



# ACADEMIA SINICA Taiwan International Graduate Program

# TiGP

<http://tigp.sinica.edu.tw>



## Bioinformatics Program (Bio)

### Introduction

Academia Sinica has established the Taiwan International Graduate Program (TIGP) in collaboration with a consortium of key national research universities in Taiwan. The purpose of the program is to develop the research manpower pool in those modern multidisciplinary fields that are important in the future economical and social development of Taiwan and to enhance the innovative potential and academic standards of research in these and related fields.

TIGP will offer Ph.D. programs in only selected disciplines to be agreed upon between Academia Sinica and its national research universities partners. It is the intent of the Program to offer Ph.D. degree programs only in areas in the physical sciences, applied sciences, engineering, biological and agricultural sciences, health and medical sciences, and humanities and social sciences.

Academia Sinica will assume principal oversight of the academic options of the Program. It will provide the intellectual leadership, the research resources, and the research and physical facilities. Qualified and interested faculty members of the participating national research universities are invited to join the various programs as affiliated faculty of the Program, and participate in the teaching of courses, supervision of research, and mentoring of the international graduate students.

### The TIGP Program on "Bioinformatics"

The Taiwan International Graduate Program has been established to attract highly qualified young researchers both from home and abroad in order to help jump-start the development of several frontier areas that are crucial to the future development in science and technology. Specific graduate programs have been developed to enhance the innovative potential and academic standards of research on these and related fields. Within this context, the graduate program on "Bioinformatics" is designed to offer specific training and research opportunities to Ph.D. students interested in working on this particular area.

The TIGP Program on Bioinformatics (BP) is a joint-degree program sponsored by Academia Sinica (Institute of Information Science, Institute of Statistical Science, and Institute of Biomedical Sciences), National Tsing Hua University, National Chiao Tung University, and National Yang-Ming University. Additional teaching support will be available from other major research universities in Taiwan. Unlike most Bioinformatics programs offered in other universities that adopt existing courses in various departments, our courses are specifically designed for BP students and taught by active and experienced researchers in bioinformatics. The program provides interdisciplinary training and research opportunities that seamlessly integrate the related areas so that students can be well-prepared for independent research in these new, fascinating areas of bioinformatics. We will focus on genetics and proteomics study and emphasize data transfer, data analysis, biological information and biological feature extraction, knowledge management using advanced computation methodologies and computer science technology.

### Research Topics

- (1) Biological knowledge management: This area focuses on the integration of various heterogeneous databases, biological knowledge representation, automation of pipeline experiments, and the construction of various annotation databases. In addition, biological literature mining is also a crucial component.
- (2) Bioinformatics: This area focuses on developing software systems to automatically analyze and using existing tools to analyze high-throughput biological sequence data, microarray data, mass spectrometry data, image data, etc. Algorithms and probabilistic models will be established. Furthermore, statistical methods and data mining techniques will be also used to reach the goal of "information-driven biomedical research."
- (3) Computational biology: This area focuses on the design of computational methods for sequence analysis, gene prediction, disease gene mapping, motif finding, gene network construction, protein structure prediction and classification, automated biomolecule docking, and molecular dynamics modeling.

## Faculty and Staff

### Institute of Information Science

#### Dr. Hsu, Wen-Lian

*Ph.D. Cornell University*

Analysis of algorithms; Graph theory; Search methods in artificial intelligence; Bioinformatics; Computational biology; Computational linguistics; Natural language understanding; Intelligent agent systems

#### Dr. Sung, Ting-Yi

*Ph.D. New York University*

Bioinformatics for mass spectrometry-based proteomics; Bioinformatics for biomarker discovery; Computational biology.

#### Dr. Tsai, Huai-Kuang

*Ph.D. National Taiwan University*

Evolutionary algorithm; Bioinformatics; Regulatory mechanism; Metagenomics

### Institute of Biomedical Sciences

#### Dr. Hwang, Ming-Jing

*Ph.D. University of Pittsburgh*

Bioinformatics; Computational biology; Systems biology

#### Dr. Jou, Yuh-Shan

*Ph.D. Michigan State University*

Cancer genomics; Molecular cancer biology; Bioinformatics

### Institute of Statistical Science

#### Dr. Li, Ker-Chau

*Ph.D. University of California Berkeley*

Bioinformatics; Systems biology; Lung cancer studies; High dimensional data analysis; Large ensembles of time series; Medical image analysis; Machine learning; Statistical graphics; Bayesian computation; Regression; Censoring; Experimental design; Survey sampling

#### Dr. Shieh, Shwu-Rong Grace

*Ph.D. University of Wisconsin-Madison*

Analysis of next generation sequencing data (e.g. ChIP-seq) and genomics data; Using genetic interactions to develop cancer therapeutics; Constructing gene networks/predicting pathway components

#### Dr. Yang, Hsin-Chou

*Ph.D. National Tsing Hua University*

Statistical genetics/genomics; Disease gene mapping; Population genomics; Omics data analysis

#### Dr. Yuan, Shin-Sheng

*Ph.D. University of California, Los Angeles*

Microarray data analysis; Drug response mechanism; Medical imaging data analysis; Manipulating mass spectra database



#### Dr. Liu, Wei-chung

*Ph.D. Imperial College London*

Mathematical biology; Theoretical ecology; Quantitative epidemiology; Network biology; Sociology; Systems biology

#### Dr. Yeang, Chen-Hsiang

*Ph.D. Massachusetts Institute of Technology*

Cancer genomics; Molecular evolution

#### Dr. Chen, Hsuan-Yu

*Ph.D. National Taiwan University*

Bioinformatics; Epidemiology and biostatistics; Integrative cancer biology; Personalized medicine

### Research Center for Applied Sciences

#### Dr. Lin, Jung-Hsin

*Ph.D. University of Duisburg*

Pharmacoinformatics; Computational biophysics; Bioinformatics; Structural biology; Molecular simulations

### Biodiversity Research Center

#### Dr. Li, Wen-Hsiung

*Ph.D. Brown University*

Evolutionary genomics; Molecular evolution; Bioinformatics and computational biology; Population genetics; Human genetics

#### Dr. Tang, Sen-Lin

*Ph.D. in Microbiology at University of Melbourne*

Microbial ecology and diversity; Microbial genomics (Metagenomics); Computational biology

#### Dr. Wang, John

*Ph.D. Stanford University*

Genetics, genomics, behavior, and evolution of social insects; Evolution of genome size in nematodes

#### Dr. Wang, Dar-Yi

*Ph.D. National Taiwan Ocean University*

Metagenomics; Evolutionary genomics

### Genomics Research Center

#### Dr. Yang, An-Suei

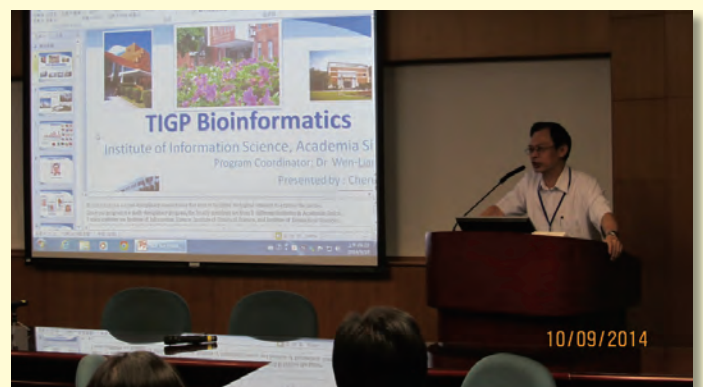
*Ph.D. The Johns Hopkins University*

Computational protein design; Recombinant antibody engineering; Protein-protein interaction; Computational structural biology; Structural bioinformatics; Phage display of antibody libraries; Synthetic antibody fragment library construction

#### Dr. Chuang, Trees-Juen

*Ph.D. National Chiao Tung University*

Bioinformatics and computational biology; Comparative & evolutionary genomics post-transcriptional modification; Systems biology; Primate evolution; Genome annotation





## Institute of Plant and Microbial Biology

### Dr. Hsing, Yue-le

*Ph.D. Agronomy, University of Illinois*

Construction of a tagged rice population for functional genomics analysis; Utilization/studies of the TRIM mutant resources; Analysis of advanced rice anther transcriptomes; Positional cloning and characterization of important rice mutants; Re-annotation of genes encoding LEA proteins in the rice and soybean genomes; Characterization of LEA proteins; Collection and characterization of wild rice and soybean in Taiwan; Sequencing of *Oryza nivara*, an annual wild rice

### Dr. Chen, Pao-Yang

*Ph.D. Oxford University*

Next generation genetics; DNA methylation in plants; DNA methylation landscape in plants, animals, and human

## Institute of Chemistry

### Dr. Hsu, Chao-Ping

*Ph.D. California Institute of Technology*

Charge transport and energy transfer in advanced materials; Dynamic description of biological systems

## Agricultural Biotechnology Research Center

### Dr. Chen, Ho-Ming

*Ph.D. Taiwan International Graduate Program, National Chung Hsing University*

Small RNA Function; Genome of non-model organism

## Institute of Molecular Biology

### Dr. Lue, Jun-Yi

*Ph.D. Yale University*

Genetic incompatibility and speciation; Experimental evolution and genomic analysis of genetic buffering

## Institute of Bioinformatics and Structural Biology, National Tsing Hua University

### Dr. Yang, Lee-Wei

*Ph.D. University of Pittsburgh*

Structural and dynamics bioinformatics/biophysics, with a focus on predictions of protein/RNA conformational changes and allosteric effects using a spectrum of physics models including fine/coarse-grained MD simulations, elastic network models and linear response theories; Theories and algorithm development for better prediction of correct druggable sites and protein-DNA/protein-protein docking interfaces; in-silico peptide design of which the efficacy is verified by experiments.

## Institute of Bioinformatics and Systems Biology, National Chiao Tung University

### Dr. Lu, Horng-Shing Henry

*Ph.D. Cornell University*

Scientific computing; Image science; Bioinformatics

### Dr. Yang, Jinn-Moon

*Ph.D. National Taiwan University*

Bioinformatics systems biology; Drug design; Systems biology

### Dr. Chu, Jhih-Wei

*Ph.D. Massachusetts Institute of Technology*

Biosystems simulation; Drug discovery; Protein conformational dynamics

## Institute of Biomedical Informatics, National Yang-Ming University

### Dr. Yang, Ueng-Cheng

*Ph.D. Princeton University*

Analysis of pathway; Bioinformatics analysis on disease candidate genes and mechanisms



### Dr. Chang, Chuan-Hsiung

Ph.D. University of Southern California

Comparative genomics; Genome design and engineering; Synthetic biology

### Dr. Huang, Hsuan-Cheng

Ph.D. National Taiwan University

Network biology; Systems biology; Bioinformatics

### Dr. Wang, Hsei-Wei

Ph.D. National Taiwan University

Bioinformatics; Viral oncology

### Dr. Wu, Kun-Pin

Ph.D. National Taiwan University

Algorithms; Computational proteomics

### Dr. Huang, Jie-Rong

Ph.D. University of Cambridge

Structural biology; Intrinsically disordered proteins; Molecular dynamics simulation; NMR spectroscopy

## Courses

There are four types of courses: (1) Required courses: courses to be taken by all students; (2) Core Courses I (Required): basic courses in molecular biology, computational methods, statistical methods, and programming; and (3) Core Courses II (Mandatory): advanced courses or related topics in molecular biology, computational methods, and statistical applications in biology; and (4) Elective Courses: any other courses offered by TIGP or partner universities that are approved by the Committee Board of BP.

\*One additional course is required for students registered with National Chiao Tung University: Thesis in Bioinformatics

### 1. Required courses:

#### Teaching Assistant

TA experience is recognized as an essential training in our program. Thus all students in TIGP-BP must serve as TA for at least one semester. TA is obligated to: 1) attend the orientation of TIGP-BP; 2) meet with students in the first class and announce TA office hours (Minimum hour: 2 hours per week); 3) respond to the students' questions and homework assignment on regular basis; 4) TA shall arrange a Review Session other than office hour upon students' request; 5) TA is obligated to show up during office hours regardless students' attendance; 6) Monitor midterm, final exam and qualifying exam.

#### Lab Rotation

Lab rotation is designed to help students familiarize with the potential advisor(s), research topics and their future working environment. This course is required to be taken for at least 1 year (2 semesters); students are welcome to take more than two semesters of Lab Rotation with different labs.

#### Seminar

This course aims to train students' skills in reading, thinking and presenting scientific papers. Students are asked to present papers and actively interact with other classmates and coaching teacher(s) in class. All students should join discussion actively, and 3 years (6 semesters) of Seminar are required for graduation.

### Special Lecture

Professors from Academia Sinica and Partner Universities will give talks in this course. Students can expect to learn the expertise and interest of studies of each professor in the Program. All students need a minimum of 1 year (2 semesters) of Special Lecture.

### Chinese Class (Required for International Students)

All international students are required to take one year course of Mandarin Chinese.

### 2. Core Courses I:

Basic Molecular for Bioinformatics I

Biological Computing

Fundamental Statistical Methods in Bioinformatics Programming (Python)

### 3. Core Courses II:

Basic Molecular Biology for Bioinformatics II

Advanced Algorithms

Advanced Statistical Methods in Bioinformatics

### 4. Elective Courses:

Any other courses offered by TIGP or partner universities that are approved by the Curriculum Committee of BP.

## Academic System

Faculty members with different research expertises are invited to participate in the TIGP-BP program. This program adopts a team-teaching system, where each faculty member teaches one or several subjects according to his or her expertise(s). All courses are offered in English.

Students are required to advance to doctoral candidacy by the end of the third year.

A thesis advisor has to be a core faculty member of TIGP-BP. Students registering with National Tsing Hua University and National Chiao Tung University need to find a thesis advisor (at least a co-advisor) who is a faculty member in the collaborating department of the registered university if his/her main advisor is not a faculty member of the registered university.

Different graduation requirements will apply depending on the university the student registers at:

	National Tsing Hua University (NTHU)	National Chiao Tung University (NCTU)	National Yang-Ming University (NYMU)
1 <sup>st</sup> Year	Find an advisor before the end of 1 <sup>st</sup> year.		
3 <sup>rd</sup> Year Candidacy	1. Complete all course requirements. 2. Pass TIGP Qualifying Exam.	1. Complete all course requirements. 2. Pass TIGP Qualifying Exam. 3. Pass NCTU oral exam on research plan.	1. Complete all course requirements. 2. Pass TIGP Qualifying Exam.
4 <sup>th</sup> Year	Pass NTHU oral exam on research plan.	--	--



## Degree Requirements

1. Students must publish at least two bioinformatics-related papers in international journals or conferences. The levels of the journals/conferences, quality of the paper, and other special cases will be assessed by TIGP-BP Academic Committee. Students must be the first author of the papers; TIGP Bioinformatics and the university which the student registers with must be listed in the author's affiliations section of the papers.
2. Ph.D. degree thesis.
3. Successful defense of the degree thesis, in which the candidate must show that she/he has made original and substantial scientific contributions.

## Admission to the Ph.D. Program

The Program only takes admission in every Fall semester. The following documents and qualification are required to complete admission application:

1. Bachelor or Master degree in biology, computer science, statistics or other related areas. Note: Students who only have Bachelor degree can only register at NYMU after admission
2. Fluency in English: A minimum TOEFL score of 550 (213 on computer-based), or IELTS score of 6. Applicants in Taiwan can take the General English Proficiency Test (GEPT) instead. Applicants are required to submit their High-intermediate level certificate when applying for admission. However, this can be waived for those who have obtained bachelor or master degrees from English-speaking countries.
3. GRE score from the general exam: For the Bioinformatics Program, an applicant may submit one of the following materials in place of a GRE general test score:
  - Any evidence of research ability, such as papers published in international conferences or journals.
  - Satisfactory highly-esteemed performance in any course or project work related to computer algorithms or statistics, such as discrete mathematics, algorithms, computational complexity, data structure, probability, computer architecture, compiler, and computer programming.
4. Evidence of basic programming skills
5. A Statement of Purpose that includes a research plan
6. Official transcripts from academic institutions attended after senior high school
7. Three letters of recommendation
8. GRE score from related subject exam (highly recommended, but not mandatory)

Application can be submitted through the on-line application system (recommended)

<http://db1x.sinica.edu.tw/tigp/index.php> or by post to:

Admissions Office  
Taiwan International Graduate Program  
No. 128, Section 2, Academia Road  
Nankang, Taipei 11529  
Taiwan

The submitted application materials will not be returned to applicants under any circumstances. The complete application materials should be received by TIGP before March 31st.

## Student Status and Degree Conferral Policy

For administrative reasons, students will need to officially register at our partner institutions, i.e., National Tsing Hua University, National Chiao Tung University or National Yang-Ming University, depending on their research interests. Upon completion of the Ph.D. study, students will receive a diploma of Ph.D. degree from the designated partner institution and a certificate jointly signed by the President of Academia Sinica and the President of the partner institution.

## Cost of Study

The payment of tuition fees (about US\$ 1,500 per year) is due upon registration. University does not accept a late payment. Students are required to find their own financial support prior to arriving in Taiwan.

## Fellowship and Stipends

TIGP fellowship support of monthly NTD 34,000 (around US\$ 1,133) is guaranteed for the first year (except violation of the school policy or occurrence of serious misconducts). Students will be evaluated at the end of each semester, the amounts they receive in the subsequent two years may reduce subject to the students' performances. The stipend will be provided only for the first six semesters at maximum.

The first fellowship will be given in the second month (October) after school starts.

From the seventh semester, thesis advisor will be responsible for the financial support.

## Medical Insurance

Six months after the students receive their Alien Resident Certificate (ARC), the students will be qualified for Taiwan's National Health Insurance Program. The students are expected to pay the same premium (about NT\$749/US\$25 per month) as all the Taiwan citizens and will be entitled to the same medical coverage.



## Living and Housing

### On campus

Self-catering student dormitory providing single study bedrooms is available to TIGP students at reasonable costs (for details please visit the housing section of TIGP website at <http://tigp.sinica.edu.tw/>).

### Off campus

Private housing is generally more expensive. Rents for off-campus apartments range between NT\$ 5, 000 to 15, 000 per month.

## Correspondence and Information

**For general information concerning TIGP, please contact:**

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**For information concerning this Program, please contact:**

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### Websites Information

Taiwan International Graduate Program (TIGP),  
Academia Sinica  
<http://tigp.sinica.edu.tw/>

TIGP-Bioinformatics Program  
<http://tigpbbp.iis.sinica.edu.tw/tigpbbp/>

Institute of Information Science, Academia Sinica  
[http://www.iis.sinica.edu.tw/index\\_zh.html](http://www.iis.sinica.edu.tw/index_zh.html)

National Tsing Hua University  
<http://www.nthu.edu.tw>

National Chiao Tung University  
<http://www.nctu.edu.tw>

National Yang-Ming University  
<http://www.ym.edu.tw>



**If there is any discrepancy with the most updated regulation, the latter is to be followed.**

This program is sponsored by  
Institute of Information Science  
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in cooperation with  
Institute of Bioinformatics and Structural Biology  
**National Tsing Hua University**

&

Institute of Bioinformatics and Systems Biology  
**National Chiao Tung University**

&

Institute of Biomedical Informatics  
**National Yang-Ming University**