Introduction to

Molecular Biology

Phuc Loi Luu, PhD

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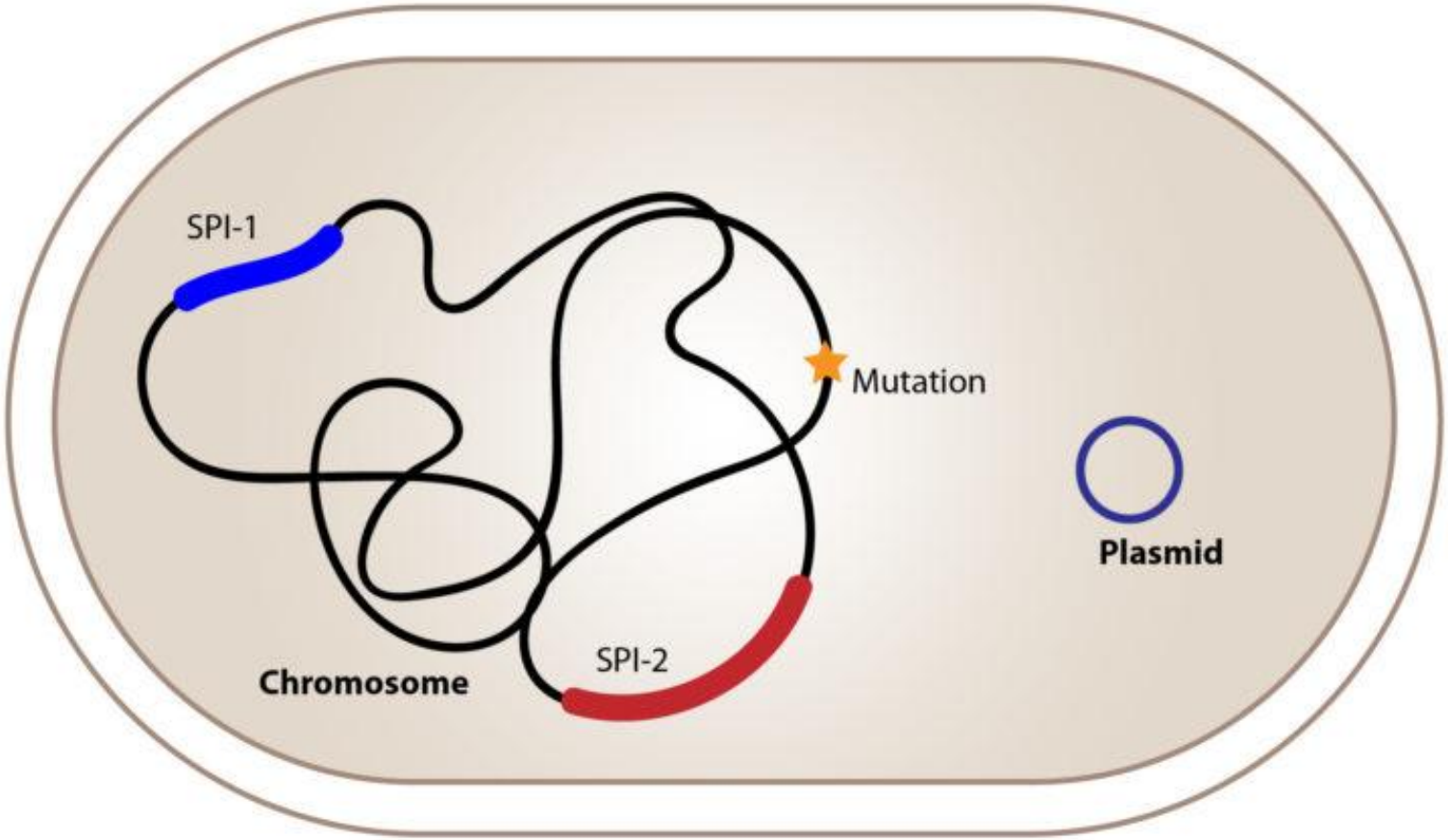
Jan 25 2025

Prokaryotes from Genome to Proteins



Content

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

Class member introduction

PHUC–LOI LUU, PhD

Current Affiliation	**Head of Scientific Research Office** 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
Webpage	https://scholar.google.com.au/citations?user=KPIqpJsAAAAJ&hl=en
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Address	592/17 Lac Long Quan, Hoa Binh ward, HCM city, Vietnam
Home	5 Rose st, Sefton, Sydney 2162 Australia
Telephone	+84 (0)901802182 **E–mail** luu.p.loi@googlemail.com loilp@bvtn.org.vn

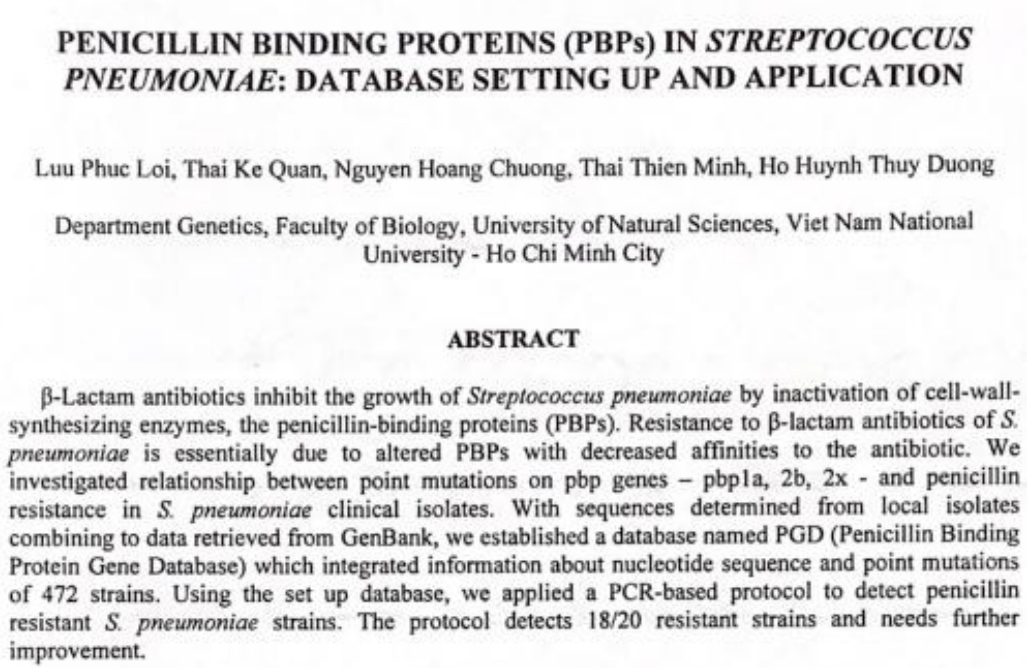
Education and Research Interest

EDUCATION AND PROFESSION

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

β-Lactam antibiotics inhibit the growth of *Streptococcus pneumoniae* by inactivation of cell-wall-synthesizing enzymes, the penicillin-binding proteins (PBPs). Resistance to β-lactam antibiotics of *S. pneumoniae* is essentially due to altered PBPs with decreased affinities to the antibiotic. We investigated relationship between point mutations on pbp genes – pbp1a, 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

Go to:

```
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
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                     /isolate="MB14"
                     /db_xref="taxon:11103"
                     /country="Viet Nam"
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ORIGIN
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       61 gccaggaacg accgggtcct ttcttggatc accc
//
```
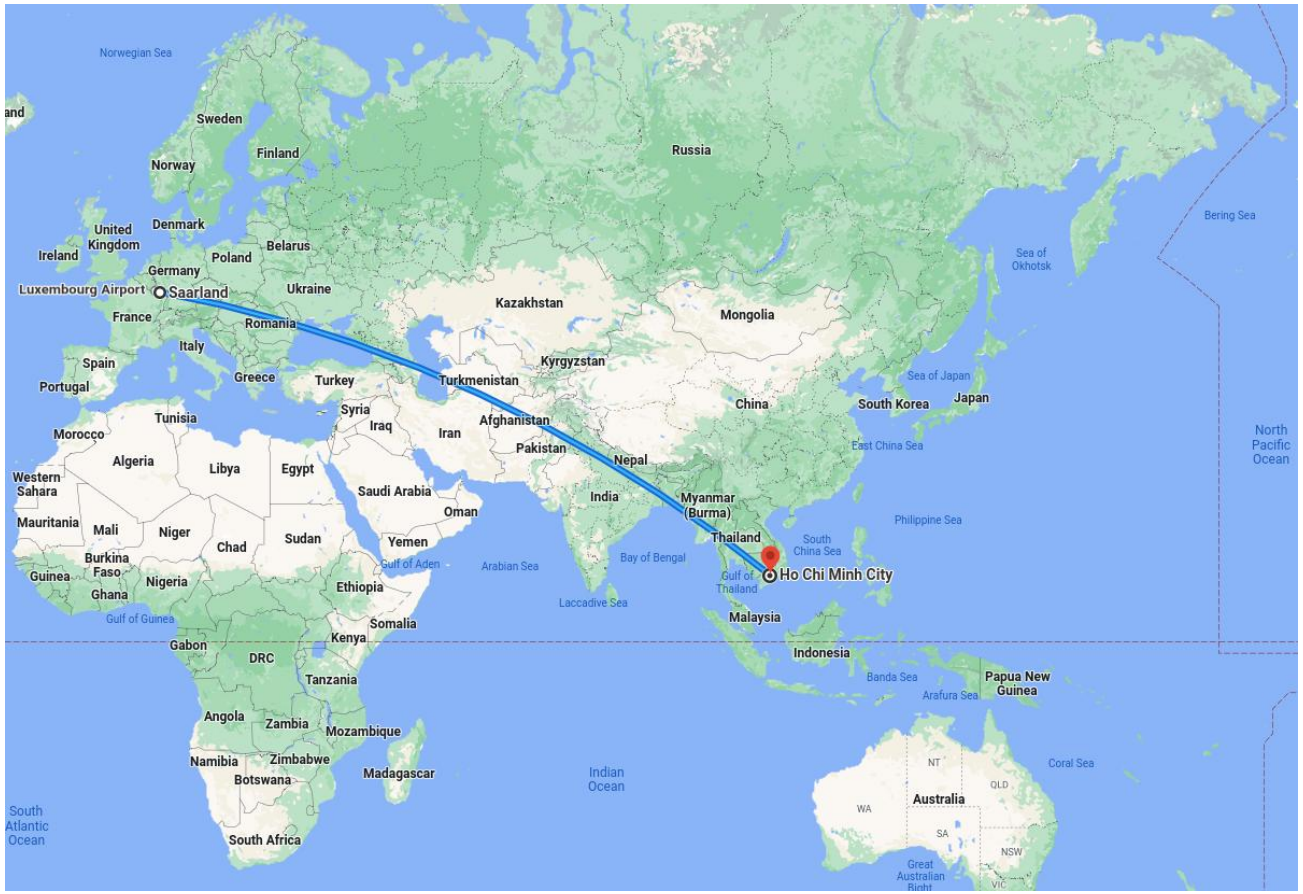
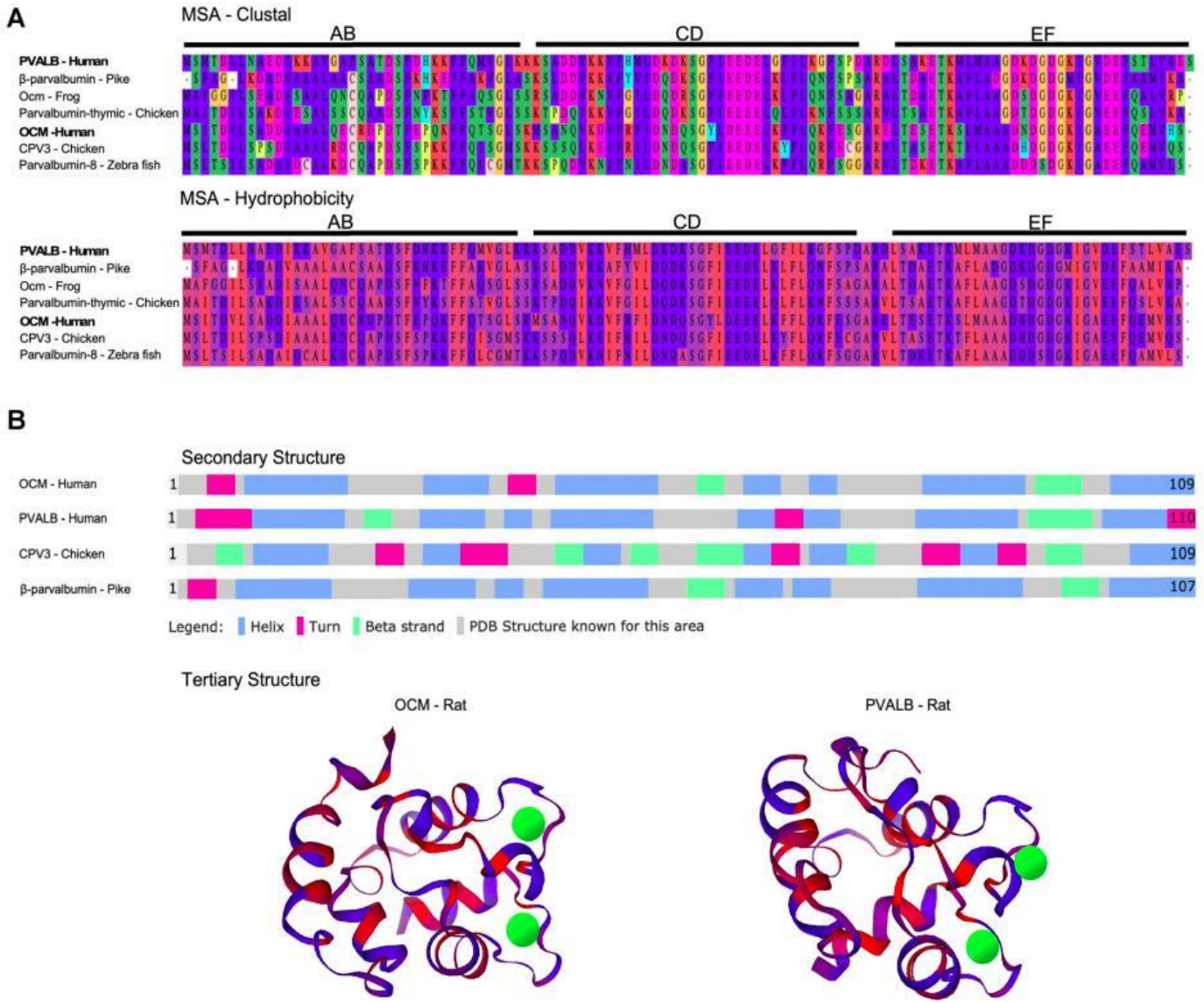

The American journal of tropical medicine and hygiene 73(6):55-55 (2005).

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

CSH PRESS GENOME RESEARCH

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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[1], Hans R. Schöler[2,3] and Marcos J. Araúzo-Bravo[1,4]

Author Affiliations

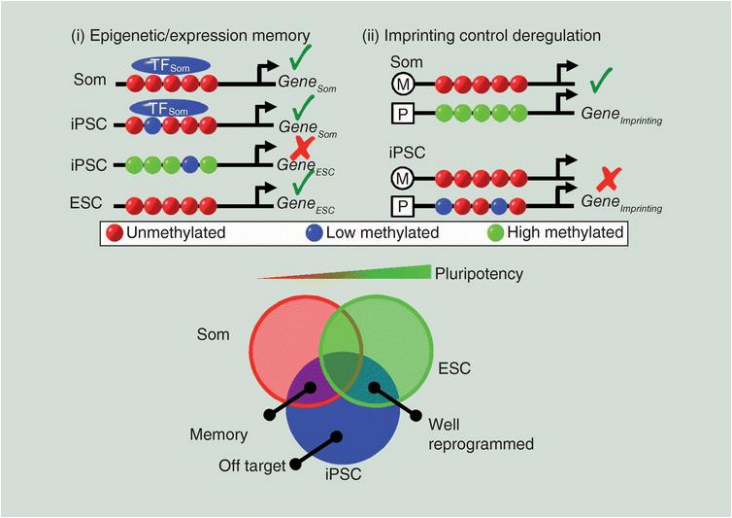
[1]Computational Biology and Bioinformatics Group, Max Planck Institute for Molecular Biomedicine, 48149 Münster, Germany;
[2]Department of Cell and Developmental Biology, Max Planck Institute for Molecular Biomedicine, 48149 Münster, Germany;
[3]University of Münster, Medical Faculty, 48149 Münster, Germany

EPIGENOMICS, VOL. 10, NO. 2 | RESEARCH ARTICLE

Rules governing the mechanism of epigenetic reprogramming memory

Phuc-Loi Luu‡, Daniela Gerovska‡, 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

FREE

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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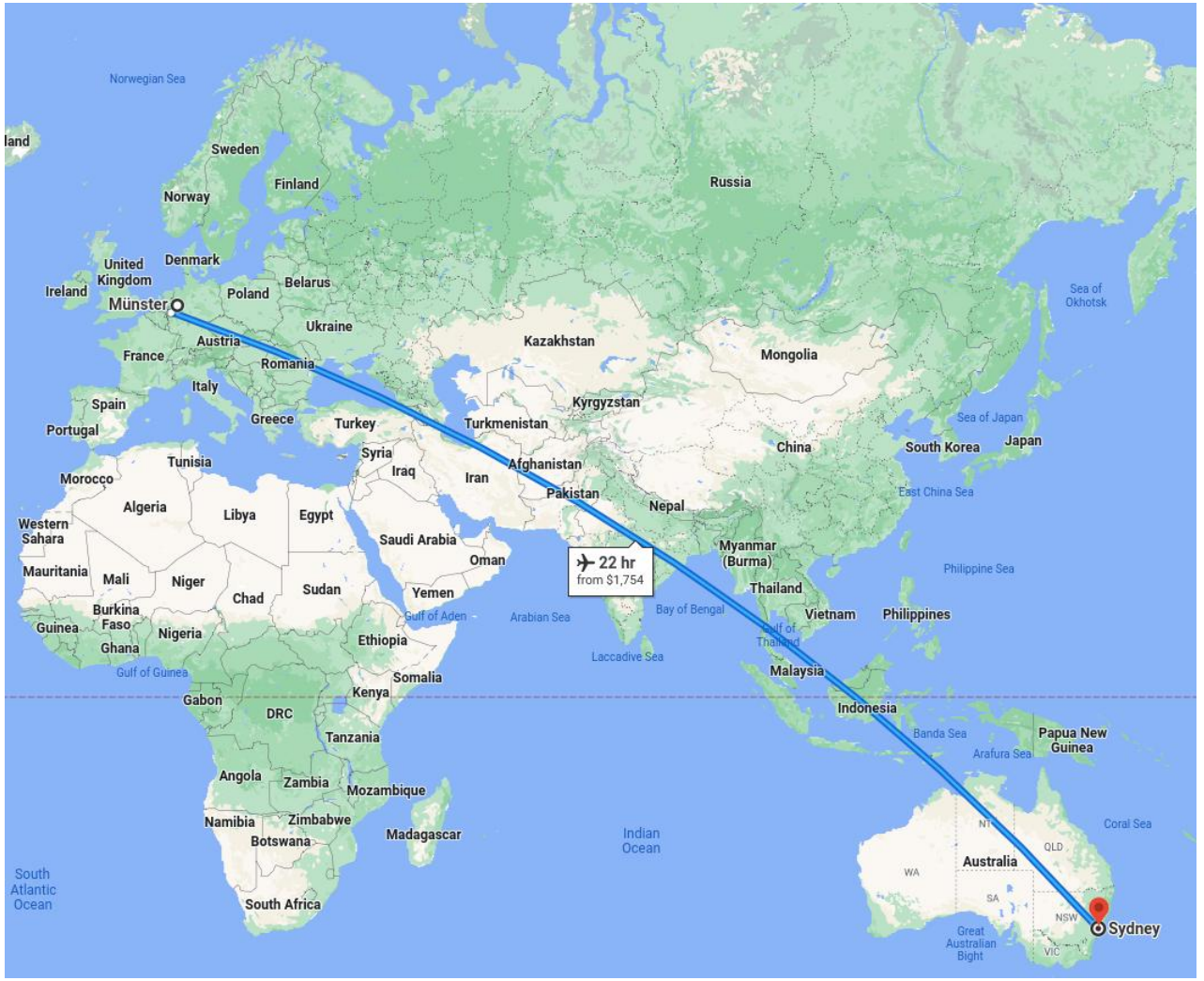
Abstract

Motivation

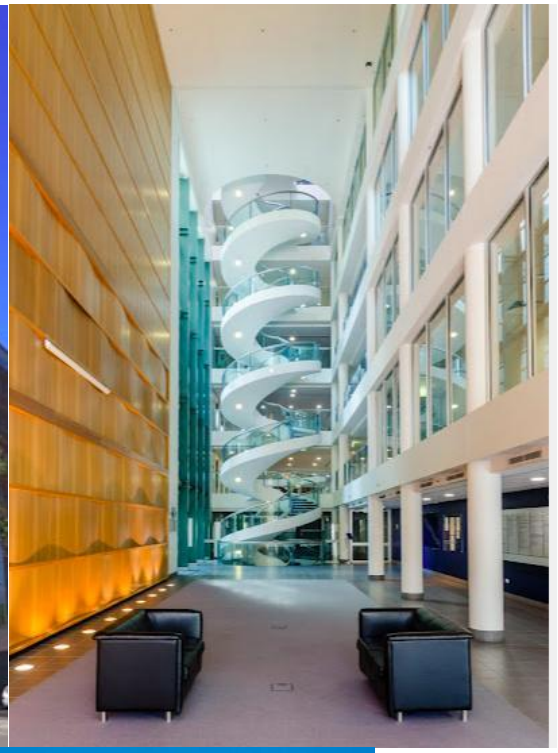
Bisulfite sequencing (BSseq) processing is among the most cumbersome next generation sequencing (NGS) applications. Though some BSseq processing tools are available, they are scattered, require puzzling parameters and are running-time and memory-usage demanding.

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



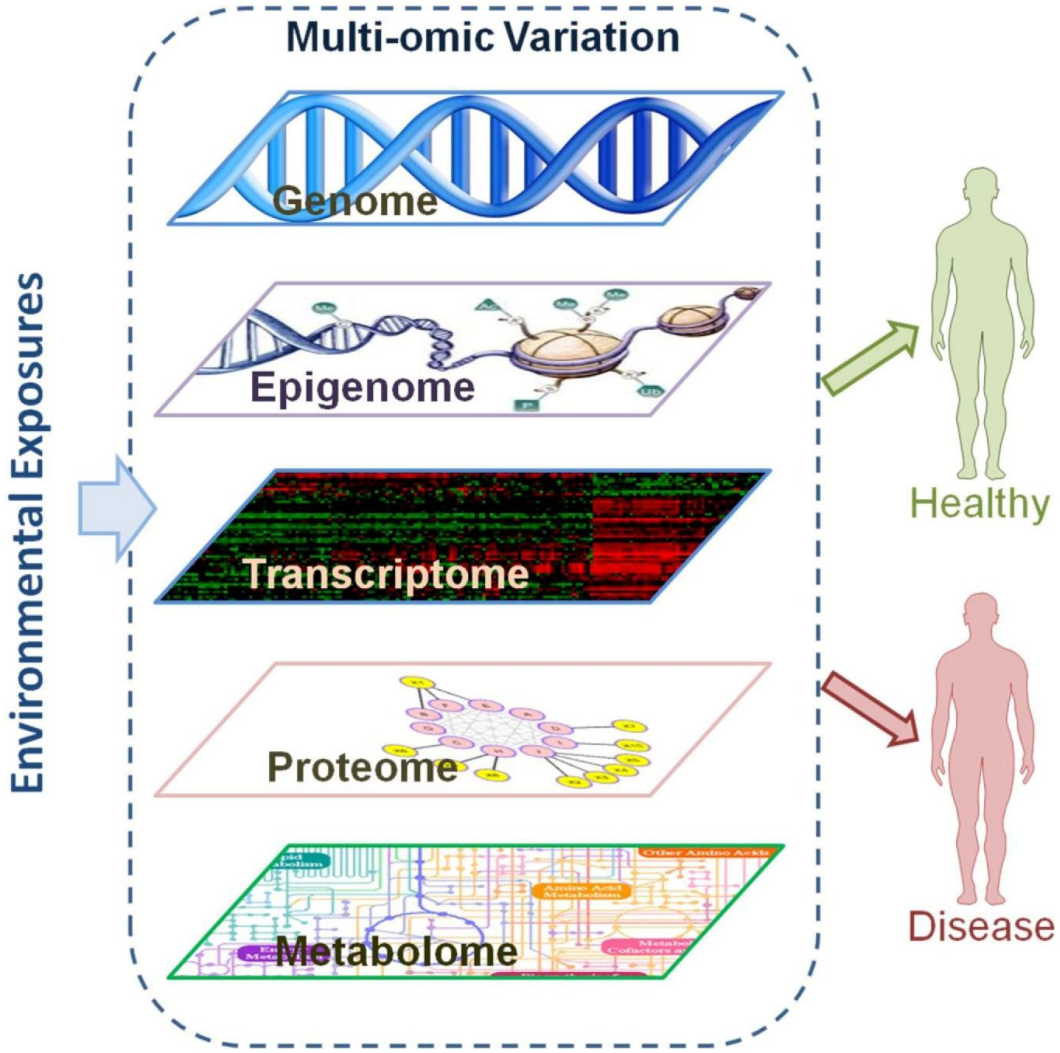
Seven years of research at Garvan Institute of Medical Research in Australia (2014-2022)

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

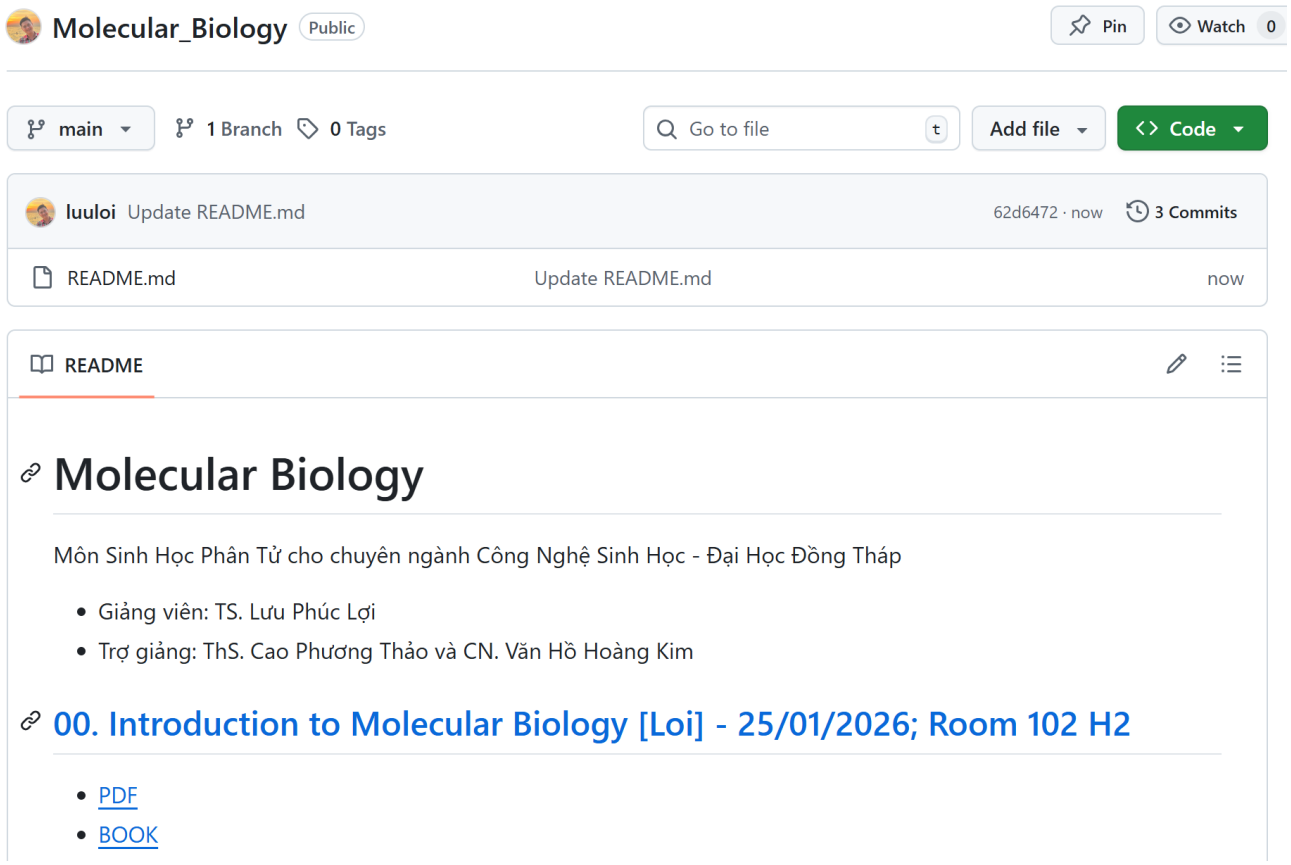


More than one year at Zymo Research (Sep 2022-Nov 2023)

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

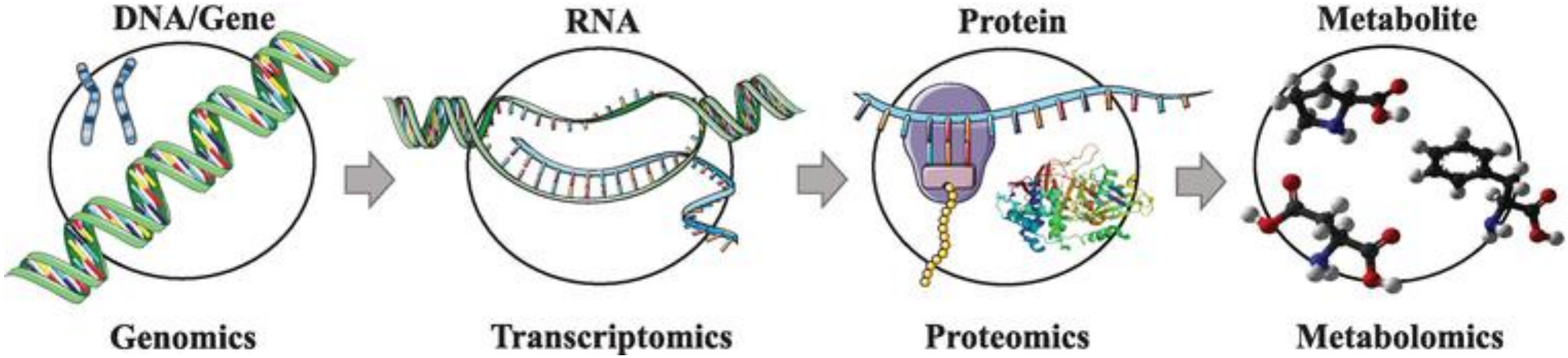


Curriculum of Introduction to Molecular Biology



https://github.com/luuloi/Molecular_Biology/

Central Dogma: Gene Mutation and Diseases



PAH gene

Ref …ATCGAT…

P1 …AACGAT…

NM_000277.3(PAH):c.971T>A

PAH mRNA

Ref …AUCGAU…

P1 …AACGAU…

NM_000277.3(PAH):c.971T>A

PAH protein

Ref …Ile-Asp…

P1 …Asn-Asp…

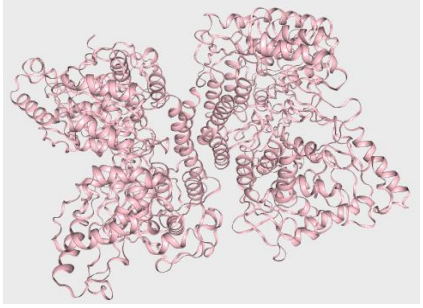
NM_000277.3(PAH):p.Ile324Asn

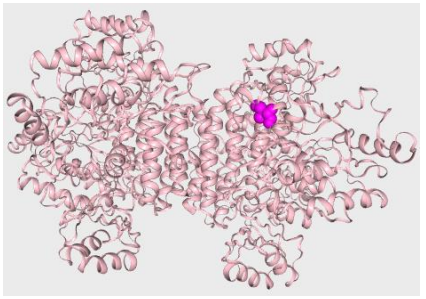
PAH

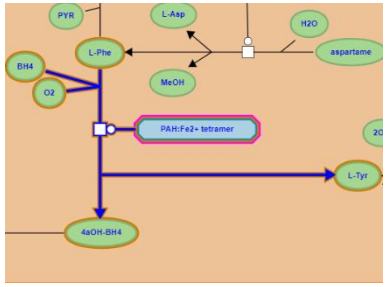
Ref Phe → Tyr

PAH

P1 Phe ~~→~~ Tyr

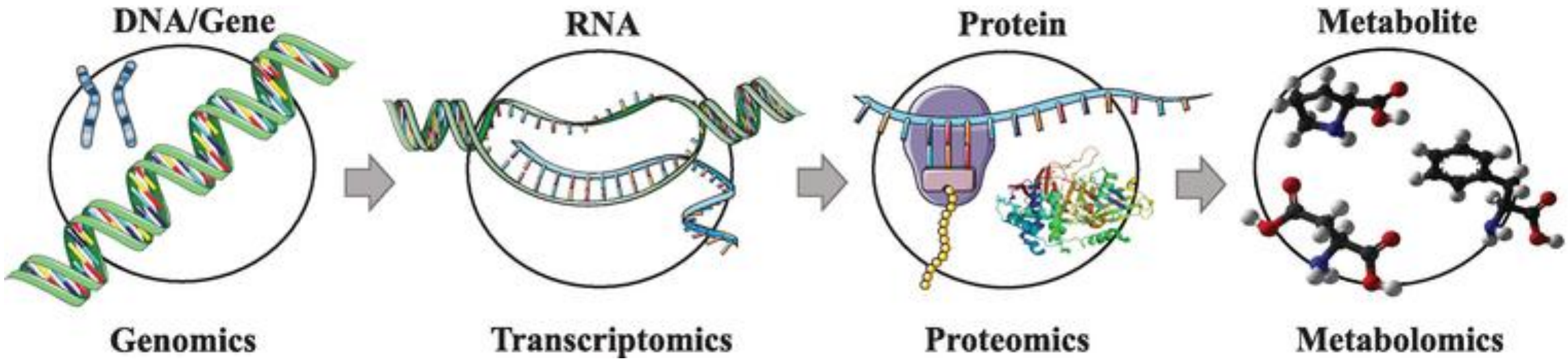






10.5772/intechopen.71769

Content of Introduction to Molecular Biology

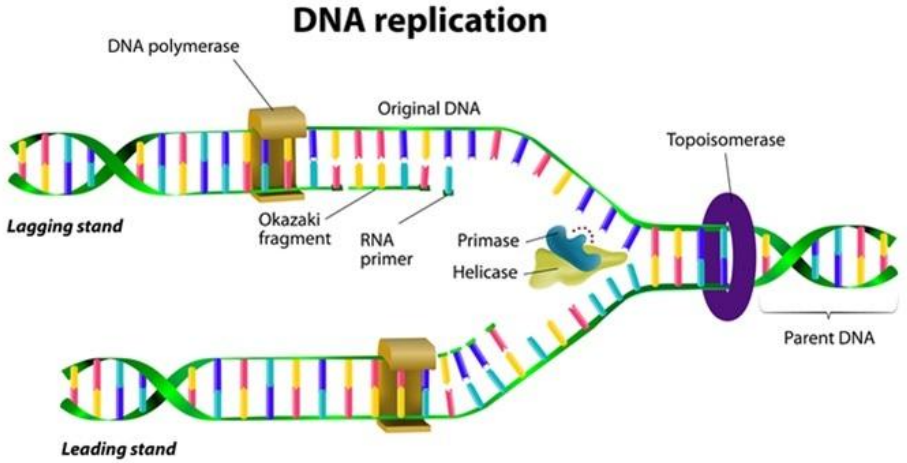


Part 1: DNA Replication and Repair

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				

Evalutation for the course

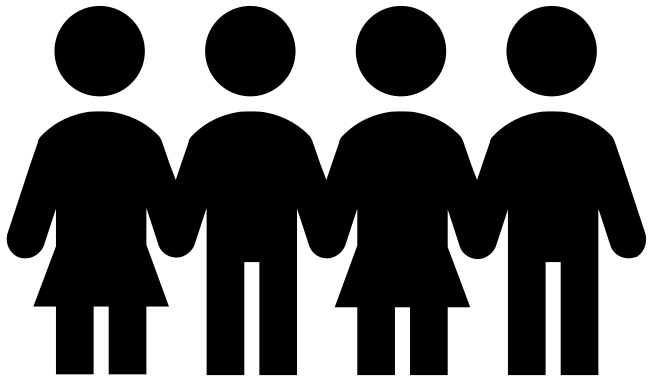
- Presentation date (Mid-term exam): **?**
- Max 3 min each group (3 students)
- 1 to 2 questions each student
- Mid-term score = Report (50%) + Presentation (40%) + Slide (10%)

- Final exam:?
- Final exam score = Quizzes (40%) + Final Test (60%)

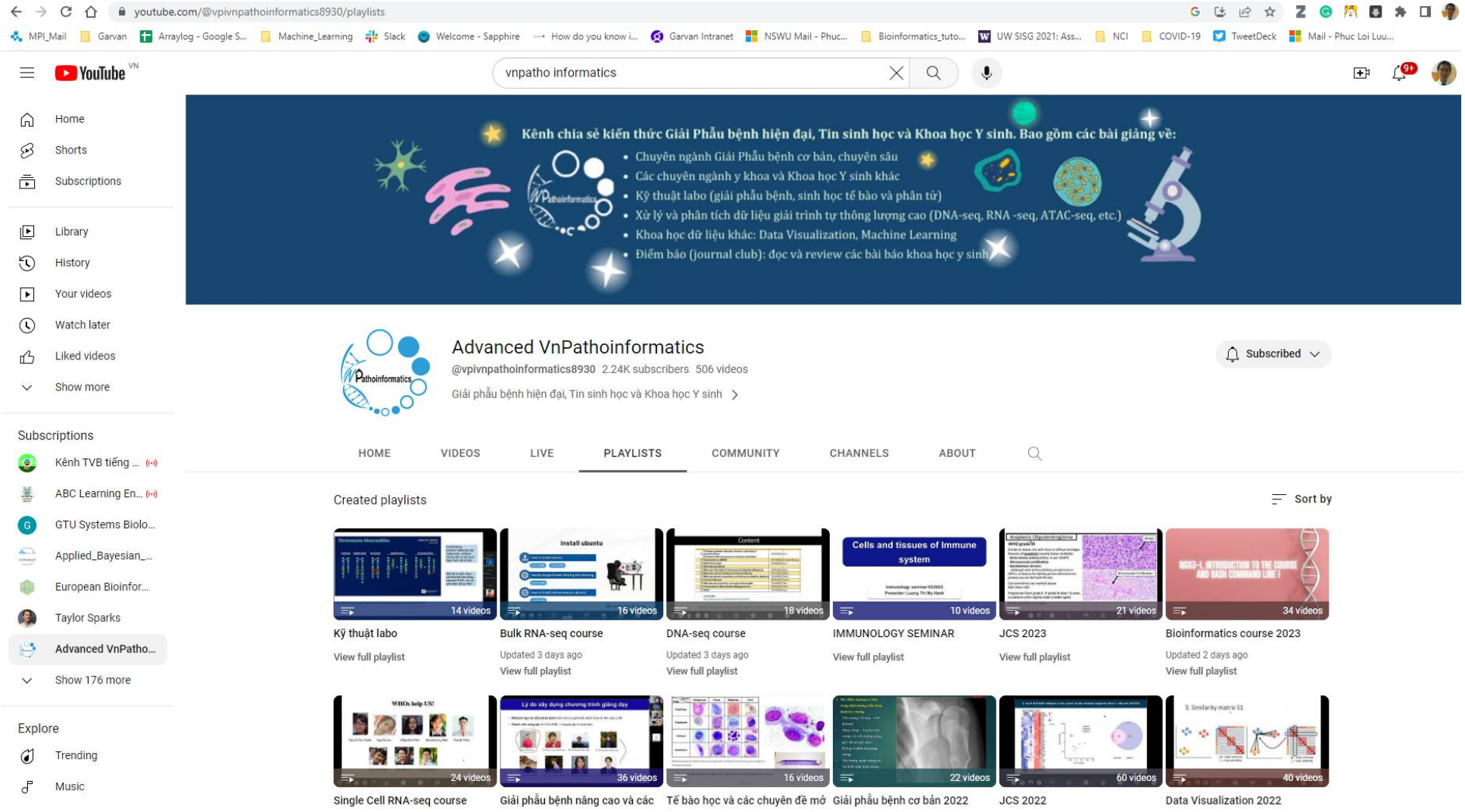
No attendance checking

Nghỉ học được không bạn?

Được nhe!



No attendance checking



https://www.youtube.com/@vpivnpathoinformatics8930/playlists

Thank you for your attention!