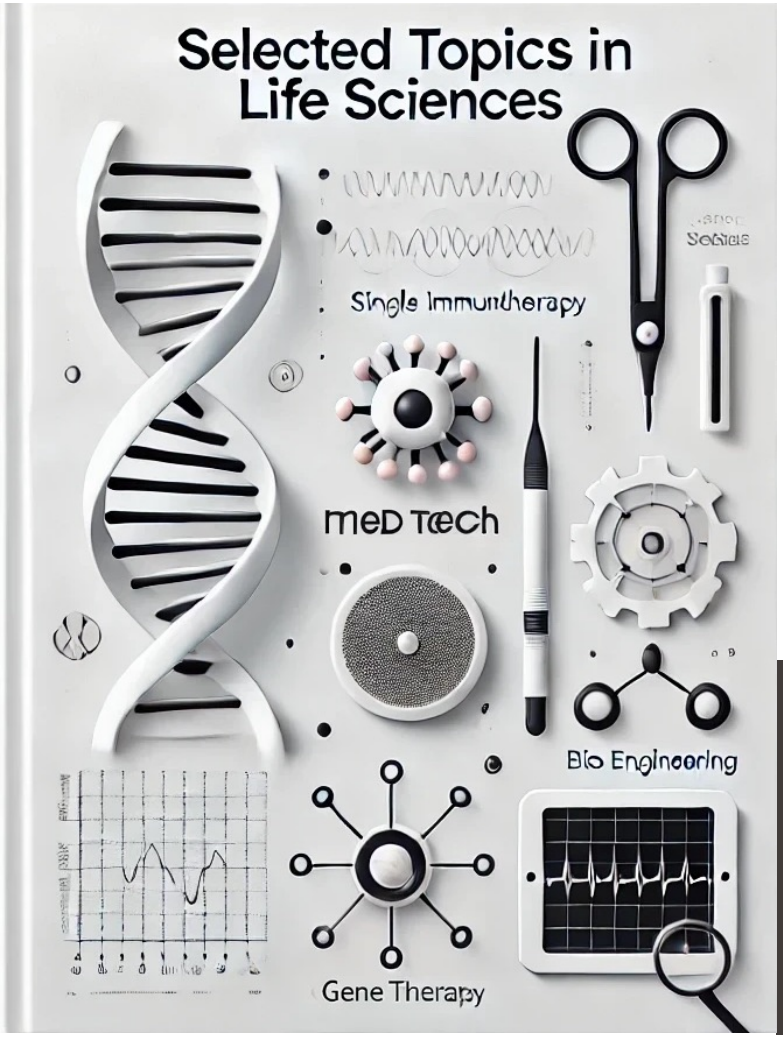


Welcome To BiO-ENG430

2024-2025

Dr. Anne-Laure Mahul-Mellier

Instructor:

Dr Anne-Laure Mahul-Mellier
Laboratory of chemical biology of neurodegeneration
IBI Institute, Life sciences Faculty

anne-laure.mahul@epfl.ch

Teaching Assistants:

Manel Boussouf, PhD student
manel.boussouf@epfl.ch

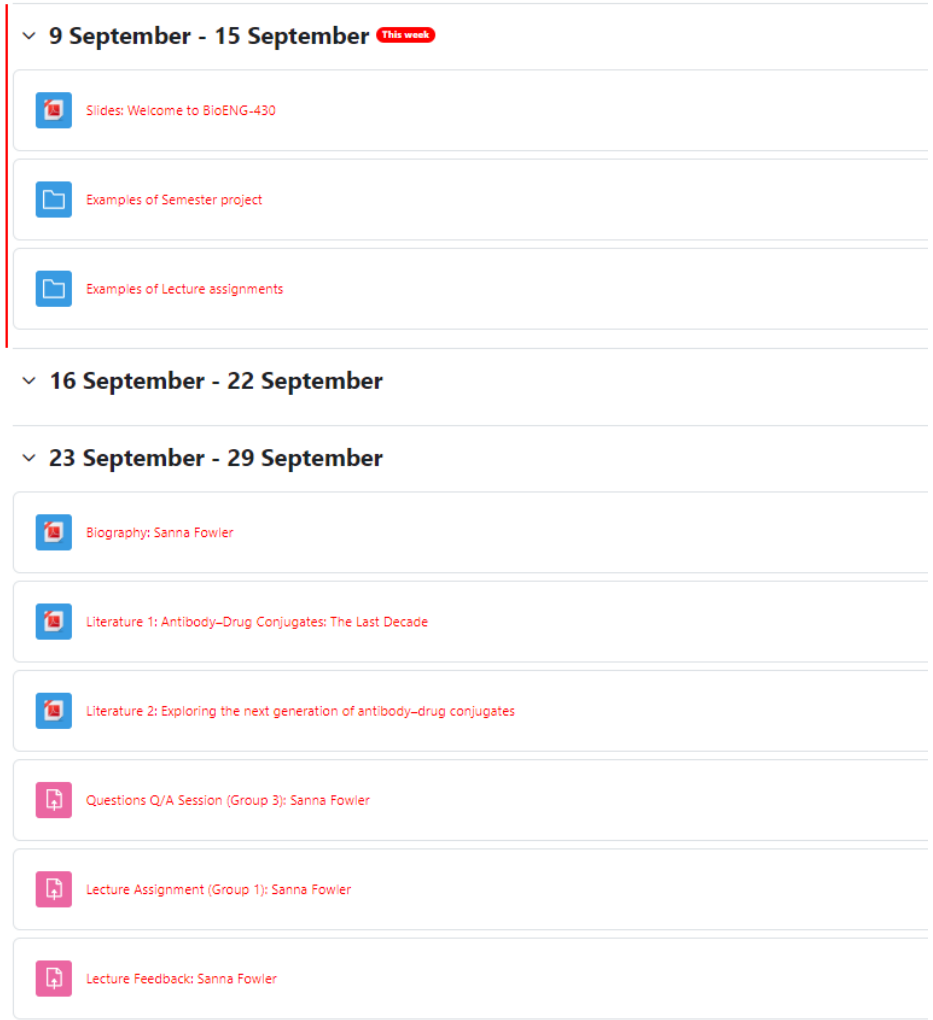
Lukas van den Heuvel, PhD Student
lukas.vandenheuvel@epfl.ch

Moodle Link:

https://go.epfl.ch/BIOENG-430

Moodle BioENG-430 - Organization

https://go.epfl.ch/BIOENG-430



BIOENG-430

at glance

Instructor and TAs

2-Minute introduction

Overview of course contents

Assignement and grading

Guest speakers

How to provide feedbacks ?

Group assignement organisation

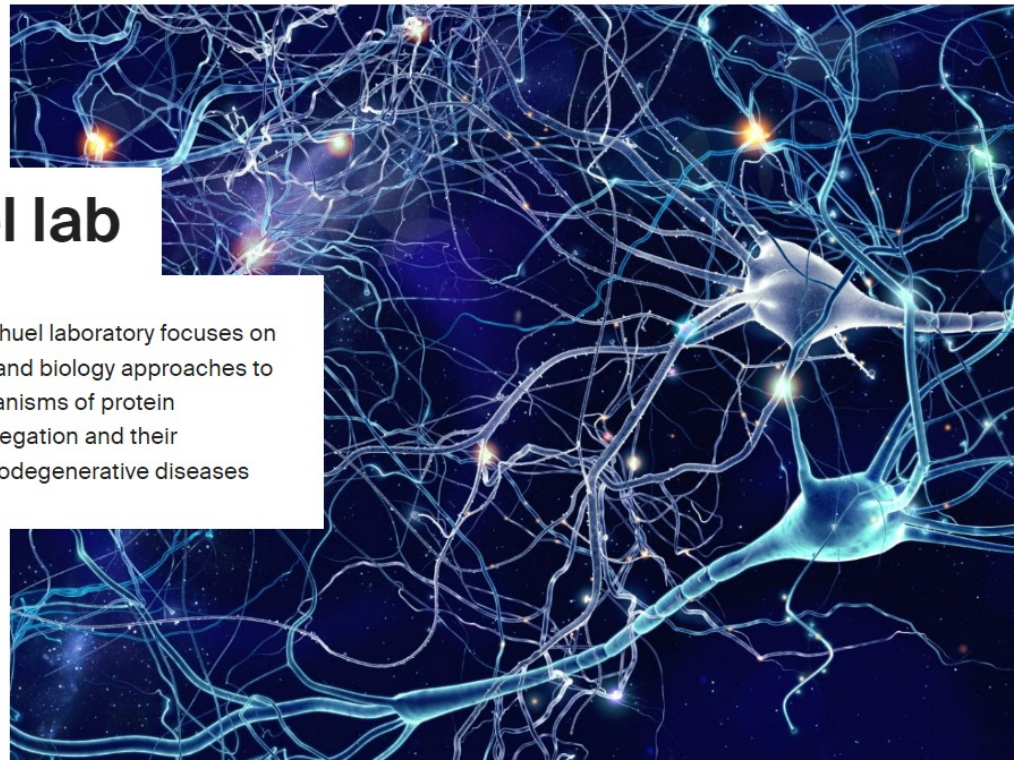
BIOENG-430

at glance

Instructor and TAs

Instructor and TAs

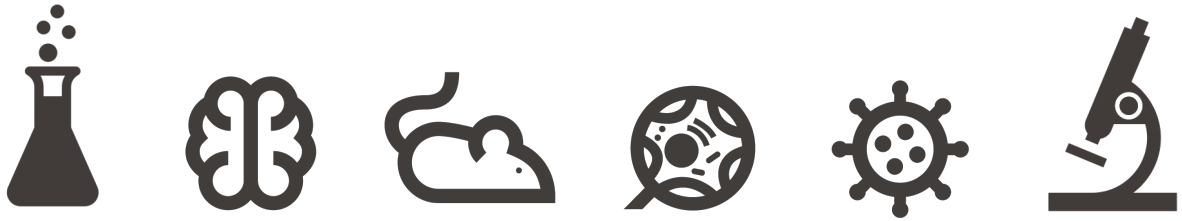
Who are we ?



Lashuel lab

Research in the Lashuel laboratory focuses on applying chemistry and biology approaches to elucidate the mechanisms of protein misfolding and aggregation and their contribution to neurodegenerative diseases

Dr. Anne-Laure Mahul-Mellier



PhD in Neurobiology
2007
Université Grenoble Alpes

1st Post-doc Cell biology of Breast cancer
2007-2011
Imperial College London

2nd Post-doc Cell biology of Brain disorders
2012-2018
EPFL

Senior scientist for the Lashuel Lab
2018-today
EPFL

Manel Boussouf

BSc. in Life Sciences Engineering — 2015-2019

- Bachelor Project — Lashuel Lab– EPFL

MSc. in Life Sciences Engineering — 2019-2022
Specialization in Neurosciences and Neuroengineering

- RA/Semester project — Lashuel Lab – EPFL
- Industry Internship — ND Biosciences – Biopôle
- Master's Thesis — Khurana Lab – Harvard MS

Post-Graduation — 2019-2023

- Research Assistant — Khurana Lab – Harvard MS

PhD in Neurosciences — 2023-(2027)

- Role of lipids in Parkinson's disease pathogenesis — Lashuel & D'Angelo labs

Lukas van den Heuvel

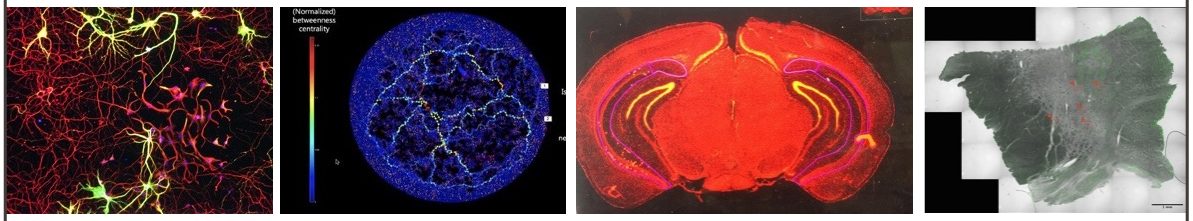
BSc Nanobiology (2017-2020) — Erasmus MC, TU Delft

Minor Computational Neurosciences (2019) — EPFL

Master Life Sciences Engineering (2021-2023) — EPFL

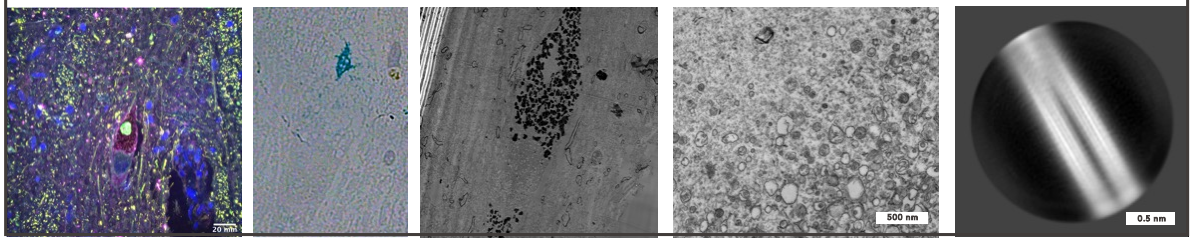
PhD in Neurosciences (2023-now) — EPFL

Scaling up: From cells to brain (and back)…



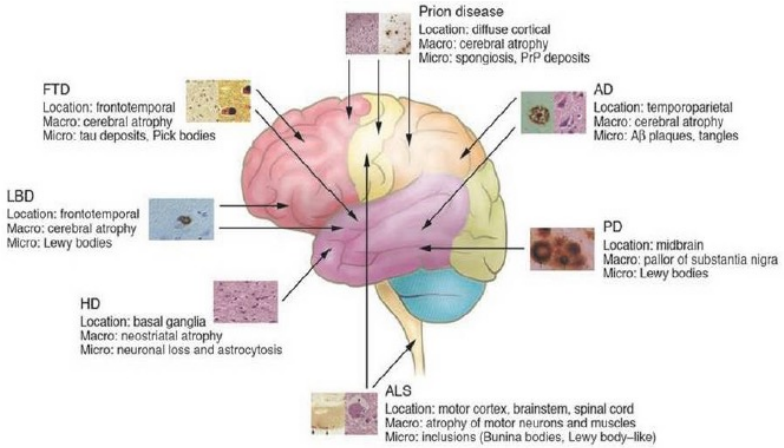
Cell models	Mouse brain	Human brain
BSc. project	Minor Internship	MSc. project

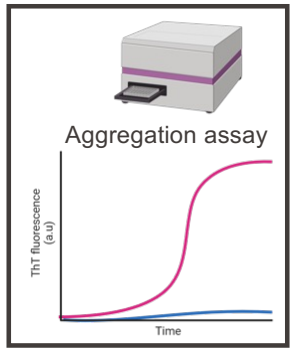
Zooming in: From light to electron microscopy (and back)…

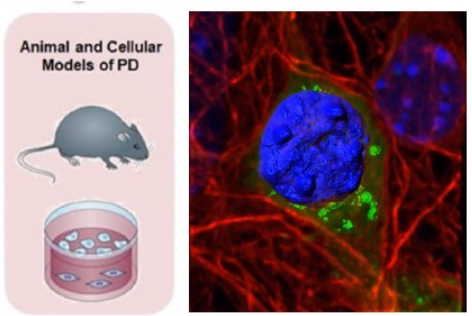


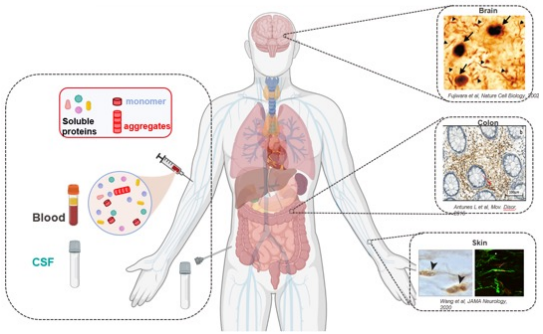
Lashuel Lab: Neurodegenerative diseases

From mechanisms to novel therapies and diagnostics

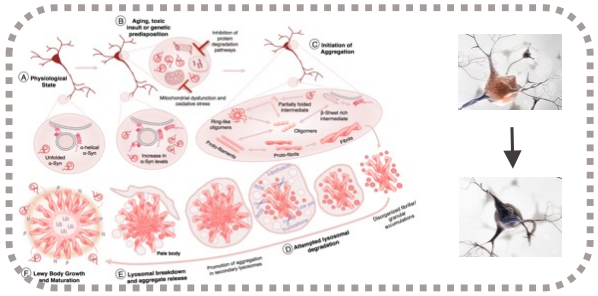


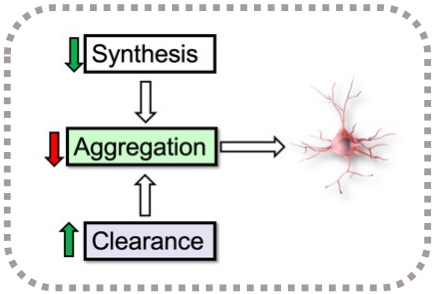


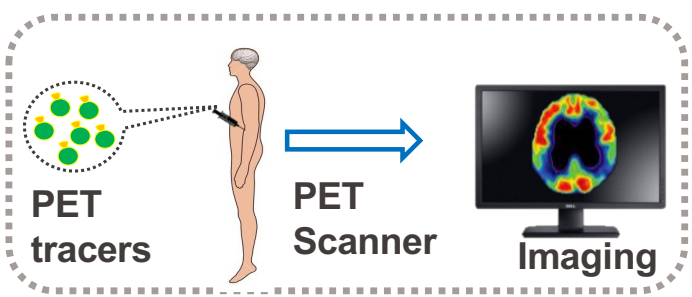


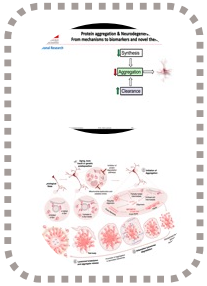


Cellular and molecular mechanisms → **Novel targets and therapies** → **Identify Biomarkers for imaging** → **Biomarkers for diagnosis**









Lashuel Lab: Neurodegenerative diseases

From mechanisms to novel therapies and diagnostics

Institutions

Patients associations

Pharma and start-up

Effective science requires engaging with institutions, academia, patient associations, and pharma

What does it require? Knowledge and technical expertise of the field, communication skills (written and oral), interpersonal skills (relationship with stakeholders), collaboration and teamwork (multidisciplinary teams), critical thinking, project management, ethic and integrity…..

Take-home message

Doing science extends far beyond the lab bench.

It requires more than just research skills

Successful scientists must possess strong communication, negotiation, and interpersonal skills, alongside cultural competence and ethical reasoning. By building partnerships and fostering dialogue, scientists can drive innovation and ensure that their work has a meaningful impact on society.

BIOENG-430 at glance

2-Minute introduction

2-Minute introduction:

To learn more about each other and set expectations

1. Who are you?

•Share your preferred name and country of origin

•A bit about you:

Background and scientific interests, your field of study, affiliation, major…..

(What was something new or exciting you tried this summer? If you could travel anywhere in the world, where would you go and why?)

2. What are your next steps career-wise?

•Share your career aspirations or next steps.

•Do you know what you want to do after the master?

•Any questions or concerns about your careers that keep you up and you may lose sleep over?

Students

2-Minute introduction:
To learn more about each other and set expectations

3. Why did you select BioENG-430?

•Explain your interest in this course

•What attracted you to this specific topic?

4. What do you expect from this course?

•Discuss what you hope to learn or achieve.

•Are there specific skills or knowledge you are excited to gain?

•List 3-5 keywords or topics that you hope to learn more about in this course

•How do you see this course fitting into your career plans?

Students

2-Minute introduction:

To learn more about each other and set expectations

Proactive engagement

During the class and at home

Don’t be shy, learn to raise your hand

THERE IS NO STUPID QUESTION

Critical thinking

How to gain knowledge?

Communication skills

Collaboration and teamwork

Interpersonal skills

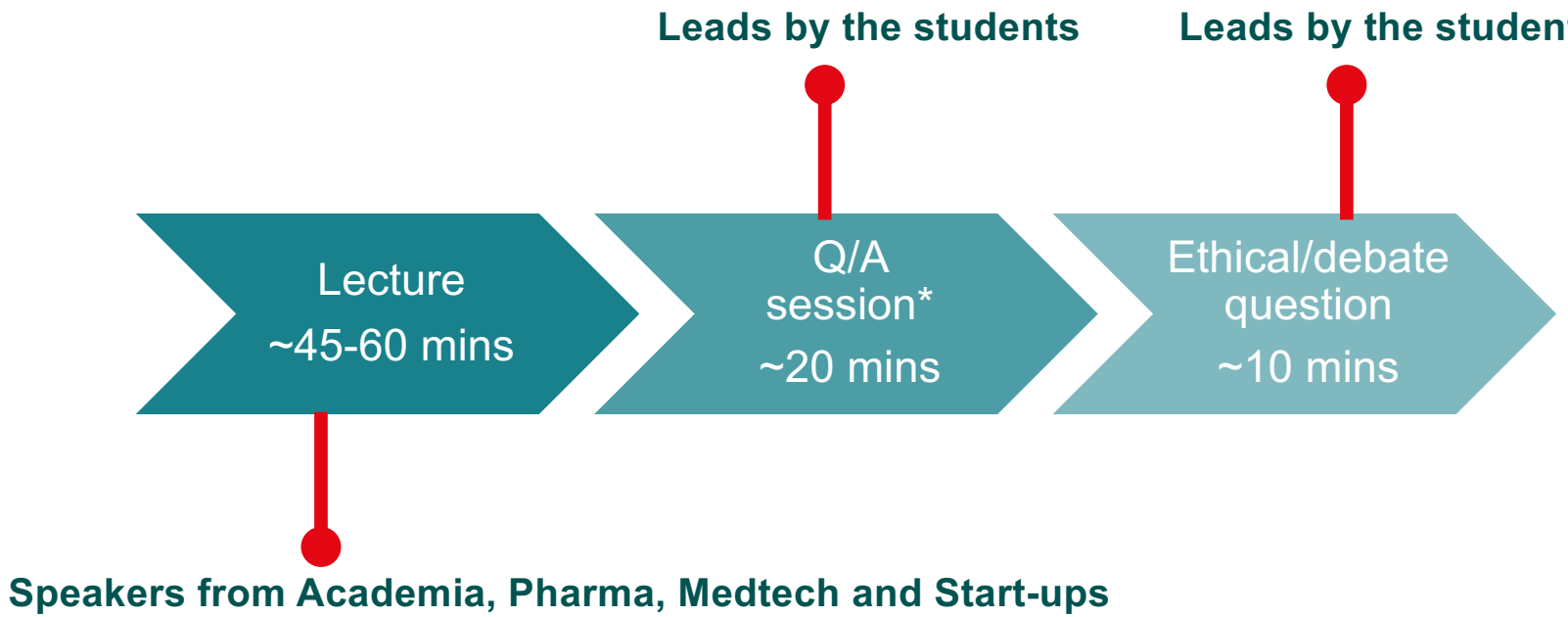
and networking

POV Teachers

BIOENG-430 at glance

Overview of course contents

Course organisation:



* **Supporting Materials** (available on the BIOENG-430 Moodle/ one folder per class):

- **Biography of each speaker**: A brief background about each guest speaker.
- **Required readings**: Two papers relevant to the lecture, provided by the guest speaker - **must be read before class**.
- **Ethical/debate questions**: questions related to the lecture and the readings will be provided in advance by the speaker.

Course objectives:

- Gain exposure to current topics shaping the field of life sciences and biomedical research today.
- Gain an appreciation of the importance of interdisciplinary research and collaborations to address complex scientific and societal challenges.
- Learn about the various career options and opportunities in life sciences or at the interfaces of the life sciences and other disciplines
- Gain a broader understanding of the societal, economic, and ethical implications of recent and emerging scientific advances and breakthroughs.
- Improve your soft skills: scientific communication (written and oral), learning how to read a life science paper, oral presentations, collaboration, and team skills.
- Improve your analytical, research design, and critical thinking skills.
- Receive constructive feedback and support to improve all the above.

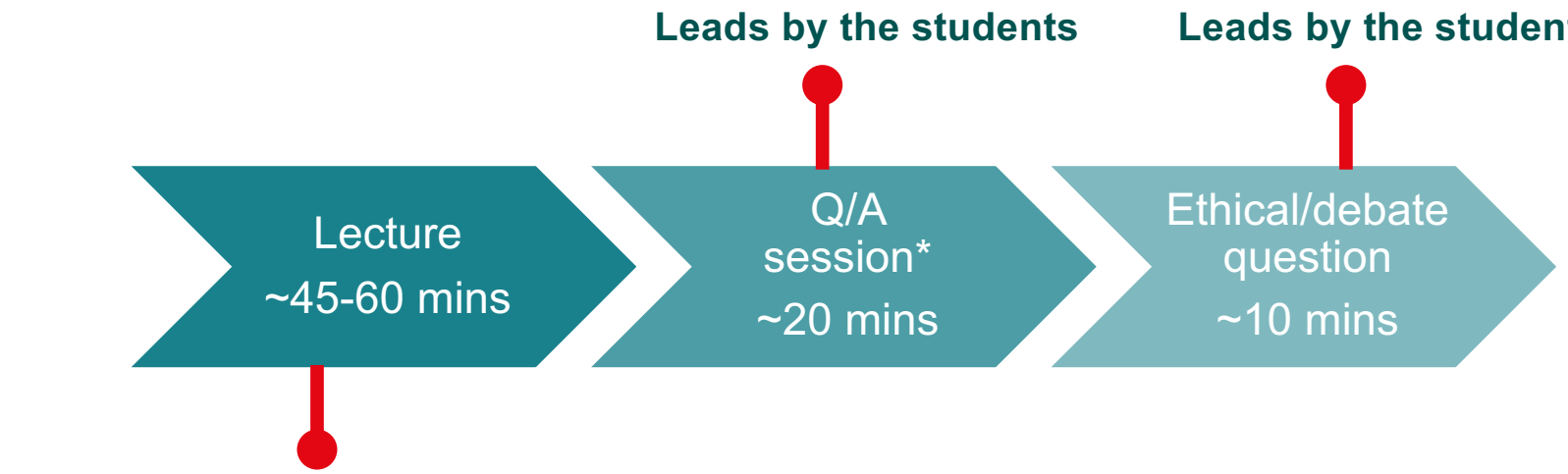
BIOENG-430 at glance

Assignement and grading

How the module will be graded?

- **Attendance (in person) is mandatory**
- If you have scheduling conflicts between this course and other courses, please see me after class or later this week
- When potential scheduling conflicts arise during the semester, please inform me immediately
- To the extent possible, prioritize your class schedule when planning your other activities and commitments.

How the module will be graded?



Assignements	Number of assignement	% of the total grade
In-Class participation (Q/A session - group)	**2**	**30%**
Lecture assignement (individual)	**2**	**30%**
Semester project (individual oral presentation)	**1**	**40%**

In-Class participation (Q/A session + debate)

Group Assignment Guidelines	30%

Group size: 4-5 members per group

Work distribution: You are responsible for deciding how to divide the tasks and manage the Q&A session.

Total assignments: 2 for the semester

Tasks:
Research: Investigate the speaker's work thoroughly (use the 2 papers provided).
Q&A preparation: Be ready to lead the discussion during the Q&A session.
Interview: Prepare to interview the speaker about their career path or any other topics that interest your group.
Debate question: Prepare arguments for both the pros and cons.

Question submission: Submit all questions to me and the TAs **at least one day before** the lecture.

Recommendations:
Meet as a group before the lecture to brief each other and ensure everyone is prepared.

Participation: All group members must contribute equally to the assignment.

*** All other class members are encouraged to participate as well!**

Lecture assignments

Assignment Guidelines (individual assignment)	**30%**

Total Assignments: 2 for the semester

1. Key take-home messages from the Lecture:
Highlight 4-5 key points or messages that you took away from the lecture.

2. Identify a relevant recent paper/discovery:
Select a recent academic paper or discovery that relates to the lecture topic.

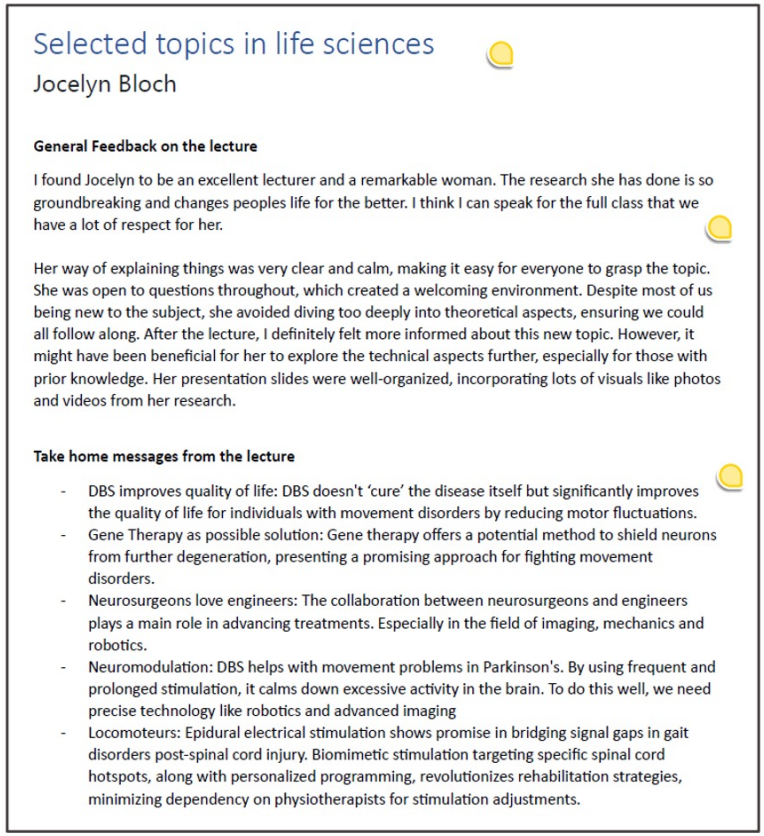
Summary: Write a brief 4-6 lines summary of the work and explain why you found it interesting.
References: Include the title of the article, authors, and the journal in which it was published.
Relevance: Explain how the topics covered in the paper connect to the lecture content.

3. Answer the 2 scientific questions related to the lecture
The scientific questions will be provided the day after the lecture on the folder of the Lecture in the Moodle

Examples of *Lecture assignments* from past years are available:

Moodle BioENG-430/Folder « Introduction course »

Lecture assignments - Example



Selected topics in life sciences

Jocelyn Bloch

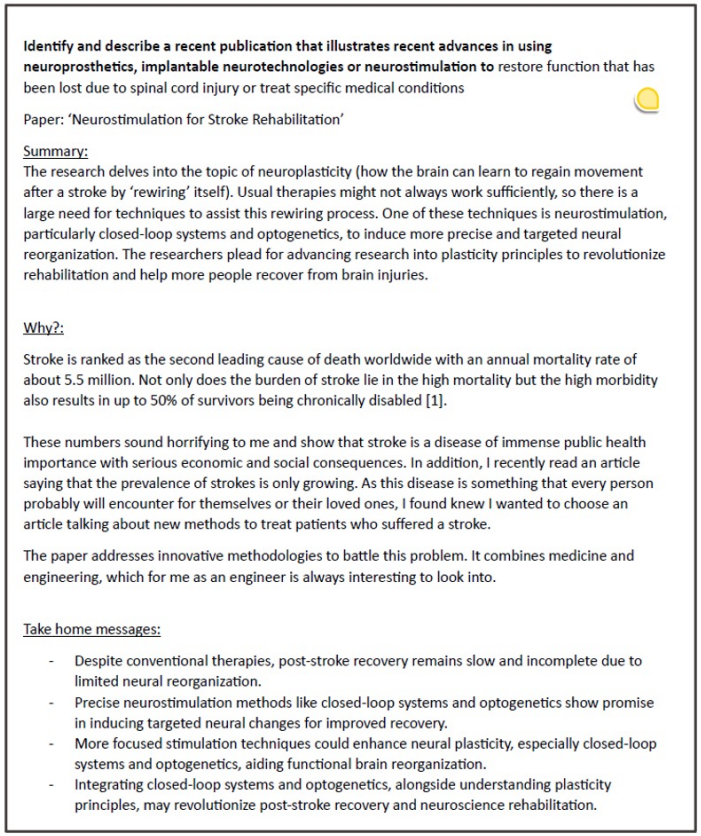
General Feedback on the lecture

I found Jocelyn to be an excellent lecturer and a remarkable woman. The research she has done is so groundbreaking and changes peoples life for the better. I think I can speak for the full class that we have a lot of respect for her.

Her way of explaining things was very clear and calm, making it easy for everyone to grasp the topic. She was open to questions throughout, which created a welcoming environment. Despite most of us being new to the subject, she avoided diving too deeply into theoretical aspects, ensuring we could all follow along. After the lecture, I definitely felt more informed about this new topic. However, it might have been beneficial for her to explore the technical aspects further, especially for those with prior knowledge. Her presentation slides were well-organized, incorporating lots of visuals like photos and videos from her research.

Take home messages from the lecture

- DBS improves quality of life: DBS doesn't 'cure' the disease itself but significantly improves the quality of life for individuals with movement disorders by reducing motor fluctuations.
- Gene Therapy as possible solution: Gene therapy offers a potential method to shield neurons from further degeneration, presenting a promising approach for fighting movement disorders.
- Neurosurgeons love engineers: The collaboration between neurosurgeons and engineers plays a main role in advancing treatments. Especially in the field of imaging, mechanics and robotics.
- Neuromodulation: DBS helps with movement problems in Parkinson's. By using frequent and prolonged stimulation, it calms down excessive activity in the brain. To do this well, we need precise technology like robotics and advanced imaging
- Locomoteurs: Epidural electrical stimulation shows promise in bridging signal gaps in gait disorders post-spinal cord injury. Biomimetic stimulation targeting specific spinal cord hotspots, along with personalized programming, revolutionizes rehabilitation strategies, minimizing dependency on physiotherapists for stimulation adjustments.



Identify and describe a recent publication that illustrates recent advances in using neuroprosthetics, implantable neurotechnologies or neurostimulation to restore function that has been lost due to spinal cord injury or treat specific medical conditions

Paper: 'Neurostimulation for Stroke Rehabilitation'

Summary:

The research delves into the topic of neuroplasticity (how the brain can learn to regain movement after a stroke by 'rewiring' itself). Usual therapies might not always work sufficiently, so there is a large need for techniques to assist this rewiring process. One of these techniques is neurostimulation, particularly closed-loop systems and optogenetics, to induce more precise and targeted neural reorganization. The researchers plead for advancing research into plasticity principles to revolutionize rehabilitation and help more people recover from brain injuries.

Why?:

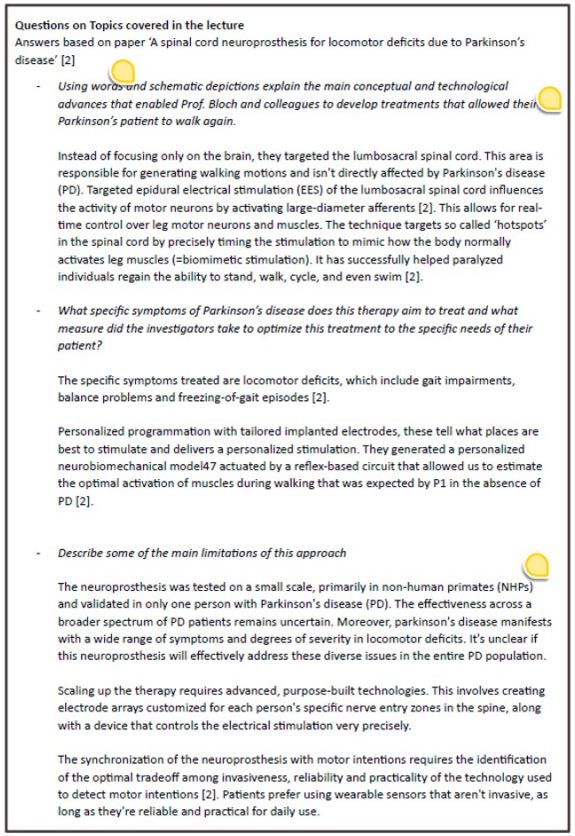
Stroke is ranked as the second leading cause of death worldwide with an annual mortality rate of about 5.5 million. Not only does the burden of stroke lie in the high mortality but the high morbidity also results in up to 50% of survivors being chronically disabled [1].

These numbers sound horrifying to me and show that stroke is a disease of immense public health importance with serious economic and social consequences. In addition, I recently read an article saying that the prevalence of strokes is only growing. As this disease is something that every person probably will encounter for themselves or their loved ones, I found knew I wanted to choose an article talking about new methods to treat patients who suffered a stroke.

The paper addresses innovative methodologies to battle this problem. It combines medicine and engineering, which for me as an engineer is always interesting to look into.

Take home messages:

- Despite conventional therapies, post-stroke recovery remains slow and incomplete due to limited neural reorganization.
- Precise neurostimulation methods like closed-loop systems and optogenetics show promise in inducing targeted neural changes for improved recovery.
- More focused stimulation techniques could enhance neural plasticity, especially closed-loop systems and optogenetics, aiding functional brain reorganization.
- Integrating closed-loop systems and optogenetics, alongside understanding plasticity principles, may revolutionize post-stroke recovery and neuroscience rehabilitation.



Questions on Topics covered in the lecture

Answers based on paper 'A spinal cord neuroprosthesis for locomotor deficits due to Parkinson's disease' [2]

- *Using words and schematic depictions explain the main conceptual and technological advances that enabled Prof. Bloch and colleagues to develop treatments that allowed their Parkinson's patient to walk again.*

  Instead of focusing only on the brain, they targeted the lumbosacral spinal cord. This area is responsible for generating walking motions and isn't directly affected by Parkinson's disease (PD). Targeted epidural electrical stimulation (EES) of the lumbosacral spinal cord influences the activity of motor neurons by activating large-diameter afferents [2]. This allows for real-time control over leg motor neurons and muscles. The technique targets so called 'hotspots' in the spinal cord by precisely timing the stimulation to mimic how the body normally activates leg muscles (=biomimetic stimulation). It has successfully helped paralyzed individuals regain the ability to stand, walk, cycle, and even swim [2].

- *What specific symptoms of Parkinson's disease does this therapy aim to treat and what measure did the investigators take to optimize this treatment to the specific needs of their patient?*

  The specific symptoms treated are locomotor deficits, which include gait impairments, balance problems and freezing-of-gait episodes [2].

  Personalized programmation with tailored implanted electrodes, these tell what places are best to stimulate and delivers a personalized stimulation. They generated a personalized neurobiomechanical model47 actuated by a reflex-based circuit that allowed us to estimate the optimal activation of muscles during walking that was expected by P1 in the absence of PD [2].

- *Describe some of the main limitations of this approach*

  The neuroprosthesis was tested on a small scale, primarily in non-human primates (NHPs) and validated in only one person with Parkinson's disease (PD). The effectiveness across a broader spectrum of PD patients remains uncertain. Moreover, parkinson's disease manifests with a wide range of symptoms and degrees of severity in locomotor deficits. It's unclear if this neuroprosthesis will effectively address these diverse issues in the entire PD population.

  Scaling up the therapy requires advanced, purpose-built technologies. This involves creating electrode arrays customized for each person's specific nerve entry zones in the spine, along with a device that controls the electrical stimulation very precisely.

  The synchronization of the neuroprosthesis with motor intentions requires the identification of the optimal tradeoff among invasiveness, reliability and practicality of the technology used to detect motor intentions [2]. Patients prefer using wearable sensors that aren't invasive, as long as they're reliable and practical for daily use.

Examples of *Lecture assignments* from past years are available:

Moodle BioENG-430/Folder « Introduction course »

Semester project

Assignment Guidelines (individual assignment)	**40%** 25% oral presentation 15% Q/A session

Total Assignments: 1 for the semester

When: In December

Select a topic of interest that made the headlines recently.
Relevant fields: Any topic/discovery/breakthrough at the interface of

- Life Sciences
- Medicine
- Bioengineering
- Chemical biology

Presentation outline (~10 mins):

a) Introduce the scientific background of the topic and why you selected this topic (2-3 slides)
b) identify the main challenges or unanswered questions (1 slide)
c) Highlight the major societal, economic, social and/or ethical implications in this field (1 slide)
d) What is the main finding/discovery/breakthrough, and how will it impact the relevant field and society? (2 slides)
e) Highlight emerging trends in the relevant fields + How do you see this field evolving during the next 5-10 years? (1 slide)
f) Share with us the views on future exciting developments in the selected field (1 slide)

Q/A session (~5 mins)

Examples of *Semester projects* from past years are available: **Moodle BioENG-430/Folder « Introduction course »**

BIOENG-430 at glance

Guest speakers

Guest speakers - Schedule

24/09	1/10	8/10	15/10	22/10	29/10	5/11	12/11	19/11	26/11
Sanna Fowler	Madiha Derouazi	Sébastien Nusslé	Bilal Fares	FALL BREAK	Anass Chiki	Nako Nakatsuka	Bernard Schneider	Gregory Servotte	Silvestro Micera
Lonza	Acimmune	genknowme	Azur Cell therapies		Incyte	CHEMINA lab	PTBTG	Edwards Life siences	TNE lab
Pharma	Pharma	Start-up	Start-up		Pharma	Academia	Academia	Pharma	Academia
https://www.lonza.com/	https://www.acimmune.com/	https://genknowme.com/	https://www.startup.ch/azure-cell-therapies		https://incyte.com/	https://www.epfl.ch/labs/chemina/	https://www.epfl.ch/research/facilities/gene-therapy/	https://www.edwards.com/fr	https://www.epfl.ch/labs/tne/

Where to find more information before the class:

- about the selected topic? Check the website of the company or the lab, google, PubMed…..
- about the speaker? LinkedIn, google, website of the company or the lab

Guest speakers

Head of Strategy, Innovation & Value Chain Management

Lonza Bioconjugates

SANNA FOWLER

Translate bioconjugates discovery to the clinic

Education & Training

DOCTOR OF PHILOSOPHY
1998-2001
Immunology, Molecular and Cellular Science
University of Oxford, UK

POSTDOCTORAL RESEARCH FELLOW
2001-2002
Immunology Research
University of Oxford, UK

SENIOR SPONSORSHIP ACCOUNT MANAGER
2002-2010
Team Alinghi SA
Americas Cup Swiss sailing

DEPUTY DIRECTOR OF COMMUNICATIONS
2011 - 2014
EPFL - Lausanne - CH

DEPUTY DIRECTOR OF DEVELOPMENT
2014 - 2017
EPFL - Lausanne - CH

EXECUTIVE DIRECTOR, HEAD OF DIVISIONAL PROJECTS
2021 - 2023
Lonza
Basel - Switzerland

HEAD OF STRATEGY, INNOVATION & VALUE CHAIN MANAGEMENT
2023 - Present
Lonza
Basel - Switzerland

Profile

Sanna Fowler is currently Head of Strategy and Innovation for Lonza's bioconjugates unit and focuses on future growth through technology and manufacturing capacity. Her goal is to support small biotech and large pharma companies translate bioconjugate discovery into the clinic and to ensure development and manufacturing keep up with the demand for innovative medicines.

Articles

CTLA-4 expression on antigen-specific cells but not IL-10 secretion is required for oral tolerance

Press

EURAXESS Researchers in motion Interview with Dr Sanna Fowler: A passionate person about Science

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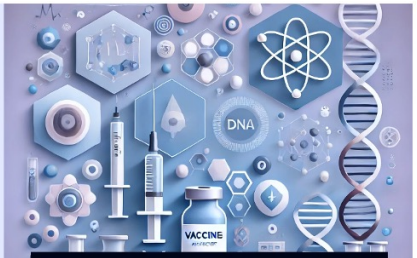
linkedin.com/in/sannafowler
sanna.fowler@gmail.com

Chief Scientific Officer

AC Immune
Lausanne, Switzerland



MADIHA DEROUAZI

Biotech Entrepreneur/ Immunotherapy

Education & Training

DOCTOR OF PHILOSOPHY
2001-2005
Biotechnology
EPFL - Switzerland

POSTDOCTORAL RESEARCH FELLOW
2001-2002
Bacterial vector engineering, Cancer vaccine, Tumor associated antigens screening
CNRS, Paris - France

MAITRE ASSISTANTE
2009-2014
HUG - Genève, Switzerland

CEO
2012 - 2022
Amal Therapeutics - Geneva - CH

CEO
2021 - 2023
Speransa Therapeutics
Frankfurt - Germany

CSO
2024 - Present
AC Immune
Lausanne - Switzerland

Profile

Dr. Madiha Derouazi holds a PhD in Cellular Biotechnology from EPFL. In 2012, she founded AMAL Therapeutics, an immuno-oncology company developing next-generation cancer vaccines, where she served as both CEO and CSO. Under her leadership, AMAL was acquired by Boehringer Ingelheim. Dr. Derouazi then became CEO of Speransa Therapeutics, where she oversaw the development of a novel platform for prophylactic vaccines. She now serves as Chief Scientific Officer (CSO) at AC Immune.

Articles

Novel Multi-Antigen Orf-Virus-Derived Vaccine Elicits Protective Anti-SARS-CoV-2 Response in Monovalent and Bivalent Formats.

Press

"When you're an entrepreneur, you need to do things your way"

linkedin.com/in/madiha-derouazi
madiha.derouazi@acimmune.com

Guest speakers

Co-Founder, CEO & CSO

genknowme
Lausanne, CH

SEBASTIEN NUSSLÉ

Genetic & Epigenetic

Education & Training

DOCTOR OF PHILOSOPHY
2006 - 2012
Ecology and evolution
Université de Lausanne - CH

RESEARCHER
2010-2013
La maison de la rivière
Tolochenaz - CH

POSTDOCTORAL RESEARCHER
2012-2013
University of Bern
Bern, Switzerland

POSTDOCTORAL RESEARCHER
2013-2017
UC Berkeley
USA

BIOLOGY TEACHER
2019-2024
VAUD - Switzerland

CSO
2019 - 2020
genknowme
Lausanne, Switzerland

Interim CEO / CEO
2020 - Present
genknowme,
Lausanne, Switzerland

Profile

Sebastien is an experienced researcher in biostatistics (PhD, University of Lausanne) with postdoctoral experience (University of Bern, University of California Berkeley). He is specialized in genetic and environment interactions. Passionate by science vulgarization and wellbeing, he co-founded Genknowme, the Swiss epigenetic company, with the will to democratizing this emerging technology to help everyone becoming healthier. Trained in ecology and founder of an environmental firm, Sébastien is also aware of environmental issues and has the will to drive the company with a sustainable mindset.

Articles

- Examining nutrition strategies to influence DNA methylation and epigenetic clocks: a systematic review of clinical trials
- Maintaining brain health across the lifespan

Press

- Genknowme révèle notre âge biologique
- Genknowme on the expansion course

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genknowme.ch
sebastien@genknowme.com

Co-Founder

Azure Cell Therapies
Geneva, Switzerland

BILAL FARES

Biotech Entrepreneur/ Neurodegenerative Diseases

Education & Training

DOCTOR OF PHILOSOPHY
2010 - 2015
Biotechnology and Bioengineering
EPFL - Lausanne, Switzerland

POSTDOCTORAL FELLOW
2015-2016
Lashuel Lab
EPFL - Lausanne, Switzerland

POSTDOCTORAL FELLOW/STUDY DIRECTOR
2017-2019
Philip Morris International
Switzerland

CO-FOUNDER / DIRECTOR OF R&D
2019 - 2023
ND BioSciences
Lausanne, Switzerland

CO-FOUNDER
2024 - Present
Azure Cell Therapies
Geneva, Switzerland

Profile

Dr. Bilal Fares completed his PhD at EPFL, specializing in Parkinson's disease (PD) research. He co-founded ND Biosciences in 2019, focusing on developing therapeutics and diagnostics for neurodegenerative diseases, raising CHF 3 million, and launching commercial products globally.
In 2024, he co-founded Azure Cell Therapies, leveraging CHF 8 million in grant funding and seven patents to develop regenerative stem cell therapies for PD. Bilal has also completed an MBA, adding strategic business expertise to his scientific background.

Articles

Comparative Analysis of Total Alpha-Synuclein (αSYN) Immunoassays Reveals That They Do Not Capture the Diversity of Modified αSYN Proteoforms

Press

ND Biosciences: The Venture Leader Biotech developing therapies for neurodegenerative diseases

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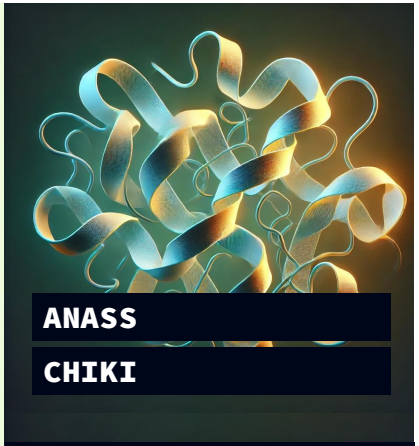
m.bilal.fares@gmail.com

Guest speakers

Senior Research Investigator

Incyte
Yverdon, Switzerland



ANASS CHIKI

Education & Training

DOCTOR OF PHILOSOPHY
2015 - 2020
Lashuel Lab
EPFL - Lausanne, Switzerland

PROJECT LEADER/PRODUCT OWNER
2019-2021
SwissDiData
Lausanne, Switzerland

SENIOR SCIENTIST DOWNSTREAM
2021-2024
Incyte
Yverdon - Switzerland

SENIOR RESEARCH INVESTIGATOR
2024 - Present
Incyte
Yverdon - Switzerland

Profile

Dr. Anass Chiki's research primarily focused on the molecular and chemical biology of neurodegeneration, with a particular emphasis on Huntington's disease. Chiki has played a key role in studying how post-translational modifications (PTMs) affect the structure and aggregation of the Huntingtin protein, which is implicated in Huntington's disease. He is now a Senior Research Investigator Downstream, Process Sciences at Incyte

Articles

- Investigating Crosstalk Among PTMs Provides Novel Insight Into the Structural Basis Underlying the Differential Effects of Nt17 PTMs on Mutant Httex1 Aggregation
- Site-Specific Phosphorylation of Huntingtin Exon 1 Recombinant Proteins Enabled by the Discovery of Novel Kinases

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Assistant Professor of Neurotechnology

Neuro-X Institute
Campus Biotech
Genève, CH

NAKO NAKATSUKA

Innovating Biosensors for Human Health

Education & Training

DOCTOR OF PHILOSOPHY
2012 - 2017
Physical Chemistry
UCLA - USA

POSTDOCTORAL SCHOLAR
2018-2018
UCLA - USA

POSTDOCTORAL FELLOW
2018-2020
ETHZ
Zurich, Switzerland

SENIOR SCIENTIST
2020 - 2024
ETHZ
Zurich, Switzerland

ASSISTANT PROFESSOR OF NEUROTECHNOLOGY
2024 - Present
EPFL,
Lausanne, Switzerland

Profile

Prof. Nako Nakatsuka is an assistant professor at EPFL, where she leads the Chemical Nanotechnology Laboratory (CHEMINA). Her research focuses on developing advanced biosensors capable of detecting real-time molecular changes in the brain, particularly neurotransmitters, which are essential for diagnosing and treating neurological disorders and mental health conditions. Prof. Nakatsuka has been honored with awards like the 2023 Prix Zonta and the 2024 Fondation Philanthropique Famille Sandoz Prize.

Articles

Aptamer-Functionalized Interface Nanopores Enable Amino Acid-Specific Peptide Detection

Aptamer Renaissance for Neurochemical Biosensing

Press

C&en Chemical & Engineering News

Talented 12 "INNOVATING NANOSCALE BIOSENSORS FOR HUMAN HEALTH"

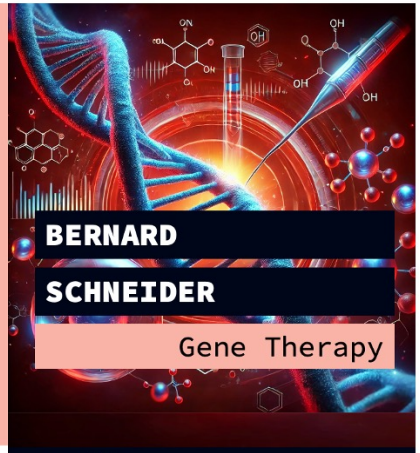
@AptaWineClub

CHEMINA

nako.nakatsuka@epfl.ch

Guest speakers

Head of Bertarelli Foundation Gene Therapy Platform
Campus Biotech
Genève, CH



Education & Training

DOCTOR OF PHILOSOPHY
1995 - 2001
Gene Therapy
University of Lausanne - CH

POSTDOCTORAL FELLOW
2001-2003
EPFL,
Lausanne, Switzerland

ASSISTANT SCIENTIST
2003-2006
University of Wisconsin
USA

SENIOR SCIENTIST
2007 - Present
EPFL,
Lausanne, Switzerland

Profile

Dr. Bernard Schneider is a prominent neuroscientist and a Research and Teaching Associate at the Brain Mind Institute of EPFL. He leads the Bertarelli Gene Therapy Platform, focusing on developing viral vectors for gene therapies targeting neurodegenerative diseases and sensory organ disorders, such as ALS, deafness, and blindness. With over 16 years of experience in neuroscience, Dr. Schneider has authored more than 100 publications and is a key figure in translational research

Articles

- Long term peripheral AAV9-SMN gene therapy promotes survival in a mouse model of spinal muscular atrophy
- Stable isotope labeling and ultra-high-resolution NanoSIMS imaging reveal alpha-synuclein-induced changes in neuronal metabolism in vivo
- Recovery of walking after paralysis by regenerating characterized neurons to their natural target region

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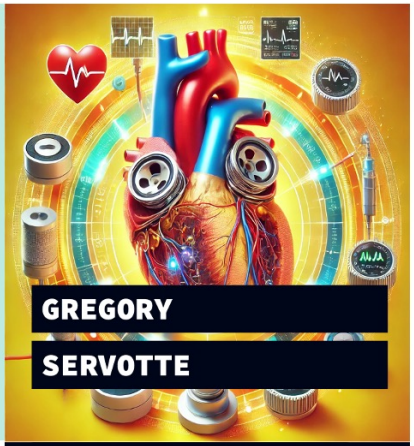
Bertarelli Foundation Gene Therapy Platform
bernard.schneider@epfl.ch

Senior Vice President

Edwards Lifesciences
Nyon, Switzerland



Education & Training

MASTER OF ENGINEERING
1994 - 1998
ECAM Brussels Engineering School
Belgium

SOFTWARE ENGINEER
1998-2001
Alcatel Microelectronics,
Brussels - Belgium

MASTER IN MANAGEMENT
2003 - 2005
ICHEC Brussels Management School
Belgium

CLINICAL AND TECHNICAL CONSULTANT
2004-2007
Medtronic
Brussels - Belgium

MARKETING MANAGER / GROUP MARKETING DIRECTOR
2007 - 2017
Medtronic,
Lausanne, Switzerland

SENIOR BUSINESS DIRECTOR / SENIOR VICE PRESIDENT
2017 - 2024
EDWARDS Lifesciences,
Nyon, Switzerland

Profile

Gregory Servotte is a passionate and visionary leader in the MedTech industry, currently serving as the Senior Vice President in the Transcatheter Heart Valve (THV) division at Edwards Lifesciences. With a proven track record of driving growth and implementing strategic plans, Gregory excels in building strategic partnerships and fostering high-performing teams. His deep understanding of medical devices and healthcare technology, combined with his focus on regulatory compliance, allows him to lead innovations aimed at improving patient outcomes and revolutionizing the healthcare experience

Press

Edwards launches Sapien 3 Ultra Resilia TAVR in Europe

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gregory_servotte@edwards.com

Guest speakers

FULL PROFESSOR
EPFL STI IBI-STI TNE
B3 4 246.134 (Campus Biotech bâtiment B3)
Ch. des Mines 9
CH-1202 Genève

SILVESTRO MICERA

Translational Neural Engineering

Education & Training

DOCTOR OF PHILOSOPHY
2000
Biomedical Engineering
Scuola Superiore Sant-Anna
Pisa, Italy

ASSISTANT PROFESSOR
2000-2009
BioRobotics
Scuola Superiore Sant-Anna
Pisa, Italy

VISITING SCIENTIST
2007
MIT
Cambridge, USA

ADJUNCT ASSISTANT PROFESSOR
2008 - 2011
Neuroprosthesis Control group
Swiss Federal Institute of Technology
Zurich, CH

ASSOCIATE PROFESSOR
2011 - 2019
Translational Neural Engineering
EPFL,
Geneva, Switzerland

FULL PROFESSOR
2019 - current
Translational Neural Engineering
EPFL,
Geneva, Switzerland

Profile

Silvestro Micera's main goal is to develop implantable neural interfaces and robotic systems aimed at restoring sensorimotor function in people with different kind of disabilities (spinal cord injury, stroke, amputation, etc...), starting from basic scientific knowledge in the field of neuroscience, neurology and geriatrics, and investigating further to gain new information by using advanced technologies and protocols

Articles

Brain reactions to the use of sensorized hand prosthesis in amputees

Advanced Neurotechnologies for the Restoration of Motor Function

A closed-loop hand prosthesis with simultaneous intraneural tactile and position feedback

Press

TEDMEDLiveBologna

A powered exoskeleton prevents the elderly from falling

@ smicera
WWW Micera Lab
silvestro.micera@epfl.ch

Learning outcomes

- Gain exposure to exciting science and research at the frontiers of the life sciences and medicine.
- Learn about ongoing exciting interdisciplinary research at the EFPL
- Gain an appreciation of how advances in the life sciences impact the quality of life, help us address global challenges, and improve the quality of healthcare delivery today.
- Acquire new skills in scientific reading and communication
- Gain insight on how to navigate career options and opportunities in the life sciences.

BIOENG-430 at glance

How to provide feedbacks ?

Feedback importance and guidelines

•Your feedback is crucial for enhancing the quality of the class.

•You will be asked to provide feedback several times during the semester.

a) on the **lecture quality** and the guest speaker

b) on the **overall quality of the course** – IS academia surveys will be conducted around the fall break and at the end of the course like for the other courses.

•Aim to be constructive in your feedback by mentioning both the positive aspects and areas for improvement. Ensure that criticisms are constructive and beneficial for the entire class.

•For personal requests or issues, it is best to communicate directly with the instructor or TAs as soon as the issue arises, so changes can be made promptly.

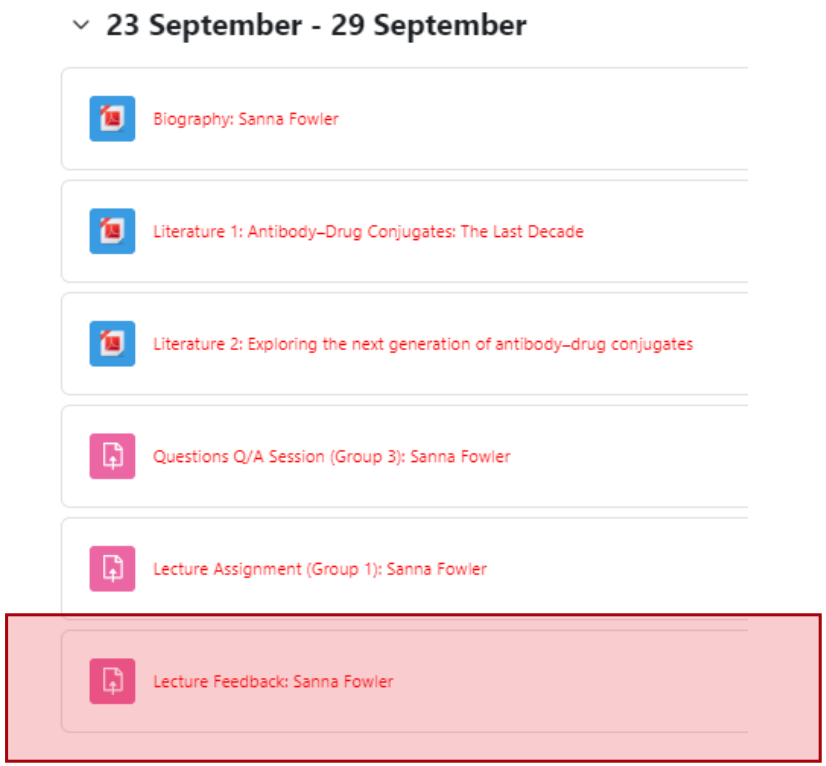
Feedback importance and guidelines

General Feedback on the Lecture (5-6 lines)

- **Clarity:** Was the information presented in a clear and understandable manner?
- **Content:** Was the material relevant, comprehensive, and well-structured?
- **Presentation:** Was the delivery engaging, well-paced, and effective?
- **Other comments:** Any additional thoughts or suggestions for improvement?

To be sent in the week max after the Lecture – on the Moodle

Feedback on the class



Feedback – Do and Don't

Good Example (Do)

•Be specific:
Provide detailed observations about what worked well and what could be improved.
•Be respectful and positive:
Focus on the content and delivery, not on the person.
•Offer suggestions:
Give concrete suggestions for improvement.
•Use "I" statements:
Frame feedback from your perspective to avoid sounding accusatory.

Constructive feedback example:
"I really appreciated the examples you used during the lecture, especially the case study about renewable energy. It made the concept much clearer for me. However, I found that the pace was a bit fast at times, and I struggled to keep up with the notes. It might be helpful to provide a summary slide or handout at the end of each section. This would allow us to review key points and ensure we understand the material fully. Overall, your enthusiasm for the topic was evident, which made the lecture more engaging."

Bad Example (Don't)

•Be vague: Provide non-specific feedback that does not give any useful information.
•Be negative or personal: Critique in a way that feels like an attack on the person, not the content.
•Offer no solutions: Give feedback without any constructive advice or suggestions for improvement.
•Use "You" statements: These can come across as accusatory or blaming.

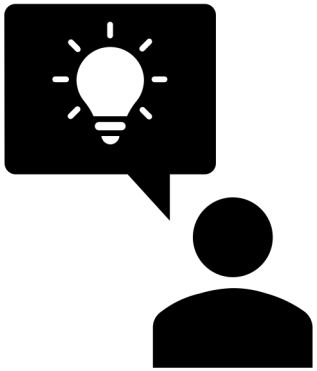
Non-constructive feedback example:
"Your lecture was confusing and too fast.
I did not like it, and it did not make any sense.
You should prepare better next time."

BIOENG-430

at glance

Group assignement organisation

Discussion on the course contents and expectations



Organisation of the groups for the Q/A session

19/19	Nom Prénom	Section	Courriel	Semestre de l'inscription	Group assignements
1	Aitken Harry	CGC_ECH	harry.aitken@epfl.ch	Semestre automne	1
2	Carminati Laure Estelle	CGC_ECH	laure.carminati@epfl.ch	Semestre automne	2
3	De Limburg Stirum Ferdinand	CGC_ECH	ferdinand.delimburgstirum@epfl.ch	Semestre automne	3
4	Droin Louise	CGC_ECH	louise.droin@epfl.ch	Semestre automne	4
5	Etique Juliette Arminda	CGC_ING	juliette.etique@epfl.ch	Master semestre 1	1
6	Ghanem Zahraa	CGC_ING	zahraa.ghanem@epfl.ch	Master semestre 1	2
7	Gosselin Louis Denis René	CGC_CHIM	louis.gosselin@epfl.ch	Master semestre 1	3
8	Möller Alexia Océane	SV	alexia.moller@epfl.ch	Master semestre 1	4
9	Mpirwa Mylène	CGC_CHIM	mylene.mpirwa@epfl.ch	Master semestre 3	1
10	Nicolae Radu	SIE	radu.nicolae@epfl.ch	Master semestre 3	2
11	Piccaluga Costanza	CGC_ING	costanza.piccaluga@epfl.ch	Master semestre 1	3
12	Pringle Jake Karl Jeffrey	SV	jake.pringle@epfl.ch	Master semestre 1	4
13	Tancredi Lisa	CGC_CHIM	lisa.tancredi@epfl.ch	Master semestre 1	1
14	Thirunavukkarasu Nithujaa	SV	nithujaa.thirunavukkarasu@epfl.ch	Master semestre 1	2
15	Torisu Miko	SV_ECH	miko.torisu@epfl.ch	Semestre automne	3
16	Tran Emilie Châu-Giang	CGC_ING	emilie.tran@epfl.ch	Master semestre 1	4
17	Villatte Tom Valentin	CGC_ING	tom.villatte@epfl.ch	Master semestre 1	1
18	Wang Ziwei	CGC_ECH	ziwei.wang@epfl.ch	Semestre automne	2
19	Wicki Emmenegger Daniela	CGC_CHIM	daniela.wickiemmenegger@epfl.ch	Master semestre 1	3

Organisation of the groups for the assignments

	24/09	1/10	8/10	15/10	22/10	29/10	5/11	12/11	19/11	26/11
	Sanna Fowler	Madiha Derouazi	Sébastien Nusslé	Bilal Fares		Anass Chiki	Nako Nakatsuka	Bernard Schneider	Gregory Servotte	Silvestro Micera
	Lonza	Acimmune	genknowme	Azur Cell therapies		Incyte	CHEMINA lab	PTBTG	Edwards Life siences	TNE lab
	Pharma	Pharma	Start-up	Start-up		Pharma	Academia	Academia	Pharma	Academia
	https://www.lonza.com/	https://www.acimmune.com/	https://genknowme.com/	https://www.startup.ch/azure-cell-therapies	FALL BREAK	https://incyte.com/	https://www.epfl.ch/labs/chemina/	https://www.epfl.ch/research/facilities/gene-therapy/	https://www.edwards.com/fr	https://www.epfl.ch/labs/tne/
Lecture assignement	Group 1	Group 2	Group 3	Group 4		Group 1	Group 2	Group 3	Group 4	No assignment Time will be allocated to the semester project
Groups for the Q/A session	Group 3	Group 4	Group 1	Group 2		Group 3	Group 4	Group 1	Group 2	Volunteers (bonus)

Organisation of the groups for Semester project

	3/12	10/12	17/12
Semester project	Groups 1 + 2	Groups 2+3	Groups 3+4

Attendance (in person) is mandatory for the 3 classes in December

BIOENG-430

How to read a life science paper efficiently?

Class 17/09/24

How to read a life science paper efficiently?

A refresher and/or introduction (?) on how to read efficiently a life science paper

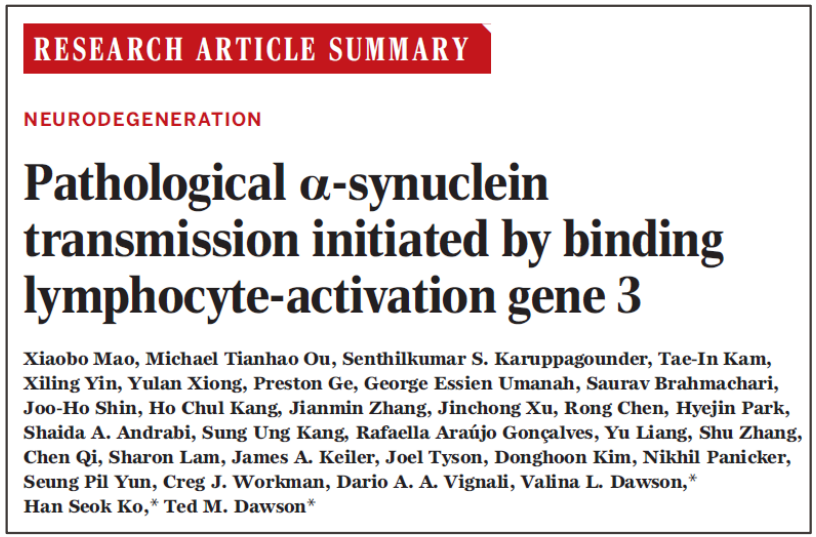
Overview of the course (17/09):

- Importance of reading scientific papers (in life sciences)
- Understand the structure of a scientific paper and determine your focus areas to allocate your time effectively
- The different strategies and techniques for reading scientific papers effectively
- Learn how to engage in critical thinking

Learn how to engage in critical thinking:

Comparing two scientific papers that present contradictory conclusions on the same topic

1



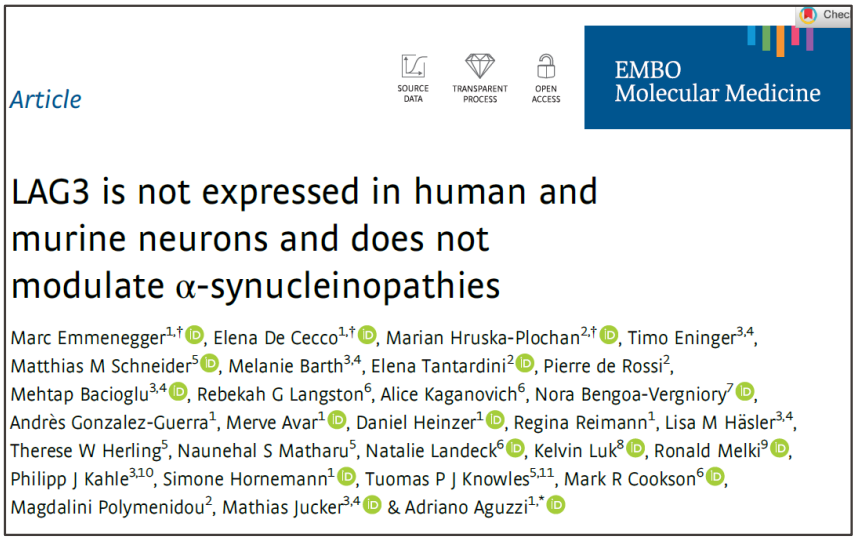
RESEARCH ARTICLE SUMMARY

NEURODEGENERATION

Pathological α-synuclein transmission initiated by binding lymphocyte-activation gene 3

Xiaobo Mao, Michael Tianhao Ou, Senthilkumar S. Karuppagounder, Tae-In Kam, Xiling Yin, Yulan Xiong, Preston Ge, George Essien Umanah, Saurav Brahmachari, Joo-Ho Shin, Ho Chul Kang, Jianmin Zhang, Jinchong Xu, Rong Chen, Hyejin Park, Shaida A. Andrabi, Sung Ung Kang, Rafaella Araújo Gonçalves, Yu Liang, Shu Zhang, Chen Qi, Sharon Lam, James A. Keiler, Joel Tyson, Donghoon Kim, Nikhil Panicker, Seung Pil Yun, Creg J. Workman, Dario A. A. Vignali, Valina L. Dawson,* Han Seok Ko,* Ted M. Dawson*

2



Article

SOURCE DATA | TRANSPARENT PROCESS | OPEN ACCESS

EMBO Molecular Medicine

LAG3 is not expressed in human and murine neurons and does not modulate α-synucleinopathies

Marc Emmenegger[1,†], Elena De Cecco[1,†], Marian Hruska-Plochan[2,†], Timo Eninger[3,4], Matthias M Schneider[5], Melanie Barth[3,4], Elena Tantardini[2], Pierre de Rossi[2], Mehtap Bacioglu[3,4], Rebekah G Langston[6], Alice Kaganovich[6], Nora Bengoa-Vergniory[7], Andrès Gonzalez-Guerra[1], Merve Avar[1], Daniel Heinzer[1], Regina Reimann[1], Lisa M Häsler[3,4], Therese W Herling[5], Naunehal S Matharu[5], Natalie Landeck[6], Kelvin Luk[8], Ronald Melki[9], Philipp J Kahle[3,10], Simone Hornemann[1], Tuomas P J Knowles[5,11], Mark R Cookson[6], Magdalini Polymenidou[2], Mathias Jucker[3,4] & Adriano Aguzzi[1,*]

PDFs are in the **Moodle BioENG-430/Folder of Week 2**

Carefully read both papers in the indicated order (1 then 2) and find the controversy !

Learn how to engage in critical thinking: Tips and Hints

Comparing two scientific papers that present contradictory conclusions on the same topic

For each paper, identify and summarize the following components:

A. Identify key components:

- **Research question:** What question or problem is the paper trying to address?
- **Hypothesis:** What is the hypothesis or hypotheses stated in the paper?
- ***Methodology:*** What methods were used to conduct the research? Consider sample size, experimental design, data collection methods, and any controls.
- **Results:** What were the key findings of the study? Summarize the results briefly.
- **Conclusions:** What conclusions did the authors draw from their results?
- ***Strengths and weaknesses:*** What are the strengths and weaknesses of each paper? Consider aspects such as sample size, methodological rigor, potential biases, and the validity of the conclusions.

B. Compare and contrast:

- **Differences in methodology:** How do the methodologies differ between the two studies? How might these differences affect the results and conclusions?
- **Contradictory results:** What are the key points of contradiction between the results and conclusions of the two papers?
- **Evaluation of evidence:** Evaluate the evidence presented in each paper. Which paper do you find more convincing and why? Consider the reliability and validity of the data and the soundness of the arguments presented.
- **Bias and limitations:** Are there any apparent biases or limitations in either paper that could affect the results? Discuss any potential conflicts of interest, funding sources, or other factors that could introduce bias.

Learn how to engage in critical thinking: Tips and Hints

Comparing two scientific papers that present contradictory conclusions on the same topic

Title	Authors (1st and last)	Keywords	Methods	Main results	Conclusions	Key figures	Others comments

Any questions ? Or Thoughts ?