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

Introduction

Under the leadership of former Director Andrew H-J Wang (2002-2006) and Ming-Daw Tsai (2006-2014), and Director Ching-Shih Chen, 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.

Starting in autumn 2009, 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 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 and Faculty Members

Academia 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
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

Shui-Tein Chen
Ph.D., National Taiwan University, Taiwan, R.O.C.
Bio-organic and chemical biology, proteomics, and drug discover

Yun-Ru (Ruby) Chen
Ph.D., North Carolina State Univ., NC, USA
Protein folding and misfolding; amyloids and amyloid interacting 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, ROC
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 Programme, Academia Sinica in cooperation with National Tsing Hua University, Taiwan, R.O.C.
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, ROC
We focus on the development of new and efficient methods to prepare the important oligosaccharides and use sugar array to address their bio-function.

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

Shih-Long Tu
Ph.D., Graduate Institute of Life Science, National Defense Medical Center, Taiwan
Molecular mechanism of light sensing and pre-mRNA splicing in plants

Hsiu-An Chu
Ph.D., University of California at Riverside, USA
Structure and molecular mechanism of photosynthesis in plants and cyanobacteria

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

Yen-Chywan Liaw
Ph.D., National Taiwan University, Taiwan, R.O.C.
Model building and crystallographic studies of CHL1, SMN and Thioesterase I

Structural Biology

Shang-Te Danny Hsu
(also specialised 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

Dr. Ming-Daw Tsai
Ph.D., Purdue University, IN, USA
Enzymology, structural biology and chemical biology
Chao-Ping Hsu  
Ph.D., California Institute of Technology, CA, USA  
Charge transport and energy transfer in advanced materials

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

Protein Chemistry  
Po-Huang Liang  
(also specialised 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 biofuels 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 biotechnological applications; plant-derived drug development for inflammatory diseases

Yu-Chan Chao  
Ph.D., University of Arkansas, AK, USA  
Baculovirus gene regulation and protein engineering; pseudotyped influenza virus and applications

Carmay Lim  
(also specialised in Structural Biology and Medicinal & Chemical Biology)  
Ph.D., University of Pennsylvania, PA, 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 specialised in Structural Biology)  
Ph.D., University of Washington, Seattle, WA, USA  
Structural biology; NMR; biophysics

Che Alex Ma  
(also specialised 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 specialised 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

Wen Chang  
Ph.D., University of Washington at Seattle, USA  
Structure and biological investigation of host and viral proteins in vaccinia virus entry and membrane fusion mechanism; virus entry mechanism and viral pathogenesis in mice

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

Key Technology  
Kay-Hooi Khoo  
(also specialised 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

Hsien-Ming Lee  
(also specialised 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, IA, USA  
Analytical and physical chemistry; biochemical and biotechnological applications of mass spectrometry; structure elucidation and unimolecular dissociation mechanisms of bio-macromolecules

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.

Chen-Yuan Dong  
Ph.D., University of Illinois at Urbana-Champaign, IL, USA  
Developing and applying optical microscopic bio-imaging techniques for cellular biomechanics, bio-nanotechnology, and single-molecular biophysics studies.

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, target identification of small-molecule drugs; 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  

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.

**Graduate Requirements**

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<tr>
<th>Required Courses</th>
<th>Doctoral Programme</th>
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<tr>
<td>1. Discussion in Advanced Chemical Biology (I)</td>
<td>Duration: 3-7 years</td>
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<tr>
<td>2. Discussion in Advanced Chemical Biology (II) or Experimental Molecular Biophysics</td>
<td>Minimum Credits: 23-26 credits depending on university and department/institute assigned.</td>
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<td>3. Lab Rotation</td>
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<td>4. Faculty Presentation</td>
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<td>5. Seminar</td>
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<td>6. Colloquium</td>
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<td>7. Mandarin Class</td>
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Please refer to CBMB’s website for detailed information.
Specialised Courses
At least 12 credits must be taken in the field of Chemical Biology and Molecular Biophysics to fulfill minimum credits for graduation. Specialised courses offered by the program are Experimental Molecular Biophysics, Advanced Chemical Biology I, and Advance Chemical Biology II.

Other Requirements
- Qualifying Exam
  - CB track: Cumulative Exam (CUM)
  - Subjects to choose from: organic chemistry, physical chemistry, inorganic chemistry, analytical chemistry, and chemical biology
  - MB track: Non-Thesis Oral Proposal Examination
  - MB track students must take a non-thesis oral proposal examination before the beginning of 5th semester.
- Pre-Oral Exam, Progress Report or Thesis Proposal Evaluation
- Minimum Publication Requirements
- Safety Training

TIGP Admission Office
Taiwan International Graduate Programme
128, Academia Road Sec. 2
Nankang, Taipei 115
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. English Test Result
   With regard to English requirements, CBMB applicants will be assessed in accordance with the policy as stated below.
   - Applicants whose first language is not English are required to submit a proof of an English qualification that fulfills at least the minimum required level from one of the following approved examinations in English language 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 who have completed a bachelor’s or master’s degree from an accredited college or university in countries where all instruction is provided in the medium of English are exempted from providing English test result. For example, applicants with degrees from: Australia, Canada (except Quebec), New Zealand, Singapore, United Kingdom (England, Scotland, Ireland, Wales) will automatically receive an English language waiver.

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.

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<tr>
<th>TOEFL Type</th>
<th>IELTS Score</th>
<th>GEPT Level</th>
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<tbody>
<tr>
<td>Internet-Based TOEFL</td>
<td>79</td>
<td>High Intermediate</td>
</tr>
<tr>
<td>Computer-Based TOEFL</td>
<td>213</td>
<td></td>
</tr>
<tr>
<td>Paper-Based TOEFL</td>
<td>550</td>
<td></td>
</tr>
</tbody>
</table>

Application Process and Deadline
If you wish to apply, please complete your application through online application system (highly recommended) (http://db1x.sinica.edu.tw/tigp/) or post your application with required documents listed below to the following address:
Applicants with degrees from countries where English is spoken but not all courses are provided in the medium of English are not exempt from providing English test result.

Citizenship with native English speaking countries does not automatically exempt an applicant from providing English test result if the applicant’s first language is not English.

Please note that under special circumstances applicants who have difficulties in submitting English results before the application closing date but whom have been evaluated as qualified for the graduate programme with regard to other areas of their application may be conditionally admitted to the programme. Such applicants should submit their English test results to the Admission Office of the Taiwan International Graduate Program (TIGP) prior to July 31 each year.

Selection Process
I. Applications are assessed through a 70/30 split between a student’s academic record (degree certificates etc.) and interview.
II. The method of admission
   ♦ 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 NTD 58,000 (basic fee + credit fees about US$1,930) per academic year. The health insurance cost is approximately NTD 7,250 (about US$240) per academic year. Please note that International students will be qualified for Taiwan’s National Health Insurance programme six months after receiving the Alien Resident Certificate (ARC). 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 (NTD 34,000/ USD 1,133) 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 NTD 5,500 (about US$ 180) per month. Please be noted that there is an additional charge for parking space: NTD 1,000 (about US$ 30) per month for car.

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

Correspondence and Information
For more information about the program, please visit http://www.sinica.edu.tw/~tigp/cmb/ or contact:

Dr Chun-Hung Hans Lin
CBMB Programme Coordinator
Institute of Biological Chemistry
128 Academia Road sec. 2,
Nankang, Taipei 115, Taiwan
E-mail: chunhung@gate.sinica.edu.tw
Tel: +886-2-2785-5696 ext. 8021
Fax: +886-2-2788-9759

Ms Elveira Lin
CBMB Programme Secretary
Institute of Biological Chemistry
128 Academia Road sec. 2,
Nankang, Taipei 115, Taiwan
E-mail: elvelin@gate.sinica.edu.tw
Tel: +886-2-2785-5696 ext. 1164
Fax: +886-2-2788-9759

Ms Huan-Yi Shen
TIGP Administrative Assistant
Taiwan International Graduate Program
128, Academia Road sec. 2
Nankang, Taipei 115, Taiwan
E-mail: tigp@gate.sinica.edu.tw
Tel.: +886-2-2789-8050
Fax: +886-2-2785-8944