Chemical Biology and Molecular Biophysics Program (CBMB) in Drug Discovery and Biotechnology

Introduction

Under the leadership of previous directors, the Chemical Biology and Molecular Biophysics Program in Drug Discovery and Biotechnology – founded by TIGP, Academia Sinica in 2002 – has advanced to one of the best interdisciplinary programs in Taiwan. In the collaboration with leading universities in Taiwan: National Taiwan University and National Tsing Hua University, the program aims to enhance scholarly exchanges in order to benefit all parties on their overall research achievements and to increase the number of research professionals in the field in hopes of promoting the economic and social development of Taiwan. Over these years, the alumni and alumnae from CBMB have served in either academic institutions or biotech industry to contribute their expertise.

The program is divided into two tracks: Chemical Biology (CB) track and Molecular Biophysics (MB) track. CB track collaborates with Department of Chemistry at NTU and NTHU while MB track collaborates with Institute of Biochemical Sciences and Department and Graduate Institute of Pharmacology at NTU and College of Life Science at NTHU. NTU and NTHU are the two top-ranked universities in Taiwan.

The program lays a special emphasis on five research fields, including (1) protein chemistry, (2) structural biology, (3) medicinal and biological chemistry, (4) molecular and cell biology and (5) key technology. In addition to categorizing our faculty members and courses, this way reflects the necessary integration of multiple disciplines involved in today's biotech development. The core courses offered by the program are Experimental Molecular Biophysics, Advanced Chemical Biology I and Advance Chemical Biology II. Through the training in courses, bench skills and thesis research, this program intends to offer students with two unique strengths: one is to become an independent researcher capable of solving problems and the other is to have the vision and ability to coordinate teamwork.
Faculty Members

Acadia Sinica

Medicinal & Chemical Biology

Chi-Huey Wong
Ph.D., Massachusetts Institute of Technology, MA, USA
Bio-organic and synthetic organic chemistry

Ching-Shih Chen
Ph.D., Pharmaceutical Biochemistry, University of Wisconsin, USA
Drug design and discovery, cancer biology, medicinal chemistry, signal transduction

Chun-Hung Hans Lin
Ph.D., the Scripps Research Institute, CA, USA
Development of enzyme inhibitors for drug discovery; dissections of disease-related protein glycosylation and redox-modification

Shih-Hsiung Wu
Ph.D., School of Pharmacy, University of Wisconsin, Madison, WI, USA
Studies of structure-functional relationship of biomolecules including protein, peptide, polysaccharide, oligosaccharide, polyketide and any small molecule

Hsiao-Ching Lin
Ph.D., National Taiwan University, Taiwan
Secondary metabolite biosynthesis, biocatalysts, drug discovery, natural product chemistry

Yane-Shih Wang
Ph.D., Texas A&M University, USA
Expanding genetic codes, protein chemistry, protein polyhetero-Ub/SUMO modifications, biocatalysis and protein drug discovery

Joseph Jen-Tse Huang
Ph.D., National Taiwan University, Taiwan
Protein misfolding and therapeutic strategy development in neuron degenerative diseases; protein engineering and molecular probe design

Yun-Ru (Ruby) Chen
Ph.D., North Carolina State Univ., NC, USA
Protein folding and misfolding; amyloids and amyloid in therac ting partners; diagnosis and therapeutic development of neurodegenerative diseases especially Alzheimer’s disease

An-Suei Yang
Ph.D., the Johns Hopkins University, USA
Antibody therapeutics and diagnostics engineering and discovery; antibody bioinformatics and phage-displayed synthetic antibody library design

Wei-Chieh Cheng
Ph.D., UC-Davis, USA
Development of new chemical methods, enzyme inhibitors, and small molecules as chemical chaperones; investigation of bacterial cell wall assembly

Rong-Jie Chien
Ph.D., National Chiao-Tung University, Taiwan
Development of new synthetic strategies and methods; total synthesis and the study of the chemistry and biology of natural products and designed molecules

Cheng-Chung Wang
Ph.D., TIGP-CBMB Program, Academia Sinica in cooperation with National Tsing Hua University
Taiwan Development of new tools and methodologies for carbohydrate chemistry; development of new technologies and methodologies for automated carbohydrate synthesis; synthesis of glycoconjugates and study of their interactions with envelop proteins of viruses

Wen-Shan Li
Ph.D., Case Western Reserve University, OH, USA
Medicinal and bioorganic chemistry

Chung-Yi Wu
Ph.D., National Chiao-Tung University, Taiwan
We focus on the development of new and efficient methods to prepare the important oligosaccharides and use sugar array to address their bio-function.

Jiun-Jie Shie
Ph.D., National Taiwan University, Taiwan
Organic synthesis, chemical biology and drug discovery: We are interested in using organic chemistry as chemical tools to study and address in biology

Shang-Cheng Hung
Ph.D., Chemistry, National Tsing Hua University, Taiwan
Carbohydrate Synthesis, Glycotechnology, and Glycobiology

Structural Biology

Shang-Te Danny Hsu
(also specialized in Protein Chemistry)
Ph.D., Utrecht University, the Netherlands
Molecular biophysics of functional dynamics and kinetics of proteins and nucleic acids; folding mechanism of topologically knotted proteins; solution state NMR spectroscopy
Meng-Chiao Joseph Ho  
(also specialised in Protein Chemistry)  
Ph.D., Boston University, USA  
Structural studies of protein complexes involved in signal transduction and cancer biology; protein engineer of industrial enzymes; structure-based drug discovery

Chung-I Chang  
Ph.D., University of Texas Southwestern Medical Center at Dallas, USA  
Structural biology, protein engineering, structure-based drug discovery

Ming-Jing Hwang  
Ph.D., University of Pittsburgh, PA, USA  
Interested in all areas of computational biology, especially those related to structural biology and post-genomics analysis.

Su-Chang Lin  
Ph.D., Life Sciences, National Defense Medical Center, Taiwan  
To unravel the signaling mechanisms in immune responses and cancer by structural and functional studies, and reconstitution of the signaling complexes

Hanna S. Yuan  
Ph.D., University of Southern California, USA  
Structural and functional studies of RNA and DNA metabolism

Der-Lii M. Tzou  
Ph.D., Georgia Institute of Technology, GA, USA  
Structural and functional analyses of vaccinia viral proteins and protein-protein complexes; solid-state NMR characterization of steroidal conformation

Chi-Yu Fu  
Ph.D., Biochemistry and Molecular Genetics, University of Alabama at Birmingham, USA  
Cryo-electron microscopy, electron tomography and image analysis

Tsyr-Yan Dharma Yu  
(also specialised in Protein Chemistry)  
Ph.D., Washington University in St. Louis, USA  
Membrane protein research and NMR spectroscopy

Jung-Hsien Lin  
Ph.D., University of Duisburg, Germany  
Pharmacoinformatics; computational biophysics; bioinformatics; structural biology; molecular simulations

**Protein Chemistry**

Po-Huang Liang  
(also specialized in Medicinal & Chemical Biology)  
Ph.D., University of Maryland, MD, USA  
Kinetics, mechanisms, and inhibitors of enzymes; anti-cancer drug discovery targeting protein-protein interactions; cellulose/hemicellulose degrading enzymes for biofuel production

Rita P.-Y. Chen  
Ph.D., University of Cambridge, UK  
Protein folding and misfolding; mechanism and prevention of prion formation; therapy of Alzheimer’s disease

Tsung-Lin Li  
Ph.D., University of Cambridge, Cambridge, UK  
Natural products chemistry; drug discovery; structural and mechanistic enzymology; synthetic biology

Lie-Fen Shyur  
Ph.D., National Taiwan University, Taiwan  
Creation and structure-function study of novel enzymes for bio industrial application; plant-derived drug development for inflammatory diseases

Carmay Lim  
(also specialized in Structural Biology and Medicinal & Chemical Biology)  
Ph.D., University of Minnesota, Minneapolis, USA  
Drug target identification and drug design using physical principles; development of methods for studying macromolecular systems

Steve S.-F. Yu  
Ph.D., National Tsing Hua University, Hsinchu, Taiwan  
Metallo-enzymes and bio-mimetics for catalytic conversions of hydrocarbons; physiological roles of iron-sulfur complexes in transcriptional factors from Prokaryotic systems

Chinpan Chen  
(also specialized in Structural Biology)  
Ph.D., University of Pennsylvania, USA  
Structure and function of membrane proteins in drug discovery

Che Alex Ma  
(also specialized in Structural Biology and Medicinal & Chemical Biology)  
Ph.D., University of Pennsylvania, USA  
Structure and function of membrane proteins in drug discovery

Chwan-Deng Hsiao  
(also specialized in Structural Biology)  
Ph.D., University of Pittsburgh, PA, USA  
Structural and functional studies of protein-protein and protein-nucleic acids interaction
Cell Biology

Ruey-Hwa Chen  
**Ph.D., Michigan State University, USA**  
Protein ubiquitination in tumor promotion and autophagy regulation

Guang-Chao Chen  
**Ph.D., University of Texas at Austin, TX, USA**  
Post-translational modification of autophagy pathway; molecular signaling of protein tyrosine phosphatases (PTPs) in development and human diseases

Tzu-Ching Meng  
**Ph.D., University of Nebraska Medical Centre, NE, USA**  
Cell signaling; protein phosphorylation; nitric oxide biology in cardiovascular system

Yu-Ling Shih  
**Ph.D., University of Cambridge, UK**  
Bacterial cell division and cytoskeleton, membrane stress response, and antibiotic-resistance mechanism

Takashi Angata  
**Ph.D., University of Tokyo, Japan**  
Glycobiology

Chi-Kuang Yao  
**Ph.D., National Yang-Ming University, Taiwan**  
Fly developmental biology and genetics, mechanisms of function and growth of synapses,

Steven Lin  
**Ph.D., Microbiology, University of Illinois at Urbana-Champaign, USA**  
CRISPR/Cas9’s mechanism and technology development; Genome engineering; DNA repair

Key Technology

James C. Liao  
**Ph.D., Chemical Engineering, University of Wisconsin-Madison, Wisconsin, U.S.A.**  
Professor Liao is a world leader in metabolic and synthetic biology, particularly in the area of microbial synthesis of fuels and chemicals, and in the redesign of primary metabolic network. He also developed Network Component Analysis (NCA) and Ensemble Modeling for analyzing transcription regulatory networks, and designed synthetic (artificial) gene-metabolic regulatory circuits, which set the foundation for metabolic synthetic biology.

Kay-Hooi Khoo  
(also specialized in Protein Chemistry)  
**Ph.D., Imperial College, London UK**  
Development and applications of mass spectrometry-based protein modification analysis, glycomics and glycoproteomics; glycobiology of cell-cell interactions in inflammation and immunity

Wei-Yuan Yang  
**Ph.D., University of Illinois at Urbana-Champaign, USA**  
Autophagy, Biomolecular and Cellular Imaging

Hsien-Ming Lee  
(also specialized in Medicinal & Chemical Biology)  
**Ph.D., Purdue University, IN, USA**  
Controlled-release of liposome for advanced drug delivery; biochemical applications of novel luminescence materials including upconversion nanoparticle and photosensitizers; Protein / enzyme engineering

Keng-Hui Lin  
**Ph.D., University of Pennsylvania, USA**  
Microfluidics, Nano- and micro- material assembly; biophysics; tissue engineering scaffold; 3D cell culture; mechanics of solid foam

Yu-Ju Chen  
**Ph.D., Iowa State University, IW, USA**  
Analytical and physical chemistry; biochemical and biotechnological applications of mass spectrometry; structure elucidation and unimolecular dissociation mechanisms of bio macromolecules

Wei-Hau Chang  
**Ph.D., Stanford University, USA**  
Structural biophysics; Low temperature microscope.

Ying Chih Chang  
**Ph.D., Stanford University, CA, USA**  
Biomimetic Smart Materials and Interfaces; Rare Cell Isolation, Purification and Maintenance by Smart Surfaces and Microfluidics

Chao-Ping Hsu  
**Ph.D., California Institute of Technology, CA, USA**  
Charge transporter and energy transfer in advanced materials

Charles Pin-Kuang Lai  
(also specialized in Medicinal and Chemical Chemistry)  
**Ph.D., 2010, University of British Columbia, Canada**  
Bionanotechnology, molecular imaging, extracellular vesicles (e.g. exosomes, microvesicles), gene therapy, cell-to-cell communication, pharmacokinetics.

NTU

Peter (Hung Yuan) Chi  
**Ph.D., Yale University, CT, USA**  
Deciphering the mechanisms of recombination-mediated DNA repair; devising the strategies for prevention and treatment of various cancers that arise because of recombination-repair deficiency or inappropriate regulation
Hwan-Ching Tai  
Ph.D., 2010, California Institute of Technology, USA  
Understanding proteome changes that underlie aging and Alzheimer’s disease, and protein quality control mechanisms against aging; development of protein mass spectrometry methodologies useful for clinical investigations

Geen-Dong Chang  
Ph.D., Physiology University of Illinois at Urbana-Champaign, USA  
Cell responses to oxidative stress, machinery and mechanism of cell plasma membrane repair, development of analytical techniques for small molecules by is-mass spectrometer

Chung-Yuan Mou  
Ph.D., University of Washington, USA  
Applications of Nano porous silica nanoparticle in biomedicine

Jim-Min Fang  
Ph.D., Yale University, Conn, USA  
Organic synthesis and chemical biology including synthesis methods, asymmetric catalysis, bimolecular recognition, natural products and drug discovery

Chii-Shen Yang  
Ph.D., University of Illinois at Chicago, IL, USA  

Tsung-Shing Andrew Wang  
Ph.D., Harvard University, USA  
Understanding bacterial virulence factors and host-pathogen interactions; Development of new antibiotics and antibacterial agents; Design of new functional reagents to solve biological problems.

NTHU

Lee-Wei Yang  
Ph.D., University of Pittsburgh, PA, USA  
Computational Biology; Bioinformatics; theoretical biophysics and chemistry; molecular model development; protein-protein interaction; (non)-equilibrium dynamics; conformational changes and interactions of essential enzymes, RNA molecules, ribosome, ion channels and growth factors; peptide and protein design (wet and dry)

Shih-Che Sue  
Ph.D., National Tsing-Hua University, Hsinchu, Taiwan  
NMR Developments and applications in structural biology and pharmacology

Hsien-Sheng Yin  
D.V.M. & Ph.D., National Chung Hsing University, R.O.C.  
X-ray crystallography, molecular immunology, molecular virology

Biing-Jiun Uang  
Ph.D., Yale University, CT, USA  
Organic synthesis; natural product synthesis; asymmetric synthesis

Chun-Cheng Lin  
Ph.D., the Scripps Research Institute, CA, USA  
Syntheses of complex carbohydrates, site specific immobilization of protein, and nano biotechnology

Reuben Jih-Ru Hwu  
Ph.D., Stanford University, CA, USA  
Bionano sciences & technology, gene therapy, organic synthesis and reactions, silicon chemistry, polymer science

Dah-Tsyr Chang  
Ph.D., the Johns Hopkins University, MD, USA  
Genetic engineering; bioorganic chemistry

Jya-Wei Cheng  
Ph.D., University of Washington, Seattle, WA, USA  
Structural biology, drug design; nuclear magnetic resonance

Ping-Chiang Lyu  
Ph.D., New York University, NY, USA  
Structural biology; biophysics; bioinformatics

Rong-Long Pan  
Ph.D., the Ohio State University, OH, USA  
A new look at the structure and function of vacuolar h+- pyro phosphatase and h+-atpase; exploration on the plant dna end-binding proteins; bio nanotechnology

Thy-Hou Lin  
Ph.D., University of Michigan, MI, USA  
Docking & 3D-QSAR; molecular dynamics simulation & Binding free energy analysis; quantum mechanics to study drug reaction mechanism; carbohydrates metabolism-related genes of Lactobacillus; construct a stable food grade integration vector for Lactobacillus.

Wen-Guey Wu  
Ph.D., University of Virginia, VA, USA  
The group is interested in the structure and dynamics of model and biological membranes, especially upon treatment with toxins or exogenously added lipids. We are also interested in applying NMR to study the structure and dynamics of model and biological membranes.

Yuh-Ju Sun  
Ph.D., University of Pittsburgh, PA, USA  
X-ray diffraction; macromolecular crystallography; structural biology
## Graduation Requirements

<table>
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<tr>
<th>Doctoral Programme</th>
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<td><strong>Duration</strong></td>
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<tr>
<td><strong>Minimum</strong></td>
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### Required Courses
- Discussion in Advanced Chemical Biology (I)
- Discussion in Advanced Chemical Biology (II) or Experimental Molecular Biophysics
- Lab Rotation
- Faculty Presentation
- Seminar
- Colloquium

### Specialised Courses
At least 12 credits must be taken in the field of Chemical Biology and Molecular Biophysics to fulfil minimum credits for graduation. Specialised courses offered by the CBMB: Experimental Molecular Biophysics, Advanced Chemical Biology I, and Advance Chemical Biology II.

### Other Requirements
- Qualifying Exam
- Pre-Oral Exam, Progress Report or Thesis Proposal Evaluation
- Minimum Publication Requirements
- Safety Training
- English Requirements
- Ethics Course

Please refer to CBMB’s website for detailed information.

## International Experience

The CBMB program also offers students a chance to exchange cultural experiences with American scholars and students from UC Davis, California during their stay in Taipei in spring every year. It is also a great opportunity for students to gain the most up-to-date knowledge on pharmaceutical chemistry while interacting with professors and students from UCD.

Courses offered by UCD professors are Fundamentals of Pharmaceutical Chemistry, Computer Modeling for Drug Design and Lectures from Professional Pharmaceutical/Medicinal Chemists. Students who successfully complete those courses may receive a certificate of completion from UCD, Dean of Mathematical and Physical Sciences and UCD, Department of Chemistry and will be able to use those courses to complete program’s credit requirements for specialized courses.

For more information, please refer to: http://www.ibc.sinica.edu.tw/ucd-as/

## Admission Requirements

### Qualifications
Candidature is open to both local and International students with a BSc or MSc degree in the appropriate field from an accredited institute.

### English Language Requirements
For those applicants for whom English is not their first language an English test result of one of the following combinations is required.

<table>
<thead>
<tr>
<th>TOEFL</th>
<th>IELTS</th>
<th>GEPT</th>
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<tbody>
<tr>
<td>Internet-Based TOEFL</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td>Computer-Based TOEFL</td>
<td>213</td>
<td>5.5</td>
</tr>
<tr>
<td>Paper-Based TOEFL</td>
<td>550</td>
<td></td>
</tr>
</tbody>
</table>

Please refer to CBMB’s website for detailed information.
Application Process and Deadline

If you wish to apply, please complete your application through the online application system (highly recommended) (https://db1x.sinica.edu.tw/tigp/) or post your application with required documents listed below to the following address:

TIGP Admission Office
Taiwan International Graduate Programme 128, Academia Road Sec. 2
Nankang, Taipei 11529 Taiwan
The application deadline is 31st March

Required Documents

The required materials listed below must be in English. Original documents will be returned only upon request and must be accompanied by a self-addressed envelope.

I. Bachelor’s degree or Master’s degree with signature of the registrar and seal of the issuing institution

II. Official Academic Transcripts
Official transcripts with grading scales must be sent directly by the registrar of the institutions or submitted with the application form in sealed envelopes. An explanation for any non-standard grading system is highly recommended.

III. Statement of Purpose
The statement of purpose should comprise of a brief statement of the candidates' scientific interests and career goals together with a description of past accomplishments that are not evident from other submitted documents. If applicable, the result of any research in progress may be specified.

IV. 3 Letters of Recommendation

V. GRE Score (optional)
General and Subject scores of the General Test of the Graduate Record Examination (GRE) are optional but applicants are strongly encouraged to provide such documents. Applicants who do not provide a GRE result will instead be evaluated using the supporting documents submitted along with the application.

VI. Supporting Documents
We highly recommend applicants provide supporting documents relating to their professional experiences, publications, and other original works.

VII. Proof of English competency is required for applicants from non-English speaking countries. With regard to the English proficiency requirement, CBMB applicants will be assessed in accordance with the following policies.

- Applicants whose first language is not English are required to submit a proof of English proficiency that meets the minimum requirement in one of the following standardized tests as part of the application procedure.
  - TOEFL (Test of English as a Foreign Language)
  - IELTS (International English Language Testing System)
  - GEPT (General English Proficiency Test) (locals only)
  - The test must be taken in the last 24 months.
  - Applicants with degrees from countries where English is spoken, but not all courses are provided in English, are not exempt from submitting an English proficiency test result.
  - Citizenship from native English speaking countries does not automatically qualify an applicant for exemption from the English proficiency test requirement if the applicant's first language is not English.
  - Applicants who have completed a bachelor’s or master’s degree from an accredited college or university in native English speaking countries (United States, Australia, Canada (except Quebec), New Zealand, United Kingdom (England, Scotland, Ireland, Wales) are exempt from the standardized test requirement. If your country is not listed above, please provide supporting documents or certificates to prove that all courses were taught entirely in English. It is still highly recommended that the score of one of the above English proficiency tests is submitted for evaluation. If your country is not listed, we cannot guarantee that your petition for the English language waiver will be granted, which might place you at a disadvantage compared to applicants who have provided proof of English proficiency.
Selection Process

I. Applications are assessed based on a student’s academic record (degree certificates etc.) and interview.

II. The method of admission Interview
- International Students – Skype interview
- Local Students – face to face interview

Student Status and Degree Conferral Policy

In application form, students should indicate which track (Chemical Biology or Molecular Biophysics) they want to pursue for Ph.D. degree and their preferred institute to be assigned to (students applying to CB track will have an option between Department of Chemistry at National Taiwan University or at National Tsing Hua University; and students applying to MB track will can choose from Institute of Biochemical Sciences at National Taiwan University, or College of Life Science at National Tsing Hua University). Upon completion of the programme, each student will be conferred a Ph.D. degree by the designated partner university and a certificate jointly signed by the President of Academia Sinica and Director of TIGP.

Tuition Fee and Medical Insurance Cost

Tuition fee is approximately NT$58,000 (basic fee + credit fees about US$1,812) per academic year. Six months after the international students receive the Alien Residence Certificate (ARC), the student will be qualified for Taiwan’s National Health Insurance Program (NHI). The students are expected to pay the same premium as all the Taiwan citizens and will be entitled to the same medical coverage.

Fellowship and Stipend

The TIGP scholarship, payable to students as a monthly stipend, is granted to all students admitted to TIGP for up to 3 years; the scholarship amount for first year is guaranteed (NT$ 34,000/ US$ 1,060) whereas the stipend amount for the second and third year will depend on students’ performance. Starting from 4th year, advisors will take charge of paying the students and the amount will be settled by both parties.
Living and Housing Costs

Meals are available at modest costs at the Cafeteria/Dining Hall, the Chinese restaurant, and the Western restaurant of the Activity Centre, Academia Sinica.

The Sport Centre on campus is equipped with jogging track, gym, swimming pool, aerobic court, tennis court, badminton court, and basketball court. The entrance fee for students to access the jogging track, gym, and swimming pool is NTD 50 (about US$ 1.5) per person. And there is an additional charge for accessing courts.

On campus
Self-catering single room is guaranteed for TIGP students for 1 year. The rent is NT$ 5,500 (about US$ 171) per month. Please be noted that there is an additional charge for parking space: NT$ 1,000 (about US$ 31) per month for car.

Please visit http://tigp.sinica.edu.tw/Accommodation.html for more information.

Off-campus
Rents for off-campus apartments range from NT$ 5,000 - 15,000 per month.

Correspondence and Information

For more information about the program, please visit http://proj1.sinica.edu.tw/~tigpcmb/index.htm or contact:

Dr. Chun-Hung Hans Lin
CBMB program Coordinator
Institute of Biological Chemistry, Academia Sinica
E-mail: chunhung@gate.sinica.edu.tw

CBMB Office
Institute of Biological Chemistry, Academia Sinica
128 Academia Road Sec. 2,
Nangang, Taipei 115, Taiwan
E-mail: cbmbtigp@gate.sinica.edu.tw
Tel: +886-2-2785-5696 ext. 1164
Fax: +886-2-2788-9759

For general information concerning TIGP, please visit http://tigp.sinica.edu.tw/ or contact:

Ms. Huan-Yi Shen
TIGP Administrative Assistant
Taiwan International Graduate Program 128, Academia Road sec. 2
Nankang, Taipei 11529, Taiwan
E-mail: tigp@gate.sinica.edu.tw
Tel.: +886-2-2789-8050
Fax: +886-2-2785-8944