



# Introduction to Molecular Biology

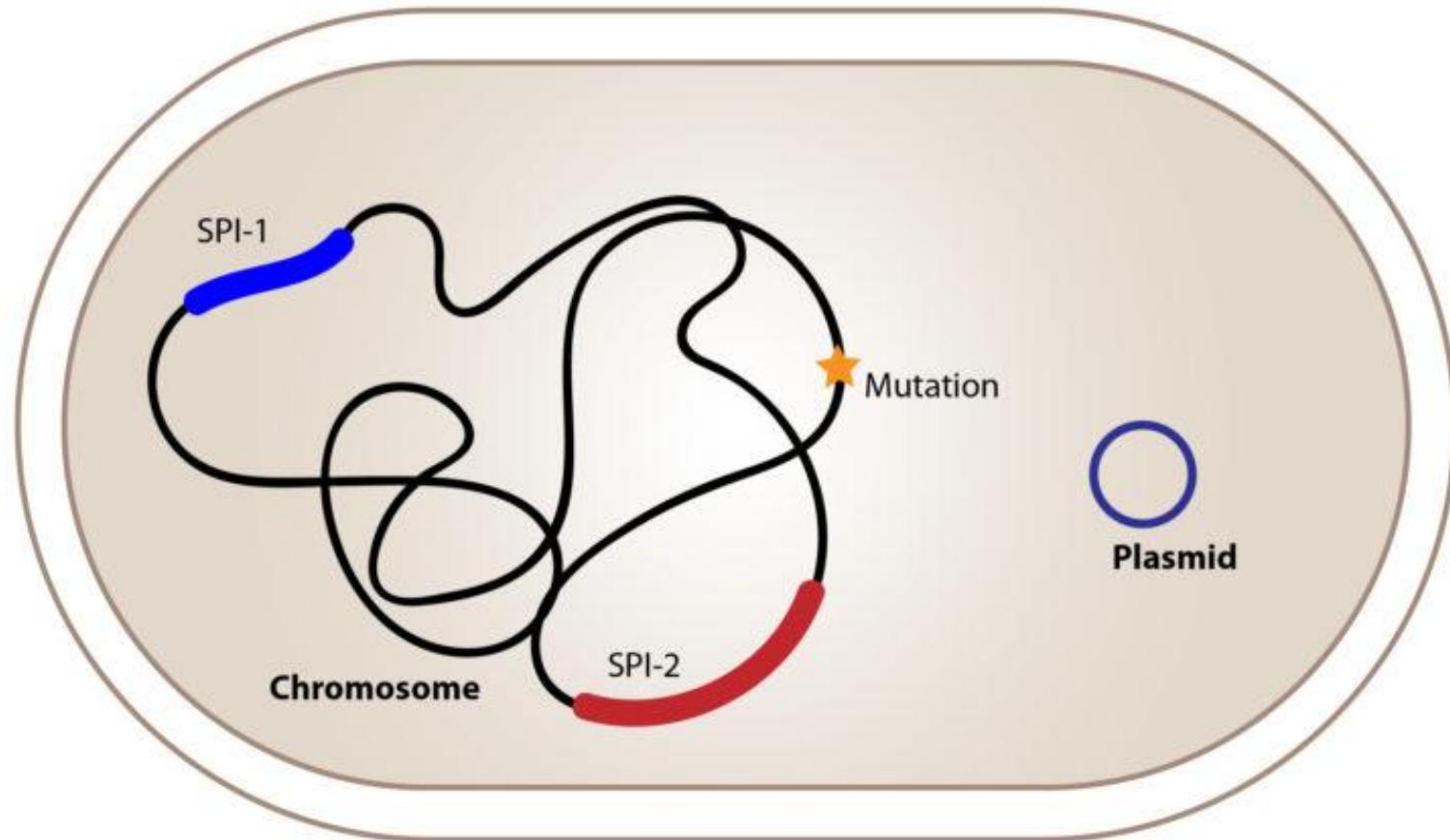
Phuc Loi Luu, PhD

Email: Luu.p.loi@googlemail.com

Zalo: 0901802182

Jan 25 2025

# Prokaryotes from Genome to Proteins



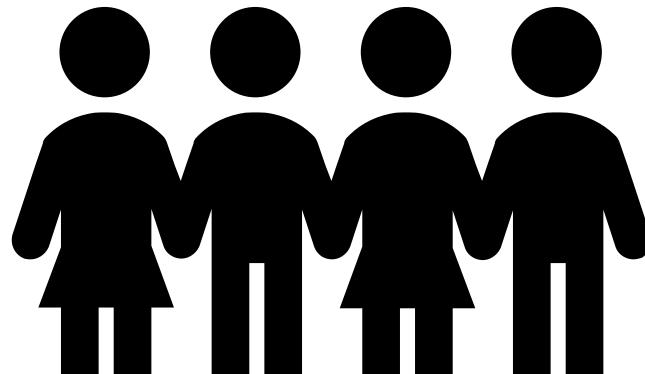
# **Content**

- **Class member introduction**
- **Curriculum of Introduction to Molecular Biology**
- **Projects and important dates**
- **Evaluation for the course**
- **How Introduction to Molecular Biology lecture work?**

# Class member introduction

Bạn phẻ  
không?

Phẻ! Cảm  
 ơn bạn.  
Còn bạn?



## PHUC–LOI LUU, PhD



### **Head of Scientific Research Office**

**Current Affiliation** Institute for Applied Research in Health Sciences and Aging (ARiHA) - Thong Nhat Hospital  
01 Ly Thuong Kiet street, Tan Son Nhat ward, HCM city, Vietnam

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**Webpage** <https://scholar.google.com.au/citations?user=KPIqpJsAAAAJ&hl=en>

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[loilp@bvtn.org.vn](mailto:loilp@bvtn.org.vn)

# **Education and Research Interest**

# EDUCATION AND PROFESSION

2023 – 2024	<b>Tam Anh Research Institute (TAMRI)</b>	<i>Head of Data Science Division</i>	Ho Chi Minh City, Vietnam
2022 – 2023	<b>Zymo Research</b>	<i>Bioinformatic Group Leader</i>	Ho Chi Minh City, Vietnam
2014 – 2022	<b>Garvan Institute of Medical Research,</b> UNSW Sydney	<i>Bioinformatics researcher in Computational Cancer Genomics and Epigenomics under the supervision of Prof. Susan Clark</i> <i>Conjoint Senior Lecturer</i>	Sydney, Australia
2011 - 2014	<b>Max Planck Institute for Molecular Biomedicine,</b> University of Muenster	<i>PhD student in stem cell computational biology under the supervision of Prof. Hans R. Schöler</i>	Muenster, Germany
2010 – 2011	<b>KIST–Europe</b>	<i>Data Scientist</i>	Saarbruecken, Germany
2008 – 2010	<b>Max Planck Institute for Informatics,</b> University of Saarland	<i>Bioinformatics Post-graduate student under the supervision of Prof. Thomas Langauer</i>	Saarbruecken, Germany
2005 – 2008	<b>Nong Lam University</b> - Ho Chi Minh City	<i>Lecturer</i>	Ho Chi Minh City, Vietnam
2000 – 2005	<b>University of Science</b> - Ho Chi Minh City National University	<i>Bioinformatics undergraduate student under the supervision of Prof. Ho Huynh Thuy Duong</i>	Ho Chi Minh City, Vietnam

# Undergraduate at University of Science - Ho Chi Minh City National University (2000 – 2005)

- Major: Bioinformatics

- Research Topics:

- Genotyping HCV, HBV, HPV
- Anti-biotics resistance in bacteria

## PENICILLIN BINDING PROTEINS (PBPs) IN *STREPTOCOCCUS PNEUMONIAE*: DATABASE SETTING UP AND APPLICATION

Luu Phuc Loi, Thai Ke Quan, Nguyen Hoang Chuong, Thai Thien Minh, Ho Huynh Thuy Duong

Department Genetics, Faculty of Biology, University of Natural Sciences, Viet Nam National University - Ho Chi Minh City

### ABSTRACT

$\beta$ -Lactam antibiotics inhibit the growth of *Streptococcus pneumoniae* by inactivation of cell-wall-synthesizing enzymes, the penicillin-binding proteins (PBPs). Resistance to  $\beta$ -lactam antibiotics of *S. pneumoniae* is essentially due to altered PBPs with decreased affinities to the antibiotic. We investigated relationship between point mutations on pfp genes – pfp1a, 2b, 2x - and penicillin resistance in *S. pneumoniae* clinical isolates. With sequences determined from local isolates combining to data retrieved from GenBank, we established a database named PGD (Penicillin Binding Protein Gene Database) which integrated information about nucleotide sequence and point mutations of 472 strains. Using the set up database, we applied a PCR-based protocol to detect penicillin resistant *S. pneumoniae* strains. The protocol detects 18/20 resistant strains and needs further improvement.

## Hepatitis C virus isolate MB14 5' UTR

GenBank: AY690659.1

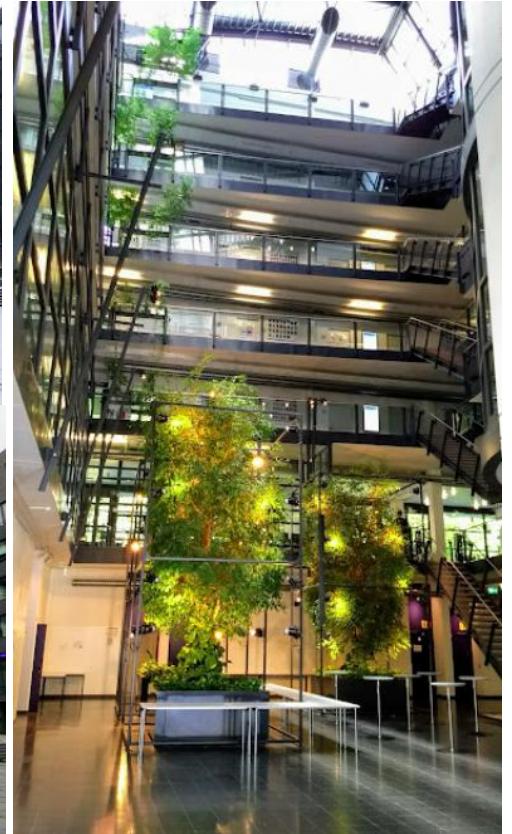
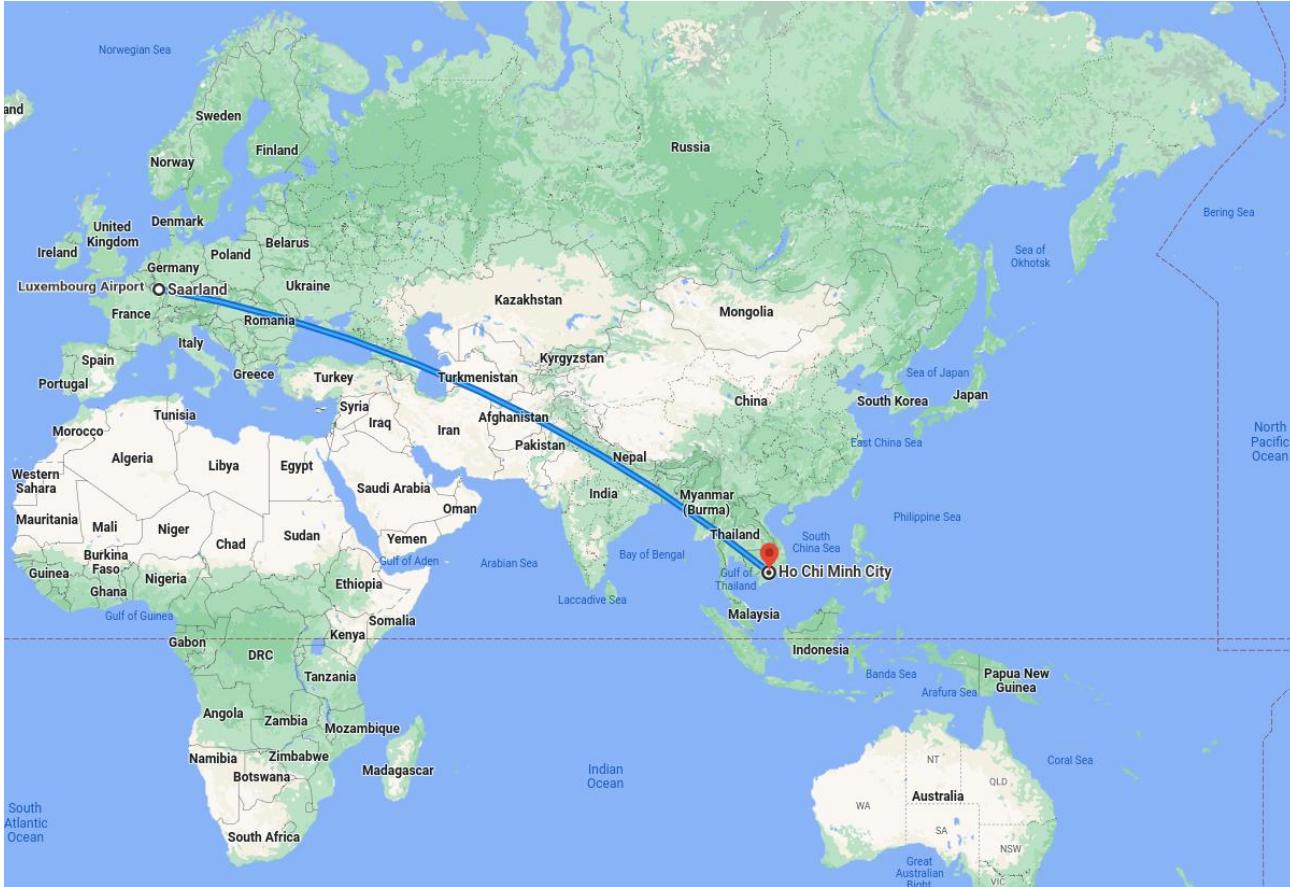
[FASTA](#) [Graphics](#) [PopSet](#)

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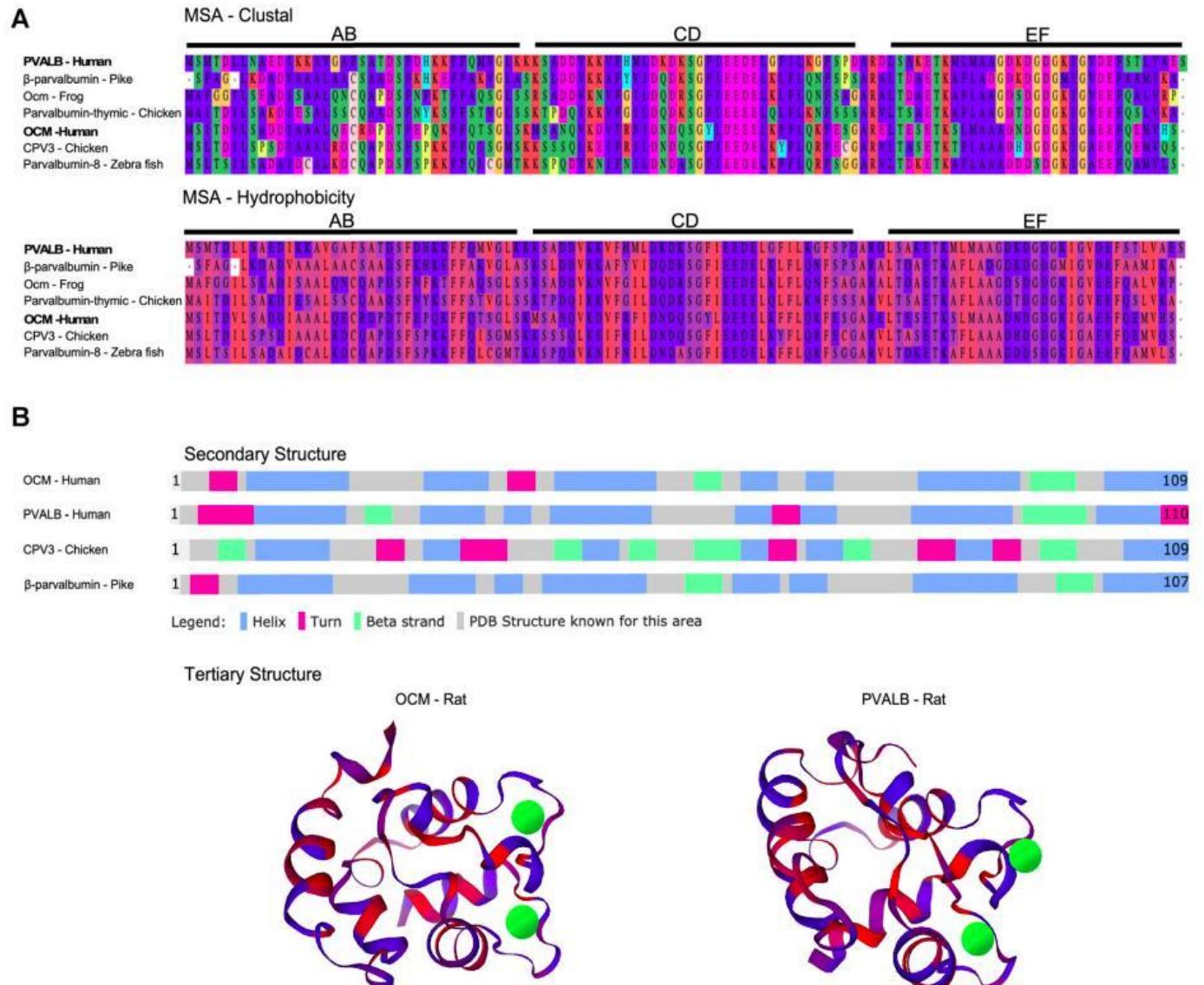
LOCUS AY690659 94 bp RNA linear VRL 22-AUG-2004  
DEFINITION Hepatitis C virus isolate MB14 5' UTR.  
ACCESSION AY690659  
VERSION AY690659.1  
KEYWORDS .  
SOURCE Hepacivirus C  
ORGANISM [Hepacivirus C](#)  
Viruses; Riboviria; Orthornavirae; Kitrinoviricota; Flasuviricetes; Amarillovirales; Flaviviridae; Hepacivirus.  
REFERENCE 1 (bases 1 to 94)  
AUTHORS Nguyen,H.C., Ho,T.T.T., Luu,P.L. and Ho,H.T.D.  
TITLE Genotyping of Hepatitis C virus by real-time RT-PCR  
JOURNAL Unpublished  
REFERENCE 2 (bases 1 to 94)  
AUTHORS Nguyen,H.C., Ho,T.T.T., Luu,P.L. and Ho,H.T.D.  
TITLE Direct Submission  
JOURNAL Submitted (20-JUL-2004) Genetics, University of Natural Sciences Viet Nam National University - Ho Chi Minh City, 227 Nguyen Van Cu Street Dist. 5, Ho Chi Minh City 0848, Viet Nam  
FEATURES Location/Qualifiers  
source 1..94  
/organism="Hepacivirus C"  
/mol\_type="genomic RNA"  
/isolate="MB14"  
/db\_xref="taxon:[11103](#)"  
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5' UTR <1..>94  
ORIGIN //  
1 ctcgcttccct ggagctggcc ggatccgagg atgatttcat gtgcgtatgag ctgcctgacg  
61 gccaggaacg accgggtcct ttcttgatc accc

The American journal of tropical medicine and hygiene 73(6):55-55 (2005).

# Master degree in Bioinformatics at Max Planck Institute for Informatics University of Saarland in Germany (2007 - 2010)



# Identifying functional discriminative motifs in protein families



- Protein structures and functions
- Bigdata mining and Machine Learning



# PhD at Max Planck Institute for Molecular Biomedicine and University of Muenster in Germany (2011 - 2014)



# PhD in Bioinformatics and iPS technology

- Research:

- The dynamics of stem cell and induced pluripotent stem cell (iPS) epigenomes using genome-wide Next Generation Sequencing (NGS)
- Somatic memory in iPS technology
- Bioinformatics pipeline development



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Disclosing the crosstalk among DNA methylation, transcription factors, and histone marks in human pluripotent cells through discovery of DNA methylation motifs

Phuc-Loi Luu<sup>1</sup>, Hans R. Schöler<sup>2,3</sup> and Marcos J. Araúzo-Bravo<sup>1,4</sup>

Author Affiliations

<sup>1</sup>Computational Biology and Bioinformatics Group, Max Planck Institute for Molecular Biomedicine, 48149 Münster, Germany;

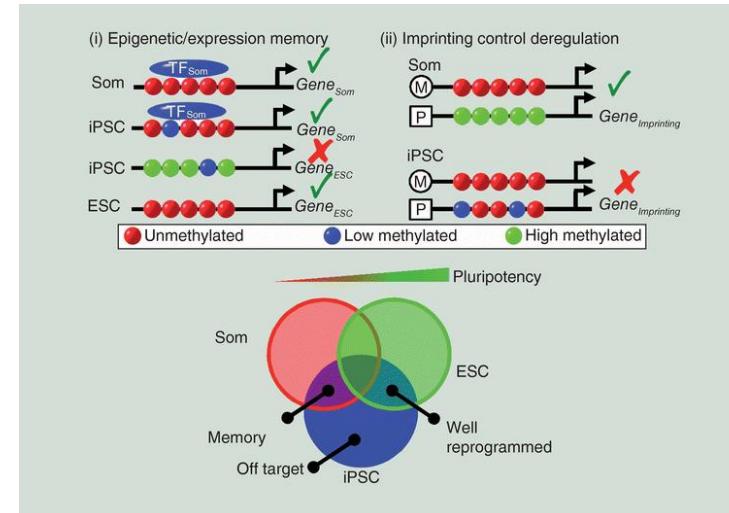
<sup>2</sup>Department of Cell and Developmental Biology, Max Planck Institute for Molecular Biomedicine, 48149 Münster, Germany;

<sup>3</sup>University of Münster, Medical Faculty, 48149 Münster, Germany

EPIGENOMICS, VOL. 10, NO. 2 | RESEARCH ARTICLE  
Rules governing the mechanism of epigenetic reprogramming memory

Phuc-Loi Luu<sup>†</sup>, Daniela Gerovska<sup>†</sup>, Hans R Schöler & Marcos J Araúzo-Bravo

Published Online: 16 Jan 2018 | <https://doi.org/10.2217/epi-2017-0098>



P3BSseq: parallel processing pipeline software for automatic analysis of bisulfite sequencing data

Phuc-Loi Luu, Daniela Gerovska, Mikel Arrospide-Elgarresta, Sugoi Retegi-Carrión, Hans R Schöler, Marcos J Araúzo-Bravo

Bioinformatics, Volume 33, Issue 3, 1 February 2017, Pages 428–431, <https://doi.org/10.1093/bioinformatics/btw633>

Published: 06 October 2016 Article history ▾

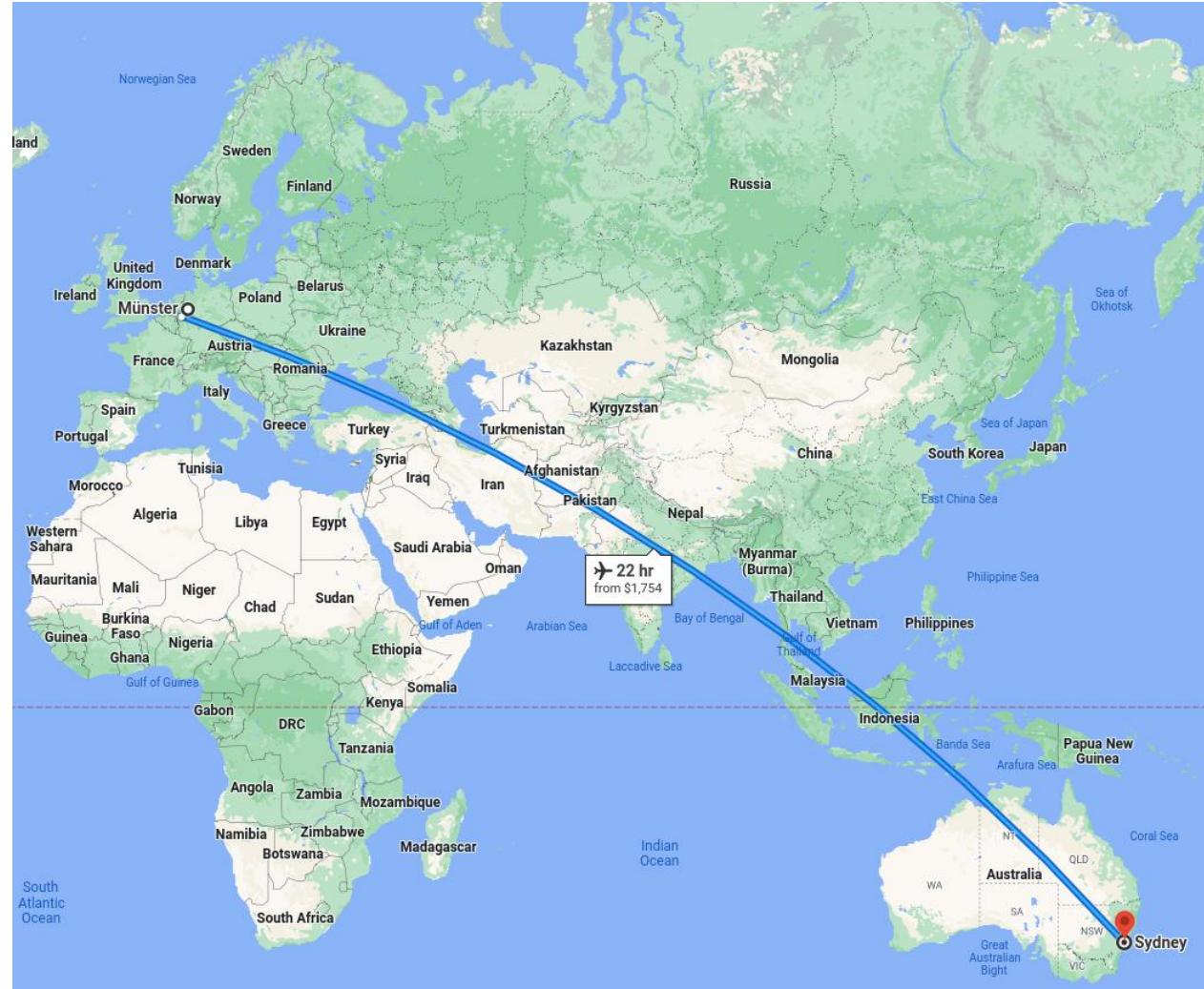
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## Abstract

## Motivation

Bisulfite sequencing (BSseq) processing is among the most cumbersome next generation sequencing (NGS) applications. Though some BSseq processing tools are available, they are scattered, require puzzling parameters and are running-time and memory-usage demanding.

# Seven years of research at Garvan Institute of Medical Research in Australia (2014 - 2022)



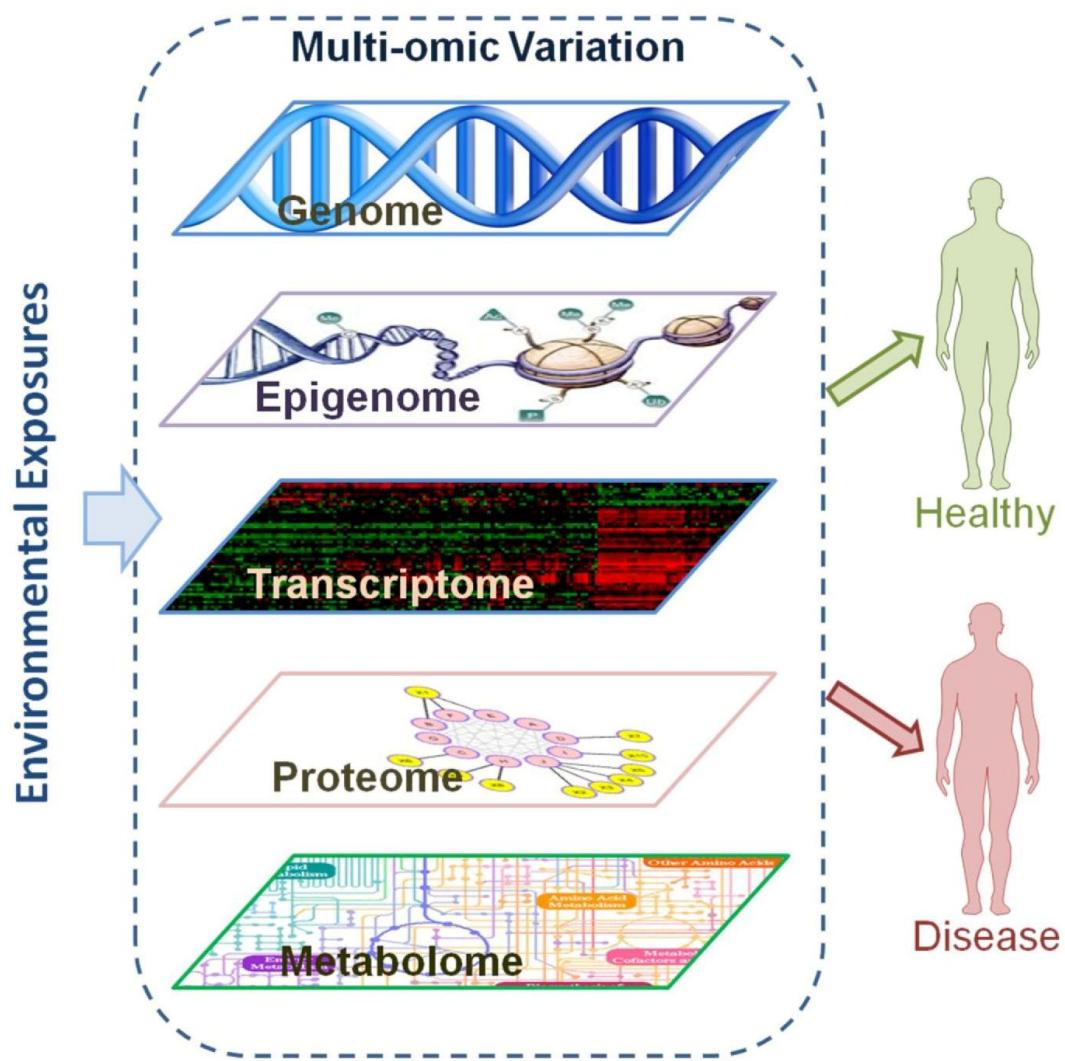
# Seven years of research at Garvan Institute of Medical Research in Australia (2014-2022)

- Major: Bioinformatics and Machine Learning
- Research:
  - Cancer Genomics and Epigenomics
  - Single cell and Spatial transcriptomics technology and other diagnosis methods
  - Bioinformatics pipeline development



# More than one year at Zymo Research (Sep 2022-Nov 2023)

- Microbiomics
- Epigenomics
- Transcriptomics
- Proteomics
- Metabolomics
- Bioinformatics



# Curriculum of Introduction to Molecular Biology

The screenshot shows a GitHub repository named "Molecular\_Biology". The repository is public and has one branch and no tags. The README file contains information about the course, including the teacher (TS. Lưu Phúc Lợi) and co-instructors (ThS. Cao Phương Thảo and CN. Văn Hồ Hoàng Kim). It also links to PDF and BOOK versions of the curriculum.

**Molecular\_Biology** Public

Pin Watch 0

main · 1 Branch · 0 Tags

Go to file Add file Code

luuloi Update README.md · now 62d6472 · now 3 Commits

README.md Update README.md · now

README

**Molecular Biology**

Môn Sinh Học Phân Tử cho chuyên ngành Công Nghệ Sinh Học - Đại Học Đồng Tháp

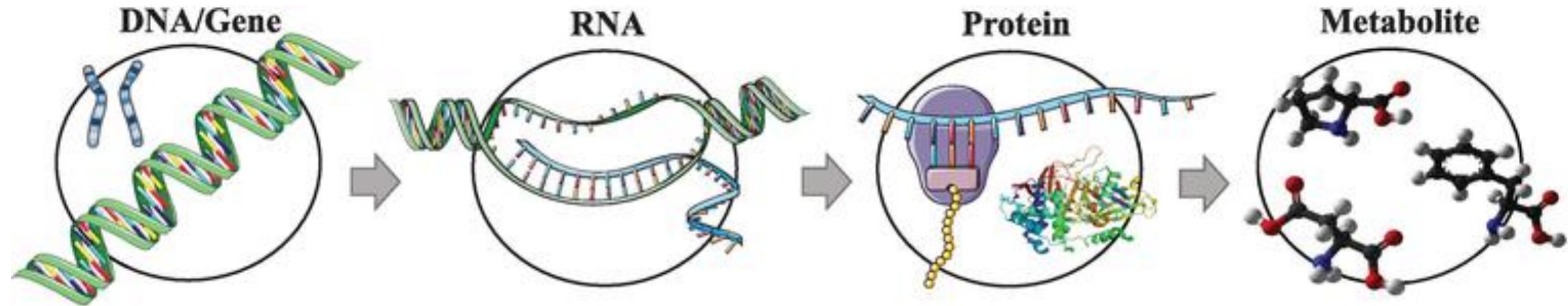
- Giảng viên: TS. Lưu Phúc Lợi
- Trợ giảng: ThS. Cao Phương Thảo và CN. Văn Hồ Hoàng Kim

**00. Introduction to Molecular Biology [Loi] - 25/01/2026; Room 102 H2**

- [PDF](#)
- [BOOK](#)

[https://github.com/luuloi/Molecular\\_Biology/](https://github.com/luuloi/Molecular_Biology/)

# Central Dogma: Gene Mutation and Diseases



Genomics

PAH gene  
Ref ...ATCGAT...  
P1 ...AACGAT...  
  
NM\_000277.3(PAH):c.971T>A

Transcriptomics

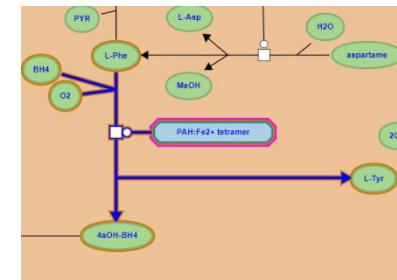
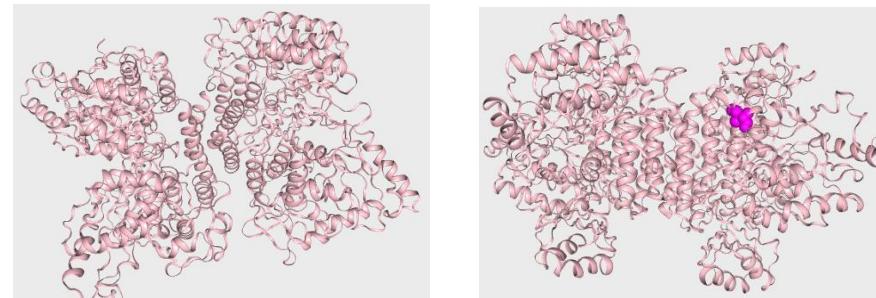
PAH mRNA  
Ref ...AUCGAU...  
P1 ...AACGAU...  
  
NM\_000277.3(PAH):c.971T>A

Proteomics

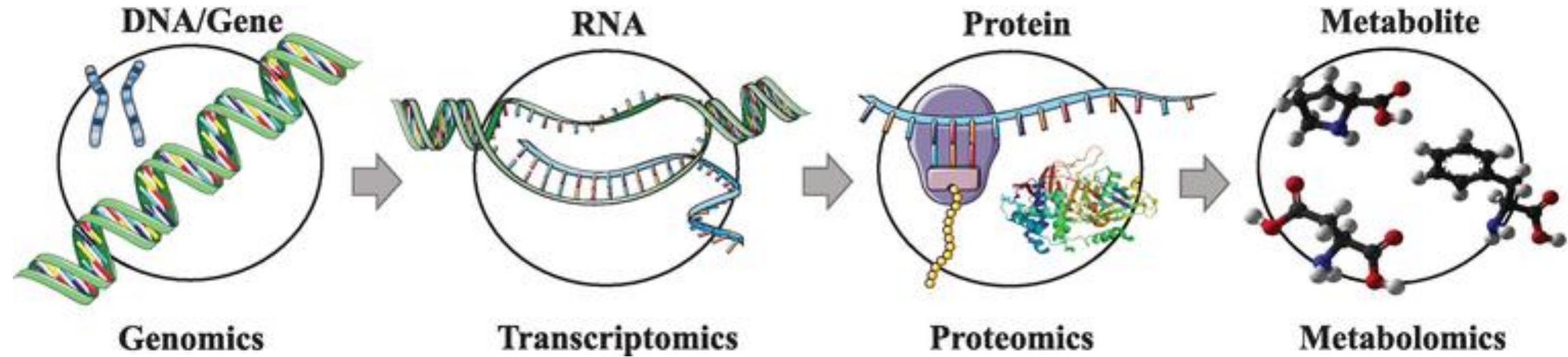
PAH protein  
Ref ...Ile-Asp...  
P1 ...Asn-Asp...  
  
NM\_000277.3(PAH):p.Ile324Asn

Metabolomics

PAH  
Ref Phe → Tyr  
  
PAH  
P1 Phe ~~→~~ Tyr



# Content of Introduction to Molecular Biology

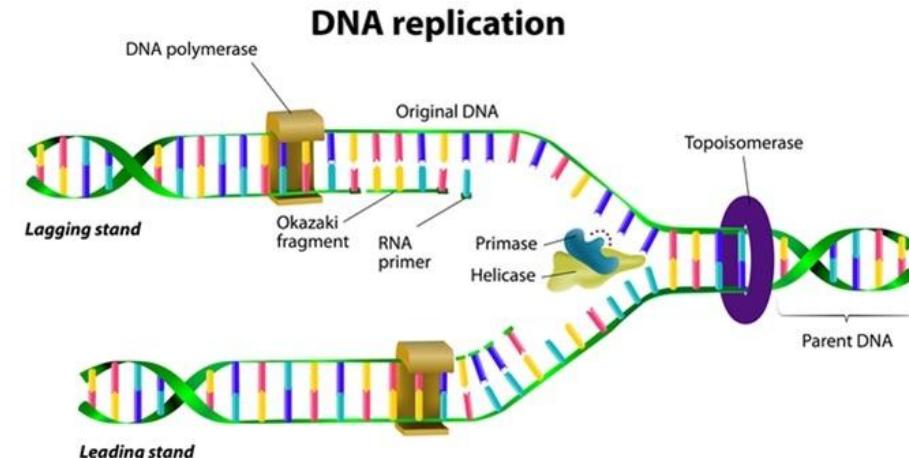


Part 1: DNA Replication and Repair

Part 2: Transcription and Transposition

Part 3: RNA Processing and Translation

Part 4: Molecular Techniques



# Projects for Mid-Term and important dates

No	Project	Aim	Requirement	Group
1				
2				
3				
4				
5				
6				

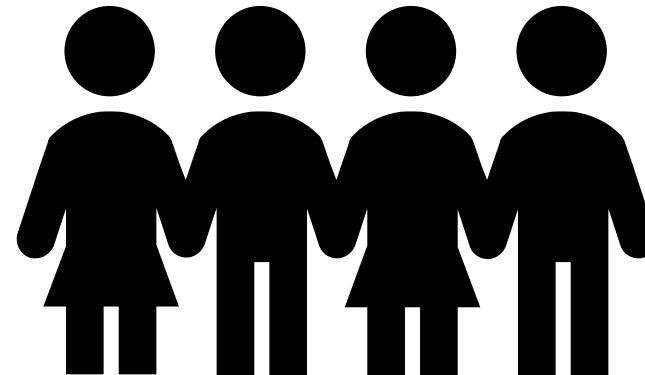
# Evaluation for the course

- Presentation date (Mid-term exam): ?
- Max 3 min each group (3 students)
- 1 to 2 questions each student
- Mid-term score = Report (50%) + Presentation (40%) + Slide (10%)
  
- Final exam:?
- Final exam score = Quizzes (40%) + Final Test (60%)

# No attendance checking

Nghỉ học  
được không  
bạn?

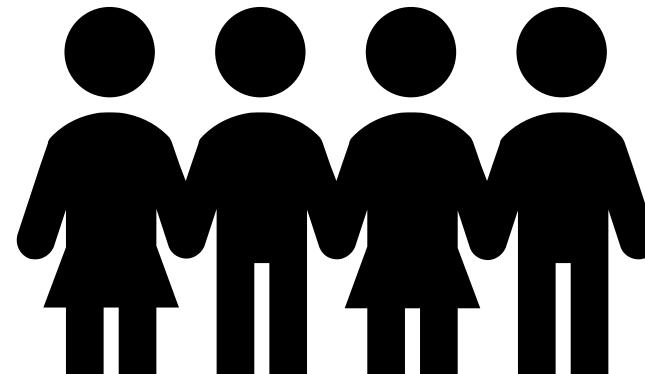
Được nhe!



# No attendance checking

Nghỉ học  
được không  
bạn?

Nhưng khó  
đậu nhe!



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vnpatho informatics

Kênh chia sẻ kiến thức Giải Phẫu bệnh hiện đại, Tin sinh học và Khoa học Y sinh. Bao gồm các bài giảng về:

- Chuyên ngành Giải Phẫu bệnh cơ bản, chuyên sâu
- Các chuyên ngành y khoa và Khoa học Y sinh khác
- Kỹ thuật labo (giải phẫu bệnh, sinh học tế bào và phân tử)
- Xử lý và phân tích dữ liệu giải trình tự thông lượng cao (DNA-seq, RNA -seq, ATAC-seq, etc.)
- Khoa học dữ liệu khác: Data Visualization, Machine Learning
- Điểm báo (journal club): đọc và review các bài báo khoa học y sinh

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