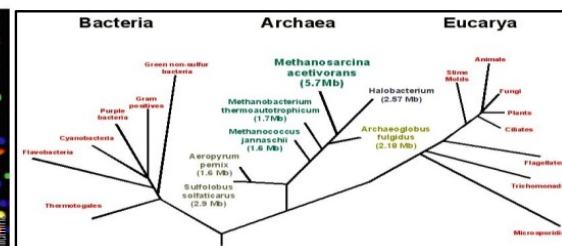
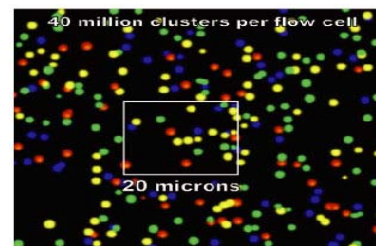




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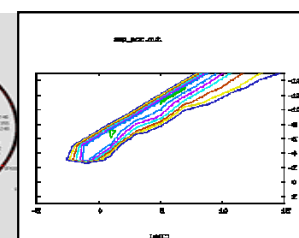
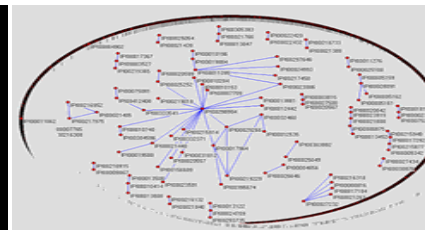
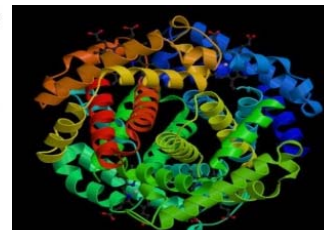
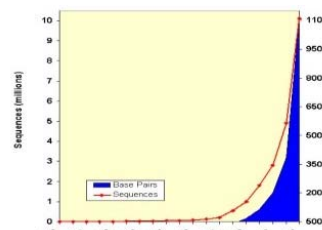
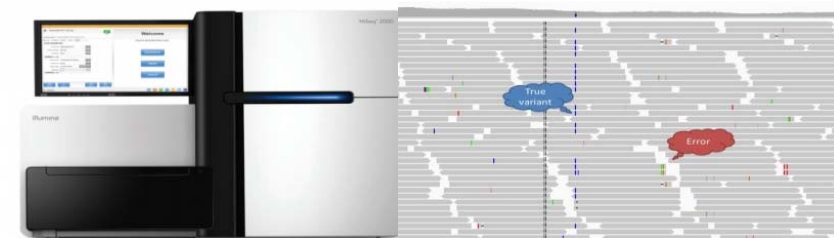


# Introduction and History

北京大学生物信息学中心 魏丽萍

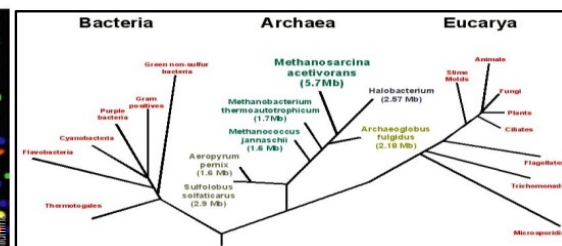
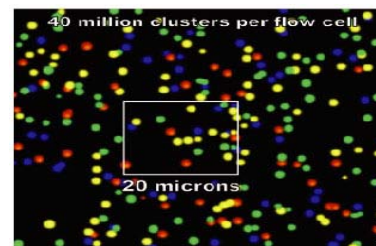
Liping Wei, Ph.D.

Center for Bioinformatics, Peking University





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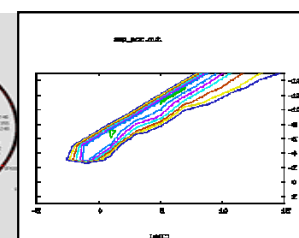
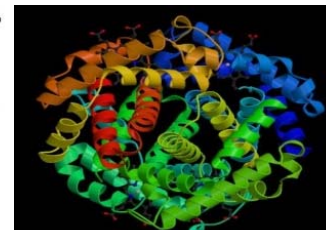
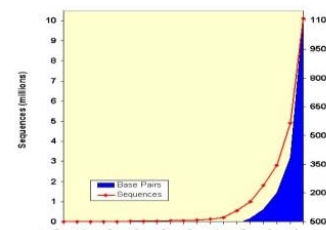
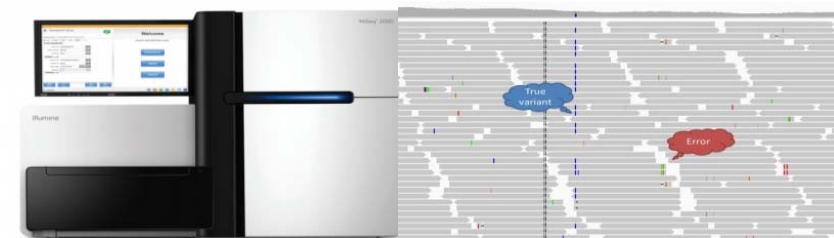


# Unit 3: Bioinformatics in Mainland China

北京大学生物信息学中心 魏丽萍

Liping Wei, Ph.D.

Center for Bioinformatics, Peking University





Perspective

# Bioinformatics in China: A Personal Perspective

Liping Wei<sup>1\*</sup>, Jun Yu<sup>2\*</sup>

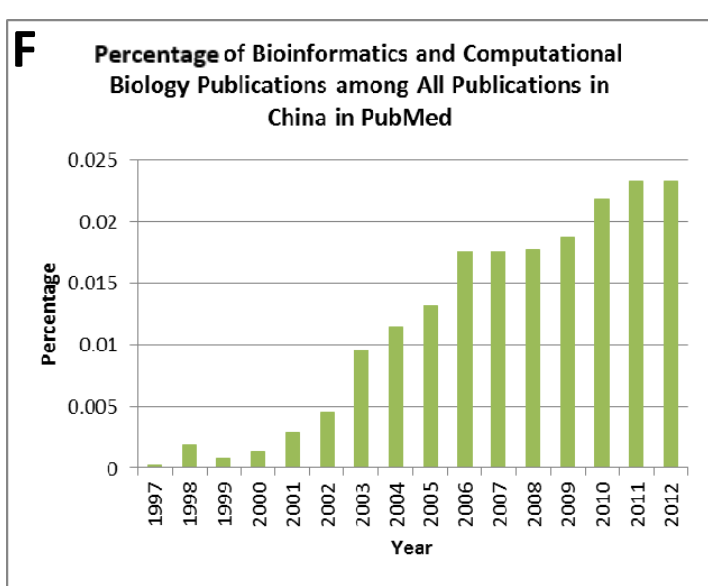
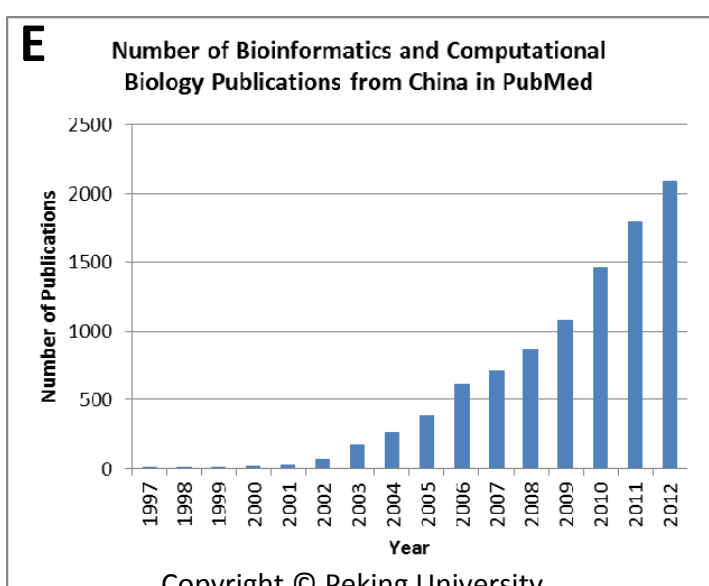
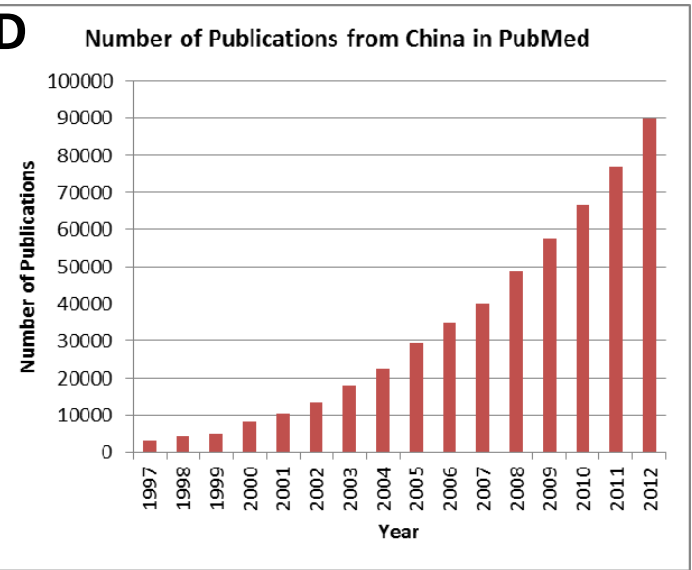
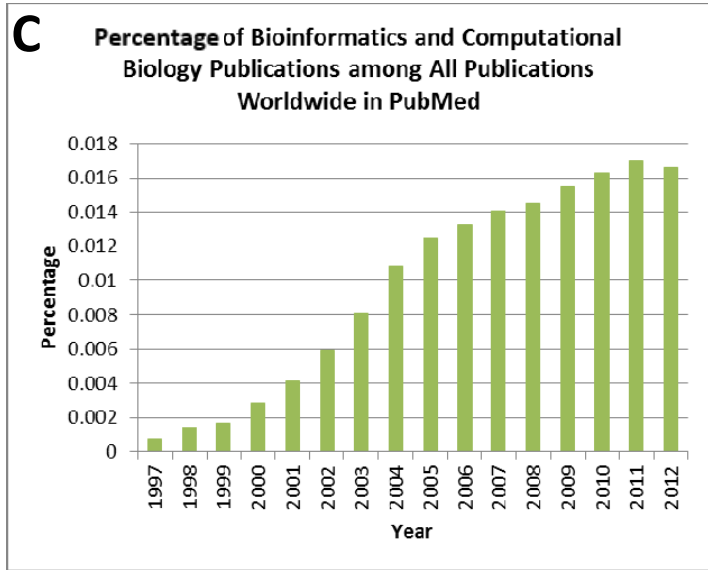
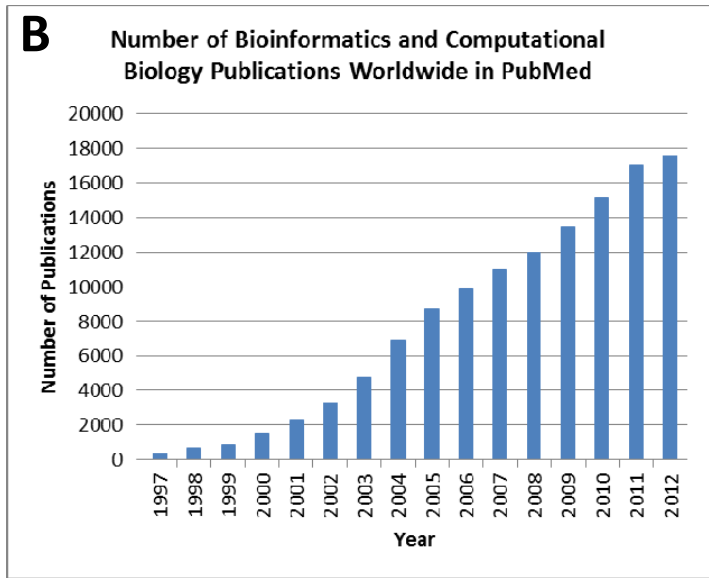
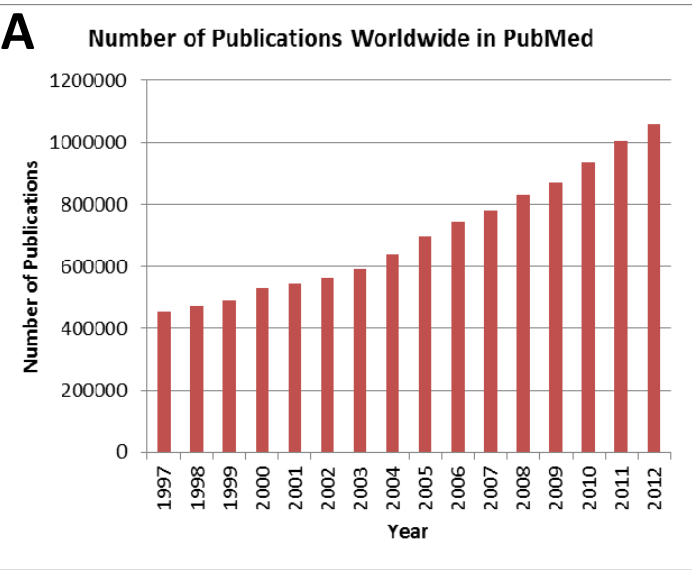
**1** Center for Bioinformatics, National Laboratory of Protein Engineering and Plant Genetic Engineering, College of Life Sciences, Peking University, Beijing, People's Republic of China, **2** CAS Key Laboratory in Genome Sciences and Information, Beijing Institute for Genomics, Chinese Academy of Sciences, Beijing, People's Republic of China

In this personal perspective, we recall the history of bioinformatics and computational biology in China, review current research and education, and discuss future prospects and challenges. The field of bioinformatics in China has grown significantly in the past decade despite a delayed and patchy start at the end of the 1980s by a few scientists from other disciplines, most noticeably physics and mathematics, where China's traditional strength has been. In the late 1990s and early 2000s, rapid expansion of the field was fueled by

tion of bioinformatics research is becoming more significant within the life sciences in China. Comparing it with the situation worldwide, we observe that the number of bioinformatics publications from China is growing faster than the number of bioinformatics publications worldwide (Figure 1A versus 1D). Additionally, the number of PubMed publications from China has also been growing faster than the total number of PubMed publications (Figure 1B versus 1E). Furthermore, we observe that, very interestingly, for each

and Technology (MOST). Despite the difficulties, starting from the end of the 1980s bioinformatics research was pioneered by a few scientists from other disciplines, most noticeably physics and mathematics where China's traditional strength has been, applying theoretical frameworks and analytical tools from their original specialty to study biological questions.

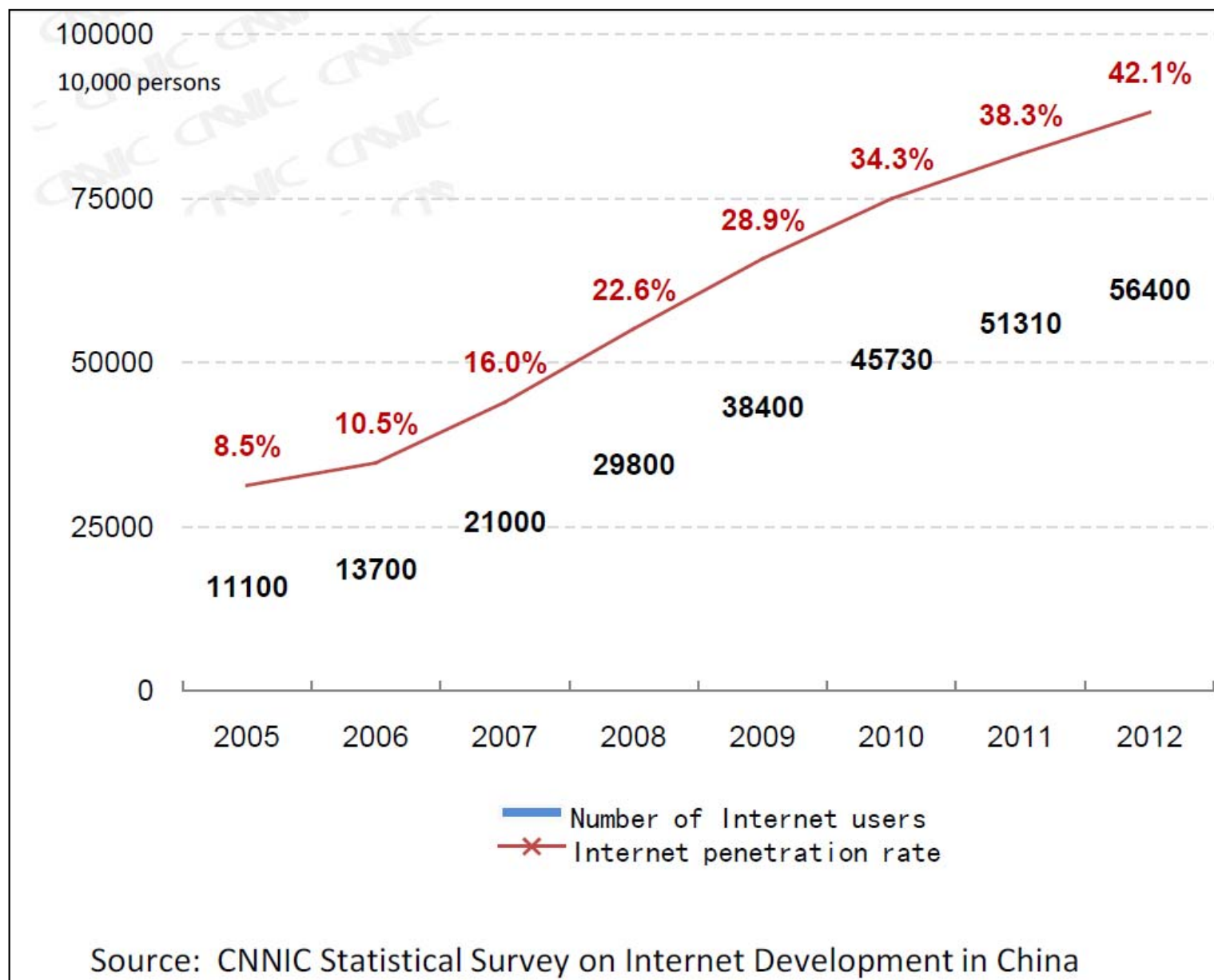
A great example of these early scientists was Bailin Hao, who, trained in the former Soviet Union, was at the time already an



# Rapid growth since 1990s

- **Driving force #1: internet**

- 1994: full TCP/IP internet connection between China and the rest of the world was established.
  - A dial-up X.25 connection between the Institute of High-Energy Physics (IHEP) in Beijing and the Stanford Linear Accelerator Center (SLAC).
- On May 17th 1994, the official connection to FIX-West was announced and the U.S.-based Energy Sciences Network (ESnet) agreed to carry China IP traffic.





- **Driving force #2: genomics**

- China National Human Genome Center (Shanghai and Beijing), Beijing Genomics Institute (BGI), Beijing Institute of Genomics, CAS
- 1% of human genome sequencing
- Sequencing of rice and many other genomes



国家人类基因组北方研究中心

**Chinese National Human Genome Center, Beijing**

<http://server.chinaunix.net/a2009/1206/820/000000820086.shtml>

[http://en.wikipedia.org/wiki/File:Illumina\\_Hiseq\\_2000\\_sequencers,\\_BGI\\_Hong\\_Kong\\_sequencing\\_room.JPG](http://en.wikipedia.org/wiki/File:Illumina_Hiseq_2000_sequencers,_BGI_Hong_Kong_sequencing_room.JPG)

- **Driving force #3: increased research funding**
  - Ministry of Science and Technology (MOST): “863” and “973” grants
  - Natural Science Foundation of China (NSFC): young investigator awards and research grants





- **Driving force #4: critical mass of researchers & students**

# Pioneers in the late 80s and early 90s

| Name            | Original background | Research in bioinformatics                   |
|-----------------|---------------------|--|
| Bai-Lin Hao     | Theoretical physics | Phylogenetic analysis with k-strings         |
| Run-Sheng Chen  | Biophysics          | Small RNAs and noncoding RNAs                |
| Chun-Ting Zhang | Theoretical physics | Z-score for DNA sequence analysis            |
| Yanda Li        | Automation control  | Gene expression regulation                   |
| Yunyu Shi       | Biophysics          | Structural biology and bioinformatics        |
| Liaofu Luo      | Theoretical physics | Genome evolution                             |
| Dafu Ding       | Mathematics         | Protein structure modeling and design        |
| Zhirong Sun     | Automation control  | Molecular network and pathway analysis       |
| Luhua Lai       | Chemistry           | Docking and drug design                      |
| Xiaocheng Gu    | Biophysics          | Protein structure analysis                   |
| Jingchu Luo     | Biology             | Plant transcription regulation and evolution |

# Center for Bioinformatics, Peking University

- Founded in 1997 as the first bioinformatics center in China
- Administratively located within the School of Life Sciences
- Has  $\frac{3}{4}$  “dry” labs and  $\frac{1}{4}$  “wet” labs.
- Financially supported by MOST, NSFC, and MOE

Faculty members:

Liping  
Wei



Ge  
Gao



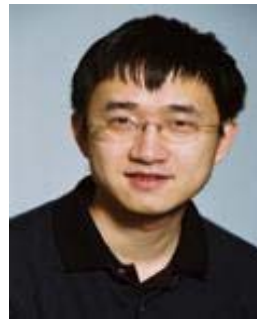
Letian  
Tao



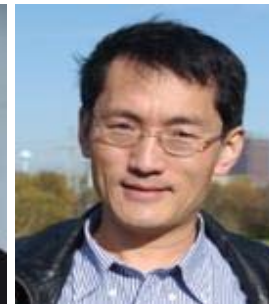
Jian  
Lu



Cheng  
Li



Manyuan  
Long



Jingchu  
Luo

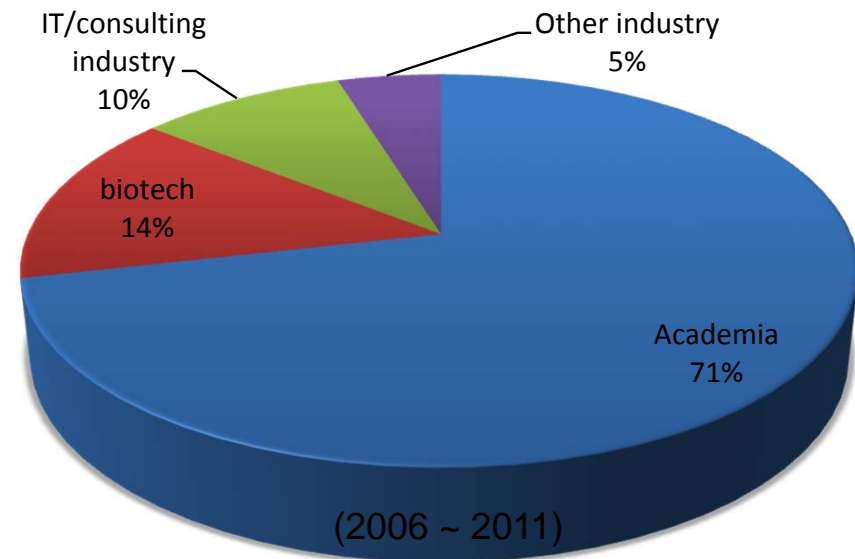
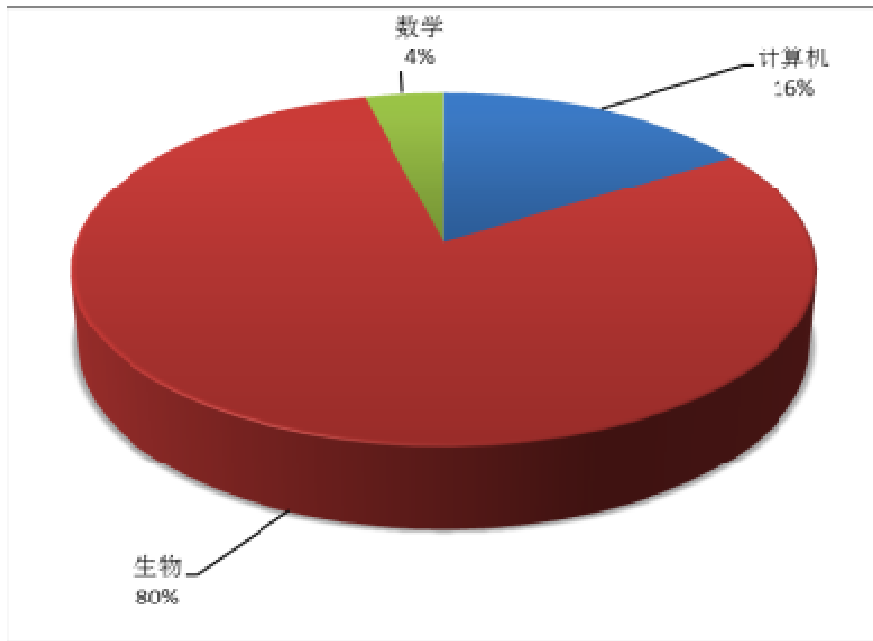


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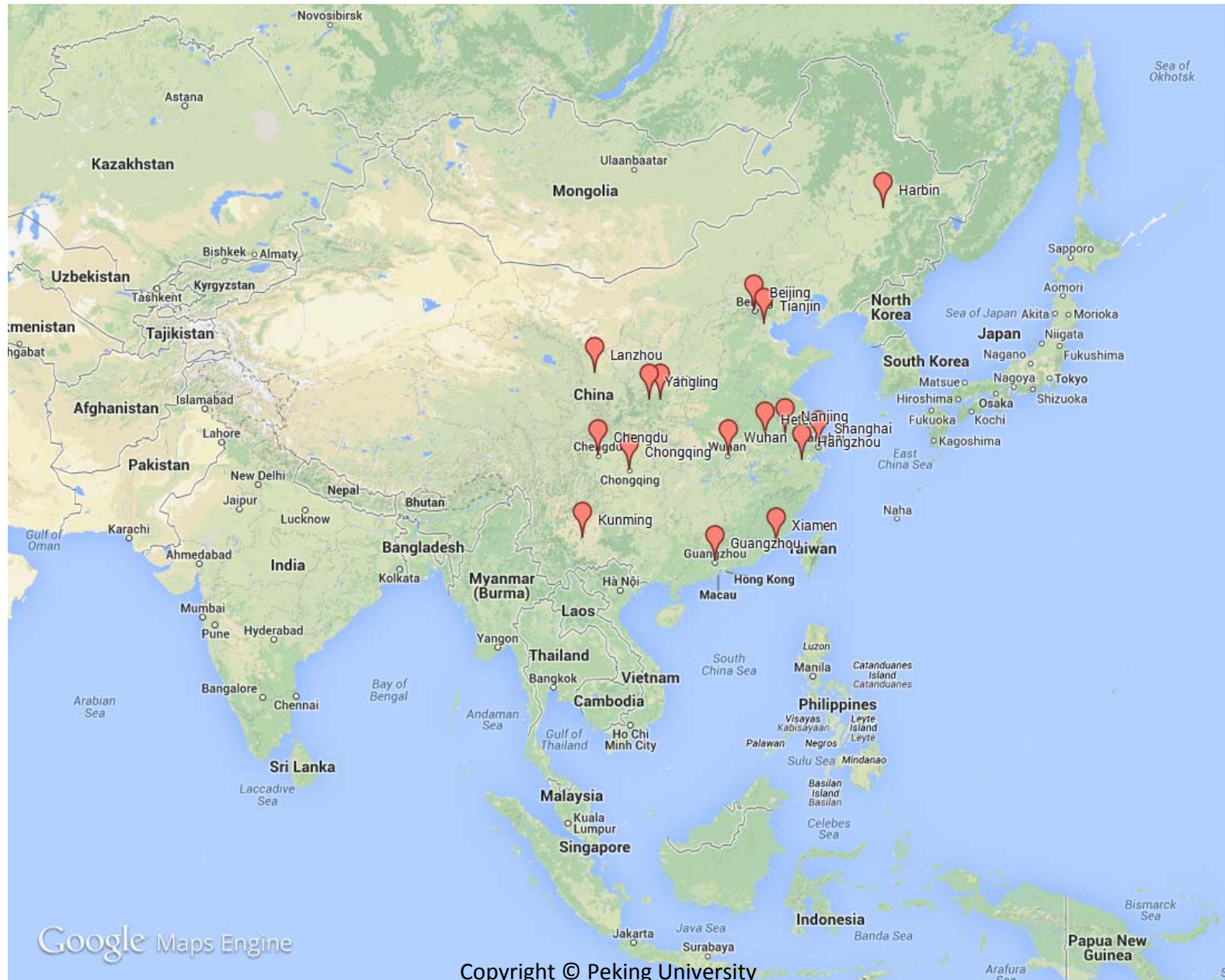


# Center for Bioinformatics, Peking University

- Also the first to offer Ph.D. degrees in bioinformatics in China







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# Bioinformatics degree programs in Mainland China

| City      | University/Institute                                 |          | School/Center   | Degrees          |
|-----------|--|----------|---|------------------|
| Beijing   | Peking University                                    | 北京大学     | Center for Bioinformatics, School of Life Sciences; Center for Quantitative Biology   | PhD              |
| Beijing   | Tsinghua University                                  | 清华大学     | Department of Biological Sciences and Biotechnology; Institute of Bioinformatics, Department of Automation  | PhD              |
| Beijing   | Chinese Academy of Sciences                          | 中科院      | Beijing Institute of Genomics; Center of Systems Biology, Institute of Biophysics; Center of Molecular Systems Biology, Institute of Genetics and Developmental Biology | PhD              |
| Beijing   | China Agricultural University                        | 中国农业大学   | College of Biological Sciences  | PhD, Master      |
| Beijing   | Beijing Normal University                            | 北京师范大学   | College of Life Sciences, Laboratory of Computational Molecular Biology   | Master           |
| Chengdu   | Sichuan University                                   | 四川大学     | School of Life Sciences   | PhD, Master      |
| Chongqing | Chongqing University of Posts and Telecommunications | 重庆邮电大学   | College of Bio-information  | Bachelor         |
| Guangzhou | Sun Yat-sen University                               | 中山大学     | Center for Bioinformatics, College of Life Sciences   | PhD, Master      |
| Hangzhou  | Zhejiang University                                  | 浙江大学     | School of Life Science, Institute of Bioinformatics   | Bachelor         |
| Harbin    | Harbin Medical University                            | 哈尔滨医科大学  | College of Bioinformatics Science and Technology  | Master, Bachelor |
| Hefei     | University of Science and Technology of China        | 中国科学技术大学 | School of Life Sciences   | PhD, Master      |
| Kunming   | Yunnan University                                    | 云南大学     | School of Life Sciences   | Master           |
| Lanzhou   | Lanzhou University                                   | 兰州大学     | School of Life Sciences   | Master           |

|          |   |            |  |                  |
|----------|---|------------|--|------------------|
| Nanjing  | Nanjing University                            | 南京大学       | School of Life Science   | PhD, Master      |
| Nanjing  | Nanjing Agricultural University               | 南京农业大学     | Center for Bioinformatics, College of Life Sciences  | Master           |
| Nanjing  | Southeast University                          | 东南大学       | State Key Laboratory of Bioelectronics, School of Biological Science & Medical Engineering | PhD, Master      |
| Nanjing  | China Pharmaceutical University               | 中国药科大学     | School of Life Science and Technology  | PhD, Master      |
| Shanghai | Fudan University                              | 复旦大学       | School of Life Sciences  | PhD, Master      |
| Shanghai | Shanghai Institute for Biological Sciences    | 上海生命科学研究所以 | Key Laboratory of Systems Biology  | PhD              |
| Shanghai | Tongji University                             | 同济大学       | School of Life Science   | PhD, Master, BS  |
| Shanghai | Shanghai Jiao Tong University                 | 上海交通大学     | Department of Biomedical Engineering, College of Life Science and Biotechnology            | Master           |
| Shanghai | East China Normal University                  | 华东师范大学     | School of Life Sciences  | PhD, Master      |
| Shanghai | Shanghai Jiao Tong University                 | 上海大学       | School of Life Sciences  | Master           |
| Tianjin  | Nankai University                             | 南开大学       | College of Life Sciences   | PhD, Master      |
| Tianjin  | Tianjin University                            | 天津大学       | Tianjin University Bioinformatics Centre   | Master           |
| Wuhan    | Huazhong Agricultural University              | 华中农业大学     | School of Life Sciences  | Master, Bachelor |
| Wuhan    | Huazhong University of Science and Technology | 华中科技大学     | School of Life Science and Technology  | PhD, Master, BS  |
| Xiamen   | Xiamen University                             | 厦门大学       | Department of Chemistry  | PhD, Master      |
| Xi'an    | Xi'an Jiaotong University                     | 西安交通大学     | School of Life Science, Institute of Bioinformatics  | PhD, Master      |
| Yangling | Northwest Agriculture and Forestry University | 西北农林科技大学   | Center for Bioinformatics, College of Life Sciences  | PhD, Master      |

# 生物信息学：导论与方法

## Bioinformatics: Introduction and Methods



<https://www.coursera.org/course/pkubioinfo>