Molecular Biology & Biotechnology (MB&B)

Kadoorie Biological Sciences Building

Dr. Wallace B. L. Lim
Associate Professor

School of Biological Sciences

Faculty of Science, The University of Hong Kong

School of Biological Sciences

Faculty of Science, The University of Hong Kong

Four majors:

√ **Molecular Biology & Biotechnology Major (MB&B)**
Biological Sciences Major (BS)
Food & Nutritional Science Major (F&NS)
Ecology & Biodiversity Major (E&B)

All under programme 6901 Bachelor of Science

School of Biological Sciences

Faculty of Science, The University of Hong Kong

ASIA'S GLOBAL UNIVERSITY

THE NEXT DECADE
Our vision for 2016-2025

Molecular Biology & Biotechnology (MB&B)

Missions:

- To expose students to the cutting-edge biotechnologies of the 21st century
- To provide hands-on laboratory trainings and experimental based projects
- To equip students with skills in translation of basic knowledge into modern industrial and medical applications

36 graduates in June, 2017

Why did you choose Science?

Interest?

Career Goal?

No Other Choice?

Do Not Know?

I am Dr. Wallace Lim
School of Biological Sciences

I studied at Pui Ching Primary School
Pui Ching Middle School
CUHK (BSc)
University of Oxford (D.Phil.)

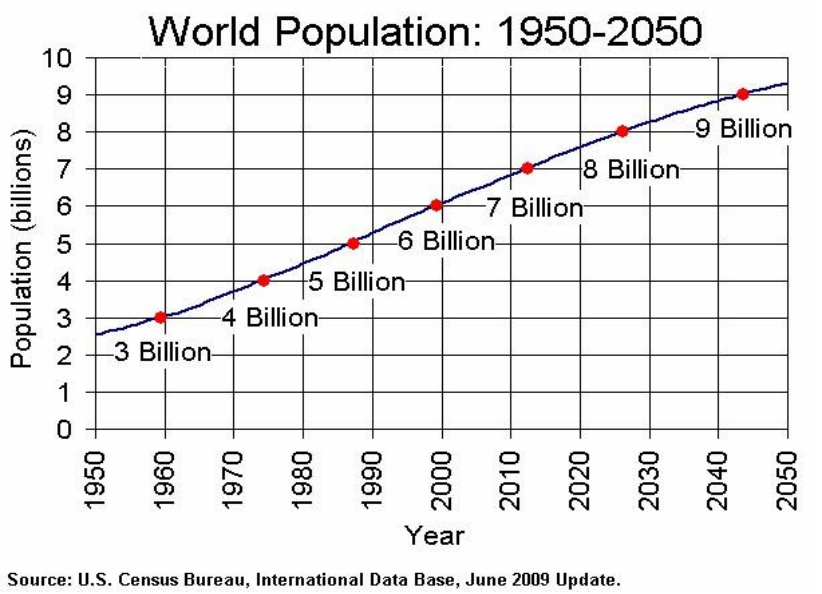
At high school, I studied BIOLOGY in Chinese

ATP = 腺嘌呤核苷三磷酸

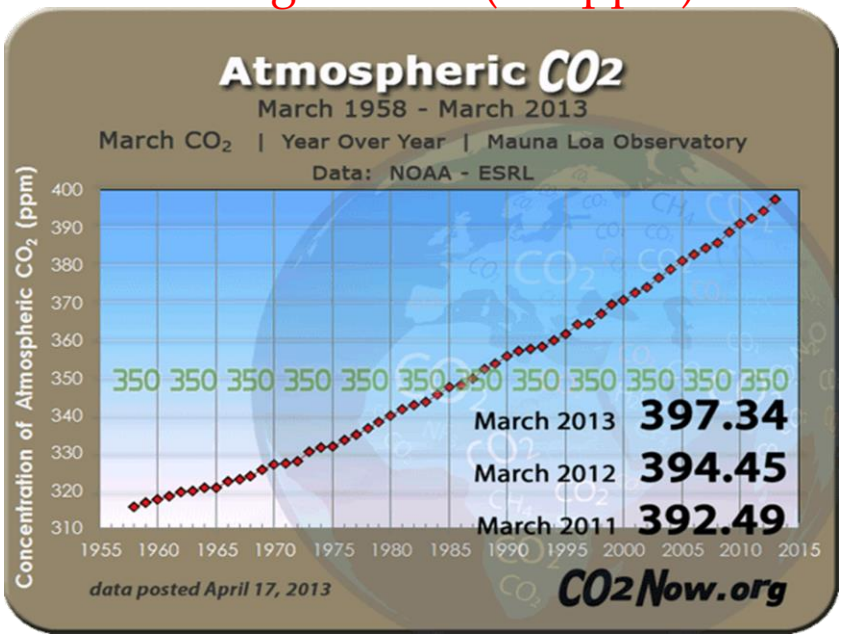
Why did I choose Biology? Interest

Why Biotechnology is important to human welfare?

- What problems are you facing?



9th August 2018 (410 ppm)



Food supply

Global Warming

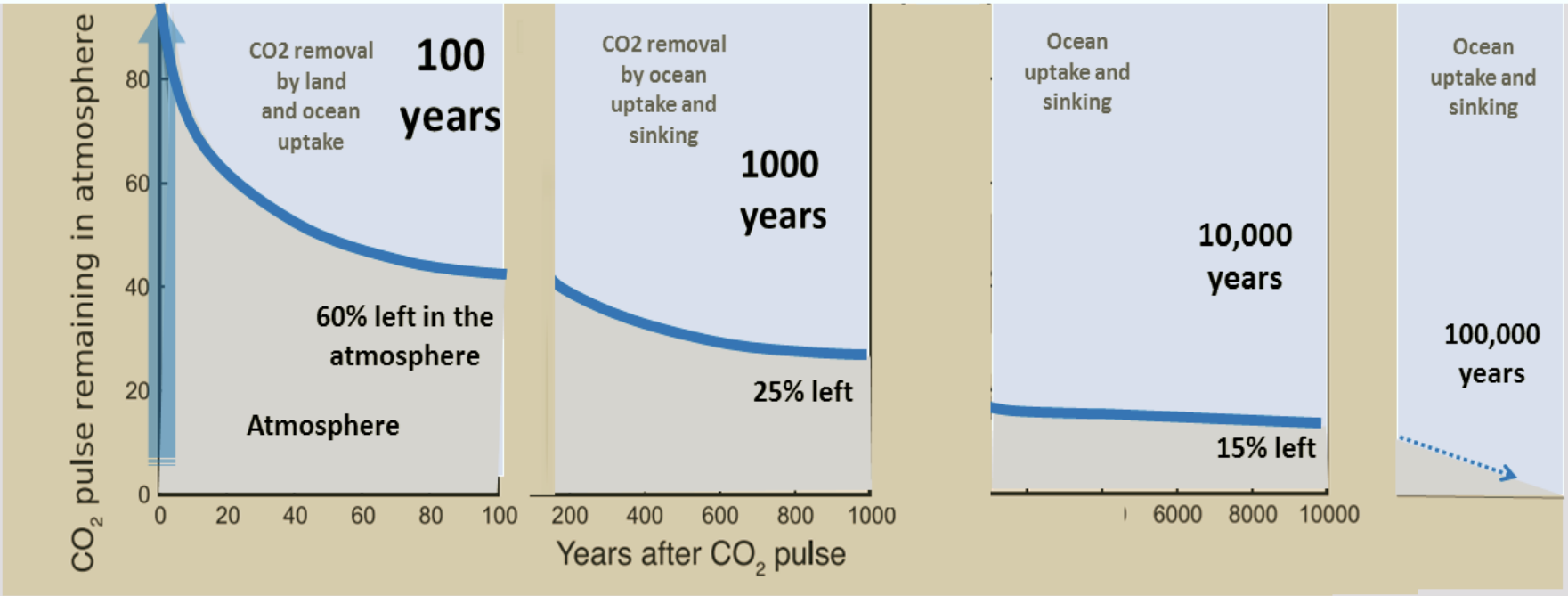
http://www.co2.earth

The removal of all the human-emitted CO2 from the atmosphere by natural processes will take a few hundred thousand years (high confidence) (AR5 Box 6.1)

CO2 is forever (David Archer 2008)

The atmospheric lifetime of CO2 is 100,000 years

1000 years after emissions 25% of CO2 is left in the atmosphere
...heating the earth surface and acidifying the oceans



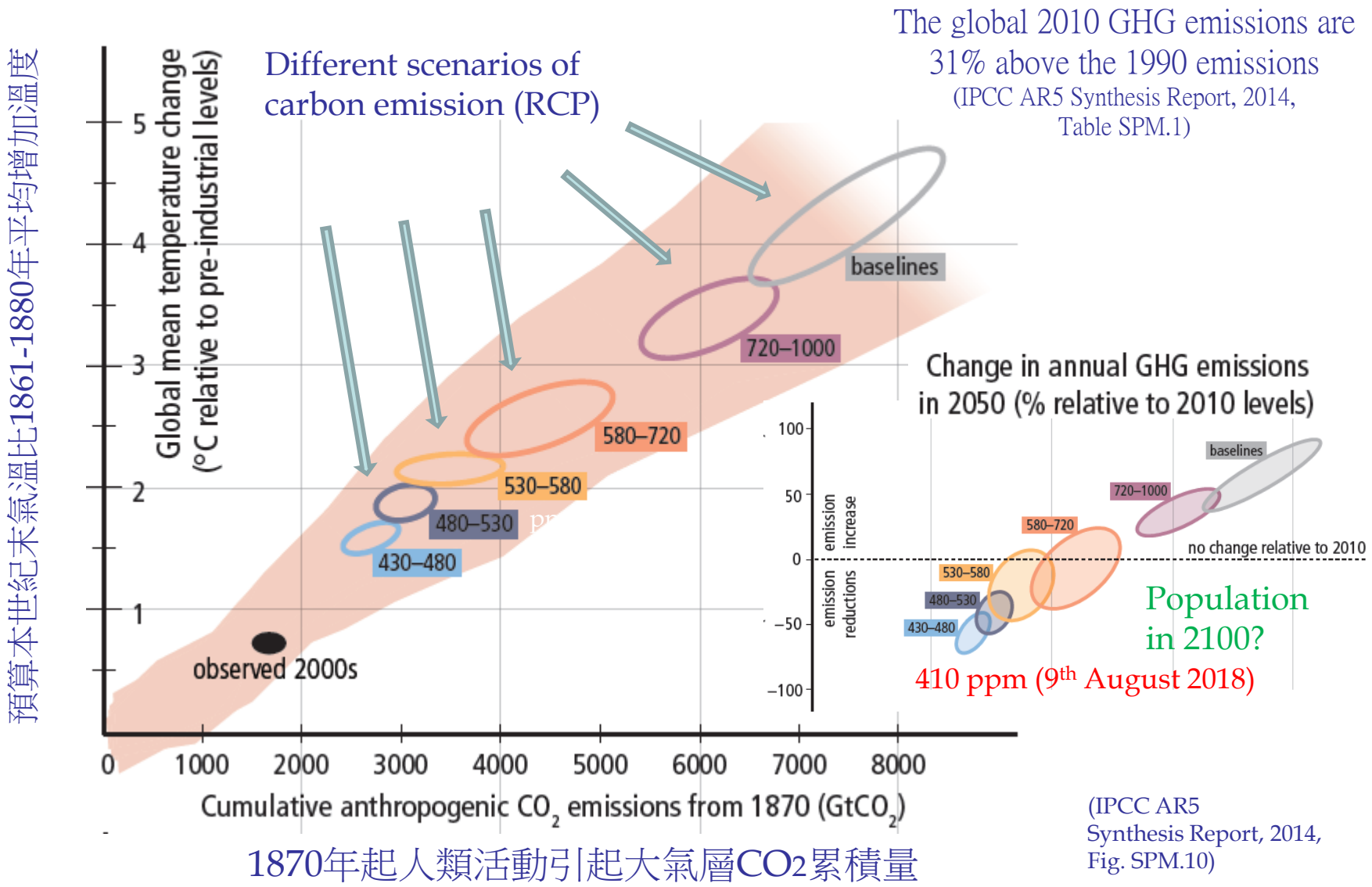
Percentage of emitted CO2 remaining in the atmosphere in response to an instantaneous CO2 pulse emitted to the atmosphere

from IPCC AR5 WG1 Box 6.1, Figure 1

Peter Carter

CO_2 absorbed by ocean causes acidification!

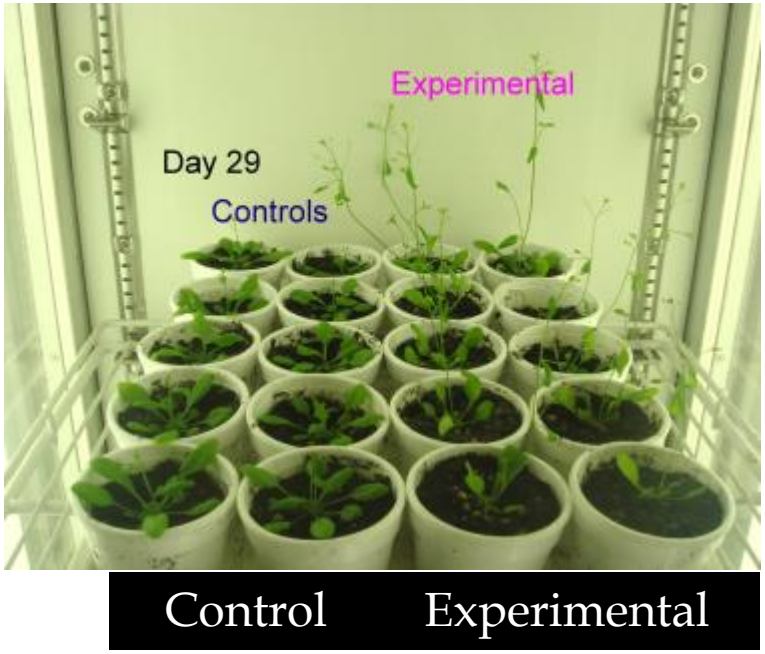
Use of fossil fuels increases CO_2 emission and global temperature



HKU technology speeds up photosynthesis

8 hrs light/day

16 hrs light/day

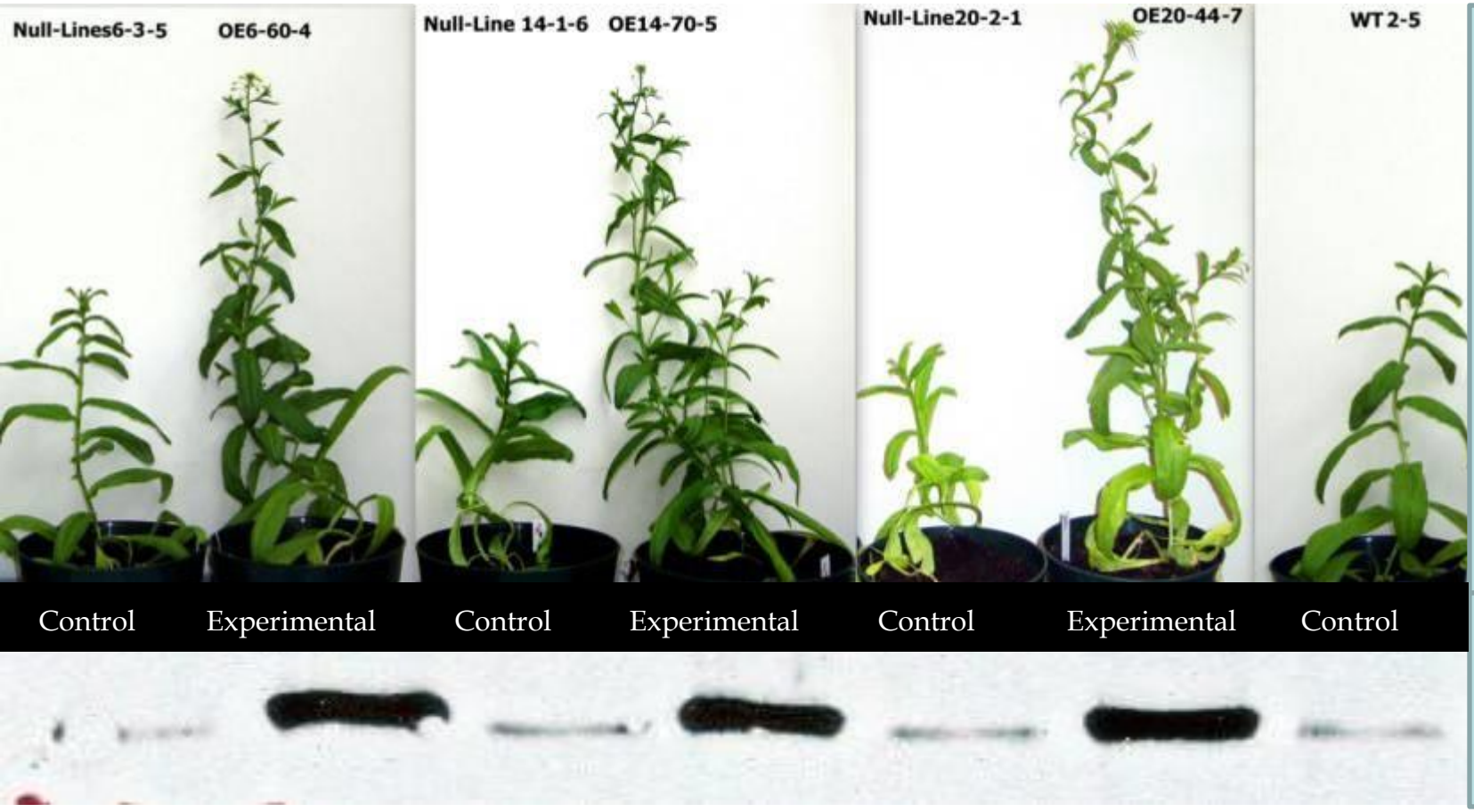


	STUDY No. 1	**No. 2**
Seed Yield	+ 38 to 40 %	+ 55 to 57 %

(Dr. B. L. Lim, SBS)

AtPAP2 promote growth of Biofuel Crop (*Camelina sativa*)

Aviation Biofuel with 50% Camelina seed oils -> New Jet Biofuel

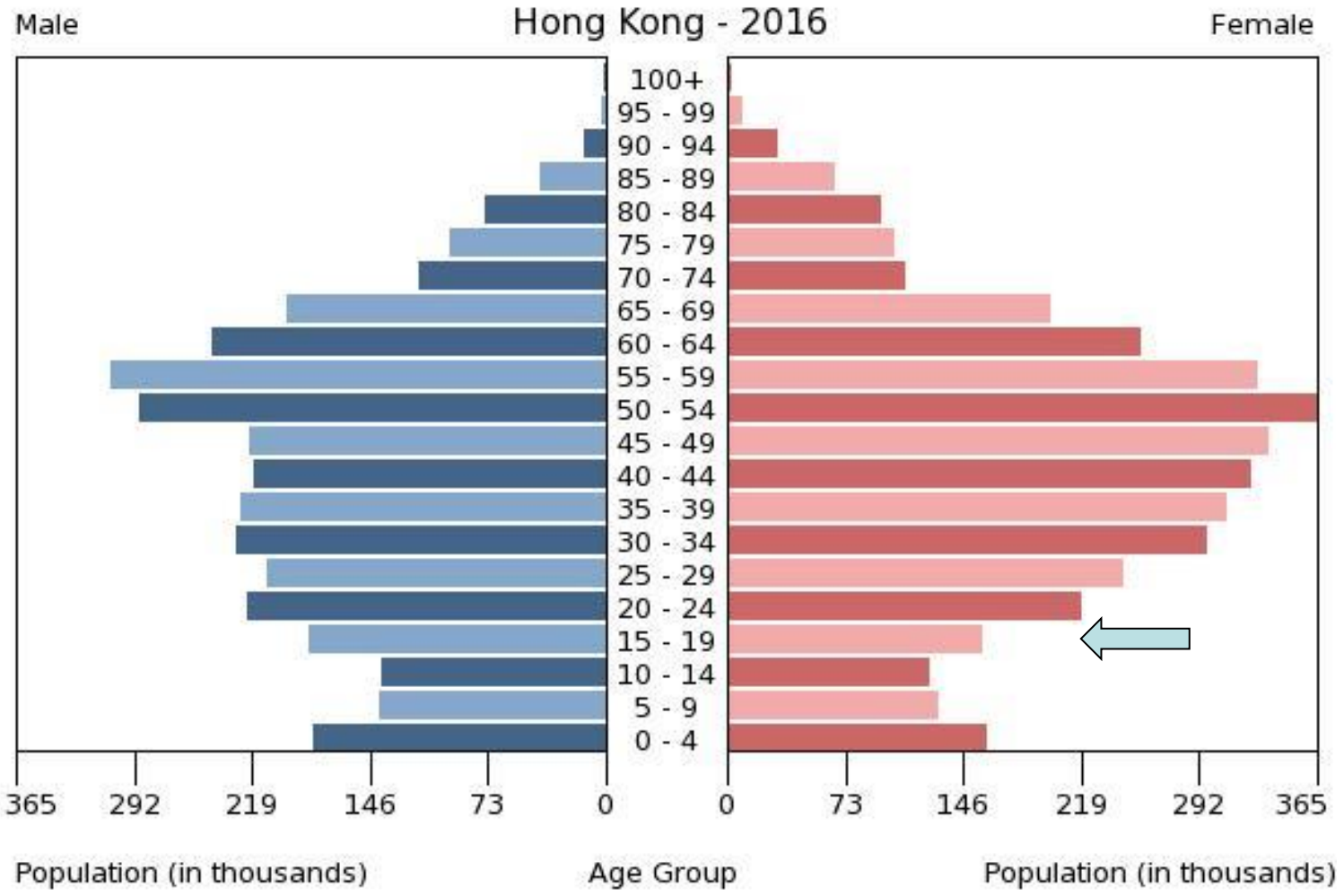


The technology was licensed to Agragen LLC (USA)

Camelina-based jet fuel reduces carbon emissions by around 80% (US Navy)

(Zhang et al., Biotechnology for Biofuels, 2012)

Why Biotechnology is important to human welfare?



Aging: Healthcare Biotechnology

HK & Shenzhen Healthcare biotech companies

- BGI Genomics Raises RMB 547M in IPO (14 July 2017)

Mr Alex Wong (CUHK classmate)
Executive Director BGI-Hong Kong

BGI-HK@Tai Po

- Grail goes global, merges with Hong Kong's Cirina (31 May 2017)

Cirina, which has R&D teams in Hong Kong and San Francisco, shares Grail's mission. The company was cofounded by Dennis Lo, the first scientist to learn of the presence of fetal DNA in a mother's blood plasma. Lo's research includes using liquid biopsy to detect certain cancers.

- Diagcor was found by Prof. Joseph Tam in 2006.

HK$214.2 million acquisition of the entire issued share capital of two companies, which together hold a 48.3 percent stake in DiagCor Technology Ltd., a holding company of a group of molecular diagnostics companies (17 Jan, 2017).

Amvet Biosciences is the first biotechnology company dedicated to provide the highest quality animal genetic healthcare in Hong Kong. We focus on individualized DNA tests and precision therapeutics. Amvet Biosciences is the sole genetic service provider to the Hong Kong Kennel Club. We are the genetic consultant to the breeding program of the Hong Kong Seeing Eye Dog Services.

Dr. Chin
Was my Final Year Project Student

Founder & Scientific Director
Mario P S Chin, PhD

Dr. Chin is a bioentrepreneur and an expert in molecular genetics and systems virology. He is a Professor and Associate Director in the Institute of Genomics at Huaqiao University. Before founding Amvet Biosciences, he was an Assistant Professor at Temple University School of Medicine in the U.S. Prior to that, he was a Scholar at the Aaron Diamond AIDS Research Center of the Rockefeller University in New York City.
He also received several awards from the National Institutes of Health, the Comprehensive NeuroAIDS Center and the International AIDS Society for his innovations in science. He served on the scientific review committees of the American Association for the Advancement of Science, the National Institutes of Health, the American Cancer Society and the University of Wisconsin, and on the mentoring committee of the International AIDS Society. He also serves on the editorial and review boards of several international journals.

Dr. Chin received his PhD in molecular genetics from the University of Hong Kong Faculty of Medicine, where he was a Swire Scholar, and graduated with a BSc (Hons) in zoology from the University of Hong Kong.

MBB Curriculum (Major)

Year 1/2

Required courses (96 credits)

1. Introductory level courses (42 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)

SCNC1111	Scientific method and reasoning (6)
SCNC1112	Fundamentals of modern science (6)

Disciplinary Core Courses (24 credits)

BIOL1110	From molecules to cells (6)
BIOL2102	Biostatistics (6)
BIOL2103	Biological sciences laboratory course (6)
BIOL2220	Principles of biochemistry (6)
	OR
BIOC2600	Basic biochemistry (6)

Disciplinary Electives (6 credits)

BIOL1309	Evolutionary diversity (6)
	OR
BIOL2306	Ecology and evolution (6)

MBB Curriculum

Year 2/3/4

2. Advanced level courses (48 credits)

Disciplinary Core Courses (24 credits)

BIOL3401	Molecular biology (6)
BIOL3402	Cell biology and cell technology (6)
BIOL4411	Plant and food biotechnology (6)
BIOL4415	Healthcare biotechnology (6)

Disciplinary Electives (24 credits)

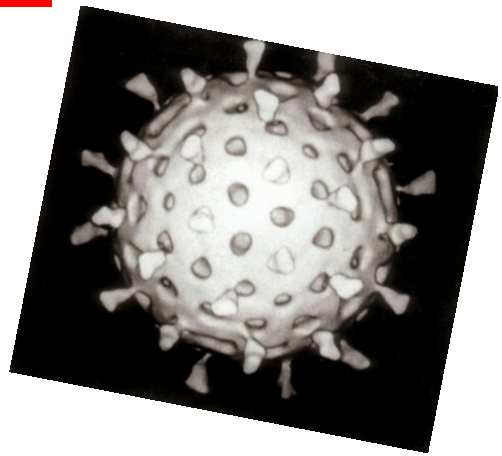
At least 24 credits selected from the following courses:

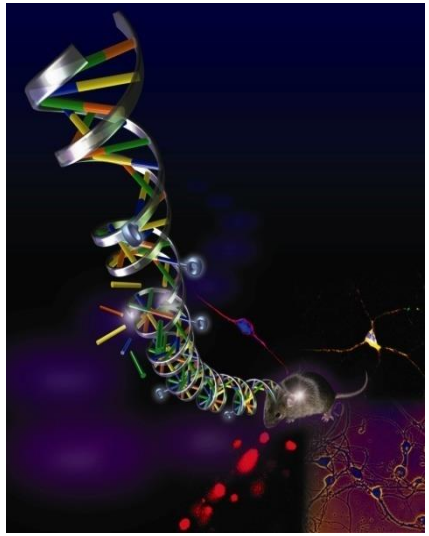
BIOL3403	Immunology (6)
BIOL3404	Protein structure and function (6)
BIOL3406	Reproduction and reproductive biotechnology (6)
BIOL3408	Genetics (6)
BIOL3508	Microbial physiology and biotechnology (6)
BIOL4401	Medical microbiology and applied immunology (6)
BIOL4409	General virology (6)
BIOL4416	Stem cells and regenerative biology (6)
BIOL4417	'Omics' and systems biology (6)
ENVS4110	Environmental remediation (6)

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

BIOL3993	Directed studies in Molecular biology & biotechnology (6)
BIOL4963	Molecular biology & biotechnology internship (6)
BIOL4993	Molecular biology & biotechnology project (12)





HKU Faculty of Science obtains Royal Society of Biology accreditation for two Majors

28 Jan 2018

The 6901 Bachelor of Science Programme, offered by the Faculty of Science of the University of Hong Kong (HKU), has been conferred accreditation of its Ecology & Biodiversity and Molecular Biology & Biotechnology Majors by the Royal Society of Biology (RSB), UK, for the purpose of meeting in part the academic and experience requirement for the Membership and Chartered Biologist (CBiol).

Royal Society of Biology

Accredited Degree

The Majors of Ecology & Biodiversity and Molecular Biology & Biotechnology at HKU School of Biological Sciences have obtained accreditation from the Royal Society of Biology (RSB), UK.

The Ecology & Biodiversity Major is the first programme of its type accredited by RSB in Asia. Enhancement of the two Majors will be reflected in the curriculum starting from September 2018, and the intake of cohort 2018-19 will be able to apply for the accredited options of these two Majors.

Graduates from accredited programmes will receive one year of guest membership of the Royal Society of Biology at Associate level.

May progress to Chartered Biologist (CBiol) in UK

MBB Curriculum (Intensive Major)

Year 1/2

(96→ 144 credits)

Introductory level courses (66 credits) (42 for ordinary major)			
Disciplinary Core Courses: Science Foundation Courses (12 credits)			
	SCNC1111	Scientific method and reasoning (6)	
	SCNC1112	Fundamentals of modern science (6)	
Disciplinary Core Courses (42 credits)			(24 for ordinary major)+ 3 courses
	BIOL1110	From molecules to cells (6)	
	BIOL2102	Biostatistics (6)	
	BIOL2103	Biological sciences laboratory course (6)	
	BIOL2409	Biotechnology Industry and Entrepreneurship (6)	Quota 50, students major in MBB has priority
	BIOL2220	Principles of biochemistry (6)	Take either BIOL2220 or BIOC2600, but not both.
or	BIOC2600	Basic biochemistry (6)	Take either BIOL2220 or BIOC2600, but not both.
	CHEM1042	General chemistry I (6)	
	CHEM1043	General chemistry II (6)	
Disciplinary Electives (12 credits)			(6 for ordinary major) + 1 course
	Biol 2408	Green earth-plants and mankind (6)	
	BIOL2306	Ecology and evolution (6)	May take either BIOL1309 or BIOL2306, but not both.
	BIOL1309	Evolutionary diversity (6)	May take either BIOL1309 or BIOL2306, but not both.
	COMP1117	Computer programming (6)	
	MATH1011	University mathematics I (6)	
	MATH1013	University mathematics II (6)	

MBB Curriculum (Intensive Major)

Year 3/4

2	**Advance level courses (66 credits)** (48 for ordinary major)		
Disciplinary Core Courses (30 credits) (24 for ordinary major)			+ 1 course
	BIOL3401	Molecular biology (6)	
	BIOL3402	Cell biology and cell technology (6)	
	BIOL4411	Plant and food biotechnology (6)	
	BIOL4415	Healthcare biotechnology (6)	
	BIOL4417	"Omics" and system biology (6)	
Disciplinary elective (36 credits) (24 for ordinary major)			+ 2 courses
	BIOL3107	Plant physiology (6)	
	BIOL3205	Human physiology (6)	
	BIOL3403	Immunology (6)	
	BIOL3404	Protein structure and function (6)	
	BIOL3406	Reproduction & reproductive biotechnology (6)	
	BIOL3408	Genetics (6)	
	BIOL3508	Microbial physiology and biotechnology (6)	
	BIOL4401	Medical microbiology and applied immunology (6)	
	BIOL4409	General virology (6)	
	BIOL4416	Stem cells and regenerative biology (6)	
	ENVS4110	Environmental remediation (6)	
3	**Capstone requirement (12 credits)**		FYP
	BIOL4993	Molecular biology & biotechnology project (12)	Need GPA > or = 3.0

Final Year Project

(12 credits) (cGPA 3.0 or above)

Intensive write-up of a topic based on laboratory research

Need a supervisor and required to work in his/her lab

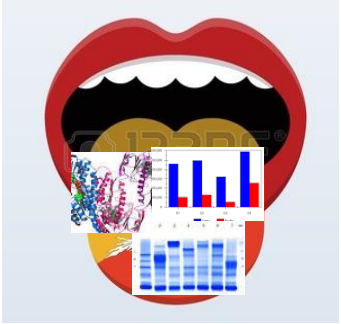
Come up with conclusions based on lab work and other published results

News about SBS seminars:
SBS web → News & Events

Assessments

FYP:

1. Written report 9000-12000 words (by April)
2. Oral presentation 15- 20 min (in early May)
3. Attending 2 postgrad or guest seminars at SBS (during the semesters)



BIOL2409 Biotechnology industry and entrepreneurship

Overview of the biotech industry, case studies and start-up

Teachers	Topics	Basic concepts	Companies
Lecture 1	How to initiate a Start-up company? IP rights – Major assets	Business model IP rights Patents	Assignment 1
Lecture 2 (24 Jan)	Licensing Technology Transfer Office How to raise fund?	Licensing Business plan	Assignment 2
Lecture 3 (7 Feb)	Agrobiotechnology Green Technologies	Plant Biotech Biofuels	Monsanto Syngenta
Lecture 4 (14 Feb)	Biotech company analysis	4P, Pipeline, PB PB, PEG, SWOT	
Lecture 5	Biotechnology Industry		
Lecture 6	Diagnostics business	Molecular diagnostics	FCL Biotech Quest Diagnostics
Lecture 7 Dr. Ng	Pharmaceutical Industry Drug Development	Clinical trials	GILEAD Sciences
Lecture 8 Dr. Ng	Clinical Research Organization		Wuxi PharmaTech
Lecture 9 KYY	Stem Cell Biotechnology	Stem Cell	
Lecture 10 BLL	Company Visit to Science Park	Stem Cell Molecular diagnostics	Science Park
Lecture11 BLL	Company Visit to Diagcor	Molecular diagnostics	Diagcor/BGI

Experiential Learning

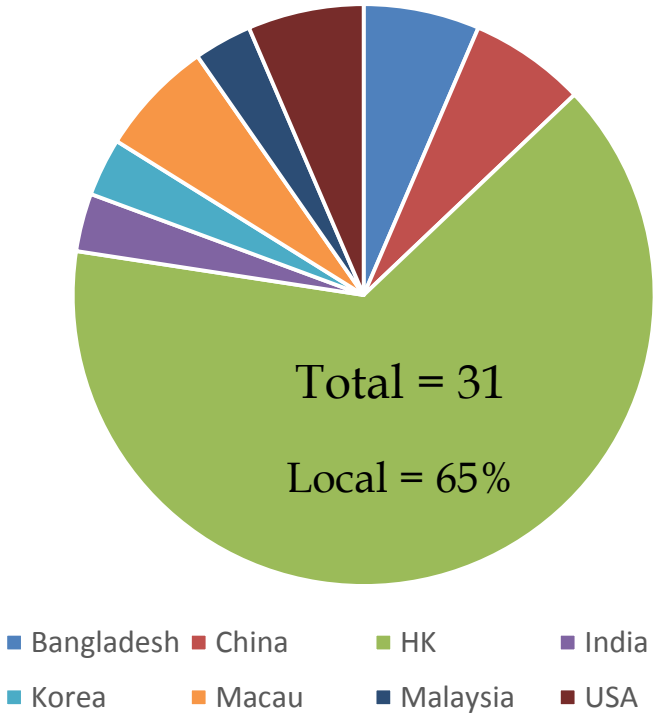
- **Exchange study programmes** in overseas universiti in the UK, USA, Canada, Australia and Europe

- **Internship** (Biological Sciences Internship)
  1. Local and foreign universities
  2. Departments and statutory bodies of the HKSAR
  3. Local biotechnology companies

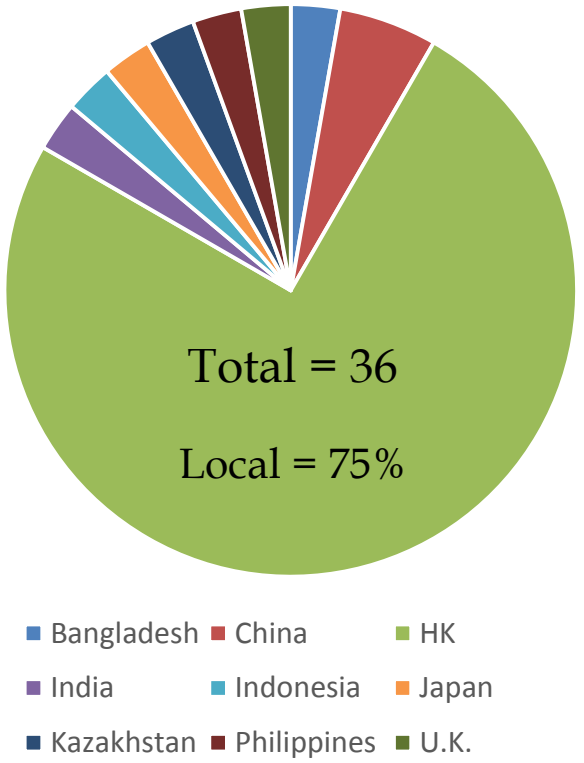
- **Research projects**
  1. Final Year Project (FYP) : Publications
  2. Directed Studies in Biological Sciences
  3. Summer Research Fellowship (SRF)
  4. Overseas Research Fellowship (ORF)

Nationality of MBB graduates

2016



2017

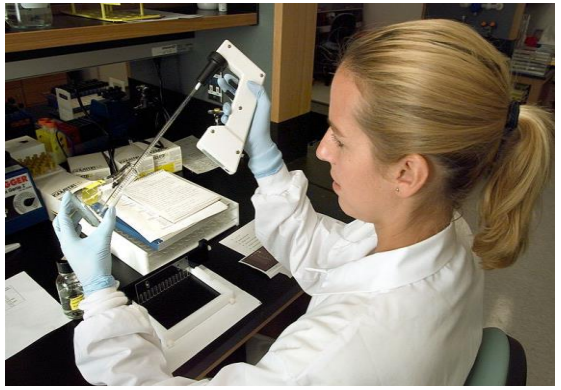


The Job Market

There are plenty of positions available in the job market, and they are not restricted to biotechnology companies, but also many other types of organizations, both in the public and private sector.

HKSAR Government

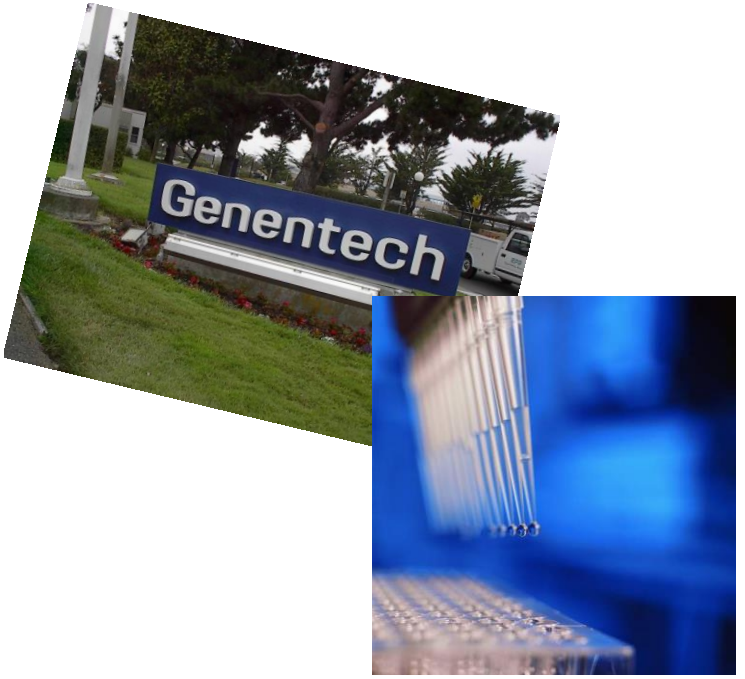
1. **The Agriculture, Fisheries and Conservation Department**
2. **Environmental Protection Department**
3. **Food and Environmental Hygiene Department**
4. **Department of Health**
5. **Hospital Authority**
6. **Secondary and tertiary educational institutions**



- **Commerce, industry and community/personal/social services**
  1. **Biotechnology companies (e.g. CK Life Science International Inc.)**
  2. **Health products companies (e.g. Vita Green Health Products Company Ltd.)**
  3. **Pharmaceutical industries (e.g. Novartis Pharmaceuticals Ltd.)**
  4. **Private medical laboratories (e.g. PathLab Medical Laboratories Ltd.)**
  5. **Research institutes (e.g. Genome Centre, HKU)**

Positions include:

- **Health product consultants**
- **Laboratory technicians**
- **Medical sales representatives**
- **Quality control officers**
- **Research scientists**
- **Sales and marketing executives**
- **Secondary school teachers**
- **Teaching/research assistants**



2015 MBB Graduates

11 Commerce
3 Education

	2015	
	No.	%
No. of respondents	18^	100%
Employed	14	78%
Unemployed seeking F/T job	0	0.0%
Further Studies	3	17%
Emigrated/Returned to home country	1	5.6%
Not seeking F/T job	0	0.0%

^ Not all MBB graduate responded to survey

Commerce and Industry -

* - ACGP
- AIA Group Limited
- Buying Hong Kong Limited
* - CJ CheilJedang
- Edelman
* - HealthCare Diagnostics Limited
* - LF Asia
* - Optimal Medical Laboratory Limited
* - Pfizer Corporation Hong Kong Limited
* - St. Jude Medical, Inc.
- Organization's name not reported

* Related to Biotechnology/Biosciences

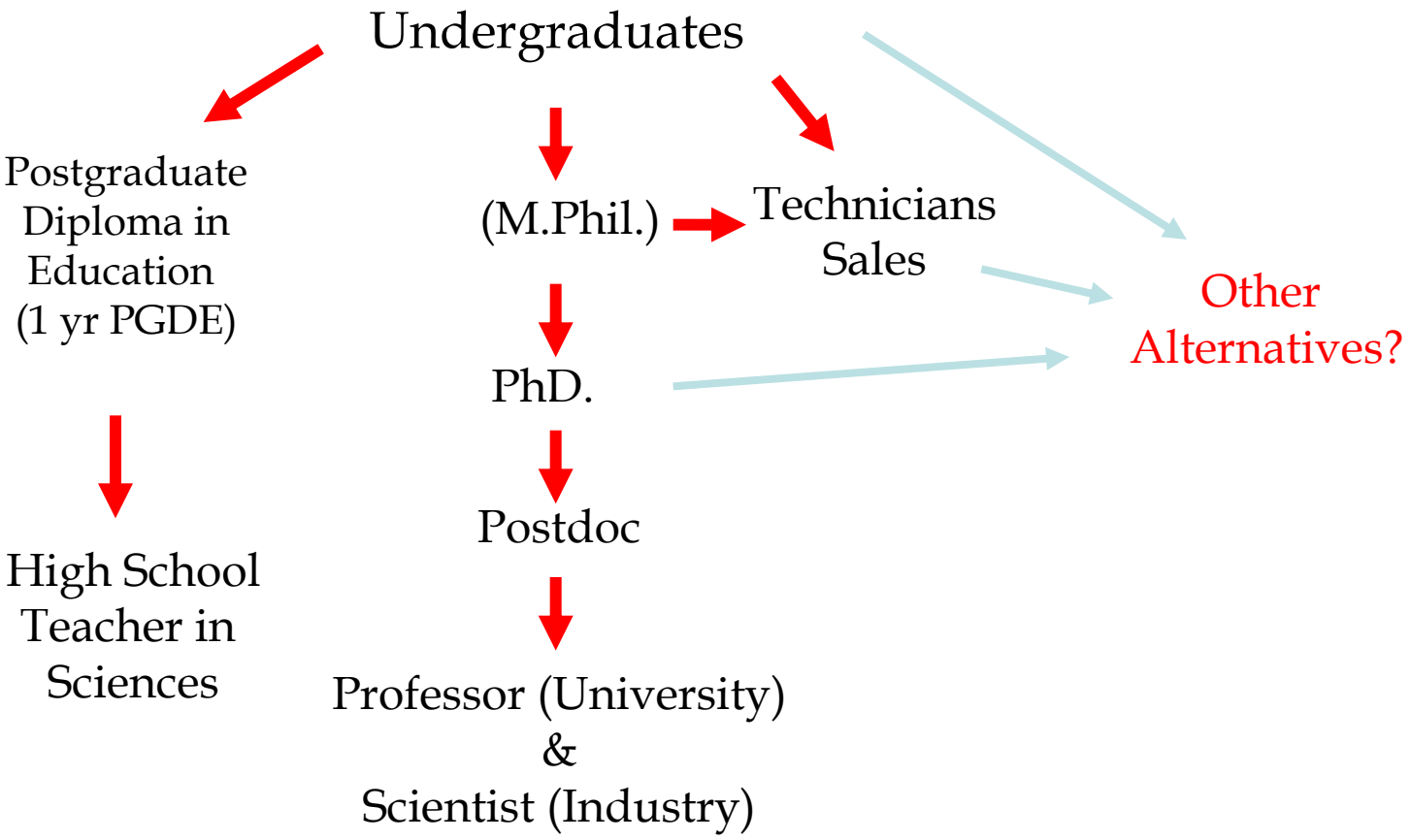
(CEDARS Report, 2016)

2016 MBB Graduates (Employment)

Employers	Job Titles
	* Related to Biotechnology/Biosciences
Educational Institutions -	
- The Chinese University of Hong Kong	* - Research Assistant
Community, Social and Personal Services -	
- BGI Hong Kong	* - Lab Technician
- Tech Dragon Limited	* - Laboratory Technician
- Organization's name not reported	- Teacher
Commerce and Industry -	
- Action X-Ray & Medical Diagonstic Centre	* - Medical Laboratory Assistant
- GlaxoSmithKline Limited	* - Medical Service Associate
- Jean Marie Pharmacal Company Limited	* - QA Officer
- John Swire & Sons (H.K.) Ltd	- Sales Operations Assistant
- Johnson & Johnson (Hong Kong) Ltd	* - Clinical Assistant
- St Jude Medical (HK) Ltd	* - Occupation's name not reported
- Tricor Services Limited	- Corporate Service Associate

(CEDARS Report, 2017)

Career development of science students



Alternatives for MBB Graduates

Undergraduates/Postgraduates

Trainees at Investment Bank Management Consultant

MBA/CFA

Seniors/CEO/ Financial Analyst

CPE (HK SPACE or UK)
2 year part time

Conversion Course (1 yr)

PCLL (1 yr)
(300 spaces/1000 applicants)

Lawyers (Hong Kong)

IP lawyers (Patents)

Conversion Course
(1 year part time,
4 months full time)

HKI CPA Qualifying exam

Accountants

Major & Minor options

- Major/Double Major in MBB
- Minor in MBB
- Minor in other science subject
- Minor in other Faculties (Business, Social Sciences, Arts, Engineering, etc).

Non-academic skills

- Good Language ability (Oral, Listening)
- Common sense (Know this world!)
- Communication skills (Do not be shy!)
- Mature/Easy characters
- Academic Exchange/Leadership in ECA
- Independent thinking
- Self-motivated learning

I wish you enjoy your study at HKU!!

Your future….

June 1990, CUHK, Biochemistry

Executive Director
BGI-Hong Kong

Civil
Servant

Finance

PhD (Cambridge)
Professor, CUHK

Vice President of
a Biotech Co.
Stock no: 1298

May, 2017

MBB Student Peer Advisers (SPAs)

Ms. POON Hoikiu, Year 2
Email: kphoikiu@hku.hk

Ms. Miss LIM Hui Yuan, Year 2
Email: huiyuan@hku.hk

General roles of SPAs:

- *to offer advice in relation to academic studies to freshmen*
- *to facilitate freshmen's smooth transition from secondary to university education.*

Specific roles of SPAs:

- *to offer assistance during the add/drop period for freshmen: by performing shift duty in the 'Student Peer Advising Corner' counter in the Faculty to assist in checking course selection documents submitted by freshmen and answering their enquiries; and*

Laboratories