

中文大學校刊  
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Number Four 1985





# Chinese University Bulletin

## Number Four 1985

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## Contents

### *News*

Curriculum Review Report Accepted by Senate . . . . .	1
First Exercise Under New Admissions System Completed . . . . .	1
1985 Meeting of the Co-ordinating Board of the UNESCO Regional Network for Microbiology in Southeast Asia. . . . .	2
Regional Workshop on Application of Microbial Protoplasts in Genetic Manipulation and Genetic Engineering . . . . .	3
University Sponsors Conference on Asia-Pacific Perspectives in International Business . . . . .	4
Comparative Literature Conference – Narrative in a Chinese-Western Context . . .	5
International Symposium on Recycling of Organic Wastes for Fertilizer, Food, Feed and Fuel . . . . .	6
News in Brief . . . . .	7

### *Recent Developments*

Departmental Profiles	
Department of Biochemistry . . . . .	9
Department of Biology . . . . .	12
Department of Chemistry . . . . .	15
Department of Physics . . . . .	18
Research Projects in Science . . . . .	20

### *Academic/Cultural Events*

Seminars . . . . .	30
--------------------	----

<i>Profiles</i> . . . . .	31
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<i>Personalia</i> . . . . .	32
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Cover: *Marine Science Laboratory (photo by Michael Leung)*

### **Advisory Committee on *Chinese University Bulletin***

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## *Curriculum Review Report Accepted by Senate*

The University Senate has accepted proposals made by a Special Panel on Curriculum Review to revise its undergraduate curriculum. The review is a normal academic exercise aimed at re-examining the curriculum of the University, which has evolved over the years.

The major recommendations of the Special Panel are as follows:

- (1) a more balanced curriculum structure be formulated under the credit unit system, allowing students greater freedom in selecting courses to meet their individual academic interests and needs;
- (2) repetition of examinations be avoided and at the same time student assessment by course examination with continuing participation by external examiners be strengthened;

- (3) the General Education Programme be strengthened and given more weight in the overall curriculum; and
- (4) greater emphasis be placed on the standard of Chinese and English languages of applicants who seek admission, and undergraduate students be further assessed in their language abilities after entrance.

Appointed by the Vice-Chancellor in January 1983, the Special Panel on Curriculum Review under the chairmanship of Professor Ambrose King comprised five academic staff members of the University. Its report was submitted to the Vice-Chancellor in late 1984 and was subsequently circulated within the University in January 1985 for internal discussion and consultation at various levels. The Panel's major recommendations received wide support within the University, and were finally approved by the Senate with minor modifications.

## First Exercise Under New Admissions System Completed

Applications for admission under the Provisional Acceptance Scheme were accepted in mid-September 1984, marking the beginning of the first admissions exercise under the University's New Admissions System, which comprises three channels for admission: the Provisional Acceptance Scheme, the Hong Kong Higher Level Examination and the Hong Kong Advanced Level Examination. After a year, by the end of August 1985, the entire exercise was successfully completed, through which 1,297 new students were admitted to the five Faculties of the University. The number of new students admitted to each Faculty is as follows:

Faculty of Arts	: 272
Faculty of Business Administration	: 218
Faculty of Medicine (Pre-clinical Year One)	: 39*
Faculty of Science	: 455**
Faculty of Social Science	: 313
	<hr/>
	<u>1,297</u>

The Provisional Acceptance Scheme was a

successful accomplishment as evidenced by the very enthusiastic response of the students at various stages of the Scheme. Over 7,000 applications were received in September/October 1984; the majority applied through schools. More than 99% of those invited for interview attended in December 1984. When provisional offers were given to successful applicants in February 1985, over 95% accepted the offers. About 98% of the applicants with provisional offers or on reserve took the Final Scholastic Assessment in July 1985. When formal admission offers were given to successful applicants in August 1985, over 95% accepted the offers and enrolled.

Application through the other two channels of admission, the Hong Kong Higher Level Examination and the Hong Kong Advanced Level Examination, was also enthusiastic. Over 2,000 candidates applied through each channel.

Application for admission in August 1986 under the Provisional Acceptance Scheme started on 16th September, 1985.

\* 63 new Pre-clinical Year One students internally promoted are not included.

\*\* Including 82 new Potential Medical Major students.

# 1985 Meeting of the Co-ordinating Board of the UNESCO Regional Network for Microbiology in Southeast Asia



*(From left) Dr. Purwo Arbiyanto (Indonesia), Associate Professor Hj. Zulkifli Hj. Shamsuddin (Malaysia), Professor Soon-woo Hong (Korea), Professor Pornchai Matangkasombut (Thailand), Mr. T. Kuroda (Unesco Jakarta), Professor Nancy F. Millis (Australia), Dr. V. Prakash (Unesco Jakarta), Professor S.T. Chang (Hong Kong), Dr. R.H. Thornton (New Zealand), Dr. William Padolina (Philippines) and Dr. T. Yoshida (Japan).*

At the 1983 Meeting of the Co-ordinating Board of the UNESCO Regional Network for Microbiology in Southeast Asia held in Jakarta, Indonesia, it was resolved that for the next term the Headquarters of the Network be moved from the Philippines to Hong Kong for a term of three years, effective 1st March, 1984. Professor S.T. Chang of the Department of Biology of this University was appointed Executive Secretary of the Headquarters of the Regional Network. In 1st-2nd July, 1985, Hong Kong hosted this year's Co-ordinating Board Meeting at The Chinese University.

The Network for Microbiology was founded in 1975 with the aim to strengthen and foster research and cooperation among microbiologists through the establishment of linkages between universities, scientific laboratories and industry of the participating countries in Southeast Asia. All the activities of the Network, including training courses, symposia, workshops and exchange programmes of scientists are formulated and planned by the Co-ordinating Board. The Board consists of ten National-Point-of-

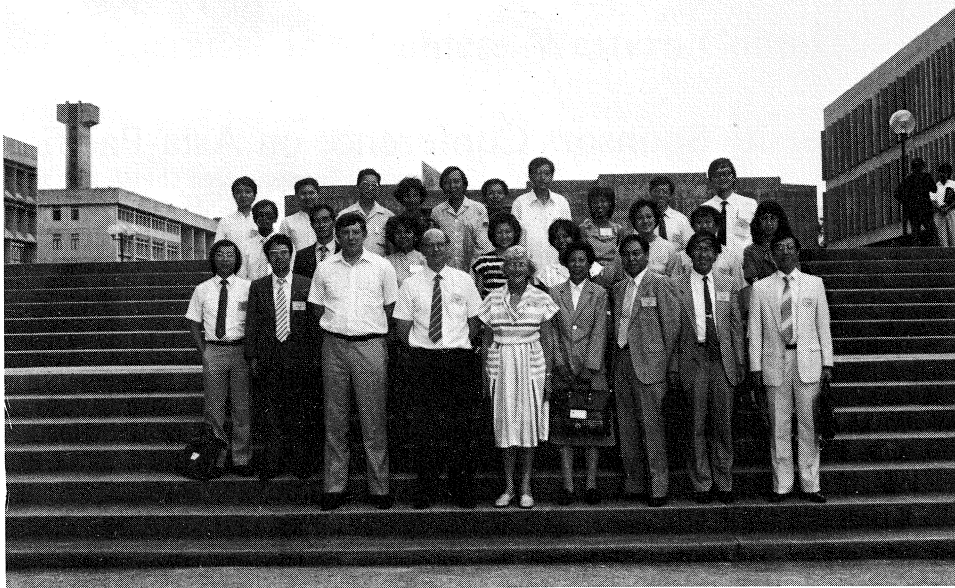
Contact Representatives (NPCRs) from ten member countries (Australia, Hong Kong, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore and Thailand), plus two ex-officio members from UNESCO.

The opening ceremony of the two-day meeting, at which Professor S.T. Chang officiated, was held at Cho Yiu Conference Hall of this University. Mr. G.A. Higginson, Deputy Secretary for Economic Services, Hong Kong, gave the opening address, and Professor B. Hsu, Acting Vice-Chancellor of this University, the welcoming address, and Dr. V. Prakash, Director of the Regional Office for Science and Technology for Southeast Asia, Jakarta, Indonesia, delivered a message from UNESCO. Immediately after the opening ceremony, the two representatives from UNESCO and the NPCRs from Australia, Hong Kong, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines and Thailand attended the meeting at the Conference Room of the Science Centre, where they reviewed the various activities and programmes of the Network during the past ten years, and worked out plans for future operation.

— S.T. Chang



# Regional Workshop on Application of Microbial Protoplasts in Genetic Manipulation and Genetic Engineering



*Lecturers, participants and staff of the Workshop. Front row from left to right (lecturers): Dr. H.S. Kwan (Hong Kong), Dr. J. Sekiguchi (Japan), Dr. C. Ball (U.S.A.), Professor J.F. Peberdy (U.K.), Professor N.F. Millis (invited guest, Australia), Professor P. Liang (China), Dr. M. Tsuboi (Japan), Professor S.T. Chang (Hong Kong) and Dr. K.Y. Chan (Hong Kong).*

The Regional Workshop on Application of Microbial Protoplasts in Genetic Manipulation and Genetic Engineering, jointly organized by UNESCO, the Hong Kong Society of Microbiology, and this University, was held from 4th to 13th July, 1985 at the Department of Biology. It was officially declared open by Professor B. Hsu, Acting Vice-Chancellor of the University, on 4th July, 1985. Messages were delivered by Professor G. French, Acting President of the Hong Kong Society of Microbiology and Dr. V. Prakash, Director of the UNESCO Regional Office for Science and Technology for Southeast Asia.

During the opening ceremony, a special lecture on 'Surveillance of Genetic Engineering' was given by Professor N.F. Millis, Chairman of the Australian Recombinant DNA Monitoring Committee. The keynote lecture on 'Current Status on Microbial Protoplast Fusion' was presented by Professor J.F. Peberdy, Professor of Microbial Genetics at the University of Nottingham.

The Workshop was intended to provide participants with information on the principles and techniques in isolation, reversion and fusion of microbial protoplasts, and to promote the exchange of research experience among young scientists in the field. The development of protoplast-based techniques for genetic manipulation and genetic engineering in microorganisms involving fusion and vector-mediated

transformation provides an opportunity for overcoming many of the difficulties in hybridization and recombination experienced with intact cells. The programme consisted of lectures and laboratory demonstrations dealing with the use of protoplast techniques for the study of yeast, algae, fungi (including *Aspergillus*, *Penicillium*, and edible fungi), and bacteria (including *Bacillus* and actinomycetes). The programme also considered the use of microbial protoplasts in industry by transformation techniques. A demonstration of basic recombinant DNA techniques was also conducted.

Lecturers of the Workshop included Professor P. Liang (China), Professor J.F. Peberdy (England), Dr. J. Sekiguchi and Dr. M. Tsuboi (both from Japan), Dr. C. Ball (U.S.A.), as well as Dr. K.Y. Chan, Professor S.T. Chang and Dr. H.S. Kwan of this University. Apart from the four local participants, there were ten overseas participants: two from Indonesia, one each from Korea and Malaysia, and three each from the Philippines and Thailand. In addition, there were four observers from China.

Professor S.T. Chang was Chairman of the Local Organizing Committee and Workshop Director; Professor J.F. Peberdy was the International Organizer, and Dr. H.S. Kwan of the Department of Biology, CUHK, was the Workshop Coordinator.

— S.T. Chang

## University Sponsors Conference on Asia-Pacific Perspectives in International Business

The Inaugural Meeting of the Southeast Asia Region of the Academy of International Business (AIB), jointly organized by the Academy of International Business and the Department of Marketing and International Business of this University, was held from 4th to 6th July, 1985, at the Hong Kong Hilton Hotel. The theme of the Inaugural Meeting was 'Asia-Pacific Perspectives in International Business'. The Conference was well represented, with paper presenters and participants coming from Canada, China, Japan, Malaysia, Singapore, Taiwan, the United Kingdom, the United States, and Hong Kong. There were over eighty papers presented during the nine sessions, with well over one hundred paper presenters and participants attending this meeting.

The Academy of International Business is a world-wide organization with over 1,600 members in more than fifty countries. The organization, primarily comprised professors of international business and executives concerned with international business activities, has the primary objective of fostering education and advancing professional standards in the field of international business. The Academy provides opportunities for the exchange of ideas through its annual meetings, regional meetings, and international meetings.

At AIB's International Meeting held at Singapore in June 1984, a large number of participants from the Southeast Asia region discussed the need for additional and closer cooperation for members in the region. Subsequently, a new Southeast Asia Region was proposed to and approved by the Academy's Executive Board. Professor K.C. Mun, Chairman of the Department of Marketing and International Business of this University, was elected Chairman of this newly established Region. Hong Kong was selected as the venue for the Inaugural meeting and The Chinese University of Hong Kong as the host institution.

Professor K.C. Mun officiated at the inauguration of the Southeast Asia Region at the Opening Ceremony of the Conference. The Keynote speaker at the Plenary Session was Professor Michael J. Baker, Deputy Principal and Professor of Marketing at the University of Strathclyde, and he presented his views on 'Globalization versus Differentiation, as International Marketing Strategies'.

The Conference consisted of nine sessions; each session had three concurrent discussions held at different conference rooms. A wide variety of research papers were presented during the concurrent sessions, including: International Advertising, China's Investment and Trade, International Marketing and Channels Considerations, Exports from the Asia-Pacific to the U.S., Stock Market in Singapore, Marketing in Singapore, Comparative Studies in Human Resources Management, International Accounting and Taxation, Foreign Direct Investment Issues, Impact and Pattern of Technology Transfer, Business Knowledge and Education, Issues in International Banking, Issues in Multinationals, and many others. All the papers selected by the Programme Committee for presentation at the Conference were published in the 765-page Proceedings, edited by Professor K.C. Mun and Dr. T.S. Chan of the Department of Marketing and International Business.

One of AIB's objectives is to facilitate the exchange of information and ideas among people in academic life, business, and government, and the Southeast Asia Region will surely uphold this tradition through the annual regional meetings to provide ample opportunities for exchange. The city of Taipei, Taiwan, has been selected as the venue for the next regional meeting, to be held around the end of June 1986.

— T.S. Chan

## Comparative Literature Conference — Narrative in a Chinese-Western Context

The first half of this decade has witnessed an intense interest by P.R.C. scholars in the field of Chinese-Western Comparative Literature studies. During this brief period, a half dozen full-length books have been published; two journals (one in Chinese and one in English) are devoted exclusively to the discipline, and numerous institutions have begun courses on both the undergraduate and postgraduate levels. In October, the National Comparative Literature Association of China will be formally inaugurated at Shenzhen University on the occasion of a three-week workshop and conference.

One year ago the Comparative Literature Research Unit of the English Department felt the time was ripe for an exchange of scholarly ideas between scholars in Hong Kong and the P.R.C. An organizing committee was formed (Drs. Ying-hsiung Chou, John J. Deeney, Peter Glassman, Michael Holstein, Thomas Yun-tong Luk, and Heh-hsiang Yuan) and the topics were chosen with the intention of testing a variety of comparative perspectives. The Conference was held in 2nd – 7th September, 1985.

The participants were invited to probe more deeply into some of the basic assumption in comparative literature studies: To what extent can comparisons be fruitfully made between literatures which are not historically or genetically connected? To what extent can interdisciplinary considerations unfold unnoticed layers of meaning in literary texts? To what extent are common views on what constitutes the definition of a given genre valid? To what extent do ideological considerations inform the literary text and determine its merit? To what extent can we say that a given text or portion of a text is distinctively Chinese or distinctively Western? What makes it so? What cultural sensibilities are revealed by considering these works together?

The texts chosen for comparison did not produce the conventional influence type of study in which direct contact of one kind or another is the issue. Rather, the texts stimulated spirited exchanges, in which all the speakers and discussants voiced their opinions. The approaches suggested and the texts selected were:

- I. The treatments of cultural history in narrative prose:

*War and Peace*

*San Kuo*, or *The Romance of the Three Kingdoms*, trans., C.H. Brewitt-Taylor

- II. Thematic structures and the significances of memory in autobiography:

*The Confessions* of Jean-Jacques Rousseau, trans., J.M. Cohen

*Shen Fu: Six Records of a Floating Life*, trans., Leonard Pratt and Chiang Su-hui or *Ba Jin's Random Thoughts*, trans., Geremie Barmé

- III. Formal and generic innovations in fiction:

*To the Lighthouse*

Wang Wen-hsing's *Chia-pien*

- IV. Presentations of ideology/philosophy in literature:

*Don Quixote*, trans., M. Cohen and/or

*Ah Q* or *Journey to the West*, trans., Anthony C. Yu or W.J.F. Jenner

- V. Fictional portrayals of self and society:

*Pride and Prejudice*

*Dream of Red Mansions*, trans., Yang Hsien-yi and Gladys Yang or

*The Story of the Stone*, trans., David Hawkes and John Minford

Although the papers were written in English the official languages of the Conference were Mandarin and English. The main task of simultaneous interpretation was carried out by Dr. Philip Shen, Mr. Rupert Chan, Dr. Simon Chau from The Chinese University and Ms. Wang Jiexiang and Mr. Wu Ningkun from the P.R.C.

In addition to sixteen papers read by P.R.C. participants, there were also papers by Professor John Preston of the Department of English Studies and Comparative Literature, Hong Kong University, and our own contributions by Drs. Chou Ying-hsiung, Peter Glassman, and John J. Deeney. During the discussion periods, other colleagues from the P.R.C., The Chinese University, and Hong Kong University, enlivened the proceedings with fresh and original comments. In the final round-table session, we were privileged to have presentations made by Mr. Yang Zhouhan (Peking University), recently elected Vice-president of the International Comparative Literature Association, and Mr. Sun Jingyao (Guangxi Univer-

sity). A substantial recapitulation was shared between our visiting Fulbright Professor Earl Miner (Princeton University) and Dr. Yuan Heh-hsiang.

We were quite honoured to have the sustained support and active participation of our advisory committee: Dr. Ma Lin, Dr. F.C. Chen, Professor D.C. Lau, Dr. Ng Lee Ming and, from the P.R.C. State Education Commission, Mr. Jiang Miaorui and Mr. Yang Xun. Mr. Mark Sheldon, Yale-China representative, spoke on behalf of the funding agencies, the Trustees of Lingnan University and the United Board for Christian Education in Asia, in the closing cere-

mony.

All forty-five participants spoke in warm terms about the unfailing support on the part of the secretarial staff and the postgraduate students in the smooth running of the Conference.

Dr. Ma Lin anticipated the results of the Conference best, perhaps, when he started in his welcoming address, 'Such a gathering . . . suggests a worthwhile intellectual pursuit in which lies the better understanding of ourselves and our world.'

— J. Deeney

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## International Symposium on Recycling of Organic Wastes for Fertilizer, Food, Feed and Fuel

An International Symposium on 'Recycling of Organic Wastes for Fertilizer, Food, Feed and Fuel' was held at this University from 28th to 30th August, 1985. The symposium was the follow-up of a previous conference entitled 'Ecological Aspects of Solid Waste Disposal', also held at the University in 1983.

The symposium was once again sponsored by COSTED (Committee on Science and Technology in Developing Countries) and UNESCO, and organized jointly by the Biology Department of this University and ANBS (Asian Network of Biological Science).

Waste materials such as sewage sludge, municipal waste, animal manure, etc. will increase tremendously in the near future. Reutilization of these materials is therefore of prime importance, especially in a densely populated area such as Hong Kong, where land for waste disposal is limited.

Furthermore, in terms of resource conservation and environmental protection, waste should be regarded as potential materials for fertilizer, food, feed and fuel. Resource recovery can therefore forestall shortage of natural resources and, at the same time, greatly reduce waste disposal problems.

Many alternatives to waste disposal, either currently available or under study, focus on the recovery of material or energy. In a world of diminishing resources and increasing needs, each opportunity

for the reuse of waste materials must be examined. We have gathered at the University a group of scientists and engineers from fifteen countries to exchange ideas and experience in various aspects of waste recycling. Meetings such as this can serve as a media through which one can contribute significantly to solving the pressing environmental problems.

Apart from the twenty papers presented during the Symposium, there were three keynote speeches: 'Microbial biotechnology — Integrated studies on utilization of solid organic wastes' by Professor S.T. Chang, Chairman of the Department of Biology, CUHK; 'Redressing the balance — The problem of agricultural wastes in Hong Kong' by Mr. R. Hoare, Acting Commissioner, Hong Kong Environmental Protection Agency; and 'Low capital cost bioconversion of municipal and agricultural wastes' by Dr. D.L. Wise, Vice-President of Dynatech Research/Development Company, USA. A field trip was organized at the end of the Symposium to study the waste recycling facilities of the Agricultural and Fisheries Department, where pig and poultry manure is successfully turned into a high-quality soil conditioner for various plants.

Although the two-and-a-half-day Symposium has ended, research links have been established between different institutes.

— M.H. Wong

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## News in Brief

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### *Senate Committee on Undergraduate Admissions Revised*

The composition of the Senate Committee on Undergraduate Admissions has been revised to cope with the University's new admission scheme launched in September 1984. The new composition is as follows:

Chairman: Dr. P.W. Liu (Appointed by the Vice-Chancellor)

Members: The Heads of the Colleges  
The Deans of the Faculties  
The Dean of the Graduate School  
The Director of the School of Education  
The Registrar  
Admissions Tutors of the Faculties

Secretary: Senior Assistant Registrar (Admission and Registration)

### *Admissions Tutors Appointed*

The Vice-Chancellor has appointed the following members as Admissions Tutors for the various Faculties for a term of two years beginning 1st September, 1985:

<i>Arts</i>	<i>Science</i>
Dr. Ng Lee-ming	Dr. Kenneth Young
<i>Business Administration</i>	<i>Social Science</i>
Dr. Nyaw Mee-kau	Dr. Wong Yue-chim
<i>Medicine</i>	
Professor G.H. Choa	

### *Chairman of the Senate Committee on Physical Education Reappointed*

The Vice-Chancellor reappointed Professor Y.T. Chung as Chairman of the Senate Committee on Physical Education for a further term of two years from 1st August, 1985.

### *New Appointments Board Members*

The following new members have recently been invited to join the Appointments Board for a term of two years until 31st July, 1987:

\* Mr. Y.F. Zee, General Manager, General Administration Department of Island Navigation Corporation Ltd., to replace Captain John N. Tuanmu of the same Company.

\* Mr. A.M. Child, Personnel Manager of the Hong Kong & Shanghai Banking Corporation, to replace Mr. S.A. Martyn of the same Company.

\* Mr. Karl Ho, Chief Manager, Personnel and Administration Division, World-Wide Shipping Agency Limited, to replace Mr. S.B. Cheuk of the same Agency.

\* Mrs. Lily K. Lam, Principal Assistant Secretary, Civil Service (Appointments), Government Secretariat, to replace Mr. Peter Lai of the same Branch.

\* Miss Sophia Kao, Personnel Manager, Hong Kong Telephone Co. Ltd.

\* Mr. David Woo, Director of Management Services, IBM World Trade Corporation.

### *University Members to Serve on Outside Committees*

(1) The following members of the University have been appointed by H.E. the Governor to serve on various committees and councils:

\* Professor John Espy as a member of the Board of Governors, Hong Kong Baptist College from 1st June, 1985 to 31st December, 1986.

\* Professor S.W. Tam as a member of the Hong Kong Polytechnic Council until 31st March, 1987.

\* Dr. P.W. Liu as a member of the Hong Kong Examination Authority for a further term until 31st July, 1986.

\* Dr. S.C. Cheng as a member of the ICAC Citizen Advisory Committee on Community Relations for a further term until 31st May, 1986.

\* Professor G.H. Choa as a member of the Medical Council of Hong Kong for a further term of three years from 1st October, 1985.

\* Professor C.Y. To as a member of the Board of Education for a term of one year until 30th June, 1986.

\* Dr. Byron Weng as a member of the Law Reform Commission for a term of three years from 4th July, 1985.

\* Mr. William H.C. Wan as a member of the Country Parks Board for a term of two years from 16th August, 1985.

(2) The following members have been nominated by the University to serve on various Boards/Committees:

\* Mr. James G.N. Lee, on the Committee on Training of Technologists of the Vocational Training Council, in place of Dr. J.S. Dahele.

\* Dr. P.W. Liu and Dr. Y.C. Wong, on the School Examinations Board for a term from 1st September, 1985 to 31st August, 1988.

### *Honorary Director of ICS Honoured by the British Academy*

Professor Cheng Te-k'un, Honorary Director of the Institute of Chinese Studies, has been elected a Corresponding Fellow of the British Academy.



Professor Cheng is the first scholar from Asia ever to become a Fellow of the Academy.

#### *Collaborative Research Agreement on Biotechnology between the University and the Academia Sinica*

An agreement on the collaborative research in Biotechnology was signed by Professor Xue Yugu, Director of the Institute of Microbiology, Academia Sinica and Professor S.T. Chang, Chairman of the Department of Biology of this University on 2nd August. The agreement, which takes effect immediately, will be for an initial period of three years. The collaborative research will lay special emphasis on fusion technique and genetic analysis of protoplasts and the vector-host system, as well as gene expression and regulation in gene engineering. It will encourage the exchange of research scholars and organize seminars in Beijing or Hong Kong to report on research findings.

#### *Gifts to Medical Library*

A collection of over 300 newly-published medical books was donated to the University by the Foreign Office of the Federal Republic of Germany. At a brief ceremony which took place at the Prince of Wales Hospital on 2nd September, Mr. Herbert Kamps, Deputy Consul-General of the Federal Republic of Germany, presented the gift to Professor G.H. Choa, Pro-Vice-Chancellor and Dean of Medicine of the University.

#### *Ming Yu Visiting Scholar*

Professor Chang Zunliu of the Research Institute of History, the Chinese Academy of Social Sciences, arrived on 11th August for a two-week visit to New Asia College under the College's Ming Yu Visiting Scholar Programme.

#### *CUHK Federation of Alumni Associations*

The Federation of Alumni Associations, The Chinese University of Hong Kong, at its meeting held on 2nd September, 1985 elected the new office-bearers of the following committees:

##### *Executive Committee*

President: Mr. Cheung Huen Cheong (United)  
Vice-President: Mr. Yu Ip Kun (Graduate School)  
Honorary Secretary: Mr. Lung Ching Cheung (School of Education)  
Honorary Treasurer: Mr. Wong Tak Shing (Chung Chi)  
Welfare & Recreation: Mr. Wong Yuk Ying (United)  
Academic: Ms. Chan Shuk Chun (School of Education)  
General Affairs: Mr. Lee Kai Ming (New Asia)

##### *Representative Council*

Chairman: Mr. Cheung Huen Cheong (United)  
1st Vice-Chairman: Mr. Yu Ip Kun (Graduate School)  
2nd Vice-Chairman: Ms. Chan Shuk Chun (School of Education)  
3rd Vice-Chairman: Mr. Chan Chat Yin (Chung Chi)  
4th Vice-Chairman: Mr. Lee Kai Ming (New Asia)  
Honorary Secretary: Ms. Kwan Choi Wah (New Asia)  
Members: Mr. Ho Man Sum (United)  
Mr. Lo King Him (United)  
Mr. Law Hoh Shing (United)  
Mr. Wong Yuk Ying (United)  
Mr. Chan Yue Kai (Graduate School)  
Mr. Ng Kwok Kee (Graduate School)  
Mr. Fam Kwok Kay (School of Education)  
Mr. Leung Yue Kam (School of Education)  
Mr. Chan Pik Kiu (Chung Chi)  
Mr. Fung Tak Choi (Chung Chi)  
Mr. Wong Chee Ham (Chung Chi)  
Mrs. Juni Li (New Asia)  
Mr. AuYeung Kwok Wah (New Asia)  
Mr. Yip Hon Chow (New Asia)



*Past Presidents of the CUHK Federation of Alumni Associations pictured here with the Chairman and Vice-Chairmen of the 1985 Representative Council, and the Alumni Affairs Officer*

## *Department of Biochemistry*

Biochemistry is a branch of science that studies the nature of the chemical compounds and processes in living organisms. It is not a simple hybridization of Biology and Chemistry. In fact, what makes Biochemistry unique is its emphasis on an integrative multidisciplinary approach in its quest to understand the mystery of life. Over the years, it has become the very language basic to the understanding of the phenomena in biological and medical sciences. In addition to its close ties to clinical medicine, Biochemistry has also found its way into many agricultural and industrial applications, including biotechnology and genetic engineering.

The Department of Biochemistry at The Chinese University of Hong Kong was established in 1970 as a department in the Faculty of Science for the purpose of advancing and promoting the study of and research in all branches of the science of Biochemistry. With the establishment of the Medical School at this University in 1981, the Department also undertook the challenging task of teaching Biochemistry to medical students. The formal objectives of the Department are education, research and community service.

### **Education**

The Department organizes both undergraduate (BSc and preclinical Biochemistry) and postgraduate (MPhil and PhD) programmes of studies. It serves over 700 students each year including about 100 major Biochemistry undergraduates and 200 pre-clinical medical students. Throughout its existence, the Department aims at producing not just biochemists but educated people. Thus, in addition to formal lectures and laboratory sessions which aim to motivate students to grasp the basic principles of Biochemistry, its curriculum stresses seminars, tutorials and individually-supervised research projects where frank communication and informal discussions between students and staff are encouraged.

Biochemistry offers two different sets of undergraduate courses specifically designed to suit the different requirements and prospects of the science and medical students. For the science students, the four-year programme covers the principles of basic,

analytical and physical Biochemistry. Special topics offered include: proteins and enzymes, clinical biochemistry, endocrinology, carbohydrates and lipids, neurochemistry and radioisotope application in biological sciences. The preclinical Biochemistry course, on the other hand, spans over two years and puts strong emphasis on the regulation of metabolism and its relevance to human physiology.

The Department has one of the largest post-graduate enrolment in the Science Faculty. The MPhil programme was initiated in 1972 and has since then produced over fifty MPhil graduates. The PhD programme was started in 1981 and it expects to have the first batch of PhD graduates this year. Both the MPhil and PhD programmes of studies are research-oriented, although depending on their background, candidates are also required to take certain courses. Each year, the candidate submits an oral or written report on the progress of his research and in addition presents a seminar on an approved topic. In the final year of study, a candidate must submit a thesis to his thesis committee which will make an overall assessment of the candidate's work for the award of the degree. Currently, there are sixteen MPhil and PhD students.

### **Research**

Broadly speaking, the Department is actively engaged in six major areas of biochemical research: hormones, Chinese medicinal materials, neurochemistry, membrane transport, immunochemistry and cancer research. More often than not, a staff member would be involved in more than one area of research. This eclectic approach towards research in the Department helps it to keep abreast of the research frontier in Biochemistry and to improve the quality of teaching. Detailed research projects are listed in Table I.

A wide range of standard biochemical equipment is available for use in research in the Department. These include: high performance liquid chromatograph, gas chromatograph, spectrophotometer, fluorometer, ultracentrifuge, amino acid analyzer, electrophoretic apparatus, liquid scintillation counter and  $\gamma$ -counter. Recently, the Department has also

set up a cell culture laboratory and a high radiation laboratory.

The Department is keen to promote intra- and inter-departmental collaborative research, so as to make full use of the limited scientific resources and manpower available. The research on the biochemical pharmacology of Chinese medicinal materials is an example of such collaborative efforts; the work on the effect of steroidal hormones on hepatic function is another. In 1984-1985, no less than twenty joint papers have been published which are co-authored by members of the Department of Biochemistry and those of the Departments of Anatomy, Biology, Chemistry, Pharmacology, Physics and Psychiatry of The Chinese University and of the Departments of Chemistry and Microbiology of the University of Hong Kong. At the international level, the Department is one of the seven collaborative research centres supported by the World Health Organization under the Plant Task Force of the Special Programme of Research, Development and Research Training in Human Reproduction. A summary of the results of this international collaborative project has been reported recently at a symposium on 'The Development of New Fertility Regulating Agents from Plants' held at this University on 25th January, 1985. Over a hundred local and overseas scientists participated in this international conference.

Over the years, the Department of Biochemistry has been very fortunate in soliciting generous financial support for its research activities. Most recently, the Department received an award of HK\$2,385,000 from the Royal Hong Kong Jockey Club to support its research project on amino acid transport in horse red blood cells. A grant of US\$99,500 was also obtained from the World Health Organization to support the study of antifertility drugs. The Croucher Foundation has awarded a three-year grant of HK\$300,000 to the Departments of Biochemistry and Medicine for work on astrocyte membrane function. The Lee Foundation (Singapore), granted HK\$430,000 over three years to support the project on endogenous opiates. Other granting bodies which have made awards to the Department in 1984-85 include the Alberta Cancer Board, the Population Council, the Cancer Research Campaign, the Ford Foundation, and the World Health Foundation (H.K.). Apart from these granting agencies, the private sector has also contributed substantially towards the research funding. The benefactors include Kevin Hsu, Esq., the Takshing Investment Co., Ltd. and the Hopen and Shangtung Natives (Hong Kong) Association Ltd. Sincere thanks are due to these benefactors for their very generous support.

## Profile of Biochemistry Students

The official student body for Biochemistry students, the Biochemistry Society, was founded in 1973. Its official publication, the *Bridge*, has been in circulation since 1975. The latest issue is a special report on the 'Career Workshop for Biochemistry Graduates', which was held in November 1984 by the Biochemistry Society. In addition to *Bridge*, the Biochemistry Society also publishes a newsletter (小橋) to keep the Biochemistry students and staff abreast of its activities.

The Biochemistry Society is a very active association and it organizes many academic (exhibition, lecture, seminar, research project) as well as social (sports competition, picnic, camping, social gathering) activities for its members. Many of these activities also involve staff participation. For instance, no one in the Biochemistry Department would like to miss the annual events including the Biochemistry dinner, the Biochemistry picnic and the Biochemistry Shield Competitions. The Biochemistry Society also helps to organize, in conjunction with staff in the Department, voluntary summer research projects for those undergraduates who are interested in research. These informal staff-student gatherings in the Department, during the fifteen years of its existence, have successfully fostered the spirit of 'Biochemistry Fraternity', which it believes is the key to higher effectiveness in teaching and learning.

## Career of Biochemistry Graduates

Over the past five years, about one-third of the Department's graduates chose to further their studies after obtaining the first degree. While most of them have enrolled in the Department's postgraduate programmes, some have received scholarships to continue their postgraduate work abroad. Our record shows that at this very moment, there are over ten Biochemistry graduates working towards their PhD degree in universities in the United Kingdom, the United States, Australia, Canada and Germany. It is interesting to note that of those graduates who elected to seek employment, about half entered the business sector. In the early days, a high percentage of Biochemistry students became teachers when they graduated, but the number of graduates opting for a career in education has been steadily declining since 1980.

## Future Developments

If one were to identify an area that is advancing rapidly in modern Biochemistry, it would undoubtedly be the area of genetic engineering. The impact of research in gene manipulation is felt in diverse fields

ranging from agriculture to medicine to the production of cheaper fuels. For instance, large-scale production of medically important proteins such as interferon and human insulin is now possible with gene cloning techniques. Such research holds out hope for the early diagnosis and treatment of such dreaded diseases as  $\beta$ -thalassaemia, Lesch-Nyhan syndrome and perhaps even cancer. Genes inserted into plant cells might make the plants frost resistant or capable of utilizing atmospheric nitrogen more efficiently for the production of food materials. In animal husbandry, the viral hoof-and-mouth disease has been successfully combatted with the introduction of a vaccine developed through genetic engineering. The Department of Biochemistry is fully aware of the importance of these developments and plans to initiate a research and teaching programme in biotechnology. The exact form which the programme will take is as yet unclear but the possibility of setting up a Biotechnology Research Laboratory and of establishing an inter-departmental MPhil programme in Biotechnology is being actively explored.

TABLE I: Research Fields in the Department of Biochemistry

1. Biochemistry of pituitary hormones and neuropeptides
2. Growth hormone and prolactin receptors
3. Steroid hormones and sexual differentiation
4. Hepatocyte and hepatoma metabolism – effects of hormones and drugs
5. Mammary gland and lactation biochemistry – effects of hormones, drugs and potential regulatory principles from Chinese medicinal materials
6. Determination of CSF opioid peptide levels in disease and normal states
7. Characterization of opiate-receptor in neuroblastoma x glioma cells
8. Narcotics and neurotransmission
9. Neurochemical changes in neurological and neuropsychiatric illnesses
10. Biological effects and mechanism of action of neuropeptides, biogenic amines and adenosine
11. Biochemical studies of brain development
12. Regulation of LDL-receptor synthesis
13. Role of carbohydrate component in receptor binding
14. Denervation changes in proteolytic enzymes of skeletal muscle
15. Reproductive endocrinology of teleosts and rodents
16. The mode of action of gossypol, a male contraceptive

17. The physiological effect of cottonseed oil
18. Anti-spermic natural products
19. Chemistry and biology of potential fertility-regulating agents from Chinese medicinal plants
20. Immunopharmacology and neuropharmacology of Chinese medicine
21. Bioactive peptides and proteins from Chinese medicinal materials
22. Chemistry of ginseng
23. Effect of ginseng on brain metabolism and carbohydrate metabolism
24. Trace elements and iron metabolism
25. The biochemistry of potassium
26. Pharmacogenetics of alcohol metabolism
27. Applied microbiology-immobilized cells
28. Effect of food or drugs on the growth of Ehrlich ascites tumour
29. Changes of glucose carriers on erythrocytes during development of Ehrlich ascites tumour
30. Pharmacokinetic studies of human interferons
31. Mechanism of anticancer agent
32. Host immune mechanisms in the control of tumour growth and metastasis
33. Analysis of cell surface glycoproteins and receptors using monoclonal antibodies
34. Membrane biochemistry of tumour cells
35. Red blood cell amino acid transport
36. Nucleoside transport in animal cells
37. Red blood cell membrane antigens
38. Reticulocyte maturation *in vitro*
39. Sickle cell disease
40. Red blood cell insulin receptors



Professor Lee Cheuk Yu

**Professor Lee Cheuk Yu**  
*Professor of Biochemistry*

Professor Lee Cheuk Yu has been Professor of the Department of Biochemistry since January 1985, and his profile was published in the No. one 1985 issue of the *Chinese University Bulletin*.

# *Department of Biology*

Biology is the branch of science which deals with living things, from viruses to man. It is concerned with the structure, physiology, genetics and behaviour of individual species of living organisms, the interactions among different species and their interactions with the environment. In addition to its intrinsic importance, biology is basic to agriculture, industry, fisheries, medicine, environmental protection and biotechnology.

In some universities there are separate departments of Botany, Microbiology and Zoology, which are concerned respectively with plants, microorganisms and animals. This University has chosen an integrated approach to the subject with 'botanists', 'microbiologists' and 'zoologists' working together in the same Department; so that staff members with different academic backgrounds can complement one another in both research and teaching at the molecular, cellular, organismic and population levels. The Department is fortunate in sharing a large modern Science Centre with other science Departments (Biochemistry, Chemistry, Electronics, Physics, Mathematics and Statistics), and in having the Basic Medical Sciences Building (where the Pre-clinical Medical Departments are accommodated) only a few metres away. In addition, the Department operates a Marine Science Laboratory, which is located on the western shore of Tolo Harbour, about one km away from the University Science Centre and a mushroom house, which is located on the Chung Chi campus for experimental cultivation of edible fungi.

## **Curriculum**

### *Undergraduate Programmes of Studies*

The undergraduate programme takes four years, and students are required to select a major and a minor subject. Since 1983, freshmen who wish to study Biology as their major (or minor) subject will have some choice among their first-year courses

dealing with the development of life, microorganisms, human biology and environmental studies.

At the beginning of the second year, students majoring in Biology can select their minor subjects and Biochemistry, Geography or Psychology are most frequently selected. The second-year courses aim to consolidate the students' knowledge of the main groups of living things through a study of form and function.

The third and fourth years form a coherent unit leading to the degree examinations. At the beginning of the third year, every student selects an area of specialization or 'stream'. The streams are Physiology, Ecology and Marine Biology, Microbiology and Genetics, Developmental Zoology and Plant Science. In addition, every student must prepare a Senior Seminar based on original research or a literature review under the close supervision of a member of the academic staff. Much of the work is done during the summer vacation between the third and fourth years, and there are regular tutorial meetings with the Supervisor throughout the fourth year. An oral presentation is made early in January of the fourth year as part of a departmental scientific conference, and a written report is submitted before the end of the fourth year.

### *Postgraduate Programmes of Studies*

The PhD programme was started in 1981. This research-oriented programme normally takes three years to complete, but those with a Master's degree from this University may take two years. Students may be required to take courses, tutorials etc., and are required to present seminars on topics to be approved by his Supervisor. At the end of the final year, a thesis must be submitted and an oral examination attended.

The MPhil programme was introduced in 1972, replacing the one-year MSc programme. Students are required to take courses, present seminars and



submit a research report by the end of the first year. At the end of the second year, the student must submit a thesis and attend an oral examination.

### Research Activities

Over the years, staff of the Department have been recruited to undertake undergraduate teaching and direct postgraduate research. There are fourteen academic staff in the Department, and research in a variety of subdisciplines has been carried out by individual members of staff and their graduate students. This arrangement has been quite productive as attested by the submission of seventy theses for higher degrees and the production of more than 650 publications. The great majority of research papers was published in international journals.

Recently much thought has been given to assembling 'Teams' for research purposes. Opportunities for individual research should be retained, but team research should be encouraged to a greater extent. There are now under the Department two major research groups: the Research Laboratory for Food Protein Production and the Marine Science Laboratory.

#### *Research Laboratory for Food Protein Production*

Research activities of the Laboratory are carried out along two main directions: (1) Production of algal protein as food for aquaculture and feed for livestock from sewage wastes, and (2) Production of mushrooms from cotton wastes and used tea leaves. Both research efforts are correlative with the dual goal to convert waste materials through microbial activities into food or feed protein on one hand, and solve the problem of waste disposal in order to minimize environmental pollution on the other. At present, active research concentrates on the following projects: a) Studies of protoplast production and fusion in edible fungi, b) Analysis of vitamin contents and other chemical composition of edible mushrooms, c) Cultivation of edible mushrooms, d) Determination of animal manure and sewage sludge effects as supplementary feeds for livestock and fish, e) Studies on algal protoplasts, and f) Chemical analysis of a high protein blue-green alga grown in sewage effluent.

#### *Marine Science Laboratory*

The research activities of the Laboratory involve studies on the physiology of several species of fish (sea breams and groupers) and the penaeid shrimps which are of maricultural importance. Studies on fish include investigations on the effects of hormones, diets and environmental factors (salinity, temperature and dissolved oxygen) on growth and intermediary metabolism. Research on shrimp physiology has been extended into the areas of nutritional

energetics, development and transport physiology. Besides academic interests, these studies will provide the basic information required for the development of scientific methods in mariculture. It is hoped that these studies would eventually benefit the local mariculture industry, which at the present time, is still at a developing stage. To maintain a constant contact with the local mariculture industry, the Laboratory has been producing enough shrimp larvae for sale to local fishermen at nominal prices.

Members of the Department also contribute to other interdepartmental research groups, notably the Research Centre on Chinese Medicinal Materials and the proposed Biotechnology Laboratory. In addition, active research is conducted in areas of bacteriophage genetics, microbial genetics, physiology and metabolism, microbial protoplast fusion, comparative endocrinology, embryology of fish and crustaceans, entomology, environmental pollution (especially by heavy metals) and plant physiology (including tissue culture).

### Host of Local, Regional and International Organizations

#### *Hong Kong Research Council in Biological Education*

Since 1971, the Department has been the base of the Hong Kong Research Council in Biological Education, which has published several editions of the textbook *Modern Biology* for secondary school students, in both English and Chinese.

#### *UNESCO Regional Network for Microbiology in Southeast Asia*

The Department serves as the Headquarters of the Regional Network for Microbiology in Southeast Asia, which is under the auspices of UNESCO, from March 1984 to February 1987. The *Microbiology Newsletter* is published by the Headquarters of the Regional Network twice yearly, and three issues have so far been published in Hong Kong.

#### *International Mushroom Society for the Tropics*

The International Mushroom Society for the Tropics was founded in Manila, the Philippines in 1980. Since then the Department has been the host of the Society. The *Mushroom Newsletter for the Tropics*, the official publication of the Society, is published quarterly. Five volumes, in total twenty issues, of the *Newsletter* have been published since 1980. The Newsletters contain contributions on all aspects of the research, cultivation and economics of edible mushrooms, particularly those which can be grown in tropical climates.

#### *Hong Kong Society of Microbiology*

The Department served as host to the Hong Kong Society of Microbiology from 1979 to 1984.

The Society's aim is to promote understanding and awareness of infectious diseases, public health and water pollution. Seminars and activities of local and regional interest, particularly in the public health area and in applied microbiology, are organized.

### **Collaborative Research**

The Institute of Microbiology of the Academia Sinica, Beijing, and the Biology Department signed a collaborative research agreement on Biotechnology for a period of three years on 2nd August, 1985. The agreement centres on biotechnology, with special emphasis on fusion technique and genetic analysis of protoplasts and vector-host systems as well as gene expression and regulation in gene engineering. Hebei Academy of Sciences, Shiziazhuang, China, has started three collaborative research projects with the Department, namely, nitrogen fixation in cereal crops (e.g. wheat), fruit preservation and cultivation of edible mushrooms. The Department is also engaged in collaborative research projects with several institutes both abroad and in China.

### **Future Development**

A critical review of both undergraduate and postgraduate curricula has been undertaken and is expected to be completed within the coming academic year. The various fields of biological knowledge including recent advances in biotechnology, environmental biology, genetic engineering, physiology and socio-biology are being considered.

Since Biology encompasses all aspects of life and its interaction with the environment, team work and collaborative research will be encouraged particularly in the fields of biotechnology and marine sciences. Jointly with the Department of Biochemistry, the Department is planning to establish a research and teaching programme in biotechnology at the University. The joint programme has received a grant from the Croucher Foundation to support its establishment. Also, a joint programme in marine bacteriology involving the Marine Science Laboratory, Qingdao Oceanographic Institute and the University of Maryland has received support from UNESCO and is expected to start work at the end of 1985. Members of the Marine Science Laboratory are also exploring the feasibility of launching a research project on the possible effects of the Daya Bay Nuclear Plant on marine life, in collaboration with the South China Sea Institute of Oceanology, Academia Sinica. It is anticipated that in the future, more contacts will be made to establish additional 'links' with institutions abroad so as to promote research of mutual interests.



*Professor Chang Shu-Ting*

### **Professor Chang Shu-Ting**

*Professor of Biology*

Professor Chang Shu-Ting was born in Shanxi, China. He received his BSc degree from National Taiwan University in 1953. He went to the United States for graduate studies at the University of Wisconsin, receiving an MS degree in 1958 and the PhD degree in 1960. He was a Postdoctoral Fellow at Harvard University in 1966-67 and a Visiting Fellow at the University of Tokyo in 1969. He was at the same time a Visiting Fellow of the Australian National University and the Commonwealth Scientific and Industrial Research Organization in 1972-73, 1976 and 1978-79.

Before The Chinese University of Hong Kong was established, Dr. Chang was appointed to the position of Assistant Lecturer in the Biology Department of Chung Chi College in 1960. He was promoted Lecturer in 1961, Senior Lecturer in 1970, Reader in 1974, and Professor in 1978. Professor Chang is now Professor and Chairman of the Department of Biology, Director of the Institute of Science and Technology, and Director of the Marine Science Laboratory of this University.

Professor Chang is also the President of the International Mushroom Society for the Tropics, National-Point-of-Contact Representative of Hong Kong for the UNESCO Regional Network of Microbiology in Southeast Asia, Executive Secretary of the Headquarters of the UNESCO Regional Network of Microbiology in Southeast Asia, and Director of Hong Kong MIRCEN (Microbiological Resources Centre). He has been a member of several international academic societies for many years.

At this University, Professor Chang was Dean of the Faculty of Science in 1975-77, and Director of the Office of Student Affairs in 1979-81. He also

served as Vice-Chairman of the Hong Kong Research Council in Biological Education (1971-80), and was President of the Hong Kong Society of Microbiology (1982-84). Professor Chang was appointed Head of the Hong Kong Delegation to the 12th Pacific Science Congress, Canberra, Australia, in 1971 and also to the 13th Pacific Science Congress, Vancouver, BC, Canada, in 1975.

Professor Chang's research interests and publications are mainly in the areas of fungal genetics, protoplast fusion technology and the biology and cultivation of edible mushrooms, particularly

*Volvariella volvacea*, *Pleurotus sajor-caju* and *Lentinus edodes*. He has published six books and more than sixty papers in scientific journals. Professor Chang is now the Editor-in-Chief of the *Mushroom Newsletter for the Tropics*, which is the official publication of the International Mushroom Society for the Tropics, Editor of *Microbiology Newsletter* published by the Regional Network for Microbiology in Southeast Asia, and member of the Editorial Board of *MIRCEN Journal of Applied Microbiology and Biotechnology*, Oxford University Press, London.

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## Department of Chemistry

Chemistry is a *central science* with Physics and Mathematics on one side and the Life Sciences, Earth Sciences and Medicine on the other. Traditionally Chemistry is classified into five main divisions: Analytical, Inorganic, Organic, Physical, and Theoretical, whereas crosslinking of these parts leads to more specialized sub-fields such as Physical Inorganic and Organometallic Chemistry. Basic chemical researches, starting in the middle of the last century, were mainly responsible for the discovery and production of many new materials which had an enormous impact on the development of human society. Important chemical industries now play an indispensable part in our daily lives, as evidenced by such products as synthetic fibres, dyes, plastics, rubbers, glass, paint, pharmaceuticals, fuels, petrochemicals, insecticides and herbicides. The modern chemist is essential to the rapid development of new materials for high technology, e.g. in the design and manufacture of microprocessors, semiconductor devices, optical fibres, and liquid crystal displays. He is also involved in the broader aspects of community life, as in teaching, patent law, pollution monitoring and control, forensic science, crime detection, and quality control. The extensiveness of these activities means that the Chemistry graduate enjoys many and varied career prospects in manufacturing industry, government laboratories and education. In addition, with his training in analytical perception and logical deduction

as well as command of technical knowledge, a Chemistry graduate is well equipped to pursue a career in management and administration.

The Department of Chemistry is among the oldest and largest in the University. The smaller College Departments were physically amalgamated into a single unit when, in the summer of 1972, the Department moved into five floors of space totalling 3,300 sq. m. in the Science Centre. Currently the Department has sixteen faculty positions, 219 major students, and sixteen graduate students. Major instruments for teaching and research include a Bruker WM250 superconducting NMR spectrometer, a VG 70-70 high resolution GC/MS system, and a Nicolet R3m four-circle X-ray diffractometer.

### Research Activities

Research in pure and applied chemistry continues to develop at a rapid pace. Current activities of the faculty members are briefly summarized as follows:

#### *Tze-lock Chan*

Synthesis of cyclophanes via organosulfur compounds; dimethyl sulfone-triggered generation of dihalocarbenes from polyhalogenated methanes.

#### *Ping-kay Hon*

Trace analysis by atomic absorption, UV, VIS and fluorescence spectrometry; crystal structure determination.

*Kwan-yu Hui*

Syntheses, properties and structure of organometallic compounds of group VI, VII and VIII transition metals; syntheses, properties and kinetic studies of coordination compounds of Co(III) and Cr(III).

*Choi-nang Lam*

Organic synthesis of aromatic and antiaromatic bridged ring compounds.

*Oi-wah Lau*

Atomic-absorption, spectrophotometric, electrochemical and gas-chromatographic methods for the determination of trace elements.

*Wai-kee Li*

Semi-empirical and *ab initio* molecular orbital studies of (i) electronic and geometric structures of novel organic and inorganic species and (ii) pathways of simple reactions.

*Tien-yau Luh*

Transition metal promoted organic reactions; homogeneous and heterogeneous catalysis; synthesis and reactivity of strained organic molecules; mechanistic study on the hydrodesulfurization process.

*Danny S.H. Mak*

Study of amino acids and peptides by gas chromatography and computer correlation.

*Thomas C.W. Mak*

Synthesis and structural characterization of clathrate inclusion compounds, salt hydrates, and hydrogen-bonded molecular adducts; metal coordination by cyclic polyenes, polycyclic tertiary amines, (arylthio)-acetic acids, penicillamines, pseudohalides, and macrocyclic ligands; structure elucidation of organic compounds and natural products.

*James C.N. Ma*

Isolation and physiological studies of active components in Chinese medicinal materials; instrumentation of NMR, GC/MS/DS and chromatography.

*Tsun-kong Sham*

Structure and electronic properties of surfaces; chemical- and radiation-induced luminescence of solids, liquids and gases; photoelectron spectroscopy and X-ray absorption spectroscopy.

*Suk-ping So*

Force constant calculations; *ab initio* molecular orbital studies of electronic structures of molecular species.

*Shang-wai Tam*

Synthesis and study of the properties of metal complexes of 3,4,7,8-tetrahydroazocine; iron carbonyl complexes in organic synthesis.

*Kam-han Wong*

Crown ether chemistry; ion pair reactivities; polymer reactions; polymer catalysis.

*Henry N.C. Wong (N.Z. Huang)*

Application of deoxygenation in organic synthesis; synthesis of highly strained unnatural molecules; synthesis of natural products.

### Undergraduate Programmes

The Department offers both major and minor undergraduate programmes plus a number of service courses. The first three years of the major programme are devoted to sound basic training of students in all major disciplines of modern chemistry. Major students in their final year are allowed the choice of a variety of elective courses in their chosen areas of specialization. Fourth-year students of good academic standing may also elect to do a research project and submit an undergraduate thesis in lieu of a full degree paper. Some twenty to thirty undergraduates annually participate, on a voluntary basis, in summer research projects organized by staff members, thereby gaining valuable practical experience which supplements their formal education in the regular curriculum.

### Employment Prospects of Graduates

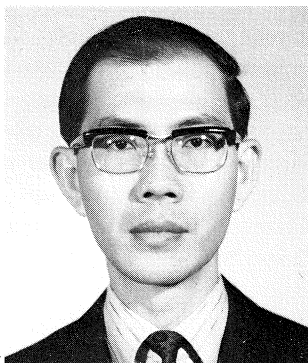
According to statistics compiled by the Appointments Service in the past few years, about thirty-four percent of fresh chemistry graduates found employment in the education sector, thirty percent joined industrial and commercial firms, sixteen percent proceeded to graduate school, and the remaining twenty percent served society in a variety of capacities. Many former graduates now occupy prominent positions in the academic profession, as well as in local and Asian branches of international companies doing business in the trading of industrial chemicals, petroleum products, and scientific equipment.

### Graduate Programme

The Department has a tradition of encouraging its best graduates to pursue their higher degrees abroad, and accordingly has always had a relatively small enrollment of graduate students. The MPhil programme started in 1970 and has so far produced sixty-one graduates. This two-year programme involves both course work and a thesis embodying the results of original research, which is graded by an External Examiner. A new PhD programme has been introduced in the 1985-86 academic year.

### Further Development

The Department aims to further enhance its status as a centre of chemical research, being motivated by the conviction that active involvement of its staff members in current research effectively and continually upgrades the levels of undergraduate and graduate teaching.



Professor Thomas C.W. Mak



Professor S.W. Tam

### **Professor Thomas Chung Wai Mak**

#### *Professor of Chemistry*

Professor Thomas Chung Wai Mak received his primary, secondary and matriculation education in 1948-1957 at Wah Yan College, Hong Kong. He then attended The University of British Columbia (UBC), where he majored in Chemistry and Physics and earned his First Class Honours BSc degree in 1960. In the summer of 1959, he was employed as a Research Technician at Maitland Works, Dupont of Canada. After spending the following summer doing research at the National Research Council (NRC) in Ottawa, he pursued graduate studies at UBC on a NRC Scholarship and obtained his PhD degree in Chemistry in 1963. Supported by the award of a National Aeronautics and Space Administration Fellowship, he spent the next two years as a Research Associate in the Department of Crystallography at the University of Pittsburgh, and subsequently obtained tenure at the University of Western Ontario as Assistant Professor of Chemistry.

Professor Mak joined The Chinese University in 1969 as Lecturer in Chemistry at New Asia College, and was promoted Senior Lecturer in 1971, Reader in 1978, and Professor in 1982. He has been Chairman of the Department since 1983, and was recently elected Dean of the Science Faculty.

Apart from a sabbatical year of research in 1978-1979 as Visiting Associate Professor at UBC, Professor Mak has served the University without interruption since 1969. Over the years he has taught courses in General Chemistry, Chemical Bonding, Inorganic Chemistry, and X-Ray Crystallography. He is fervently devoted to research in the field of structural chemistry, with particular interest in (i) the synthesis and structural characterization of clathrate inclusion compounds, salt hydrates, and hydrogen-bonded molecular adducts; (ii) metal coordination by cyclic polyenes, polycyclic tertiary amines, (arylthio)acetic acids, penicillamines, pseudohalides, and macrocyclic ligands; and (iii) structure elucidation of organic compounds and natural products. He has recently developed long-term research projects in

collaboration with academic chemists in Hong Kong, the United States, Canada, Japan, Australia, Egypt, Israel, Malaysia, and China (Zhongshan University, Xiamen University, Hangzhou University, and Institute of Physics, Academia Sinica (Beijing)). His publications include *Problems in Inorganic and Structural Chemistry* (co-authored with Drs. Kwan-Yu Hui, Oi-Wah Lau and Wai-Kee Li) and over 150 research articles in international chemical journals.

### **Professor S.W. Tam**

#### *Professor of Chemistry*

Professor S.W. Tam was matriculated in Hong Kong in 1955 with the award of the King Edward VII Scholarship to read Science at the University of Hong Kong, where he obtained his BSc and MSc degrees. He was awarded a Commonwealth Scholarship in 1961 to do research in organic chemistry at the University of Nottingham, where he obtained his PhD degree in 1964.

After a year of postdoctoral work at the Institut für Organische Chemie, University of Basel in Switzerland, Professor Tam was appointed to a Lectureship in organic chemistry in 1965 at The Chinese University of Hong Kong. He was subsequently promoted to the ranks of Senior Lectureship (1970), Readership (1978) and Professorship (1982). Throughout his tenure of appointment he received several external awards, such as the Sino-British Trust Fellowship, NIH Fellowship, IUC Senior Fellowship, and CICHE Exchange Visitorship which enabled him to carry out research at the Massachusetts Institute of Technology and the University of Cambridge several times.

Since 1969, Professor Tam has been very much involved in University planning and administration. Prior to the restructuring of The Chinese University, he was appointed to the Office of the President of Chung Chi College in 1976. Throughout his academic career he held several concurrent administrative appointments which include the Dean of the Science Faculty of Chung Chi College (1969-1972), the Presi-



dent and Head of Chung Chi College (1976-1981), Master of the Postgraduate Hall (since 1976), and Dean of the Graduate School (since 1981). He has also served as members of the Administrative Board and the Executive Committee of international academic organizations such as ASAIHL and ACUCA, respectively.

Despite his heavy administrative duties, Professor Tam has been active in teaching and research. His main research interests include structural studies and synthesis of natural products, mass spectrometry, particularly studies of ion structures, and organometallic chemistry. He has published many research articles in international journals and contributed

several review articles, including chapters in two volumes of the series on *Chemistry of Functional Groups* edited by S. Patai.

Professor Tam is very active in community service. He has served as member of the Board of Education, the Medical Development Advisory Committee, and the Rehabilitation Development Co-ordination Committee. Apart from these advisory bodies, he also serves in various capacities in school councils and voluntary organizations, most notably as the Honorary Secretary of St. Christopher's Home, the Vice-Chairman of the Alice Ho Miu Ling Nethersole Hospital, and the Chairman of the Board of Directors of the United Christian Medical Service.

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## *Department of Physics*

The Department of Physics is one of the oldest in the University. Its history is as long as the University itself. In the early years the Department was small with only about half a dozen lecturing staff, divided among the three Foundation Colleges. Over the years, the Department has grown with the University, and has now a strength of sixteen lecturing staff and many supportive teaching, technical and clerical staff members. The number of students has increased from fewer than 100 in the early years to the present size of 250, and the programme of studies has developed from the Bachelor's degree level through the MPhil degree level to the PhD degree level.

### **Programme of Studies**

The Department of Physics offers a major undergraduate programme with emphasis on the broad fundamentals of classical and modern physics, with approximately 230 students enrolled. There is also a small number of students in a minor programme.

The MPhil programme, started in 1972, requires a combination of course work and research, with emphasis on the latter. Seventy students have graduated with MPhil degrees and seventeen are currently enrolled. The PhD programme was started in 1981; one student has graduated and three are currently enrolled.

### **Research**

Research is carried out actively in the Department. In the last three years alone, some 100 research articles have been published in international journals. Research projects, undertaken either individually or

in small groups, cover a wide range of topics. Below is a brief description of some of the projects.

Research in biophysics centres on conformation and electron transfer in proteins, and dynamics of single muscle cells by laser diffractometry.

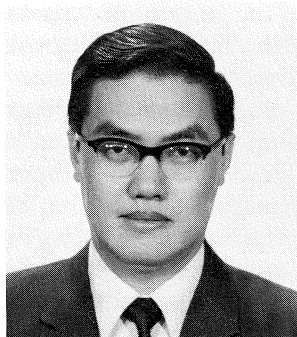
Properties of isotropic and oriented polymers and composites such as elastic moduli, thermal expansivity and thermal conductivity are studied by various experimental techniques and related to structure through theoretical models.

In other areas of solid state physics, the preparation and physical properties of amorphous semiconductor films have been studied, with potential application as low cost solar cell materials. Theoretical work covers the magnetic and electronic properties of disordered systems such as impurities in doped semi-conductors.

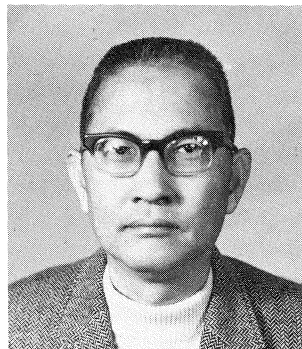
Theoretical work in electrodynamics covers the interaction of electromagnetic waves with free electrons, dielectrics, relativistic plasmas and absorbing liquids, the last being related to a recently developed experimental project on photoacoustic studies of various systems, using a pulsed Nd:YAG laser. Low power lasers are used in studying the acoustics of Chinese musical instruments.

A 14 MeV neutron generator is used for activation analysis. Diurnal variation of cosmic-ray intensity is also studied in collaboration with other laboratories. Thermoluminescence techniques are employed for the dating of Chinese pottery.

Work on denary logic arithmetic processor and induction motor speed control by microprocessors is being carried out.



*Professor Baysung Hsu*



*Professor Y.W. Chan*

There is also theoretical research on the scattering of hadrons and nuclei, and on the onset of chaos.

### **Career of graduates**

Some twenty percent of the BSc graduates go on to graduate studies, both in the Department and abroad. The largest percentage of graduates are employed as teachers in secondary schools, but many have entered a variety of professions, including scientific careers at the Observatory, in tertiary institutions, in technical sales and in the electronic and computer industries.

### **Future development**

The Department is now mature, and no further growth in student or staff number in the full-time programmes is expected in the near future. Future development is likely to be in the part-time degree programme, towards which the Department will cooperate closely with other Science Departments.

### **Professor Baysung Hsu**

#### *Professor of Physics*

Professor Baysung Hsu received his degrees of BSc and PhD from the University of Manchester and is a Fellow of the Institute of Physics. He has pursued an academic career ever since graduation, starting with research at universities and research institutes in the United Kingdom, mainly on polymer physics and fibre science, with many papers published in various international journals.

Professor Hsu was appointed to the founding Chair of Physics of this University in 1964, and has led the Department of Physics since then. Besides being the Chairman of the Physics Department, Professor Hsu has served in many university-wide positions. He was elected Dean of the Faculty of Science thrice between 1966 and 1979. Among other positions, he served as the Chairman of the University Library Committee in the late sixties when the four libraries in the University were brought together into

a single library system. Through the Joint Universities Committee on Student Finance Professor Hsu played a key role in the setting up and implementation of the Government financial assistance scheme of grant and loan, which ensures that no student who is offered a university place should be unable to accept it because of lack of financial means.

He has been appointed concurrently Pro-Vice-Chancellor since 1979.

### **Professor Y.W. Chan**

#### *Professor of Physics*

Professor Y.W. Chan obtained his PhD from the University of California, Berkeley and is a Fellow of the American Physical Society.

Professor Chan studied Physics at Lingnan University, Canton, China, and obtained his BS and MS degrees in 1950 and 1952. He taught at the University of Hong Kong from 1952 to 1958. Before joining this University in 1971, Professor Chan worked in the Brookhaven National Laboratory (USA) from 1963 to 1971 in the field of experimental atomic beam magnetic resonance, theoretical problems of secular equation and the interaction of coherent radiation with charged particles.

Soon after joining this University, Professor Chan started his experimental research in the interaction of laser with matter. Since 1976 he has been working with Dr. David Yew of the Faculty of Medicine to study the interaction of laser with visual system. Professor Chan's main interest in theoretical physics is the deterministic process of electrodynamics and the theory of free electron laser and the associated phenomena. He has developed a self-consistent theory of inertial transformation. The evolution of scientific thought is also part of his research interest. In the field of humanistics, he is interested in developing, on the basis of scientific approach, a workable theory to explain or to predict the characteristics and behaviour of a society in terms of some basic properties of human beings and the natural and cultural environments.

# Research Projects in Science

*Members of the Science Departments are actively engaged in research, and collaborative research both within and without the University is encouraged. The following are descriptions of some of the research currently undertaken by them, as well as the recently launched interdisciplinary projects on biotechnology.*

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## **(1) Research Projects on Biotechnology**

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### **What is Biotechnology?**

*W.K.K. Ho*

Biotechnology is a new word but it has a long history. The use of microorganisms to make beer, wine, soya sauce and cheese is as old as civilization. Newer fermentations for antibiotics, amino acids and vitamins are already major industries. Enzymes are used to clot milk, solubilize proteins, break down starch or produce fructose for soft drinks. However, all these uses have relied on the lucky discovery of natural enzymes or microorganisms with the desired properties.

The current excitement concerns a collection of techniques entitled genetic engineering, by which one can isolate a particular gene from animals, plants or microorganisms (cloning) and quickly determine the exact sequence of nucleotides in the DNA of which it is composed. It is this sequence which instructs the cell to make a particular protein or enzyme. Moreover, this DNA can be manipulated in a test tube and inserted (transformed) into a simple microorganism to allow it to make (express) the foreign protein. Therefore we can now *construct* new microorganisms of use to man.

Protein engineering is a very recent branch of genetic engineering. We know the complete three-dimensional structure of a few enzymes and can use computer graphics to model the effect of replacing a particular amino acid residue with another. If we clone and sequence the gene for this enzyme we can read the nucleotide sequence surrounding the triplet that encodes that amino acid. A small piece of DNA (16-18 nucleotides) containing a changed triplet is synthesized chemically, and this is then stitched into the gene in place of the natural fragment. When this mutant gene is transformed back into the host microorganism, it will make the desired mutant protein. In this way we can design, construct and test new enzymes that have never existed in nature.

Moreover, other techniques of genetic engineering allow them to be expressed in high yield. We are therefore on the threshold of a new era of biological engineering.

Genetic engineering and protein engineering are only some of the skills needed for biotechnology. The microbial physiologist must work out the correct growth conditions for the new microorganism; the protein chemist must devise ways to purify and assay the new enzymes; the fermentation technologist must develop techniques applicable on a large scale and the chemical engineer must design and cost the appropriate plant. Hence biotechnology is truly interdisciplinary.

What are the impacts of this technological revolution? The ability to make any human protein cheaply provides new opportunities in medicine: synthetic interferons to prevent viral diseases and possibly cancer; safe synthetic vaccines against malaria, hepatitis and other scourges of mankind; new hormones; and powerful new tools for medical diagnosis. Moreover, we can extend many of these principles to preventing or curing animal diseases, thereby increasing the farmer's productivity.

In the longer term, the impact on agriculture may be most significant, through a new line of attack on plant diseases and construction of improved crop plants – possibly even entirely new varieties. But there is also an impact on many other industries. Agricultural wastes could be converted to alcohol, bulk chemicals, polymers or food. Biosensors will combine the exquisite substrate specificity of enzymes with the novel electronic devices that are now becoming available – in this way we may teach computers to taste and smell!

With these tremendous economic implications, the annual world-wide market for biotechnology products has been estimated to be in the region of twenty-seven billion U.S. dollars by the year 1990. Of this total, agriculture, food and medicine will account for eighteen billion. But what does this mean for Hong Kong? At the moment very little because Hong Kong neither has the industry nor the proper resources in promoting developments in this direction. Does this mean that we shall sit back and let the opportunity go? Clearly no, because Hong Kong stands to lose both financially and scientifically if we do nothing to catch up. In this respect, the University can play an important role by taking the initiative to introduce Biotechnology to Hong Kong and to utilize its research facilities to show the opportunities available in Biotechnology to the local industrial community. With this concerted effort, biotechnology may perhaps become a major industry in Hong Kong in the nineties.

## **Protoplast fusion techniques for interspecific and intergeneric hybridization of edible mushrooms**

*\*Professor S.T. Chang, Department of Biology*

Because of the complex sexual patterns and special growth habits found in the higher basidiomycetes, our understanding of their genetics and breeding mechanism has been less extensive in comparison with both the lower fungi and higher plants. However, the development of protoplast-based techniques for genetic manipulations in fungi involving fusion and vector-mediated transformation, provide an opportunity for overcoming these inherent difficulties. Many of the difficulties in hybridization and recombination experienced with intact cells may be overcome by the use of protoplast technology.

## **Production of thermostable enzymes by bacteria**

*\*Dr. K.Y. Chan, Department of Biology*

A number of bacterial strains are known to produce exoenzymes of industrial importance. Some of these enzymes can degrade the most abundant renewable agricultural resource in the world – plant materials which include lignocellulose and starch. We are particularly interested in the production of cellulase,  $\alpha$ - and  $\beta$ -amylases by thermophilic or thermotolerant bacteria. By mutation technique and strain selection, and by optimizing the production conditions, so far we are able to obtain several hyper-production bacterial strains, which are thermophilic organisms, producing high levels of carboxymethyl cellulase,  $\alpha$ - and  $\beta$ -amylases. Some of these thermostable enzymes have been purified and their properties determined.

## **Fermentation by marine bacteria**

*\*Dr. K.Y. Chan, Department of Biology*

All industrial fermentation processes at present are carried out by freshwater microorganisms. A number of marine bacteria also have the ability of fermenting agricultural materials with useful compounds produced as fermentation end products. Our laboratory is particularly enthusiastic in the search for marine bacteria which can produce ethanol, poly- $\beta$ -hydroxybutyrate and organic acids through fermentation of cheap agricultural materials.

## **Production of algal metabolites through protoplast technology**

*\*Dr. K.Y. Chan, Department of Biology*

A number of algal species are well-known producers of proteins, lipids, glycerol, alginate, agar and carageenin. However, their usefulness in large-scale production under controlled environment is hindered by some intrinsic factors, such as slow growth rate, low yields of the metabolites or product quality. But by the use of algal protoplast technology,

it is possible to fuse protoplasts from closely related or even distantly related algal species with advantageous characters. The fusion products (hybrids) can express the genetic make-ups from both parents. We are now in the process of selecting useful biochemical markers encoded by either nuclear DNA or by cytoplasmic DNA in different algal species, and we hope to produce protoplast fusion products with desirable characters.

## **Immobilization of Cells**

*\*Dr. W.W. Tso, Department of Biochemistry*

The ultimate goal of biotechnology is to raise production in industry and agriculture. As the fermentation industry is a highly developed industry in Guangdong Province, the Guangdong Institute of Microbiology (GIM) has launched a biotechnological programme in collaboration with our group, the Bioreactor group (W.W. Tso and W.N. Leung), to raise the production of a list of biochemicals, among them, alcohol and lysine. Our project includes the genetic selection of microbiological strains that can produce the highest yield, the transfer of genetic materials to fast growing host(s), and the immobilization of such cellular bioreactors to a suitable matrix that facilitates industrial production. The group's primary target is cell immobilization.

Enzymes are invaluable biocatalyst in cells that can be used to produce a wide spectrum of biochemical products. Generally speaking, the purification of enzyme is not only a highly skilful technique but also a time-consuming one. Poor handling of the enzyme leads frequently to a drastic loss of catalytic activity. However, the catalytic activity can be tactfully preserved by the housing (immobilization) of cells in an inorganic or organic matrix. This immobilization or trapping process also prevents the previously unpreventable disposal of cells from the reactor in either a batch process or a continuous one. The immobilized cells can be recycled – a great step forward in time- and expenditure-saving.

In our four-year's collaboration, we have succeeded in attaching a strain of filamentous microorganism to porous kaolinite beads. The beads were the first GIM invention. This entrapment procedure has already been shown to raise the biogas production by 2.7-fold. We have also initiated a new investigation on organic polymers as a matrix to immobilize cells for alcohol production.

## **Cloning of the Pasteur control protein mutant gene *adhC* and physiological study of the *adhC* clone**

*\*Dr. K.K. Mark, Department of Biology*

Pasteur discovered the Pasteur effect (1861) over one hundred years ago, but little is known as to

how it works. From the industrial point of view, aerobic fermentation turns nutrients into useless carbon dioxide and water, but anaerobic fermentation converts nutrients into products of value. Thus, studying the mechanism of switch between aerobic and anaerobic metabolism is a crucial step in exploiting the use of microorganisms for industrial applications. In this respect, the Pasteur control protein appears to be one of the key factors.

At Imperial College, London, I succeeded in cloning the Pasteur control protein mutant gene *adhC* while I was on leave from the University. Since my return I have repeated this cloning operation partly to gear up our laboratory in cloning experiments and partly to get a clone with short insert for easy nucleotide sequencing. With this clone, we can modify the aerobic and anaerobic switch system to suit various industrial processes, or use it as a probe to clone similar control gene in yeast or other organisms. We can also put this Pasteur control protein gene into an expression vector to over produce this protein and use this protein to identify the aerobic-anaerobic switch effector.

The Pasteur control protein mutant gene cloned in plasmid Vector pUC18 showed many unusual physiological properties. By studying the property of this clone, one can understand the function of this Pasteur control protein. Since the aerobic and anaerobic metabolic switch is so important in industry, any understanding along this line may be useful.

For genetic manipulations, the extent of expression by the cloned gene is obviously of importance. T<sub>4</sub> early and late genes cloned into Lambda vector were used as a model system. The expression of different T<sub>4</sub> early genes and late genes was measured. It was surprising that some T<sub>4</sub> early genes have a high rate of expression while others have hardly any expression at all. The expression of bacteriophage T<sub>4</sub> late genes was also not expected.

#### Subcloning and nucleotide sequencing of the Pasteur control protein mutant gene *adhC*

*\*Drs. K.K. Mark & H.S. Kwan, Department of Biology, Dr. W.K.K. Ho, Department of Biochemistry*

The Pasteur control protein gene with mutation that over produces alcohol dehydrogenase (ADH) and acetaldehyde dehydrogenase (AcDH) has been cloned by Dr. K.K. Mark during his sabbatical leave in Professor B.S. Hartley's laboratory. An obvious extension of this work is to subclone this mutant gene into small DNA fragments and determine their nucleotide sequences. As a similar Pasteur control protein gene, *fnr* was cloned and sequenced, and a comparison between the two clonings could yield significant information. We will make attempts to clone

and sequence the alcohol dehydrogenase (ADH) structural gene. This structural gene should have a nucleotide sequence in its promoter which is recognized by the Pasteur control protein *adhC*.

#### Screening of C-DNA Libraries for Useful Proteins

*\*Drs. W.K.K. Ho & W. M. Keung,  
Department of Biochemistry*

Developments in recombinant DNA technology have enabled scientists to construct C-DNA libraries from messenger RNA extracted from different tissues. These C-DNA's can be cloned and isolated. After proper packaging of them into a host/vector system, the information residing in them can be transcribed and made to synthesize different proteins and enzymes. Using this approach, a number of useful proteins have been made. The most noteworthy of them perhaps are insulin and interferon.

Our research project in this direction encompasses the screening of a liver C-DNA library for the enzyme alcohol dehydrogenase. We hope to isolate the segment of DNA coding for this enzyme. Once this is done, we can proceed to prepare a DNA probe to examine the genetics of metabolism relating to this enzyme.

In addition to the liver, we are also interested in the C-DNA library of the brain. A variety of neuropeptides exists in this organ and some of them may have high pharmacological values. Our aim is to make use of the C-DNA technique to efficiently synthesize these peptides in the bacteria. In the long run, we hope to master this technology and to expand our work to synthesize proteins and enzymes of industrial interest.

This project is carried out in collaboration with Dr. W.Y. Chan, Department of Biochemistry and Pediatrics, Oklahoma University.

#### Protein Engineering of Trichosanthin, $\alpha$ - and $\beta$ -Momorcharin

*\*Dr. H. W. Yeung, Department of Biochemistry*

We have been studying the biochemistry and pharmacology of abortifacient proteins from the Cucurbitaceae family since 1978, particularly on Trichosanthin (first discovered in China) and  $\alpha$ - and  $\beta$ -momorcharin (first discovered in this University). From the studies carried out at this University and those in China, these proteins were found to be very effective in inducing mid-term abortion and the termination of early pregnancy in laboratory animals and humans. Clinical studies in China have shown that trichosanthin is more effective than the well-known abortifacient, prostaglandin F<sub>2</sub> $\alpha$ . We have also demonstrated the anti-cancer effect of these proteins.



The antigenic determinants of these proteins are of particular interest since their clinical use is likely to be limited by immunological side-effects such as hypersensitivity. It is fortunate that trichosanthin and  $\alpha$ - and  $\beta$ -momorcharin show great promise as clinical alternatives since both proved to be immunogenic, but the value of the whole class of proteins would increase if a large set of non-cross-reacting species were available.

A promising route to achieving such an end would be to use the frontier techniques of genetic engineering and protein engineering. The available antibodies would be used to identify those parts of the plants most active in synthesizing these proteins. From this region mRNA would be extracted and used to prepare a cDNA bank. The cDNA bank would be screened with synthetic radioactive oligonucleotide probes, encoding appropriate regions of the amino acid sequences, and relevant clones sequenced by Sanger's 'dideoxy technique' after subcloning into M13 phage. It is then relatively easy to make mutations *in vitro* that will allow intelligent replacements of any amino acid, based on a known tertiary structure. Constructions in 'expression vectors' can then be made to allow high-level synthesis of the mutant proteins in *E. coli* or yeast. In this way the antigenic determinants could be varied at will once they were identified.

### Monoclonal Antibody Production

*\*Drs. W.K.K. Ho & K.N. Leung,  
Department of Biochemistry*

Monoclonal antibodies are antibodies produced by cloning hybrid cells originally prepared *in vitro* where a normal antibody-producing cell is fused with a cancerous cell. Using this technique, a cell line capable of producing a specific and homogenous population of antibody can be obtained. Contrary to the conventional system of antibody production, this technique can theoretically produce an unlimited supply of highly pure antibodies as long as the original cell line is preserved.

The short-term goal of our research in this direction is to establish techniques for raising highly specific monoclonal antibodies. In the long range, we aim to expand our work into the area of biomedical assays. Examples of future developments may include: radioimmunoassay, enzyme-linked immunoassay and histoimmunoassay.

Our current project is to raise monoclonal antibodies against the opiate receptor and a serum protein called Apo B48. These two projects are carried out more for academic interest than for their applied value. Nevertheless, since we are more familiar with these systems, we hope the insights gained from these studies would enable us to extend to other

fields which have greater commercial value.

Projects which we are planning to develop in the field of clinical diagnosis include the raising of monoclonal antibodies against different types of human tumours, drugs and bacterial antigens. In this respect, originality would not be our primary concern. Our goal is to produce antibodies which can be developed into immunoassay for the diagnosis of diseases.

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## (2) Other Biochemical Research

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### Research Programme for the Isolation of Fertility Regulating Agents from Plants

— Y.C. Kong

As a founding member of the 'Multicentred Collaborative Research Programme for the Isolation of Fertility Regulating Agents from Plants', the Biochemistry Department has made significant breakthroughs in this eight-year old international research programme sponsored by the World Health Organization, Special Programme of Research, Development and Research Training in Human Reproduction. On 25th January, 1985, the Biochemistry Department and WHO together hosted a one-day symposium on campus under the title 'The Development of New Fertility Regulating Agents from Plants'. The Programme, its logistic approach, methodology and recent results, were presented to an audience of 150 scientists from the local and overseas academic and professional communities. The highlight of the Symposium was our first public announcement of the discovery and synthesis of yuehchukene, a novel *bis*-indole alkaloid isolated from a local plant, *Murraya paniculata*. Yuehchukene showed potent anti-implantation activity in animal tests. It is now synthesized in bulk and subjected to in-depth pharmacological evaluation. Patents for the use of yuehchukene in fertility regulation and its synthesis process are being filed. In the 13th Annual Report (1984) of WHO Special Programme in Human Reproduction, this discovery was hailed as the most advanced lead in the collaborative research programme.

The discovery of yuehchukene offers a new dimension to human fertility regulation hitherto dominated by the use of steroidal pills. Being a natural product and acting post-coitally by the oral route, yuehchukene has every promise of wide-spread social acceptability that transcends the present limitation such as education of recipients, cost of administration and delivery and technical know-how in production. On the academic front, the introduction of a new drug calls for massive intellectual input to investigate its mode of action, pharmacological profile, physiological sequelae and finally its

epidemiology of large-scale application. It offers almost unlimited research possibilities for scientists on campus and in Hong Kong and their overseas collaborators. As at present, requests for yuehchukene are plenty; WHO and the Biochemistry Department are carefully monitoring the situation as yuehchukene enters the course of a new drug development.

### Studies of Energy Metabolism of Cancer Cells

— *K.P. Fung*

It is a common phenomenon that cancer-bearing patients or experimental animals suffer from hypoglycaemia (low glucose in blood). Tumour cells depend primarily on the catabolic breakdown of glucose for the provision of energy. To maintain growth potential, it is essential that tumour cells should possess a highly efficient system for the transport of glucose into the cell and to metabolize it. Based on this hypothesis, we began to study the glucose transport system of cancer cells throughout proliferation and drug treatment.

It is a common practice in medical science that before a drug is administered to human, pilot tests on experimental animals or cell cultures should be performed. The animal model used in our studies is Ehrlich ascites tumour which grows in the abdomen of mice and is one of the commonest experimental animal models used in cancer research. The tissue cultures used in our research consisted of various human, rat and mouse tumour cell lines.

The first interesting observation we made was that the ability of Ehrlich cells to take up glucose increased progressively during the course of tumour development. Since the uptake of glucose by cancer cells is mediated through a class of molecules designated as 'glucose carrier' on the membrane of the cancer cells, we further studied the changes if any, in the number and characteristics of the glucose carriers throughout tumour growth. We found that as the rate of uptake of glucose in tumour cells rose, the cell surface density of these glucose carrier molecules also increased simultaneously. This enhancement of glucose uptake by cancer cells during tumour growth, through increases in the number of glucose carriers, constitutes the primary cause of hypoglycaemia seen in patients or experimental animals bearing cancer.

We were also interested in knowing the mechanism underlying the increase in carrier density of tumour cells during development. We hypothesized that a vicious circle might operate here. Tumour cells, in order to satisfy the hunger for glucose, elaborate a huge number of carriers for its transport into the cell. This leads to a drop in the level of blood glucose. And as the amount of available glucose

decreases, the tumour cell makes more glucose carrier molecules as a compensatory response. A series of experiments showed that this is indeed the case. Furthermore, to our delight, when we studied the growth of Ehrlich tumour cells in mice under fasting condition, we found that tumour regresses when the mice were starved. Of course, it is not a practice to starve a cancer patient in order to cure him of cancer, but, fasting tumour-bearing mice provide a good experimental animal model for studying of what makes a tumour cell tick.

A logical question to ask at this point is how do anti-cancer agents fit into this scheme of things? We studied a wide spectrum of anti-cancer agents including garlic, methotrexate, N-(phosphonacetyl)-L-aspartate, interferon-inducers and tumour necrosis factor (TNF). Of particular interest is TNF. TNF is a protein produced by macrophages (large cells capable of engulfing foreign particles and cells including bacteria) of the host. It is special in that it is capable of killing tumour cells while leaving normal cells untouched. It also exhibits no species-specificity, i.e. even TNF produced from mice can have an effect on human tumour cells. We developed a new method for the large-scale production of TNF to facilitate our studies and observed that TNF, as expected, inhibits the proliferation of tumour cells. As the growth rate decreased, the cellular uptake of glucose (and the glucose carrier density on the cell surface) were found to be reduced simultaneously. We do not know yet how TNF does this but we plan to find out. Our ultimate goal is to find ways to kill tumour cells effectively. TNF seems to be a candidate worthy of pursuit. However, TNF has been shown to have but a short life span in circulation — it gets degraded easily. This severely curtails its effectiveness as a therapeutic agent. We are working to overcome this deficiency. By modifying its structure, by complexing it with other molecular entities, we hope to increase the life span of TNF without diminishing its activity.

The research project on the effect of anti-tumour agents on the glucose transport system of tumour cells was started in 1981 in the Department of Biochemistry with financial support from World Health Foundation (H.K.).

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### (3) Research efforts of the Physics Department

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#### Physics of Proteins

— *K.C. Cho*

Protein molecules are, in many respects, the most remarkable chemical substances in living organisms. Functionally, they play two separate and distinct

roles, as structural elements and as chemical machines operating in a molecular level. A protein is a linear polymer of amino acids, but is special in that each individual protein molecule has a unique three dimensional structure which is intimately related to its functional properties. The biophysical research on proteins in the Physics Department is concentrated on the two areas described below, and the researchers include Drs. K.C. Cho, C.L. Choy, W.P. Leung and C.M. Che (Chemistry Department, University of Hong Kong).

(1) An important but difficult biophysical problem is how the protein becomes folded once synthesized in the body, and how is this folded structure maintained. Using myoglobin (the protein responsible for oxygen transport in the muscle) as a model system, we have observed by transient optical study that the folding and unfolding processes do not take place in one step, but involve a number of intermediates. The equilibrium studies have contributed to the understanding of the relative importance of various effects, including pH, hydrophobic and electrostatic interactions, in stabilizing the protein structure.

In addition to the static structure, dynamic properties such as the flexibility of the entire molecule are also of significance in protein functions. For example, it is through structural fluctuations that oxygen molecules are able to diffuse into the interior of myoglobin for the reaction to occur. We have found that studies by ultrasonic spectroscopy can provide useful information.

(2) Electron transfer process in protein molecules is probably one of the most fundamental ones in life as it is related to the generation of usable energy in all living matters. In the initial stage of energy production, electrons are released by the breaking down of food stuffs in animals and by the absorption of sunlight in plants. Subsequently, these electrons are transferred through a chain of protein carriers before being taken up by oxygen. These electron transfer reactions are exothermic and part of the energy released is used to produce ATP molecules which are responsible for driving all chemical processes in living cells. In our laboratory, the electron transfer reaction between a protein and a donor molecule is initiated by exciting the donor with a powerful pulsed laser. This novel method has provided data covering a range of redox potential not attainable by usual means. The results are useful for a better understanding of the transfer mechanism. At

present, the work is also being extended to nonbiological molecules with the hope that, in the future, our study will help to find other efficient means of harvesting solar energy by mimicking the photosynthetic process in nature.

### Biophysics of Muscle

—A.F. Leung

The research attempts to provide answers to a fundamental question about the muscular system. The question is: what are the molecules doing when the muscle is working. The answers would help scientists to design drugs to eliminate any malfunction of the system.

The research is carried out by using a laser beam to illuminate the muscle. The beam is subsequently scattered by the molecules inside the muscle. Analyses on the patterns of scattered light have provided for the first time several important features about molecular motions in working muscle. In addition, they also produce some insight into the way by which muscular contraction is regulated.

A set of equations linking the observed pattern of scattered light to the internal structure of the muscle has been developed. Recently, these equations have been used to correlate the subunits of cardiac muscle with the corresponding light pattern. This cardiac muscle research, conducted in collaboration with Dr. Kenneth Roos of the Cardiovascular Research Laboratory at the Medical School of the University of California at Los Angeles, has received worldwide attention. Besides, my collaboration with Professor Joseph C. Hwang and Ms. Y.M. Cheung of the Department of Physiology, University of Hong Kong, focuses on the use of laser light scattering method to monitor the effects of chemical agents on muscle fibres.

We have now a clear understanding of what molecules are doing during muscular activity. However, it is still unclear as to how these molecules can generate mechanical energy necessary for motion. Further experiments are being designed to answer this puzzling question.

### Polymer Physics

—C.L. Choy

Polymers are made up of long-chain molecules. This class of materials is now widely used not only in everyday life but also in advanced technology including the aerospace industry. The usefulness of a polymer in any specific application is determined largely by its properties. Therefore, to further extend the range of applications it is necessary to have a thorough knowledge of the physical properties and their relationship to the structure of the materials.

Polymer research was initiated in the Physics

Department in 1967 by Professor Baysung Hsu and Dr. S.H. Kwan (now at the Hong Kong Polytechnic). The work was concentrated on polyethylene terephthalate (popularly known as Dacron or Mylar), an important polymer commonly used as textile fibres and insulating films in electronic components such as capacitors. The mechanical strength of this material is often enhanced by drawing along one direction (in the case of fibres) or in two perpendicular directions (for films). The drawing process induces preferential alignment of molecular chains, thereby leading to significant changes in the mechanical and dielectric properties. These properties were studied as a function of the extent of stretching and were correlated with the degree of chain orientation determined from X-ray and birefringence measurements.

Since 1969 several staff members, including Drs. C.L. Choy, F.C. Chen, K. Young and W.P. Leung have also undertaken research in polymer physics, extending the work in various directions. Brief summaries of present projects are given below:

(1) Strong Materials with High Thermal Conductivity

Polymers have numerous advantages, including light weight, flexibility, chemical inertness and ease of processing but they suffer from a major drawback — they are much weaker than metals. Consequently, an important goal of many research institutes is to improve the stiffness and strength of polymers through appropriate processing techniques. A commonly used method for strengthening polymers along one direction is drawing, by means of which we have produced polyethylene fibres stronger than aluminium. This ultradrawn material has other interesting properties. For example, its ability to conduct heat is as good as that of metallic alloys, an extremely rare attribute for electrical insulators. Therefore it would be a useful material in electronic systems requiring both electrical insulation and large dissipation of heat. Structural measurements were made to pinpoint the origin of the unusual properties and it was found that they arose from the presence of perfectly aligned needle-like crystals produced during ultradrawing.

(2) Control of Thermal Expansion by Chain Orientation

Many objects are made by joining polymers to other types of materials with lower expansion coefficient. As a result of differential thermal contraction the joint may break when the temperature of the environment changes. We have found that the expansion coefficient

is sensitively dependent on the degree of orientation of polymer chains and so are able to control the amount of expansion through prior drawing.

(3) Theoretical Prediction of Ultimate Properties

We have seen that the remarkable behaviour of ultradrawn polymers merely reflects the properties of needle-like crystals in these materials. To find out how far we can improve the thermal properties it is imperative to know the ultimate limits. Our theoretical calculation shows that the thermal conductivity of polyethylene crystals along the chain axis is as high as that of copper, one of the best thermal conductors known. Surprisingly, the expansion coefficient along the chain direction has a negative value, meaning that the crystal contracts in this direction when it is heated.

(4) Composite Materials

It was mentioned that very strong fibres can be prepared by drawing. However, in many applications, it is necessary to use objects of various shapes and sizes. These can be made by embedding fibres in another polymer medium, forming what are known as composite materials. In collaboration with the Institute of Chemistry of Academia Sinica we have studied the physical properties of composites containing glass or carbon fibres. In the future, we hope to replace these fibres by the strong organic fibres produced in our laboratory.

(5) Non-destructive Testing by Ultrasonic Technique

Ultrasonics is a well-established technique for the non-destructive testing of a large variety of materials but its application to oriented polymers has been hampered by the small sample size and strong attenuation of ultrasonic waves. We have built an equipment which allows complete characterization of small-strain mechanical properties over a wide temperature range from  $-60^{\circ}$  to  $150^{\circ}\text{C}$ . Through the use of this unique facility we have collaborated with several institutions, including the University of Leeds, University of Massachusetts and Japan Telegraph and Telephone Corporation. It is worth mentioning that polyoxymethylene tubes of small diameter are now used by Japan Telegraph and Telephone Corporation to strengthen optical fibre cables and we have been able to determine all the independent mechanical moduli of these tubes.

(6) Gas and Vapour Diffusion through Polymer Films

The passage of gas or vapour through

polymer films is an important factor in various uses. Many food items are enclosed in packages to prevent contact with water vapour. On the other hand, plastic bottles for carbonated drinks must have the ability to block the flow of carbon dioxide to the outside. One of the most effective means to improve barrier properties is through the process of orientation. It was found that the diffusion rate was reduced fifty times when polyethylene and polypropylene films were drawn to ten times their original length.

In conclusion, it can be seen that over the past decade the polymer physics group has set up a research programme covering a wide range of topics of both theoretical and practical interest. It is hoped that, with the recent addition of powerful tools such as nanosecond pulsed laser, the research activities would be further enhanced.

### Amorphous Semiconductor Research

— K.P. Chik

In recent years, we have concentrated on the study of amorphous silicon films (a-Si) and on the development of new methods of producing good quality a-Si:H films. Our research is now being extended to the study of Si alloy films and microcrystalline films. This research is carried out in collaboration with the Amorphous Silicon Research Group of the University of Western Ontario, Canada under Professor B.Y. Tong. As a result of the collaboration, we have access to more sophisticated equipments such as secondary ion mass spectroscopy (SIMS) which are not available at this University.

An amorphous semiconductor differs from a crystalline semiconductor in that the former does not have long range order, whereas the latter does. Hence one does not expect to be able to dope the amorphous semiconductors just as for crystalline semiconductors. But the recent discovery that doping is possible if a-Si contains a reasonable amount of hydrogen has stimulated active research in this field worldwide. Moreover, a-Si:H has already found its way to industrial application and more important applications are expected in the near future.

A common method of producing a-Si:H is by the decomposition of silane gas by a high frequency source. This method of film production has several drawbacks. One of them is that the film quality degrades with time and with illumination. In our laboratory, we approach the problem in another way and have developed in the past years a novel method of post-hydrogenating evaporated films, using a theta-pinch plasma. The post-hydrogenated films are found to have good photoconducting properties

and very high stability. This method has been patented in the United States two years ago. Further research is now being carried out on the use of plasma gun for post-hydrogenation.

We have also developed another method of producing Si films using low pressure chemical vapour deposition (LPCVD) technique, with which we can produce a-Si films with low hydrogen content, boron-doped and phosphorous-doped silicon films. By varying the deposition conditions, films can be doped from low to very high concentration. SIMS analysis shows that some of our B-doped films has a boron concentration of more than forty atomic percent in the solid phase, while X-ray analysis shows that they are still amorphous. We would rather call such films a-Si-B alloy. These alloy films have some interesting properties. The electrical conductivity is three orders of magnitude higher than that of slightly doped samples and the thermopower increases with rising temperature. Hall mobility measurements are still underway and we have some indications that Hall mobility can have unexpectedly high value. On the other extreme, we can also produce B-doped and P-doped Si films which, according to X-ray analysis, can be regarded as microcrystalline. The electrical conductivity and thermopower measurements show that they are already degenerated. The electrical conductivity of B-doped microcrystalline Si films is at least one order of magnitude higher than similar films produced in other laboratories. We expect that this material has good potential in device application. We have tried using such films to produce a primitive heterojunction a-Si:x-Si solar cell with a conversion efficiency reaching ten percent. At present, besides carrying out detailed study of the physical properties of our new films, we are also trying to improve our LPCVD deposition technique in order to produce better-controlled films.

### Electronics

— H.H. Ho

In the Physics Department, research projects in the area of electronics are also undertaken. One of the projects worth mentioning and that may influence the future design of computer hardware is called 'multiple-valued logic'. Present digital systems are designed with binary approach. Its development is based on purely philosophical logic concepts of 'true' and 'false' (Aristotelian logic) and the mathematical foundations by Boole (Boole, G.: *The Mathematical Analysis of Logic*, Blackwell, 1948) and, the establishment of a switching theory by Nakasima and Shannon based on Boole's mathematical foundations. (Nakasima, A.: 'Theory of Equivalent Transformation of Simple Partial Paths in the Relay Circuit', *J. Inst.*

*Electr. Engrs.*, No. 165 and No. 167; Shannon, C.E.: 'A Symbolic Analysis of Relay and Switching Circuits', *AIEE Trans.*, Vol. 57.) However, it was demonstrated that the most efficient radix for a computer is not the number 2 but  $e$  ( $= 2.71828$ ) which is close to 3, and thus ternary system was suggested as an alternative to the binary. (Harvard Computation Laboratory: 'Synthesis of Electronic Computing and Control Circuits', *Ann. Harvard Univ. Computation Lab.*, Vol. 27, p. 50, 1952; Morris, D.J. & Alexander, W.: 'An Introduction to the Ternary Code Number System', *Electronic Engineering*, Vol. 32, p. 554, 1960.) One disadvantage of ternary circuits is that it requires more active elements than the binary one because of the greater number of compositions. During the performance of decimal calculation, no matter it is in radix 2 or in radix 3, a code-to-code conversion is necessary. In order to remove this kind of conversion, a denary logic is studied in the Physics Department. As VLSI is being developed rapidly, it becomes apparent that 10-valued logic system would be the most attractive alternative to binary system. From an engineering point of view, one of the most promising features of denary logic system is the potential for the reduction of the wiring complexity, at least it cuts down the interface for code conversion. We have already demonstrated how to use a single core which is conventionally operated 0 or 1 to memorize 0 to 10 instead of using 4 cores in binary. (Ho, H.H.: 'Direct Storage of Decimal Numbers by a Square Loop Core', *Int. J. Electronics*, Vol. 39, pp. 497-507, 1975.) Also, the arithmetic operation is more or less based on the idea as the paper and pencil manipulation of decimal numbers. (Ho, H.H.: 'Denary System Arithmetic Operation', *Int. J. Electronics*, Vol. 54, pp. 625-641, 1983.) Such an idea has already been demonstrated by experiments and it shows a good possibility of using denary logic as another alternative to binary logic. (Ho, H.H. and Tsun, T.O.: 'Denary Logic Arithmetic Processor', *Int. J. Electronics*, Vol. 57, pp. 307-331, 1984.) Therefore, we reckon that a challenging opportunity may be open in this area.

### Research on Musical Acoustics

— S.Y. Feng

Research on Pi-Pa acoustics started about five years ago in the Physics Department. This research has its origin in the laser optics research carried out at this University in the late 60's by Mr. L.K. Su and Professor B. Hsu, who started their nonlinear optics research at New Asia College on Farm Road. Later, in the early 70's, the centralization of the three Colleges brought all the Physics staff under the same roof at the Science Centre and L.K. Su and S.Y.

Feng collaborated on holographic spectroscopy. After the retirement of Su, Feng concentrated on laser interferometry, which provided a new technique for the measurement of very small vibration or deformation not observable by conventional methods. Feng chose musical instruments as the vibrating objects. When the object was excited, by an electromagnetic device, into a steady and periodic vibration, a laser hologram was taken. After darkroom processing, the hologram was illuminated with a laser beam to reconstruct an image of the original musical instrument. Superimposed on this image was a fringe pattern representing the 'mode' of the vibration. During the past few years, a series of measurements was performed on Pi-Pa and Cheng. The accumulated data showed a very interesting result. The sound waves produced by a Pi-Pa contain higher harmonics components which are much stronger than the fundamental. This is quite different from the behaviour of western musical instruments. Whether this feature is common to most Chinese musical instruments requires continuous and more extensive research.

Researchers on musical instrument acoustics can join hands with instrument makers in producing, hopefully, ideal and perfect instruments for the performers. No doubt, this will be a long and difficult journey.

### Nuclear Sciences and Cosmic-ray Physics

— L.S. Chuang

#### *Nuclear Sciences*

(1) In 1973 the International Atomic Energy Agency (IAEA) donated a 14 MeV neutron generator and a complete set of Ge(Li) gamma-ray spectrometer to the Physics Department. They have been used largely for the following research:

*Elemental analysis:* We have analyzed, by means of neutron activation, more than two hundred Chinese medicines for the elemental contents of protein, phosphorus, potassium and magnesium, and also the elemental contents of ancient Chinese bronze seals. Through these studies, first-hand scientific information on the elemental constituents of the Chinese medicines was gained and a further understanding of the ancient Chinese bronze was made possible. Elemental analysis by means of neutron inelastic scattering in bulk material is now in progress.

*Neutron spectrometry and dosimetry:* We have developed a unique method for neutron spectrometry. We are now studying the neutron dosimetry, using large-area plastic scintillators.

*Nondestructive testing of material defects and evaluation of precious stones:* We have developed a method of detecting the scatterer material defects, using the 14 MeV neutrons and a pulse-shape analyzer



system. The quality of precious stones, such as jade, has been studied by means of neutron activation.

(2) A computerized thermoluminescence (TL) spectrometer has been fabricated for archaeological dating (and hence authentication) of ancient pottery. Absolute dating is now in process, using improved sample preparation and TL dosimeters.

### *Cosmic-ray Physics*

A cosmic-ray observation station installed with a Nishina type ion-chamber has been in operation since 1969 (in collaboration with The Institute of Physical and Chemical Research, Tokyo). In this observatory, measurements of the diurnal variation of cosmic-ray intensity in Hong Kong has been going on since 1973. The data of measurements have been supplied regularly to the World-Data Centre for Cosmic Rays for distribution to the worldwide research laboratories. In the meantime, studies have been made on the rigidity responses of ion-chambers and long-term changes in cosmic ray diurnal variations, using the data accumulated from the observations.

Using a plastic-scintillator telescope we have also measured the spectra and zenith angle dependence of slow muons and atmospheric effects on slow muons. A study of multi-particle production in dense material of sea-level cosmic rays has been in progress for a few years and the result shows an interesting comparison with the theory.

### **Theoretical Physics**

—K. Young

One major area of theoretical work is in electrodynamics. Professor Y.W. Chan has for a number of years studied the interaction of charges with strong electromagnetic fields using classical concepts. Important examples include the interaction with electromagnetic waves (generalization of the Compton effect), with standing waves (the Kapitza-Dirac effect) and with spatially periodic magnetic fields in wigglers and undulators. The last of these is extremely important for understanding the basic mechanism in various devices proposed as free electron lasers, which are now being developed in many research centres around the world as a possible source of coherent x-rays and gamma rays.

When free charges appear not singly, but in large numbers, collective effects become important in the so-called plasma state, which is important both astrophysically and in controlled fusion. The recent works of Dr. H.M. Lai in this area include the study of radiation emitted in such plasmas in the presence of a background magnetic field, the effect of radiation reaction on relativistic plasmas, and particle acceleration by electromagnetic wave pulses. Dr. Lai has

also studied in great detail the parallel lateral displacement of a light beam upon total internal reflection (Goos-Hänchen's effect).

The interaction of electromagnetic field with dielectrics (e.g. something as simple as water) is even more common but historically controversial. Dr. H. M. Lai and K. Young have achieved an understanding of this problem from both a microscopic and a thermodynamic point of view, and provided quantitative accounts for a number of experimental situations, including the photoacoustic experiments carried out by colleagues in the Department. Current work centres on unexpected features of thermodynamics in the presence of long-range forces (including violations of the zeroth law of thermodynamics), with dielectrics providing a test ground for the theory.

While physics may be said to be the search for order in nature, the idea of disorder surprisingly provides another thread which runs through several aspects of theoretical research. Dr. K.L. Liu is interested in the behaviour of disordered magnetic systems, through which one can attempt to understand how disorder affects material properties. Dr. Liu has addressed this question by calculating a number of relevant physical quantities to very high order accuracy.

Another kind of disorder appears in dynamical systems (e.g. turbulent fluids) which become apparently unpredictable and chaotic. Dr. K.L. Liu and K. Young have recently established certain regularities on one of the more common routes to chaos.

The interaction among elementary particles is a subject of interest to many physicists. The recent work of K. Young is directed towards the case of extremely high energies, where the situation is correspondingly simple and in many ways analogous to optical diffraction. Current work exploits the concept of maximum disorder to understand hadron-nucleus scattering.

A number of other projects illustrate the close collaboration with experimental colleagues. Many amorphous materials soften rather suddenly at the so-called glass transition. Theoretical work supported by parallel experiments has proved conclusively that the transition is basically a kinetic phenomenon. The surprisingly negative axial thermal expansivity of polymer crystals measured in experiments both here and to low temperatures in other laboratories has been understood via an *ab initio* quantum mechanical calculation. The quasi-one-dimensional nature of polymer crystals has also enabled an understanding of its thermal conductivity through a fairly rigorous formalism. This work has also prompted another look into the theory of thermal conductivity, which has been neglected for several decades.

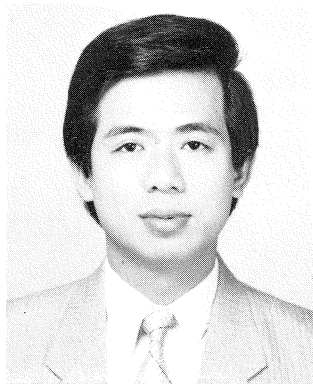
# Seminars



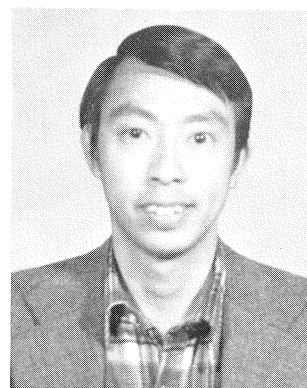
*Professor Samuel C.C. Ting conducting a seminar*

- \* The Department of Physics organized:
    - A lecture on ‘**Kondo Problem**’ by **Professor John Lowenstein**, Professor of New York University, on 24th June.
    - A seminar on ‘**The Search for the Fundamental Building Blocks of Nature**’ by **Professor Samuel C.C. Ting**, Professor of Physics, Massachusetts Institute of Technology, on 19th August.
    - A seminar on ‘**Optical Ellipsometry Studies on the Muscle Diffraction Signal**’ by **Professor Yeh Yin** of the Department of Applied Science, University of California at Davis, on 30th August.
  
  - \* **Professor A.F. Pillow**, Professor of Applied Mathematics, University of Queensland, Australia, spoke on ‘**Basic Conservation Principles in Viscous Fluid Flow**’ on 27th June. The seminar was jointly organized by the Departments of Mathematics and Physics.
  
  - \* **Professor Ray Elling**, Professor of Sociology and Community Medicine, University of Connecticut, USA and Chairperson of the Research Committee on Medical Sociology, International Sociological Association, spoke on ‘**Health and Social Development: A Cross-National Perspective**’ on 2nd July. The seminar was jointly organized by the Department of Sociology and the Centre for Hong Kong Studies.
  
  - \* The Department of Chemistry organized the following seminars:
    - ‘**Carbene Complexes and Natural Product Synthesis**’ by **Dr. K.H. Dötz**, Anorganisch-Chemisches Institut, Technische Universität, München, on 3rd July.
    - ‘**Teaching and Doing Chemistry on Microcomputers**’ by **Professor Chung Chieh**, University of Waterloo, Canada, on 22nd August.
  
  - ‘**Biological Antioxidants**’ by **Professor K.U. Ingold**, Division of Chemistry, National Research Council, Canada, on 23rd August.
  - ‘**Organic Solid State Chemistry**’ by **Professor J.M. Thomas**, University of Cambridge, England, on 30th August.
  - ‘**Synthesis and Reactions of Alpha-Dihalo Esters of the Type:  $R_F CX_2 O_2 R$  ( $R$ =haloalkyl); the Possible Intermediate Formation of Alcohols,  $R_F CX_2 OH$** ’ by **Professor Neal O. Brace**, Professor of Chemistry, Wheaton College, USA, on 6th September.
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- \* **Dr. Andrew Broderick** of the Department of Biotechnology, Cawthron Institute, New Zealand, spoke on ‘**Biotechnology in New Zealand**’ on 16th August. The seminar was presented by the Department of Biology.
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- \* The Department of Economics presented a seminar on ‘**Supervision, Incentives, and the Optimal Scale of a Farm in a Socialist Economy**’ by **Mr. Justin Lin** of Beijing University and the University of Chicago on 19th August.
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- \* The School of Education and the Association of Psychological and Educational Counsellors of Asia, Hong Kong Branch, jointly presented the following seminars by **Professor C.H. Patterson**, Professor Emeritus of the University of Illinois, and Distinguished Visiting Professor of the University of North Carolina, USA:
  - (1) **Training and Supervision in Counselling** on 24th August;
  - (2) **Crisis in the Classroom** on 26th August;
  - (3) **New Trends in Careers Counselling** on 7th September; and
  - (4) **Humanistic Educators** on 8th September.

# Profiles



*Dr. Wing-pun Leung*



*Mr. Chang Song Hing*

## **Dr. Wing-pun Leung**

### *Dean of Students, New Asia College*

Dr. Wing-pun Leung graduated in 1970 from New Asia College, The Chinese University of Hong Kong with a BSc degree in Physics. In 1971, he pursued further studies in the United States and received from the University of Akron, Ohio, an MSc degree in Physics in 1973, and from Stanford University an MSc degree in Electrical Engineering in 1976 and a PhD degree in Applied Physics in 1978.

Dr. Leung joined the Physics Department of the University in 1977 as an Assistant Lecturer and was promoted Lecturer in 1978. Besides teaching courses in Physics, he has been active in carrying out research and has published over twenty articles in international journals in the field of applied physics and polymer physics.

Dr. Leung is one of founders of the New Asia Astronomy Club. During his study at Stanford University, he was actively involved in organizing the Chinese Student Association there. Back in Hong Kong, he served for several years as a committee member of The Physics Society of Hong Kong; and at the University, he was a committee member of the Benjamin Franklin Centre Management Committee. The College is fortunate to have Dr. Leung as its Dean of Students.

## **Mr. Chang Song Hing**

### *Dean of Students, United College*

Mr. Chang Song Hing, 1970 graduate of the Chinese Department of United College, The Chinese University of Hong Kong, obtained his MA degree in Chinese Language and Literature in 1972 from the same University. Mr. Chang has been teaching in the University since 1971, first as Tutor, then as Assistant Lecturer and Lecturer of the Department of Chinese Language and Literature. He was an Honorary Fellow at the Department of East-Asian Languages, Univer-

sity of Wisconsin, in 1984-85. At this University, Mr. Chang has been for many years counsellor of the Department of Chinese and has rich experience in student counselling. He has also taken part in the design of the General Chinese Programme; and teaching of this Programme for all these years enabled him to have a deeper understanding of students from other Departments and Faculties. In 1981, United College set up two non-residential halls and Mr. Chang was appointed Warden of one of them – Ping Fan Hall. His involvement in the Non-residential Halls project began at the planning stage and he has also helped the students to set up Non-residential Hall Committees. Since the reorganization of the Alumni Association of United College in 1971, Mr. Chang has been actively involved in its work as a member of the Council and served as Secretary of the Council and the Executive Committee for several terms. Such experience would surely stand him in good stead in his present appointment as the Dean of Students.

Mr. Chang's academic interest lies mainly in linguistics and philology. He devotes much of his effort on the study of phonetics and dialects. At the Chinese Department, he teaches courses on Chinese Phonology, History of Chinese Linguistics, and Introduction to Chinese Language and Script. He has also conducted research on Chinese fictions and offered such courses as Chinese Classical Fiction, and Fiction (1917-1966) before. Mr. Chang is active in both literary activities and community service. He has been invited for several times to serve as an adjudicator of the 'Youth Literary Prize' Competition organized by the students of the two local Universities and the 'Chinese Literary Prize' Competition sponsored by the Urban Council Library. Recently, he has also served as a phonological adviser to the Hong Kong Society for the Blind for its braille book production project.

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# Personalia

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(From 16th May to 15th July, 1985)

## *I. Appointments*

Dean of Students of New Asia College  
Dr. Leung Wing-pun  
Dean of Students of United College  
Mr. Chang Song-hing

### **Academic Staff**

#### *Faculty of Medicine*

Professor Robert Chang  
Honorary Visiting Professor of Microbiology  
Dr. Kenneth Ruys Mao  
Senior Lecturer in Obstetrics & Gynaecology  
Dr. Chu Lap Ki, Laurence  
Lecturer in Medicine  
Dr. Lee Ngar Yee, Natalie  
Lecturer in Paediatrics  
Dr. Ian Edward Tam Stewart  
Lecturer in Diagnostic Radiology & Organ  
Imaging  
Dr. Stephen Robert Swindells  
Lecturer in Anaesthesia  
Dr. Robert James Campbell Steele  
Visiting Lecturer in Surgery  
Dr. Alexander Zacharia  
Visiting Lecturer in Clinical Oncology  
Dr. Avery Chan  
Honorary Clinical Lecturer in Community  
Medicine  
Dr. Chan Kin Hing  
Honorary Clinical Lecturer in Medicine  
Mr. Chin Chung-yuen  
Honorary Clinical Lecturer in Surgery  
Col. J. Dowson  
Honorary Clinical Lecturer in Surgery

Mr. John Fenn  
Honorary Clinical Lecturer in Surgery  
Dr. Ha Man-hoi  
Honorary Clinical Lecturer in Paediatrics  
Mr. Ho Yuk-hai  
Honorary Clinical Lecturer in Surgery  
Dr. Michael John Humphries  
Honorary Clinical Lecturer in Medicine  
Dr. Lillian Ko  
Honorary Clinical Lecturer in Paediatrics  
Dr. Lau Wai Keung  
Honorary Clinical Lecturer in Medicine  
Mr. Lee Po-chin  
Honorary Clinical Lecturer in Orthopaedic &  
Traumatic Surgery  
Mr. Lee Shwe-yan  
Honorary Clinical Lecturer in Orthopaedic &  
Traumatic Surgery  
Dr. Susan Leong  
Honorary Clinical Lecturer in Morbid Anatomy  
Mr. Leung Yum-kwong  
Honorary Clinical Lecturer in Orthopaedic &  
Traumatic Surgery  
Dr. Lo Ki Kam  
Honorary Clinical Lecturer in Medicine  
Mr. Mak Kan-hing  
Honorary Clinical Lecturer in Orthopaedic &  
Traumatic Surgery  
Mr. S.D. Mok  
Honorary Clinical Lecturer in Surgery  
Dr. Paul Tam  
Honorary Clinical Lecturer in Psychiatry  
Mr. Tse Yun-tin, Paul  
Honorary Clinical Lecturer in Orthopaedic &  
Traumatic Surgery  
Mr. Wong King-shing, Kingsley  
Honorary Clinical Lecturer in Surgery

Miss Nora Wong Pui-ha  
Honorary Clinical Lecturer in Paediatrics  
Mr. Yeung Sai-hung  
Honorary Clinical Lecturer in Orthopaedic &  
Traumatic Surgery  
Dr. Yu Shun-yin  
Honorary Clinical Lecturer in Obstetrics &  
Gynaecology  
Mr. Yu Sing-joe  
Honorary Clinical Lecturer in Orthopaedic &  
Traumatic Surgery

*Faculty of Science*

Professor Philip G. Miles  
Honorary Visiting Professor of Biology

**Research Staff**

Dr. Wong Pui Yee  
Honorary Research Fellow, Centre for Contem-  
porary Asian Studies  
Mr. D.A. Fincham  
Research Associate, Department of Biochem-  
istry, Faculty of Medicine

**Others**

Rev. Daniel D.Y. Wong  
Associate Director of the Pastoral Programme,  
Theology Division

***II. Promotions***

**Academic Staff**

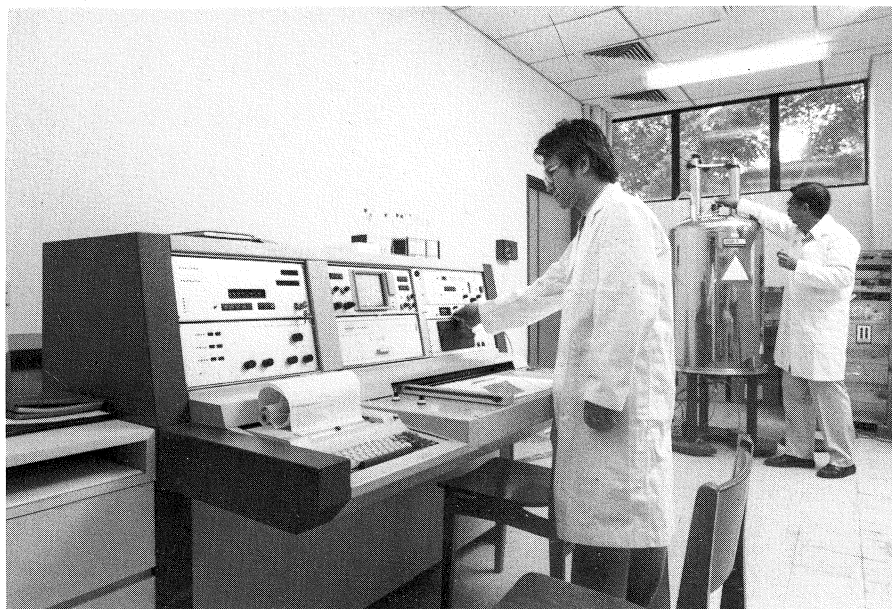
Dr. Kwong Kai Sun, Sunny  
Lecturer in Economics

**Administrative Staff**

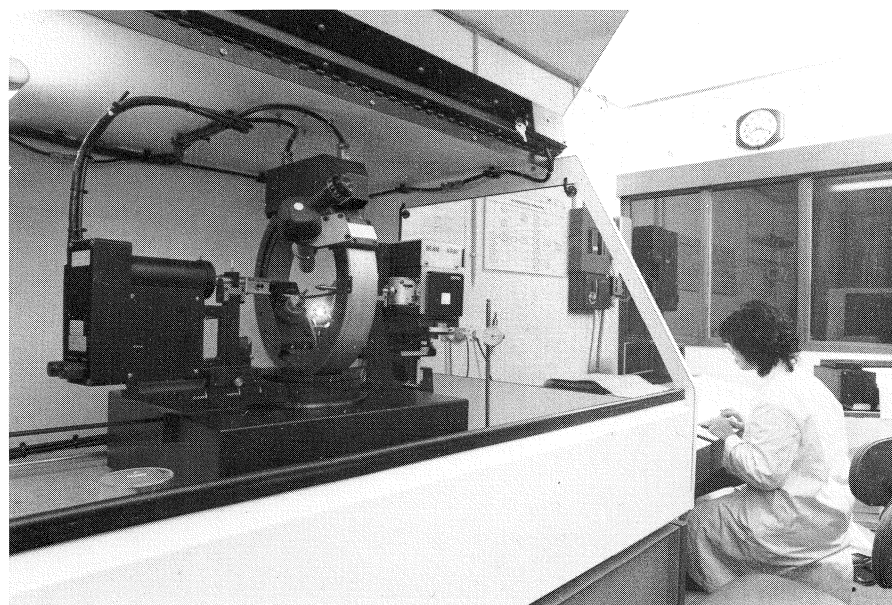
Dr. Spencer Wong  
Senior Staff Tutor, Department of Extramural  
Studies  
Mrs. Ho Wan Siu-wan  
Assistant Registrar, Part-time Degree Pro-  
grammes  
Mr. Wei Yu-chen  
Manuscript Editor, Chinese University Press  
Mrs. So Wai Bik-yim  
Accountant I, Bursar's Office

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*Major instruments of the Chemistry Department:*



*(1) Bruker WM250 superconducting NMR spectrometer*



*(2) Nicolet R3m four-circle X-ray diffractometer*