

Cell and Molecular Biology (CMB) Programme at CUHK



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What is CMB?

- A new and independent programme from September 2009
- Full support from CUHK & Faculty of Science
- Targeted student numbers: 40 (9.2009) and 50 thereafter
- Current staff members: 7 + 2 (up to 15 in its full capacity)

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Why CMB?

- The first and the only CMB programme in Hong Kong
- A high demand in well-trained students for basic and biomedical research
- CMB will also train students in all-round competence in knowledge, laboratory skills, presentation and communication skills critical thinking and problem-solving, IT technology, information processing, teamwork capacity
- CMB graduates would become the first choice for biomedical research and R&D in industry

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CMB Mission and Vision

- To provide best education for the students who are dedicated to research career in life science and medicine
- To provide best-trained personnel for the local biomedical research community and industry
- To train students in all-round competence
- To establish CMB as a research centre with local, national and international recognition and connections

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CMB in the World

- **Molecular and Cellular Biology:** Harvard University, UC Berkeley, University College London, National University of Singapore
- **Molecular, Cellular and Developmental Biology:** Oxford University, Yale University

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The CMB Planning Committee (8.2008-8.2009, appointed by Vice-Chancellor)

- Chairman, Research Committee of CUHK
- Dean, Faculty of Science
- Dean (representative), Faculty of Medicine
- Director of CMB
- Core members of CMB (X3)

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Current CMB Staff

(newly recruited members are expected to join)



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The Current CMB Team

- Excellent track records in Teaching & Research
- Awardees of Faculty and University teaching awards
- Supervisors of Best Graduate Student Research Output Awardees
- Awardees of University Excellence Research Award

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CMB is new-unique-innovative

- New, unique and innovative curriculum
- Outcome-based teaching and learning
- Model organisms for research & teaching

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CMB Admission Requirements

HKALE:

(a) AL Chemistry + one AL science subject (or two AS science subjects); or (b) AL Biology + AS Chemistry and one other AL/AS science subject

HKCEE:

Good grades in two languages (English and Chinese), Biology, Chemistry, and one science or engineering subject

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CMB curriculum: available courses

Biology	Biochemistry	Others
<ul style="list-style-type: none"> • Cell Biology • General and Molecular Genetics • General Microbiology • Plant Physiology • Animal Physiology • Developmental Biology • Genetic Engineering • Bioinformatics and Proteomics • Microbial Biotechnology 	<ul style="list-style-type: none"> • Fundamentals of Biochemistry • Molecular Biology • Methods in Biochemistry • Basic and Applied Immunology • Aspects of Neuroscience • Molecular Endocrinology • Clinical Biochemistry 	<ul style="list-style-type: none"> • Plant Biotechnology • Animal Biotechnology • Basic Statistical Concepts and Methods I • Introduction to Pharmacy • Pharmaceutical Analysis • Principles of Drug Actions

(Required courses & major elective courses)

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CMB curriculum is unique & innovative

Lecture Courses	Lab Courses	STOT Courses
<ul style="list-style-type: none"> • Biology of Model Organisms for CMB Research • Protein Trafficking • Protein Folding • Signal Transduction • Cancer Cell Biology • Stem Cell Biology • Neuronal Cell Biology • Genomics • Transcriptomics • Metabolomics • Current Topics in Cell Biology • Current Topics in Molecular Biology • Current Topics in Biotechniques 	<ul style="list-style-type: none"> • CMB Laboratory I - Technologies in Cell Biology and Cell Imaging • CMB Laboratory II - Essential Techniques in Molecular Biology 	<ul style="list-style-type: none"> • Literature Survey in CMB & Scientific Communication • Methodology of Critical Thinking • Creative Scientific Writing • Supervised Research in CMB I • Supervised Research in CMB II

- Lectures: most up-to-date topics taught by experts in the fields
- Lab Courses: specially-designed for CMB students that complement well with STOT
- STOT: all around skills in critical thinking, problem-solving, presentation & research

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Why CMB STOT Courses?

- “17 years of success in classes, come into lab clueless about physics, but became expert physicists 2-4 years later!”
- Prof. Carl Wieman (2001 Nobel Prize in Physics)



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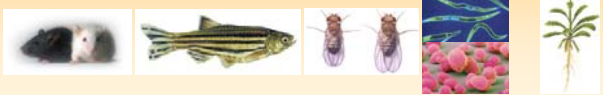
First Impression of the CMB Curriculum

- “CMB graduates will be the first choice of biomedical research at CUHK”
- “No further training is needed for their research or post-graduate studies in medical school”
- Prof. Rossa Chiu (Department of Chemical Pathology at CUHK)

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CMB Research

- To focus on **basic aspects** of cell & molecular biology and address **fundamental biological questions** in:
 - ◆ Cell structure and function
 - ◆ Cell signaling
 - ◆ Developmental biology
 - ◆ Stem cell biology
 - ◆ Neurobiology
- To adopt well-recognized cell systems such as stem cells and top model organisms, e.g., **mouse, zebrafish, Drosophila, C. elegans, Arabidopsis, and yeast**



Why Top Model Organisms?



In 1995, Edward B. Lewis, Christiane Nüsslein-Volhard and Eric F. Wieschaus won the Nobel Prize in Physiology and Medicine for their work on developmental genetics in *Drosophila*.



Paul M. Nurse received his Nobel Prize in Physiology and Medicine in 2001 for unlocking the secrets of cell cycle in the yeast.



In 2002, Sydney Brenner, H. Robert Horvitz and John Sulston were awarded Nobel Prize in Physiology and Medicine for their finding of programmed cell death (apoptosis) in *C. elegans*.



In 2006, Andrew Fire and Craig Mello shared Nobel Prize in Physiology and Medicine for their discovery of RNA interference, again in *C. elegans*.



Recently, the 2007 Nobel Prize in Physiology and Medicine was awarded to Mario R Capecchi, Oliver Smithies and Martin J Evans for their pioneering work on the development of gene targeting technology in the mouse using embryonic stem cells.

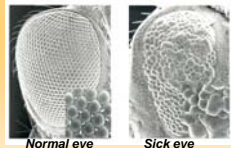
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Research in Prof. Chan's Laboratory

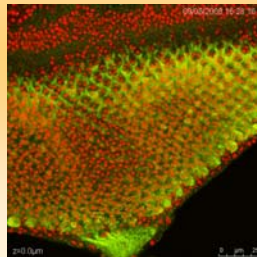
Uses the fruitfly *Drosophila* as models to study human neurological diseases including Alzheimer's (老年痴呆症) and Parkinson's (帕金森症) diseases.



Alzheimer's Disease (老年痴呆症)



Nerve cells in Alzheimer's Disease fly eyes died which resulted in irregular eye shape.



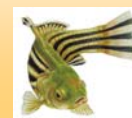
A fly eye:

Red: nuclei

Green: human disease protein

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Research in Prof. Ge's Laboratory (CMB Director)


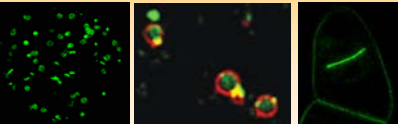



Gonadotropin-independent
Gonadotropin-dependent
Ovarian folliculogenesis

Using zebrafish (*Danio rerio*) as the model, the research in my laboratory focuses on functional analysis of the brain-pituitary-ovarian axis with particular emphasis on roles of a variety of peptide growth factors. The major issues being currently addressed are the molecular mechanisms that control sex differentiation, sex maturation and folliculogenesis, and intercellular communication and intracellular signal transduction in the ovarian follicle. A variety of cutting-edge techniques are used in the research, including gene cloning and manipulation, recombinant protein production and characterization, proteomics analysis, gene knockdown, transgenesis, and promoter analysis.

Research in Prof. Jiang's Laboratory

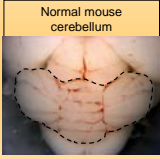
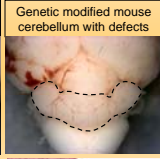



- Protein targeting
- Organelle biogenesis
- Organelle isolation and proteomics
- Plant biotechnology

Research in Prof. Kwan's Laboratory


How can a single cell (fertilized egg) develop into a multicellular organism with specialized structures and organs?

- This question also becomes a very important medical question.
- A newborn may possess some tragic abnormality when the embryo development goes wrong as shown in the figures as some genes are mutated by genetic engineering technology.
- The knowledge of normal development is the base for understanding abnormal developmental diseases.








Research in Prof. Lam's Laboratory

- Gene function and crop improvement
- Manipulation of plant nitrogen sink-source relationship via genetic engineering
- Identification of novel and useful genes from soybean and rice to be used in genetic engineering for stress tolerance and disease resistance in plants

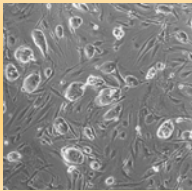
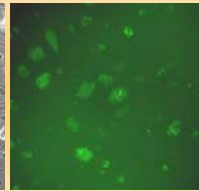


Arabidopsis




Research in Prof. Tsang's Laboratory

Embryonic Stem Cell (ESC) Research

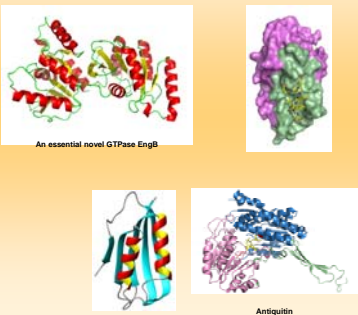


a)  b) 

Mouse embryonic stem cell line which has been genetically-engineered to stably express GFP by lentivirus-mediated gene transfer technology. Phase contrast (a), green fluorescence (b).



Research in Prof. Wong's Laboratory

Structure-function study of proteins

Centre for Cell and Development Biology

(KH\$8.8M from CUHK Scheme B - Specialized Areas, 2009-2013)




Future Perspective of CMB Postgraduate Student Training

- Proposed to start from September 2010
- A strong training program for graduate students (Ph.D. and M.Phil.)
- Research skills, critical thinking, experiment design, problem-solving, novel ideas for scientific research
- Local, national and International reputations

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Dr. Jason LAM (as an example)

- MBT B.Sc. (2001-2004)
- FYP (final year project) in Prof. Jiang's lab
- Ph.D. student (2004-2008) in Prof. Jiang's lab
- Awards and excellent publication records
- Thesis defense on 8.2008 (but got an offer from UC Berkeley on 9.2007 for a postdoc position already)
- Postdoc at UC Berkeley (Prof. Randy Schekman, editor-in-chief of PNAS)



Career Perspective of CMB Graduates

- All-round competence in facing future challenges in any disciplines
- Research career in basic and biomedical research as well as in industry R&D
- Post-graduate studies (HK & oversea)
- Government labs etc.
- Teachers

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The Future of CMB

- A new, exciting and challenging programme
- Unique opportunity with bright future in life science and basic research
- Dedicated CMB staff, unique curriculum
- Full support from CUHK and Faculty of Science
- **You are most welcome to join CMB!**

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