaching staff on study visit to Field Study Centres in UK. With the existing staff establishment and resource, we can only serve sixth form students. However, if the Education Department can make appropriate revision, we can extend our service to students of Secondary 5 and below, and even to primary school pupils.

Scientific Inquiry, a Teaching That Enhances Critical Thinking for Non-Science Majors in the General Education Curriculum Biology Education

Hafalla, J. R.
Far Eastern University, Philippines

In the Scientific Inquiry (SI) teaching strategy, the, learners are active creators of problems and hypothesis and are architects of the testing process in seeking information. The students' skills developed in this strategy through group activities include: a) Scientific process: keen sense of observation, problem identification, formulation and testing of hypothesis; b) Critical thinking skills: inquisitiveness, making logical influences, associating and noting relationships of concepts (cognitive); c) Intellectual courage and perseverance, suspension of judgement, enthusiasm in sociocentricity (affective); designing and executing procedures, creating models that test the hypothesis, concept mapping, using graphs and visual tools (creative thinking). Our university have developed and implemented the SI approach in biological sciences for non-science students as well as in basic biology subjects for majoring students of B. S. Biology, as springboard to essential concepts and as a step to enhance critical thinking. This strategy replaces the traditional method of giving lecture and of the traditional laboratory activities. Initial findings in a research made on the effect of this teaching strategy are available.

Development of a Value Inquiry Model in Biology Education

Jeong, E. and Kim, Y.
Seoul National University, Korea

There are many bioethical issues in line with the rapid advance of biology. In this situation, it is important for students to make a rational decision on value problem. In this study, value inquiry model in biology education was developed.

To develop the model, value inquiry models were reviewed. Value clarification model is helpful for the formation of the personal value as the process of individual value inquiry, but it is not helpful for clarifying the value conflicts. Value analysis model focuses on the rational solution of value problem through the logical procedure. But it has limitation that overemphasizing the logical and systematic aspects results in devaluating students' affective aspects. So it is necessary to coordinate psychological and logical aspects of value inquiry.

In this regard, the model was developed, including "identifying and clarifying value problem," "understanding biological knowledge related to conflict situation," "considering on the related persons," "searching for alternatives," "predicting the consequences of each alternative," "selecting the alternative," "evaluating the alternative," and "final value judgement and affirming it."

The educational objectives of value inquiry were selected in consideration of the ability to carry out the steps of the developed model. And the selected contents were animal duplication, test -tube baby, genetic engineering, growth hormone

injection problem, brain death, organ transplant and animal to be experimented, and were organized on the basis of the 6th and 7th science curriculum.

The suitable instructional models for the value inquiry education were selected: bioethical value clarification decision-making model, group presentation according to the value analysis model, role play and debate, and discussion through web forum. The interview was considered to be suitable to evaluate the students' value inquiry ability and the rubric was made to evaluate the attainment of the educational objectives of value inquiry.

Laboratory Exercise Suitable for Teaching the Relationship between Vertical Distribution of Seaweeds and Their Photosynthetic Characteristics in Advanced Science Classes in Japanese Junior High Schools

Kanaizuka, Y. and Katayama, N.*
*Ochiai Junior High School; *Tokyo Gakugei University, Japan*

There is only a little subject matter relating to algae and no laboratory exercises for teaching photosynthesis using seaweeds in the present Japanese Science Curriculum Standards for Junior High Schools. In the present study, we developed an experiment for teaching the photosynthetic characteristics of seaweeds in relation to their colors and vertical distributions in advanced science classes in junior high schools. We chose the red alga *Mastocarpus yendoi* Masuda et Yoshida and the green alga *Ulva pertusa* Kjellman because they can easily be collected anywhere at rocky seashores throughout the year. In addition, these seaweeds were cultured easily using filtered seawater at room temperature and maintained their photosynthetic activities for about two weeks. We examined the photosynthetic rates of these seaweeds under the light with different colors (blue, green or red) quantitatively by using the Productmeter, a gas volumeter. In any light color condition, the photosynthetic rate was measured within 50 minutes that is one class hour of junior high schools. The difference in the photosynthetic responses to the light color conditions was observed between the red alga and the green one. We introduced this experiment into an advanced science class as a laboratory exercise to evaluate its effectiveness. This experiment seems to be effective to allow students to be aware of the difference in the photosynthetic rates of seaweeds under the different light color conditions and to understand the relationship between the vertical distribution of seaweeds and their photosynthetic characteristics.

Environmental Education for All at the University of Santo Tomas: A Total Approach

Kanapi, C. G. and Hilario-Andres, J. T.
University of Santo Tomas, Philippines

The University of Santo Tomas, a 388-year-old private educational institution situated in the heart of one of Manila's most densely-populated sectors and catering to approximately 34,000 students, has embarked on a massive environmental education development project tagged as EE for All at UST (Environmental Education for All at the University of Santo Tomas). This presentation outlines the goals and objectives of this ongoing project, highlights the step-by-step development of the action plans targeting the entire university community. To date, a volunteer Core Group of committed faculty members representing all academic units has been organized, and baseline data on all non-science curricular offerings (social sciences, languages, mathematics, religion and the humanities) have been collated. A survey of teacher competency has been administered to determine the non-science teachers' capability to integrate basic EE concepts in their course syllabi. The survey results serve as a basis for more than twenty modules which are currently being developed and compiled to aid teachers in integrat-

ing basic EE concepts into the existing syllabi of tertiary level non-science subjects. Upon completion, these modules are to be used in an intensive in-service training session for teachers to be held at the beginning of the first semester of AY2000-2001, and will subsequently be pilot-tested and applied in selected classes throughout the said semester.

Teaching First Year Biology at a Rural University Campus

Wallis, A. M. and Wallis, R. L.
Deakin University, Australia

At Deakin University first year Biology is one of the largest units and is taught at four campuses. At Warrnambool Biology A (which runs in Semester 1) is taken by Science students taking three environmentally based courses as well as by Nursing students. This latter group of students takes Biology B in Semester 2. Here we outline some of the features of the program including the website and its associated interactive activities, the problems in teaching disparate groups of students in biology A and teaching students where most are living away from home and many are mature age learners who have not studied science for a long time.

Changes in Attitudes towards Nature in University Students

Wallis, R. L. and Douglas, L.
Deakin University, Australia

Development of positive attitudes towards the environment is an important element in environmental education. We investigated whether students at Deakin University who took the first year level unit SQE112 "Ecology and Environment" developed any changes in attitudes to nature. Students completed a questionnaire before and after completing the unit of study. The questions provided information on six categories of attitudes towards wildlife. We found students who had taken SQE112 developed significantly more positive attitudes to wildlife in four of these categories *(biocorrect*, *exploitation*, *natural stewardship* and *pest rights*) but not in the categories *controlled breeding* and *animal rights*. In contrast, a control group of year one students showed no significant changes in attitudes to nature. Students who studied SQE112 had higher attitude scores initially than the control group, suggesting they were more positively disposed to the environment and chose a course which reflected this greater interest in environment. There were no significant differences in attitude change for students enrolled in SQE112 at metropolitan and regional campuses, although regionally based students initially had much lower scores on the *exploitation* scale. Our results are very similar to those found for USA students.

Bridging the Gap between Secondary and Tertiary Biology Education: Case Study of a Young Scholar Program

Lam H.-M.
The Chinese University of Hong Kong, Hong Kong SAR

In Hong Kong, biology education in secondary schools used to adopt a knowledge acquiring and instructor-assisting mode, in contrast to the in depth, knowledge-exploring and self-learning characteristics in tertiary institutes. Supported by the CDI of the Education Department of HKSAR, the Biology Department at the Chinese University of Hong Kong has organized a Young Scholar Program in two consecutive summers serving to bridge the gap between secondary and tertiary biology education. This Young Scholar Program has two integral components. Firstly, a series of "hot" biology topics were covered in a seminar series that was opened to all S.6 teachers and students. The seminar series was designed not only to provide updated information, but also to stimulated follow-up discussions among secondary school teachers and students. A selected group of students were allowed to participate in

hands-on research projects tailored to cope with the seminar series they attended. Besides, they also joined the social activities organized by undergraduate students. Through this summer camp, the participants obtained different levels of exposure to university life and mode of learning. We hope that the participants will share their valuable experience to their fellow schoolmates and thus promote a better understanding of university biology education.

Promoting Biotechnology Education to Secondary Schools

Lui, C. W. K. and Chan S. L.
The Hong Kong Institute of Education, Hong Kong SAR

Due to the importance of biotechnology education, there is a worldwide trend of extending this from college to secondary school level. While many western governments have been planning to bridge the gap, the pace in Hong Kong is comparatively slow. As Hong Kong science educators, we are planning to introduce relevant and updated biotechnology elements, such as DNA fingerprinting, gene therapy and cloning, to the secondary school teachers and students. Besides these advanced techniques, we would also introduce general biotechnological applications in the field of food production, agriculture and environmental protection to the lower form students; activities such as wine production, plant tissue culture and biological washing powder will be included. In doing so, we are developing an interactive CD-ROM as well as homepage on the biotechnology education. These comprise of basic biotechnology theories which are given in more lively presentation, e.g. using animation to explain complicate mechanisms. There are also step-by-step demonstrations on simple biotechnological experiments. These experiments do not require advanced equipment and can easily be carried out in secondary schools. We also include bioethical issues, such as animal and human cloning, genetic modified food and gene therapy, to stimulate students' controversial debates and discussions. We hope that the materials presented in the CD-ROM and homepage can stimulate students' interest in these scientific advances and products.

Digital Library

Piriyakul, K. and the others
Bodindecha (Sing Singhaseni) School, Thailand

As a network for Thai schools, http://oho.ipst.ac.th, or http://web.ku.asc.th/schoolnet/index.html, the Digital Library aims at providing Thai students the way to find out information in order to enhance their knowledge. For the best utilization of Schoolnet network, this program can help reducing the problems about information rarely found for Thai teachers and students, the complexity of foreign language, etc. There are many parts of details involved in this program such as computer, mathematics, chemistry, biology, physics, environment, and basic engineering. For biology, the content includes plants, animals, health, foods, academics, and others. The content of this pilot project was developed in Thailand to persuade the schools to create a variety of academic information in order to form the virtual library on the Internet by emphasis on enhancing the children's education.

Evaluation of Physico-chemical Characteristics, Plankton and Fish Communities Survey for Estero De Balete Rehabilitation Project of Adamson University, Philippines

Lee, S. J., Laguimun, A. T. and Anes, M. L.
Adamson University, Philippines

Abiotic evaluation of bodies of water such as physico-chemical analysis and biotic survey of population is routinely done to assess quantitatively the characteristics of rivers and their tributaries. Using the Estero De Balete along Adamson University as experimental site, the research project has established baseline data to

serve as diagnostic tool in identifying the degree of severity of water pollution in as river tributary. Several data gathered has been presented to the Department of Environmental and Natural Resources and other government agencies in order for them to initiate plans of action for the rehabilitation of the waterway. As a learning institution, the Adamson University had embarked on a "Sagip Estero" (Save the waterway) Project when it established a network of research of it in different Departments of the University designed to harness the knowledge and skill of the faculty towards the rehabilitation of the highly polluted waterway. Results of these studies had been used to evaluate the physico-chemical characteristics of the "estero" and its plankton and fish population as biologic indicators of pollution. Considering that there are myriads of "dead esteros" crisscrossing the streets of Metro Manila, the results of this research project can serve as a rich source of ideas for government and private institutions intending to conduct rehabilitation programs for river tributaries.

1) Needham, J. G. and Needham, P. R. (1990) *A Guide to the Study of Fresh-Water Biology.* Holden-Day, Inc., San Francisco, USA.
2) Greisel, I. and Jensch, P. (1991) *Investigating Our Ecosystem.* Houghton Mifflin Co., Boston, USA.

Freshwater Pollution Monitoring: Putting Theory into Practice

Tilling, S. M., Quynh, N. G.*, Pinder, C. and Yen, M. D.***

*Field Studies Council, UK; * The National University of Hanoi, Vietnam; ** Institute of Freshwater Ecology, UK*

Worldwide, at least 25,000 people die every day through using dirty water. Biological monitoring of freshwaters is becoming increasingly important as a rapid-assessment tool for evaluating water quality[1)]. However, the use of biomonitoring in Asia has been hampered by the lack of baseline data, the absence of easily-used and rigorous bio-assessment protocols and a lack of people with appropriate skills and knowledge[2)]. Biology education has an important role. This paper describes the results of a project in Vietnam during which standard protocols, pollution indices and non-specialist identification keys were devised and tested. The results demonstrate a clear relationship between water quality and freshwater microinvertebrate communities. The educational potential was illustrated by the development of a number of new teaching modules and post-graduate degrees in Vietnam's colleges. It is likely that similar resources and approaches could be applied in other Asian countries.

1) Noris, R. H. and Noris, K. R. (1995) The need for biological assessment of water quality: Australian perspective. *Australian Journal of Ecology* **20**: 201-211.
2) Rosenberg, D. M. and Resh, V. H. (eds.) (1993) *Freshwateer Biomonitoring and Benthic Microinvertabrates*. Chapman & Hall, New York, USA.

Teaching the Constructivist Way to Enhance Critical Thinking among Students of Biology

Perez, T. R.

Centro Escolar University, Philippines

Constructivism allows students to become fully involved in putting together knowledge into a structured form. They are made to think carefully in the learning process. They are required to try to generate new ideas, identify and summarize relationships between various ideas and concepts. Students are actively involved mentally, hence critically. The constructivist approach to teaching has been found to be effective in achieving meaningful learning. It is important for the teacher to find out the prior knowledge of the students so that they can construct their own meanings. This approach entails a lot of preparation and requires the knowledge of several strategies on the part of the teacher in order to use what appropriate in their teaching. Constructivism stands in contrast to the more deeply rooted ways of teaching that have long typified our classrooms. Traditionally, learning

has been thought to be a "mimetic" activity, a process that involves students repeating or miming, newly presented information in reports or on quizzes and tests. Constructivist teaching practices, on the other hand, help learners to internalize and reshape or transform new information.

1) Fosnot, C. T. (ed.) (1995) *Constructivism: Theory, Perspective, and Practice*. Teachers College Press, New York, USA.
2) Constructivist Theory http://www.gwu.edu/~tip/bruner.html
3) Teacher Education Station, Constructivism: Background Knowledge http://www.hmco.com/college/educastion/station/concept/construct/conback.html
4) CSCL, Constructivism http://www.uib.no/People/sinia/CSCL/web_struktur-836.htm

Helping Science Teachers to Understand the Nature of Science

Yip, D. Y. and Lai, M. K.*
*The Chinese University of Hong Kong; * Education Department, the Government of Hong Kong, Hong Kong SAR*

The ETV (Educational Television) Section of the Education Department of Hong Kong is developing a series of ETV programs for secondary science teachers. This paper outlines the content of a programme to help teachers understand the nature of science. A historical approach is used to illustrate how early scientists used various methods to study nature. From this, the nature of scientific inquiry as a process of problem solving is elicited.

The first example refers to the age-old problem: Is the Earth really flat? By referring to discrepant events and using probing questions, the audience is guided to query the validity of the theory of a flat Earth, and develop an alternative hypothesis to account for observations that are inconsistent with the view of a flat Earth. The importance of hypothesis testing is illustrated by the attempts of early sea explorers to test the prediction that a ship traveling in the same direction on the Earth would finally return to its starting point.

The second example refers to the discovery of vaccination by Jenner in the 18th Century. Through careful observation, hypothesis formulation and testing, he was able to gain a better understanding of the relationship between cowpox and smallpox, and devise a method to develop immunity in the body against smallpox.

As a closure, the program summarizes the main steps of the process of scientific inquiry, while emphasizing the variety of methods employed by scientists in their search for knowledge.

Chromosome: Karyotype Game

Piriyakul, K.
Bodindecha (Sing Singhaseni) School, Thailand

The Karyotype Game is one of the teaching instruments for grade 12 Biology. It aims at providing the children-center for the teaching activities. So, the students can understand the meaning of karyotype and classify the sex and the characteristics of normal persons and genetics persons in accordance with the abnormal of chromosome. The students will be classified into many groups to compete for the game by making arrangement of respective chromosome. The first group who can finish arranging the karyotype will be the winner. The result of this instrument is that the average post-test scores of the students are more than their pre-test scores. Moreover, the students get the knowledge about chromosome and having fun for biological study.

Biology and New Technology: A Small Mammal Community Living in a Powerline Easement

Macreadie, J., Wallis, R. and Adams, R.
Deakin University, Australia

Small mammals living in a powerline easement that had been cleared of trees were surveyed in Bunyip State Park in Gippsland. At least five species of small mammals were found, including the rare broad-toothed rat, *Mastacomys fuscus*. The extent to which these species are also living

in the surrounding open forest is unknown. This appears to be the first report of such a rich assembly of small mammals living in such a manipulated corridor. Others elsewhere have reported that cleared powerline easements are invaded by typically grassland species, non-forest or introduced species, which invade along the easement. It is unusual that no introduced rodents were detected at the study site, in what such an obviously modified habitat.

Impact of the Internet on Insect Biology Teaching and Research in Thailand

Wongsiri, S.
Chulalongkorn University, Thailand

The Internet is affecting insect biology teaching and research. Internet tools help students communicate and easily find access information. Biology instructors who adopt these tools may discover that they are surprisingly about time consuming to implement. Requiring students to use the Internet teaches them to study by themselves from outside classroom of available information and to communicate electronically, both vital skills in today's workplace. The Internet helps meet the growing need for distance education by providing as a medium that allows students to conveniently access course materials and to communicate by e-mail and homepage with the instructors and other students. Researchers benefit from using the Internet for one-to-one and one-to-many communication and from access to large cooperative databases. Perhaps the greatest impact on research will be the migration to the Web of journals and other specialized research literature.

Biology Education in Secondary Schools of Indonesia

Sudarmi, R. and Katayama, N.
Tokyo Gakugei University, Japan

In the Indonesian secondary school curriculum, the subject of science divided into two parts, biology and physics, for lower secondary schools, and three parts, biology, chemistry and physics, for upper secondary schools. The number of biology classes is 136-138 in three terms, or three so called "catur wulan," in a year in lower secondary schools and in the first two years in upper secondary schools. In general, they have three biology classes every week. However, in the last year in upper secondary schools, students can choose one of the courses offered by the school, depending on their interests. According to the curriculum, each school has to offer two courses: social science, natural science. In the biology course, students have seven biology classes every week in addition to other subjects, whereas in the other course there is no biology class. The purpose of teaching biology in general is: "Let students understand biological concepts, utilize their biological knowledge in their daily life, understand how to consider and how to solve environmental issues wisely, respect nature as a wonderful gift from God, and understand that we have to preserve nature and take care of it." To achieve these aims, the Directorate of Education and Culture has been offering training courses for teachers to improve their ability. There is a biology teachers' association in every district of the country so that biology teachers can have some opportunities to discuss the best solutions to the problems occurring in the classes where they are teaching.

Biology Education in the Philippines: Current Status and Challenges in the Third Millennium

Lagunzad, C. G. B.
Ateneo de Manila University, Philippines

In the last few decades of the second millennium, we are witness to the awakening of the human consciousness on the issue of bioethics. With the thrust of basic education to integrate environmental issues in all courses and technology in all the sciences to highlight the need to maintain quality life for human society, the significant role

played by biology education at the turn of the third millennium cannot be over-emphasized. For biology education to effectively assume its key role, it has to meet the challenges of a society that expects and demands a healthy environment, sufficient and good quality food products, adequate medical services and access to information that can significantly affect human well-being whether in this generation or the next.

This paper is focused on basic science and biology education in the Philippines: its current status, problems and accomplishments. In addition, this paper will discuss how the science of biology influences the educational system, government socioeconomic policies and cultural development in the country. There will also be a deliberate attempt to project the potential contribution of biology education in national growth and development in the third millennium.

Diversity of Edible Invertebrates Found in Khon Kaen Province, Northeast Thailand

Na Nagara, S., Jamjanya, T., Wangsomnuk, P., Tarbsripair, P. and Polsan, Y.
Khon Kaen University, Thailand

A survey of diversity of edible invertebrates from fresh market in Kohn Kaen Province conducted during January to December 1999. There were 10 sites of study areas: Amphure Muang, A. Namphong, A. Khoasuankwang, A. Bhuviang, A. Chumpare, A. Nhongroua, A. Bhol, A. Bhanbhai, A. Chonnabot and A. Munjakiri. The result showed that seven orders 18 families and 35 species of edible insects were found. Of these beetles were the most abundant sold in market. Silkworm, ant egg and scarab beetle were sold occasionally, and the most rare case found were cicada and metallic beetles. These edible insects were collected by light trap, collected from plants they eat or may be from their own habitat. We also found that insects sold in khon Kaen market were transported from other places such as Nakornswan, Chiangmai and Chiangrai. The most favorite and make a lot of money were fried grasshopper, fried bamboo caterpillar and ant egg. Popular dishes from edible insects were Koa, Thod, Larb, Koi, Mhok and Kaeng. To collect insects by light trap during February to December 1999, 15 species were found. Mole cricket, predaceous diving beetle, water scavenger beetle, cricket, giant water bug were found all year round. Scarab beetle and dung beetle were found occasionally. The mole cricket showed the highest number of counting (273.14/day) during February. Other edible invertebrates, we found nine species of mollusk, three species were viviparid snail, three species were apple snail and other three species were bivalve. Cooking dishes were Kaengom, Kaeng-koa, Koi, Bhad and Ji. Only one species of freshwater crab and one species of freshwater shrimp were found. Cooking dishes were Larb-phu, Namya-phu, Phu-kem, Ji-phu, and Mun-phu. Dishes from freshwater shrimp were Koi-kung, Jom-kung and Nung-kung.

Biodiversity of Rare Actinomycetes in Island Soils and Their Antimicrobial Activities

Sriivibool, R.
Burapha University, Thailand

Sample soils were collected from various sites of Raet Island, Chonburi Province, and were prepared at 55ºC for 15 min and 100ºC for 1hr before making serial 10 fold dilutions. From morphological study together with the analysis of diaminopimelic acid in peptidoglycans and sugar pattern in whole cell hydrolysates, 199 strains of 17 genera were isolated. The identified genera were *Actinomadura*, *Streptomyces*, *Saccharopolyspora*, *Saccharomonospora*, *Pseudonocardia*, *Micromonospora*, *Faenia*, *Kibdelosporangium*, *Promicromonospora*, *Saccharothrix*, *Streptoalloteichus*, *Thermoactinomyces*, *Thermonospora*, *Nocardiopsis*, *Nocardioides*, *Kineosporia*, and *Kitasatosporia*. It was found that 21 strains of Actinomycetes showed some level of antibiosis

against either *Bacillus subtilis* ATCC 6633 or *Micrococcus luteus* ATCC 9341, or both of them or against *Candida albicans* DSM 70014 and either one or two of the Gram positive bacteria. Furthermore, two strains of Actinomycertes, R4-20 and R4-21, showing antifungal activity from the isolating plates were also detected.

Anticancer Properties of Lectin from the Seeds of *Dolochos lablab* Linn.

Jacinto, S. D., Sonico, M. G. I., Quitoriano, M. L. V., Cruz, F. M., Lim, R. M. and Gabius, H. J.*
*University of the Philippines, Diliman, Philippines; *Ludwig Maximilians University, Germany*

Mannose specific lectins from seeds of *Dolochos lablab* Linn., a local edible legume was purified from crude extracts by first fractionating with saturated ammonium sulfate and through affinity column chromatography using mannose Sepharose. Through *in vitro* cytotoxicity assay using the method of Mosmann [1], the lectin was found to be toxic to human cancer cell lines, A549 (lung non small cell carcinoma) and T47D, a breast cell line, but not cytotoxic to SKBr3, another breast cell line. It was also not toxic to the cell line, HUVECC, which are normal cells from human umbilical vein endothelium. *In vivo* testing was also done for 40 days by injecting T180 mouse sarcoma cells with or without lectin into male ICR white mice strain. Mice injected with sarcoma cells alone died before the 40th day. Dissection yielded profuse ascetic fluid with sarcoma cells indicating that the cells proliferated within the mouse's body. Moreover, histological examination of different organs of the digestive system showed tumorous growths in the stomach, duodenum and descending colon. Those injected with sarcoma cells incubated with different doses of lectin prior to intraperitoneal injection showed no ascites fluid nor sarcoma cells and healthy conditions to the organs of the gastrointestinal tract.

1) Mosmann, T. (1982) Rapid colorimetric assay for cellular growth and survival: Application to proliferation and cytotoxicity assay. *J. Immunological Methods* **65**: 55-63.

The Interactive Effects of Elevated CO_2, Temperature and Nitrogen Supply on the Growth and Yield of Rice

Baysa, M. C., Tremmel, D. C.*, Reynolds, J. F.*, Rivero, G. C. and Tabbada, R. A.****
*University of Santo Tomas, Philippines; *Duke University, USA; **University of the Philippines, Diliman, Philippines*

Rice (*Oryza sativa* L. cv. IR72) was grown in growth chambers under all combinations of two CO_2 concentrations (375 and 750 µl L^{-1}), two air temperatures (29/21 and 34/26°C day/night) and two nitrogen supplements (40 and 80 mg L^{-1}) from sowing until grain maturity to examine the interactive effects of CO_2, temperature and N supply on its growth and yield. Elevated CO_2 enhanced plant biomass in terms of leaf area, tiller and panicle production, especially in high temperature and N treatments. CO_2–enriched plants grown at high temperatures had lower harvest indices due to reductions in the number of filled grains per panicle and grain mass, and lower grain N content when given high N. Any potential benefit of increased atmospheric CO_2 on rice yield and grain N content under optimal N supply may therefore be offset by higher temperatures associated with future global warming conditions.

Identification of Heavy Metals concentration in Kangkong (*Ipomoea aquatica*) Grown in Laguna Lake Area

Luber, R. and Laguimum, A. T.
Adamson University, Philippines

Kangkong (*Ipomoea aquatica*) is commonly known as "poor-man's food" in the Philippines and it is basically used as one of the favorite vegetables for most native dishes. This aquatic plant is also used as animal feeds as well as an essential part of the "food chain" and "food web" in the aquatic ecosystem. The most popular site

in Metro Manila devoted for planting this vegetable is the Laguna de Bay. The proximity of this lake to Metro Manila makes it the best choice for this purpose. Unfortunately, it is a known fact that this lake is one of the biggest "pozo negro" (dumping site) of Metro Manila where industrial and residential effluents are being disposed unabated. Despite this condition the lake is still considered not fully dead due to seasonal flushing of polluted water in and out of Manila Bay which gives it a lease of life. Since "kangkong" is thriving in Laguna Lake, everything dissolved in it could be used and may end up as primary or secondary components of plants and animals raised in this area. Studies shown that heavy metals, *i.e.* Pb, Hg, Cd, As, pesticide and other effluents coming from different sources find their way into this water. Two of the known dissolved compounds are *lead* and *mercury*. With this knowledge there is a relatively high probability that these kangkong are bioconcentrating these metals which may render them hazardous for human consumption. This research project monitored the bioconcentration of these two metals in kangkong in order to establish the safeness of this food item. To achieve these objectives, sites in Laguna de Bay were selected based on a) accessibility; b) abundance of samples; and c) density of human population. Water samples and kangkong plants segregated into parts, *i.e.* root, stem and leaves, were collected for analysis. Spectrophotometer (Perkin-Elmer Atomic Analyst 700) was used for heavy metal analysis. Results showed that Pb was detected in all samples. However, Hg was not detected. The data indicated that Pb measured high in water. The fate of this metal upon bioasbsorption showed that root registered the highest, followed by leaves, and stem the least.

1) Christman, R. F. (1997) Where might heavy metals in the aquatic environment end up? *Environmental Science and Technology*.
2) Paredes, R. (1994) "Heavy Metal Analysis of *Ipomoea bantas* Grown in Lahar" Thesis U. P., Diliman, Quezon City.

<Poster Presentations>

Environmental Studies on the Ashimori River in Okayama City, Japan

Tara, M.
Hiroshima Institute of Technology, Japan

The present study was carried out by 14 members of the Science Club, who were directed by the principal T. Segawa and the director R. Noto of the Municipal Ashimori Junior High School in Okayama City. The Ashimoti River locates in the northwest of Okayama City and forms a fine natural environment. Recently, fireflies decrease in number because of water pollution by human activities. This is the reason why we started to investigate aquatic animals and water pollution on the Ashimori River in 1994. Aquatic animals were collected and examined with a naked eye, and counted in number. The number of aquatic lives on the bottom in 25 cm^2 square flame was counted. Water temperature, pH, COD, NO_2^-, PO_4^{-3} and tachometry were measured. The more upper streams, the more species appeared in number. As the result of investigation, *Zacco temmincki*, Ephemeroptera, Trichoptera, *Semisulcospira libertine* (Gould), *Potamon* (*Geothelphysa*) *dehaani*, etc. were found in the upper streams. Ephemeropteras decrease in number year by year. Measurements of water quality showed the tendency that higher values on COD, NO_2^- and PO_4^{-3} were recognized in lower streams. On the contrary, the reverse result was recognized on pH. The values on pH, COD, NO_2^- and PO_4^{-3} in the past 3 – 5 years showed that the water pollution in the Ashimori River advanced annually.

Analysis of High School Student's Decision-making Processes to Solve a Problem Involving Biological Knowledge

Hong, J.-L. and Chang, N.-K.
Seoul National University, Korea

In this study, the cognitive characteristics of students' decision-making processes centered on

phases, difficulties, and strategies are analyzed in personal daily life context involved in biological knowledge. The subjects were first year science and general high school students in Seoul, Korea; six female students and seven male students. The students' decision-making processes were analyzed by "think-aloud" and participant observation methods. On the whole, the students' decision-making processes progressed in following order: "recognizing a problem," "searching for alternatives," "evaluating the alternatives," and "decision." During the decision-making processes, the above phases are repeated by trial and error. Students preferred non-compensatory rules that do not allow trade offs among alternatives for decisions, rather than compensatory rules of selection. Students had a tendency to have difficulty analyzing the difference between initial state and desirable state of the problem, organizing biological knowledge-related problems, and clarifying values as selective criteria. Even students who had high achievement and more positive science-related attitudes did not apply biological knowledge to search for alternatives and could not utilize scientific values as selective criteria very well. Finally, we discuss the implications of these results for teaching of decision-making in respect to scientific literacy or biological literacy.

Elementary Science Education Majors' Views and Self-confidence Related on Biological Teaching

Hong, J.-L. and Kim, J.-Y.*
*Seoul National University; * Seoul National University of Education, Korea*

The purposes of this study are to investigate pre-service elementary school teachers' views and self-confidence related on biological teaching, and to find out suggestions for pre-service teachers curriculum. The subjects are 122 students of sophomores, juniors and seniors who have studied elementary science education in Seoul, Korea. The five-pint scale of Likert-type survey instrument, which is consist of 3 subscales of life-view, biological teaching-view, and self-confidence in biological teaching abilities, is used. The results show that students do not have creative life-view (m = 2.53) but have evolutionary view about origin of live (m = 3.26), and strongly agree on viewpoint of individuality, diversity, adaptativility, complexity, homeostasis, and emergency on properties of living things (m > 3.50). They significantly agree on constructive biological teaching view (m = 3.88) more than non-constructive view (m = 3.53) (p < 0.001), but, on the whole, they have both constructive and non-constructive view. Their level of self-confidence in understanding of biological concepts for elementary school is high, but not that of advanced knowledge and concepts. The levels of self-confidence in practical abilities on various science–teaching methods, and technical skills for biological teaching are in middle. Considering the results, programs for constructive teaching are to be more supported, and practical skills for biological teaching are also to be trained enough in curriculum for pre-service elementary teachers.

The Effect of a Chromosome Model on the Understanding of Genetic Concepts

Kim, H.
Wonkwang University, Korea

Genetic concepts are very difficult for secondary school students to understand. Several studies have revealed that students had misconceptions about genetics because they could not relate generic phenomena with chromosome behavior during the process of gamete formation and fertilization. Therefore, the purpose of this study was to develop a chromosome model with which students can stimulate the independent assortment of alleles during gametogenesis and the allele recombination at fertilization, and to examine the effects of conception learning by using it. For this study 130 tenth graders in four classes were sampled from a high school in the

city of Jeonju in Korea. The students were divided into two groups for implementation of the program, one experimental group and one control group. In the experimental group the chromosome model which was developed in this study was used, while the contents of a science textbook were taught in the control group. The results of this study were very informative. Students in the experimental group showed a higher record, in the test items of genetic concepts that could be solved with relation to chromosomal behavior, than those in the control group, the differences between the two groups being statistically significant. In addition, interviews with students in the experimental group provided evidence that the simulation activity was interesting and helpful in relating chromosome behavior with Mendelian genetics. The use of the model was found to be effective for improving the understanding of the concepts of genetics, particularly the chromosome theory that genes are on the chromosome.

Simulation Experiments: Teaching Mammalian Physiology in the Laboratory

Tang, P. L., Ho, S. C. F. and Yau, M. Y. C.
The Hong Kong Polytechnic University, Hong Kong SAR

Since the introduction of "Adam-the-Visible Man" in the mid-nineties, there has been lots of changes in the teaching/learning strategies on the subject "Anatomy." Thereafter nearly all disciplines in life sciences have been equipped with computer-aided learning materials. A virtual physiology laboratory can be set up if one can afford the price and the time to choose the appropriate software from the suppliers.

We ran a pilot scheme in virtual physiology laboratory for students and compared the training outcome with those going through the classical hands-on experience. The evaluation parameter used included a written assessment on understanding certain principles in physiology, problem solving and applications. In addition, a questionnaire was also employed to collect feedback from students in both groups.

It is interesting to note that the virtual physiology group picked up the basic principles much faster including solving problems but they easily got tired after a few simulating experiments. They also showed a shallow perception in applying the physiology principles in real life situations. The reverse is true for the other group. Further investigation is needed to bring out the intrinsic value of virtual real learning/teaching activities.

Work was supported by Hong Kong Polytechnic University Research Grant: Acct No. 4855.

Computer and Multimedia Resources in Molecular Biology Teaching

Lee, K. L. D.
The Hong Kong Polytechnic University, Hong Kong SAR

Multimedia, computer-aided, or web-based teaching seems to be catching on very fast these days. Just one academic year ago, PowerPoint presentations were rarely used in lectures in our university. Now, all teaching rooms and lecture halls in our university are equipped with multimedia projectors. PowerPoint presentations are commonly used in lectures of all disciplines. In molecular biology lectures, we have started using PowerPoint presentations two years ago and it was welcome by students with enthusiasm and excitement. This year, students are much less enthusiastic about these PowerPoint presentations. Some students are even complaining about lecturers using PowerPoint presentations too frequently. For the past two years, we have also been developing multimedia packages with animations and interactive components to aid students' learning in DNA technology. A package on polymerase chain reaction (PCR) has been provided to students in the form of a CD-ROM as a supplementary learning aid. The package includes the Concept, the Practice, and the Assessment sections. Throughout the

package, interactive components are built in to test the student's concepts and knowledge. Students find these interactive components most useful by offering them challenges and in enhancing their understanding of the topic.

Production of Genetically Manipulated Food: A Model in the Teaching of Biology

Tang, P. L. and Shiu, O. Y.
The Hong Kong Polytechnic University, Hong Kong SAR

The introduction of technological advancement, biotechnology, brings among other things, the food supply in terms of quantity and quality of the world into a new era. Traditionally, the quality as well as quantity of a crop may be improved artificially or naturally by cross breeding within species. This is a time consuming and unpredictable process. Presently, assisted by biotechnology, a selected gene controlling a particular trait can be shared between species, such as a cold resistance gene from the fish can be put into the plant. In the presence of the foreign gene, the plant can grow under unfavourable conditions that would not be possible otherwise. The crops and livestock produce so obtained are called genetically modified (GM) food. Examples of GM food are plenty many. Standard protocols in the production of GM foods have been widely published.

Nevertheless in teaching this module, the following questions need be considered. Does one need to know the number and kinds of GM food in the market? The kind of gene being inserted into GM food? The aim of adding such gene(s)? The sources of foreign gene(s)? The effects of foreign gene(s) on human health if consumed? The needs for the GM food? In the 21st century, should these topics be brought to the secondary education to widen student's horizon?

Work was supported by Hong Kong Polytechnic University Research Grant: Acct A-P134.

Research and Development in GM Soybean

Cheowtirakul, C. and Ruangchai, D.
Assumption University, Thailand

The utilization and application of GMO soybean as foods, ingredients, potential development and consumer perception are reviewed in this paper. The aspects of review are listed as the following outline:

1. What is "genetically engineering food?"
2. Genetically engineered v. s. germplasm mutants
3. Research and development in genetically modified soybean.
4. Agricultural biotechnology (GMO) products on the market.
5. List of companies that "use genetically engineered ingredients in some or all of their products."
6. Genetically engineered food with antibiotic marker genes. (Example: Ciba Geigy GMO Maize)
7. Public concerns about GMOs in the environment.
8. Are genetically engineered foods safe?
9. How agricultural biotechnology produce GMO.

Floristic Study and Flower Biology of *Ficus* spp. (Moraceae) Found in Mts. Palay-Palay-Mataas Na Gulod National Park (Cavite, Philippines)

Alejandro, G. D. and Madulid, D. A.*
*University of Santo Tomas; *Philippine National Museum, Philippines*

A total of 15 species and five varieties of the genus *Ficus* were collected and identified from Mts. Palay-palay–Mataas na Gulod National Park. Two taxonomic keys using vegetative parts and reproductive parts were constructed for a better guide in the identification of the *Ficus* species studied. The diversity of *Ficus* species is highest at lowland elevation from 100 – 300 m above sea level. Seven endemic species found in the National Park are also widespread in the Philip-

pines. The different flowers of the *Ficus* species (short-style female flower or gall flower, long-style female flower, male flower, and neuter flower) were studied and differentiated. A study on the insect pollinators was conducted and two genera of Aganoid wasps were identified: *Blastophaga* and *Ceratosolen*.

1) Amatya, S. M. (1989) Ficus semicordata *Buch. Ham. ex Sm. and Its Taxonomy*. Forest Research Division, Kathmandu. 1-29.
2) Corner, E. J. H. (1965) Check-list of Fucus Asia and Australasia with keys to identification. *The Gardens' Bulletin Singapore* **21**: 1-86.
3) Merrill, E. D. (1923) *An Enumeration of Philippine Flowering Plants 2*. Manila Bureau of Printing. pp. 44-69.
4) Pancho, J. V. (1983) Vascular flora of Mount Makiling and vicinity (Luzon, Philippines), Part I. Kalikasan. *Philippine Journal of Biology*, Suppl. **1**: 67-111.

Excretory System of Male Tilapia of Various Genotypes (YY, XY-GMT, XY)

Herrera, A. A., Catibog, C. and the Fisheries Genetics Breeding Program*
University of the Philippines, Diliman;
**Central Luzon State University, Philippines*

To solve the problem of small-sized tilapia, *Oreochromis niloticus* due to excessive reproduction, a fast-growing monosex male population was developed using the YY technology by a collaborative study of the University of Swansea, UK, and the Central Luzon State University, Philippines. Development of the organ systems of YY male, XY-GMT and the ordinary XY male tilapia was compared. This paper presents the results on the excretory system where the trunk kidneys, tubules and cells were significantly bigger in the YY male than in the XY-GMT and ordinary XY male.

1) Mair, G. C., Abucay, J. S., Skibinski, D., Abella, T. and Beardmore, J. (1997) Genetic manipulation of sex ratio for the large-scale production of all-male tilapia. *Can. J. Fish. Aquat. Sci.* **54**: 396-404.
2) Wohlfarth, G. W. and Hulata, G. I. (1981) *Applied Genetics of Tilapia.* ICLARM, Philippines.

Histological Investigation of the Kidney of Swiss Albino Mice Fed with *Morinda citrifolia* Fruit Puree Extract

Ramos, G. and Herrera, A. A.*
*De La Salle University; *University of the Philippines, Diliman, Philippines*

Morinda citrifolia is a plant with several alleged medical properties. It is the key ingredient in the very popular Noni Juice. Dubbed as the "miracle juice" it is clamed to have many miraculous effects. Local folks take the fresh fruit puree to cure illness. This study aimed at testing any effect of the puree on the kidney. Acute exposure of experimental mice to 4.7 ml/kg bodyweight was done for seven days. Paraffin slides showed glomerulus sclerosis, widened Bowman's space and tubule wall thickening.

1) Abt, A. B., Oh, J. V., Huntington, R. A. and Burkhart, K. K. (1995) Chinese medicine-induced acute renal failure. *Arch. Int. Madicine* **155**(2): 211-212.
2) Solomon, N. (1999) *Tropical Fruit with 101 Uses: Liquid Inland Noni,* Morinda citrifolia. Woodland Publishing, Pennsylvania.

Screening for Anti-*Staphylococcus aureus* Activity of Plant Extracts

Phrommanich, S., Techasauvepak, P., Mujchacheep, S. M. and Hrimpeng, K.
Burapha University, Thailand

Sticks and leaves of 14 species in five families of plants, Ebenaceae, Melastomataceae, Capparaceae, Guttiferae and Rutaceae from Samaesarn island, were extracted with 95% ethanol. Twenty eight of the plant ethanol extracts were tested for antibacterial activity against *Staphylococcus aureus* ATCC 25923 by standard disc diffusion and broth dilution methods. The anti-*S. aureus* activity of 16 extracts, six of *Diospyros* spp., seven of *Melecylon* spp., two of *Garcinia* spp. and one of *Cratocylum* sp., were demonstrated at various levels of minimum inhibition concentration (MIC). The range of MIC was 400 – 1,600 μg/ml. However, only eight of

them demonstrated bacteriocidal activity at various minimum bacteriocidal concentrations (MBC), the range of MBC was 800 – 3,200 µg/ml. The leaf extracts of *Diospyros* sp. and *Garcinia* sp. (PTL1003 and PTL1012) showed the highest bacteriocidal activity with the MBC of 800 µg/ml. Accordingly, they were chosen for testing the antibacterial activity against 20 clinical isolated Staphylococci, 15 isolates of methicillin-resistant *S. aureus* (MRSA) and five isolates of methicillin-susceptible *S. aureus* (MSSA), by agar dilution method. The MIC of PTL1003 against 1, 3 and 10 of 15 isolates of MRSA were 800, 1600 and 3,200 µg/ml, respectively. The MIC of PTL1003 against 1 and 3 of five isolates of MSSA were 800 and 1,600 µg/ml, respectively. The MIC of PTL1012 against 2 and 10 of 15 isolates of MRSA were 800 and 1,600 µg/ml, respectively. The MIC of PTL-1012 against 4 of five isolates of MSSA was 1,600 µg/ml.

1) Phengklai, C. (1987) *Thai Forest Bulletin (Botany) No. 11*. Forest Herbarium, Bangkok.
2) Lennette, E. H., Balows, A., Hausler, W. J. and Shadomy, H. J. (1985) *Manual of Clinical Microbiology*. American Society for Microbiology, Washington.

Anti-microbial Activity of Onion and Shallot on *E. coli* and *S. aureus*

Kulpradit, N. and Kunnathigan, V.
Assumption University, Thailand

Herbal medicines are used to cure the disease for a long time while modern medicines are recently used with more popularity due to their strong and rapid effects. In this project herbal medicines, *Allium cepa* (onion) and *Allium ascalonicum* (shallot), were used to study the antimicrobial activity on *E. coli* and *S. aureus* (TISTR97). These two herbs are locally used to relieve cold and cure digestive system diseases. The process has been done by blending onion or shallot to get its extract along with a solvent extraction method using 95% alcohol and hexane and concentrating the extract two fold. Then the herbal extract was tested for its ability to inhibit bacterial growth using the Disc Diffusion Method. The results show that *S. aureus* is more sensitive to onion and shallot than *E. coli*.

The clear zones observed from the use of onion and shallot concentrates were 2.7 mm and 2.7 mm, respectively for *S. aureus*, and 2.9 mm and 2.8 mm, respectively for *E. coli*. The use of fresh onion, onion (alcohol), onion (hexane), fresh shallot, shallot (alcohol) and shallot (hexane) give effective result at one level. Onion and shallot concentrates give more effective result than others. The learning in this project can be used as a guidance to gain benefits from herbal medicines, which are widely available in cheaper price.

Partial Purification and Characterization of Surface Tegumental Antigens of Liver Fluke *Fasciola gigantica*

Krailas, D., Ukong, S., Vejaratpimol, R., Panomsuk, S. and Taisrivichai, S.
Silpakorn University, Thailand

Fasciola gigantica is a veterinary important parasite found to infect cattle, water buffaloes and sheep. In Thailand, it costs economic damages in terms of meat and milk production. The current method for diagnosis of infection in cattle is based on the microscopic detection of eggs in feces. Convenient and reliable immunodiagnostic methods based on the detections of antibodies or antigens in the blood of infected animals should be used for epidemiological studies. The tegumental proteins whose covering membrane and associated antigens turnover rapidly and are released into the host's circulatory system. The surface tegumental antigens of *F. gigantica* were partially purified and characterized. Gel filtration (Sephadex G-100) was used to fractionate the antigens. One major fraction of crude antigen was obtained and characterized by Native Gel Electrophoresis and SDS-PAGE. Only one band of protein was observed in non-denaturing PAGE. However,

SDS-PAGE demonstrated that the proteins had molecular weight of 49, 32, 29 and 20 kDa.

This work was supported by the Research and Development Institute, Silpakorn University.

1) Fagbemi, B. O. and Hillyer, G. V. (1992) The purification and characterization of a cysteine proteases of *Fasciola gigantica* adult worms. *Vet. Parasitol.* **43**: 223-232.
2) Krilas, D., Viyanant, V., Ardseungnoen, P., Sobhon, P., Upatham, E. S. and Keawjam, R. (1999) Identification of circulating antibodies in fasciolosis and localization of 66 kDa antigenic target using monoclonal antibodies. *Asian Pac. J. Allery Immunol.* **17**: 53-57.
3) Viyanant, V., Krilas, D., Sophon, P., Upatham, E. S., Kusamran, T., Chompoochan, T., Thammasart, S. and Parasititat, P. (1997) Diagnosis of cattle fasciolosis by the detection of a circulating antigen using a monoclonal antibody. *Asian Pac. J. Allery Immunol.* **15**: 153-159.

Localization of Antigen in Frozen Sections of Adult Worms *Fasciola gigantica*

Krailas, D., Ukong, S. and Jumnearn, S.
Silpakorn University, Thailand

Fasciolosis caused by *Fasciola gigantica* infection in ruminants produces a great economic loss throughout the world. In Thailand it costs economic damages in terms of meat and milk production. The detection of circulating antigens is considered to be amore reliable method for evaluating the status of infection which could be used to monitor the efficacy of treatment. Monoclonal antibodies were developed from partially purified surface tegumental antigens of *F. gigantica*. Five monoclonal antibodies were used for anatomical localization of adult *F. gigantica*. The reaction was demonstrated by the Avidin–Biotin method. The experiment revealed that the reaction occurred mainly on the tegument of the adult worm which covered its surface and spine.

This work was supported by the Research and Development Institute, Silpakorn University.

1) Krilas, D., Viyanant, V., Ardseungnoen, P., Sobhon, P., Upatham, E. S. and Keawjam, R. (1999) Identification of circulating antibodies in fasciolosis and localization of 66 kDa antigenic target using monoclonal antibodies. *Asian Pac. J. Allery Immunol.* **17**: 53-57.
2) Sobhone, P., Anantavara, S., Dangprasert, T., Viyanant, V., Krilas, D., Upatham, E. S., Wanichanon, C. and Kusamran, T. (1998) Studies of the tegument as a basis for the developments of immunodiagnosis and vaccine. *Southeast Asian J. Trop. Med. Public Health.* **29**: 387-400.
3) Viyanant, V., Krilas, D., Sophon, P., Upatham, E. S., Kusamran, T., Chompoochan, T., Thammasart, S. and Parasititat, P. (1997) Diagnosis of cattle fasciolosis by the detection of a circulating antigen using a monoclonal antibody. *Asian Pac. J. Allery Immunol.* **15**: 153-159.

The Monogeneans of Cultured Hybrid Catfish (*Clarias macrocephalus* x *Clarias gariepinus*) in Thailand

Mhrad-Arehin, N. and Wongsawad, C.
Chiang Mai University, Thailand

The monogeneans were collected from cultured hybrid catfish (*Clarias macrocephalus* x *Clarias gariepinus*) from San Sai District, Chiang Mai Province, during December 1999 to April 2000. The prevalence of infection in fishes was 80.9% (123/152). Two species of monogeneans were shown, *Gyrodactylus* sp. and *Quaudriacanthus* sp. with prevalence 60.5% (92/152) and 55.3% (84/152), respectively. Intensity of infection were 11.02% (1675/152) and 3.92% (596/152), respectively.

This work was supported by the TRF/BIOTEC Special Program for Biodiversity Research and Training Grant BRT 542083.

Scanning Electron Microscopy to Identify Some Helminths in Watersnake, *Xenochropis piscator*, from Thailand

Nichapun, A., Wongsawad, C. and Sripalwit, P.
Chiang Mai University, Thailand

The trematode, *Acanthostomum burminis* and the acanthocephalan, *Sphaerechinorhynchus macropithospinus* were investigated by light micro-

scope and scanning electron microscope (SEM). These worms were collected from the watersnake, *Xenochropis piscator*, from Maesa Stream, Doi Suthep-Pui National Park, Chiang Mai Province, Thailand, during June 1998 to May 1999. *A. burminis* was collected from intestine and *S. macropithospinus* was collected from the muscle. The worms were fixed, stained and mounted by permanent slides processing. The identification was observed by light microscope. Some details were observed by SEM (JEOL JSM 840A). The body size of *A. burminis* is elongated and slender subcylindrical, crown of spines 26 in number, genital pore is located immediately in front of the acetabulum, bifurcate ceca opening to outside posterior part of the body. *S. macropithospinus* is long; trunk elongate and cylindrical, widest anterior and tapers in both direction, more gradually posterior; posterior areas widens; body spine absent; proboscis globular, slightly wider than long; proboscis spines in 14-15 alternating longitudinal rows of nine spines each including three anterior rooted robust spines and six posterior rootless spiniform spines.

This work was supported by the TRF/BIOTEC Special Program for Biodiversity Research and Training Grant BRT 541064.

Diversity of Helminths in Maesa Stream, Chiang Mai, Thailand

Wongsawad, C., Rojanapaibul, A., Rojtinnakorn, J.*, Wongsawad, P., Marayong, T. and Suwattanacoupt, S.
Chiang Mai University; Maejo University, Thailand

Freshwater vertebrates from Maesa Stream, Doi Suthep-Pui National Park, Chiang Mai, were collected from January 1997 to June 1999. They were 3,900 of 32 fishes; 149 of nine amphibians; three of three reptiles. Fifty-six species of helmiths were recorded: five monogenea are *Dactylogyrus* sp. I and II, *Trianchoraus* sp., *Gyrodactylus* sp. and *Diplozoon* sp.; 27 trematodes are *Allocreadium* sp. I and II, *Haplorchiodes* sp. (metacercaria; meta), *Haplorchiodes* sp. (adult), *Posthodiplostomum* sp., *Gauhatiana* sp., *Plagiophorus* sp., *Transversotrema patialense*, *Euryhelmis* sp. (meta), *Centrocestus caninus* (meta), *Acanthostomum* sp. (meta), *Genarchopsis goppo*, *Genarchopsis* sp. (meta), *Phyllodistomum* sp. I, II and III, *Brevicreadium* sp., *Gorgoderina gracilis* n. sp., *Pleurogenooides sphaericus*, *Stellantchasmus falcatus* (meta), *Haplorchis* sp. (meta), *Urotrema* sp., *Encyclometra bungara*, *Pleurogenes chiangmaiensis*, *Telorchis* sp., *Mantereill* sp. and *Ganeo tigrinus*; Six Cestodes are *Senga changmaiensis* n. sp, *Ptychobothrium mystacoleucusi* n. sp., *P. maesa*e n. sp., *P. rojanapaibuli* n. sp., and *Circumoncobothrium baimaii* n. sp. Three Acanthocephala are *Cystacanth*, *Pallisentis* sp. and *Acanthocephalus lucidus*; 15 nematodes are cyst *Spinitectus* sp. (larva), *Spinitectus* sp., *Rhabdochona* sp. I, II and III, *Camallanus* sp., *Zanclophorus* sp., *Anisakis* sp., *Proleptus* sp., *Cosmocerca* sp., *Ascaridia* sp., *Camallanus anabantis*, unknown I and unknown II. Specimens were surveyed one of each season for the first year. The prevalence (%) and intensities of infection were recorded, first year in season and second to third year in every two months. Parasitic distribution, relationships between host and parasite, and classification were analyzed by cluster analysis.

This work was supported by the TRF/BIOTEC Special Program for Biodiversity Research and Training Grant BRT 139031.

Prevalence of the Rumen Cow Flukes in Chiang Mai and Lumphun Province, Thailand

Sripalwit, P., Wongsawad, C. and Anuntalabhochai, S.
Chiang Mai University, Thailand

The rumens of cows (*Bos indicus*) from Amphur Maung, Chiang Mai Province and Amphur Maung, Lumphun Province were examined during January to March 2000; 37 cows were investigated while 29 cows were infected by trema-

todes. The prevalence of infection was 78%. Three trematode species found are as follows: *Fischoederius elongates* (Poiries 1883), *Orthocoelium parvipapillatum* (Stiles & Goldberger 1910) and *Paramphistomum epiclitum* (Fischoedes 1904). The prevalence of infection was 41%, 49% and 76% in these species, respectively. In Chiang Mai Province, the prevalence was 88% while it was 81% in Lumphun Province. The parasitic infections were caused by *F. elongates* (50% and 33% in Chiang Mai and Lumphun Province, respectively), *O. parvipapillatum* (50% and 48%) and *P. epiclitum* (81% and 71%). This work was supported by the TRF/BIOTEC Special Program for Biodiversity Research and Training Grant BRT 542084.

Contraceptive Effects of Some Thai Medicinal Plants in Rats

Kaweewat, K., Smitasin, Y.*, Kananthai, W. and Saenphet, S.*
*Chiang Mai University; * Mae Fa Luang University, Thailand*

Some Thai medical plants are reputed to prevent conception. This study was carried out to investigate the contraceptive effects of ten extracts: (1) hexane and (2) chloroform extracts from *Sida rhombifolia*; (3) hexane, (4) methanol and (5) aqueous extracts from *Aegle marmelos*; (6) methanol and (7) aqueous *extracts from Monordica charantia*; (8) chloroform, (9) methanol and (10) aqueous extracts from *Pueraria mirifica*. Groups of male and female rats were orally treated with 50 mg/kg b. w. of each extract for 20 days, and subsequently mated with untreated rats. After 14 days of pregnancy, females were sacrificed for examining the success of fertility and fetal malformation, if present. The results showed that extracts 7, 9 and 10 effectively prevented pregnancy. With exception of rats treated with extract 2, all treated females had significantly lower numbers of implantation as compared to controls. In the case of treated male rats, all ten extracts did not have any significant effect on testicular weight. Nevertheless, seminal vesicle weight of rats treated with extracts 2, 3, 4, 6, 9 and 10 were significantly lower than those of controls. Moreover, a decrease in the number of implantation was observed in untreated females mated with males treated with extracts 1, 2, 4, 5, 6, 8, 9 and 10. No sign of fetal abnormality was observed in fetuses of both treated males and females. It could be concluded from the results that extracts 7, 9 and 10 could be effectively used female birth control, while the other extracts could only reduce fertility.

Low-cost Nutritive Cookies (LCNC)

Trimala, N. and Cheowtirakul, C.
Assumption University, Thailand

Humans require close to 50 specific substances in sufficient qualities to meet the body‘s needs that must be taken into the body in order to have them perform properly. These essential materials are nutrients. This project is aimed to produce a product, low cost nutritive cookies (LCNC), which contains every essential nutrient to meet the body’s needs. The LCNC contains at least 38 essential substances, which meet the Recommended Dietary Allowances required by the man at the age 25 years and 75 kg weight. Besides the complete nutrients, these cookies are also low at cost because we selected all the raw materials, which are available in Thailand. The 530 grams of LCNC can substitute the whole day diet and the cost is only 23 baht per day.

Both quantitative analysis and qualitative analysis were done on the LCNC. Animal feeding test for a period of 28 days on mouse showed the weight gain was 123.97 grams when fed with the LCNC and 109.89 grams in control. The proximate analysis result showed that the LCNC contains 11.92% of protein, 26.64% of fat, 61.18% of carbohydrate and fiber, 3.12% of ash and 0.51% of moisture content.

<Talks>

Hong Kong Country Parks and Nature Education

Ngar, Y. N.
Agriculture, Fisheries and Conservation Department, the Government of Hong Kong SAR

There are 23 country parks in Hong Kong and they cover about 40% area of the HK territory. They have been and will continue to be a major environment for nature conservation, education and out door recreation. Large variety of activities are organized every year for the public, in particular the teachers and students, to enhance their interests, understanding and appreciation of the natural environment. Ultimately, it is hoped that all citizens will take up an environmental-friendly concept to conserve the precious nature.

Hong Kong Marine Parks and Marine Reserve

Kwok, A.
Agriculture, Fisheries and Conservation Department, the Government of Hong Kong SAR

In Hong Kong, there are three marine parks and one marine reserve, covering a total area of 2,160 hectares. They comprise scenic coastal areas, seascapes, and important marine habitats. Marine parks and reserve are managed by Agriculture, Fisheries and Conservation Department for conservation, education, scientific studies and recreation. Law enforcement actions are taken against the prohibited activities such as trawling, unauthorized fishing, hunting or collecting marine life, damaging marine and costal features in marine parks and reserves. To arouse public awareness of the need to conserve the marine environment, educational activities such as guided tours, beach clean-ups, seabed clean-ups, seminars and public lectures are regularly organized.

<Abstracts submitted>

A Simple, Rapid, Inexpensive and Wholistic Method in the Detection of Toxic Chemicals and Fecal Coliforms in Drinking Water Based on Luminous Bacteria Immobilized on Filter Paper Disc and the Lactose Fermentation and Iodole Production Tests

Quinto, E. A.
University of Santo Tomas, Philippines

Clean and safe drinking water is based on the absence of harmful pathogenic bacteria as well as the absence of harmful chemicals (toxicants). Examination of water for potability is just usually based on the Fecal Coliform Test. A test based on bacterial bioluminescence to measure chemical water toxicity is currently available in the market [1)]. Both tests are quite expensive to perform and require sophisticated laboratory equipment and gadgets. The wholistic method described does not need any sophisticated laboratory device and is user-friendly, rapid and quite inexpensive. The fecal coliform test is done by simply adding 100 ml of water sample to two containers (A and B): A contains lactose, tryptophan, sodium lauryl sulfate, Phenol Red and Brilliant Green with an inverted tube while B contains tryptophan, potassium phosphate and sodium lauryl sulfate. After 24 to 48 hours of incubation at room temperature assuming an averaged tropical daily temperature of at least 30°C, turbidity, yellow-green coloration and gas formation is observed for A and red upper layer is observed for B after the addition of 30 ml of Kovac's Reagent. This result is indicative of the presence of the fecal coliform bacterium: *Escherichia coli* in the water sample. For the bacterial bioluminescence test, a 6.0 mm Whatman No. 1 filter paper disc is immersed in a brightly luminous broth culture of *Photobacterium leiognathi* causing the immobilization of luminous cells on the paper. The paper disc is immersed in 10 ml water sample contained in a screw capped tube which has been previously made 3.0% saline and pH 7.0. Complete or par-

tial light inhibition in one to two hours compared to a negative control is indicative of the presence of minute amount of toxicants in the water sample. Water samples negative for both tests: fecal coliform and bioluminescence tests are considered clean and safe to drink.

1) Bulich, A. A., Tung, K. K. and Scheibner, G. (1990) The luminescent bacteria toxicity test. Its potential as an in vitro alternative. *J. Biolum. Chemilumin.* **5**(2): 71-77.

The Isolation, Cultivation, Preservation and Phenotypic Characterization of Marine Luminous Bacteria Obtained from the Seawater of Manila Bay and Indigenous Saltwater Fishes and Squid

Quinto, E. A.
University of Santo Tomas, Philippines

Fifty marine luminous bacteria were isolated from different sources. Three luminous bacterial isolates were obtained from the seawater of Manila Bay while the remaining 47 were obtained from the intestinal content of various saltwater animals namely: *Trichiurus leptus* Linn. 1758 (Espada), *Nemipterus* sp. (Bisugo), *Leiognathus* sp. (Sapsap), *Selar crumenophthalmus* Bloch 1793 (Matang Baka), *Decapterus* sp. (Galunggong), *Caesio* sp. (Dalagang Bukid) and *Loligo* sp. (Pusit)[1)]. Pure culture technique and cultivation of the marine luminous bacteria were done in trypton-yeast extract-glycerol-seawater medium. The 50 isolates were classified and subsequently identified using a battery of morphological, cultural, physiological, biochemical and ecological characterizations. Comparison of the phenotypic characterizations was done with 2 luminous bacterial type strains: *Vibrio harveyi* DSM6904 and *Vibrio fischeri* DMS7151. The three luminous bacteria obtained from seawater were classified as belonging to the genus *Vibrio* while other 47 luminous bacteria obtained from the intestinal tract of fishes and squid were classified as belonging to the genus *Photobacterium*[2)]. The Vibrio species were identified as *Vibrio harveyi*, *Vibrio orientalis* and *Vibrio splendidus* while all the Photobacteria were identified as *Photobacterium leiognathi*. Preservation of the cultures is done in soft agar trypton-yeast extract-glycerol-seawater stab medium overlaid with sterile light mineral oil and kept at chilled to room temperature.

1) Conlu, P. (1986) *Guide to Philippine Flora and Fauna Vol. IX Fishes.* JMC Press.
2) Nelson, K. H. and Hastings, J. W. The luminous bacteria. In: Balows, A. H., Trueper, G., Dworkin, M., Harder, W. and Schleifer, K. H. (eds) *The Prokaryotes 2nd ed*. Springer-Verlag, New York.

Immunomodulating and Free Radical Scavenging Activity of *Schefflera odorata*

Ramos, M. C. R. and De Castro Bernas, G.
University of Santo Tomas, Philippines

The butanolic extract of the leaves of *Schefflera odorata* was investigated in view of its immunomodulating and free-radical scavenging effects. The immunomodulating activity was assessed in terms of the release of cytokines, like interleukinn-1 (IL-1) and tumor necrosis factor (TNF-α) from human macrophages using the ELISA method. The release of IL-1 and TNF-α from human macrophages was induced by incubation with the butanolic extract for 24 hours at concentrations 20, 40, 50, 100 and 150 μg/ml using 10 μg/ml lipopolysaccharide (LPS) as the positive control. LPS induced the release of 339 pg/ml of IL-1, whereas the leaf extracts at 20, 40, 50, 100 and 150 μg/ml released 83, 64, 249, 1612 and 722 pg/ml, respectively. On the other, 4191 pg/ml TNF-α was released by LPS at 10μg/ml. The leaf extract stimulated the release of 361, 755,438, 801 and 1118 pg/ml TNF-α at 20, 40, 50, 100 and 150 μg/ml of the leaf extract respectively.

The free-radical scavenging activity of *S. odorata* was determined using the Electron Spin Resonance (ESR) technique. Briefly, hydroxyl and superoxide free-radicals were generated and measured by spin trapping technique. In the presence of the butanolic extract of *S. odorata*, 69.18% of hydroxyl radicals were scavenged at

1.136 mg/ml while at 11.63 mg/ml of the extract almost 100% of hydroxyl radicals were scavenged. On the other hand, *S. odorata* did not show any significant superoxide scavenging effect.

Teaching Developmental Biology Using *Rhacophrus leucomystax* (Boie) Embryos

Simeon, E. C.
University of Santo Tomas, Philippines

Rhacophrus leucomystax (Boie) or known as Banana frog produces embryos at any time of the year. It can be obtained from ponds or from moist grasses. The embryos are embedded in usually floating white jelly masses. Each jelly mass normally contain about 200 to 2,000 embryos that are at the same developmental stages to have ideal experimental sampling size. Several jelly masses can be collected at different period of the day especially during rainy seasons, hence, embryos that represent the various stages of development of a typical vertebrate can be readily available. These can be easily reared in the laboratory in simple, inexpensive and health-safe culture medium of rain water and cutting of *Hydrilla* sp. in clear plastic glasses. They are not very sensitive to light and temperature changes. The development of the embryos can be observed with the naked eyes or with the use of a simple had lens. Monitoring their development can be done within 5–7 days from the cleavage stage to the 7 mm embryonic stage. No feeding nor complicated management are needed within their period of embryonic development. With these conditions, the embryos of *R. leucomystax* are very practical and safe to use for classroom demonstration on the study of vertebrate embryonic development.

This paper initially presents the different stages of development of *R. leucomystax* embryos. This can be used as a basic reference for the study of developmental biology. It further presents a study which demonstrates the use of these embryos to determine anti-mitoticity, cytotoxicity, embryonic toxicity and teratogenicity of substances or agents that may affect developing embryos. The principles of growth inhibition and acceleration are also included in the study.

Biogeography of *Nepenthes* Species in the Philippines

Madulid, R.S.
University of Santo Tomas, Philippines

The population of 14 species of *Nepenthes* [1)] are discussed with important notes on their distribution, habitat whether highland or lowland, the kind of soil where they thrive, climate as well as rainfall.

While *N. alata* has the widest range covering the whole islands, *N. ventricosa* ranks second occurring in a moderately broad range. Two recently named species *N. argentii* and *N. sibuyanensis* have been found to be confined only in one small island in Luzon. There are some six species that occur in the northeastern strip of the Philippines that includes the mountains in the Bicol region moving downward to Samar and to the upper tip of the island of Mindanao particularly Surigao and still downwards towards Davao. There is the big elongate island of Palawan along the southeast boundary of Philippine territory where three *Nepenthes* species has been secluded and in the island of Mindoro, another species *N. burkei* seem to have remained cloistered through the year.

Distribution maps for the 14 species will be presented to show their various occurrences. Of the 14 species of *Nepenthes*, 13 are endemic to the islands. Species richness is apparent where there has been history of volcanic activity.

1) Jebb, M. and Cheek, C. (1997) A skeletal revision of Nepenthaceae. *Blumea* **41**: 1-90.