

International Bachelors Program

- Track coordinator: Guillaume Blin
- PI Chemistry: Manuel Gaudon
- PI Computer Science: Francieli Zanon Boito
- PI Mathematics: Haak Bernhard
- PI Physics: Jonathan Braine
- PI Physics-Chemistry: Jonathan Braine and Manuel Gaudon
- PI Engineering Science: Sophie Fasquel Perrin
- PI Biology: Karine Masse and Clotilde Billottet

Overview

- You are enrolled in a bachelor track (*Computer Science, Mathematics, Physics, Chemistry, Physics-Chemistry, Biology, Engineering*) – called your **major**
- You are preparing an **international bachelor degree** (a classic bachelor degree with some *extra credit*)
 - Many of your classes will be in **English**
 - You will have extra courses to attend (so-called **minors** – a secondary area of expertise different from your major)
 - You will attend **specific English courses**

First Year



- You need to choose a minor that you will follow during 2 years
 - <https://moodle.u-bordeaux.fr/course/view.php?id=2730>
 - Minor presentations will follow shortly
 - You will need to order your preferences (at least 3) and you may not be enrolled to your first choice in the end due to capacity
- You will attend specific English courses on both semesters
- In order to stay on the International Bachelors Program, you will need
 - To achieve an average of at least 11/20 (minor excluded) and 10 in the minor
 - Fulfill the classic bachelor requirements
- If you fail (or if you want to quit), you will be able to go back to the classical bachelor program

Second Year

- You will keep studying your minor
- You will prepare your international mobility
- In spring semester, you will enroll to one of
 - Infinitely Small
 - Artificial Intelligence
 - Methodology in research articles

Third year

- You will be in international mobility
- If your mobility is only a semester,
 - You will be enrolled to the classical third year bachelor
 - You will participate to an extra course in the semester at Bordeaux

English classes L1

- Suibhne Blaix @u-bordeaux.fr (on site programme)
- Alexandra Reynolds@u-bordeaux.fr (international off--site programme)

English classes – S1

- 12 on-site sessions in a group of 25 students
- AUTUMN TERM - Keeping up with the news and current affairs (articles, videos), debates on topical issues. Work on oral fluency and presentations.
 - Evaluation: oral presentation and writing related to one of the topics discussed in class and participation in English.
- SPRING TERM Focus on listening comprehension through different activities (podcasts, interviews, TedTalks) followed by discussions.
 - Evaluation: presenting a foreign university, listening comprehension and participation in English
- CC intégral
 - Autumn: Présentation orale: 0.4, Travail écrit: 0.4, Participation 0.2
 - Spring: Compréhension orale: 0.5, Présentation orale: 0.3, Participation 0.2

Code UE S1: 4TPU109U - Intitulé: ENLIVE virtual exchange - 20 places

English classes – S1

ENLIGHT Network Language and Intercultural Virtual Exchange
Responsable: Alexandra Reynolds

- 6 ZOOM sessions starting 5 November 2024 (Tuesdays 18-20h or 17h-19h to be confirmed)
- Students will select and research a topic in order to design and disseminate a social media campaign to their chosen target audience
- Topics:
 - Gender and education
 - Diversity on screen
 - Climate change and youth activism
 - Body image and social media
 - Science denial and anti-science movements
- **Each week, groups of 10 students will meet for 2h via Zoom.** They will alternate plenary phases where all members of the group are engaged in dialogue, and project work in dyads in breakout rooms
- ENLIGHT: **European university Network** to promote equitable quality of **Life**, sustainability and **Global** engagement through **Higher** education **Transformation**
- **Université de Bordeaux, National University of Ireland Galway, Universiteit Gent, Rijksuniversiteit Groningen, Georg-August-Universität Göttingen, Uppsala Universitet, Tartu Ülikool, Univerzita Komenského, Euskal Herriko Unibertsitatea**
- CC intégral
 - Evaluations continues individuelles orales (coef 05) dont (03) Video Project, et (02) Participation
 - Evaluations continues individuelles écrites (coef 05) dont (02) Weekly Reflective Journal et (03) Social Media Project



English classes – S1

- Sign up for ENLIVE virtual exchange below
 - <https://enquetessphinx.u-bordeaux.fr/v4/s/01qHsWEblG>
- All students will be automatically attributed to Think International S1 (**unless they request to do ENLIVE**).
- Please note there are only 20 places available for ENLIVE and that the programme will start in November only.



English classes – S2

- S2 Anglais renforcé pour PI
- S2 ENLIVE (20 new places for new candidates)
- S2 Erasmus Virtual exchange (24 places)
- S2 Eloquence anglaise (24 places)
- S2 Eloquence française for non-native French speakers (24 places)

Minors

- Industrial Engineering
- Computer Science
- Mathematics
- Epistemology
- Biology
- Biosourcing

Minor Industrial engineering

- The objective is
 - to introduce students to enterprise and industry knowledge and culture
 - to facilitate their future professional carrier in economic world,
 - to prepare some students with necessary knowledge to facilitate their admission in the master programmes of the university of Bordeaux in industrial engineering or, more generally, in technologies
- Semester 1 - The product - Julien Francois and Bruno Vallespir
- Semester 2 - The industrial enterprise - Julien Francois and Anne Zouggar
- Semester 3 - The industry of the future - Anne Zouggar and Bruno Vallespir
- Semester 4 - The enterprise modelling - Minh-Phuoc Doan and Bruno Vallespir

The product

- **Purpose**

- Introduce the students to the notion of product and to the concepts and techniques of product design

- **Content**

- Notion of product and value
- Functional analysis and value analysis
- Services and servitization
- Products design and innovation



The industrial enterprise

- **Purpose**

- Introduce the students to the industrial enterprise, typology, main collaboration configurations, principles of production and inventories management

- **Content**

- What an enterprise is, what industry is
- Typology of production: from process to one of a kind, from flowshop to openshop
- Collaborations configurations: supply chain, extended enterprise, etc.
- Inventory management
- Principles and techniques of production management



The industry of the future

- **Purpose**

- Provide an introduction on the evolution of the industry (past and future), from technical and organization points of view

- **Content**

- The history of the industry and the industrial revolutions
 - The technological bricks of the industry of the future (industry 4.0)
 - New organizational principles and lean manufacturing



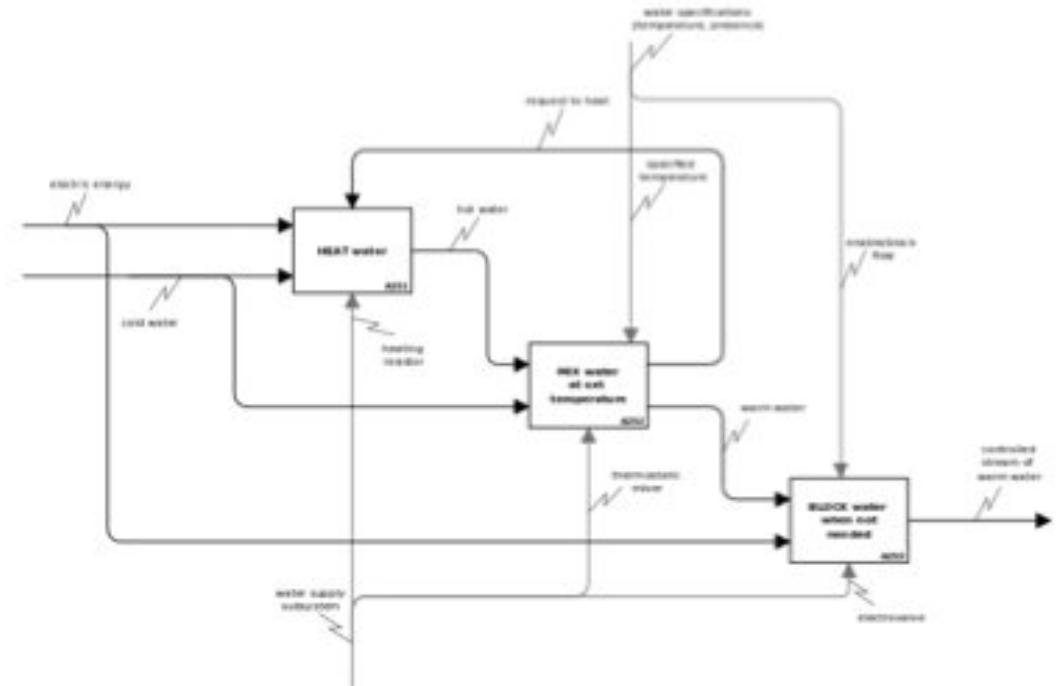
The enterprise modelling

- **Purpose**

- Introduce the students to the concept of model and modelling: introduction to enterprise modelling tools and techniques, introduction to digital modelling approaches

- **Content**

- Concept of model: what a model is, what modelling for?
- Enterprise modelling: introduction to data and process modelling
- Digital modelling: introduction to simulation, towards digital twins

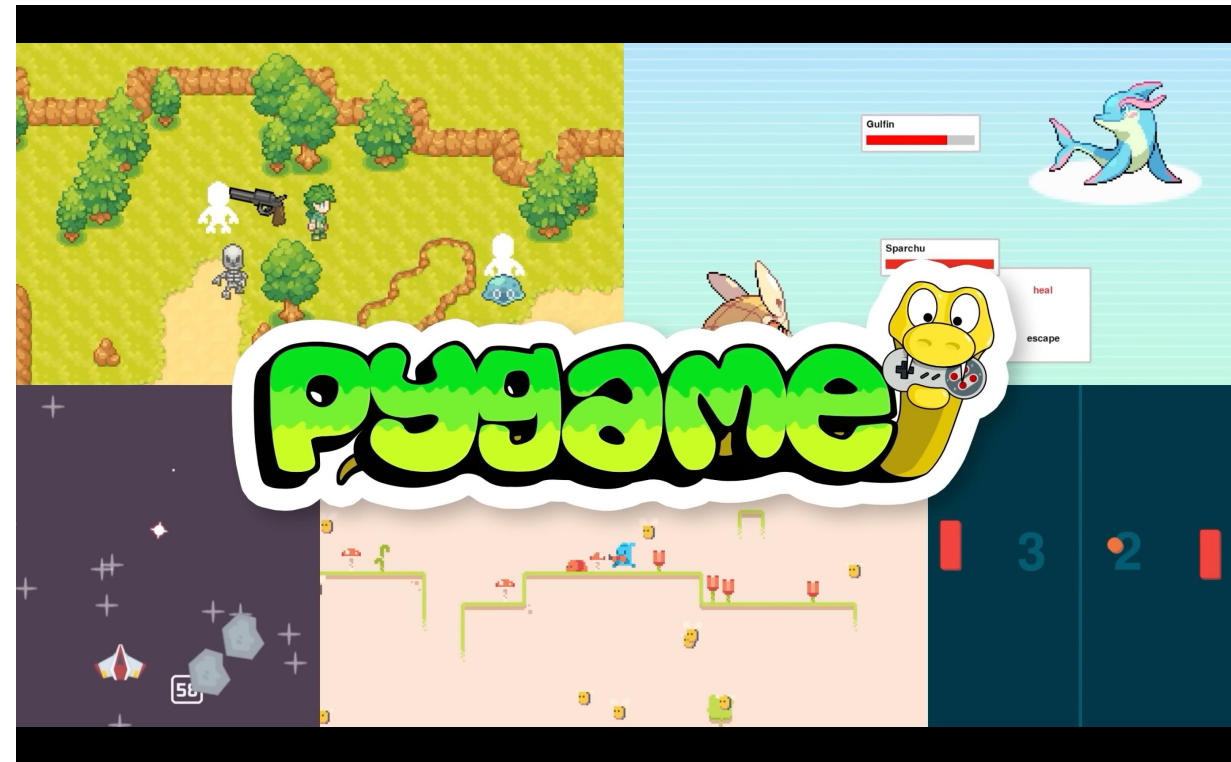


Minor Computer Science

- The overall goal is to learn the **basis of computer programming around Python.**
- Semester 1 - Basic Algorithms and Programming - Guillaume Blin
- Semester 2 - Data Management and Web Design - Luan Teylo
- Semester 3 - Modeling and Simulation in Python - Guillaume Blin
- Semester 4 - Introduction to Image Processing - Pascal Desbarats

Basic Algorithms and Programming

- What about being able to program a full game from scratch without programming background?
- You will program 5 full games in Python using an easy to use programming library called PyGame
- To get there, you will learn step by step and at your pace how to draw stuff on the screen, how to move stuff, how to interact with the user.
- Everything will be accessible online.



Data Management and Web Design

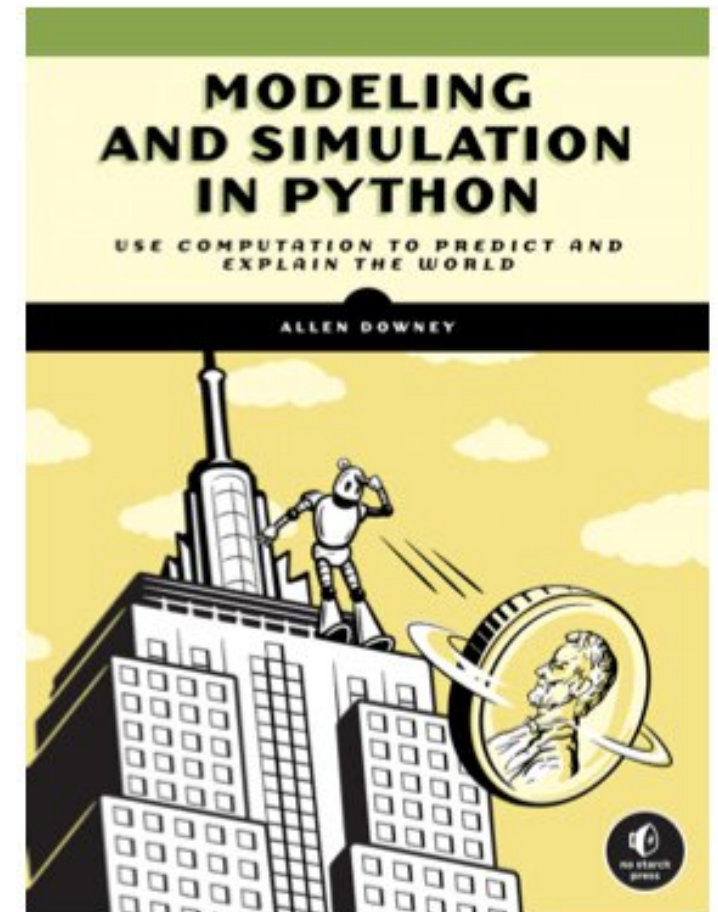
- Whether you have a large amount of biological data, a huge file displaying the historical data of patients in a hospital, or years of data from observing a dying star, you will need one thing: **a tool to process and handle all this data**. One very important step in all these data processing activities is **visualization**.
- This course focuses on data management, with a particular emphasis on data visualization using Python. Additionally, there is a web component, which is the **dashboards**. What is a dashboard? In summary, a dashboard is an interactive tool that we can use to visualize and interact with data.
- In this course, you will learn how to handle data using dataframes and create charts, interactive graphs, and dashboards using Python.

Modeling and Simulation in Python

- Are you a fan of Myth Buster ? Do you wonder how bike share system can work in a town with hills ? Are you fascinated by the famous Coffee Cooling Problem ?
- You will have a very instructive introduction to Modeling and Simulation in Python based on Allen B. Downey book
- For example, do you know that the Falling Penny Myth that consider that a penny drop from the Empire State Building would be going so fast that if it hit a person, it would break their skull is

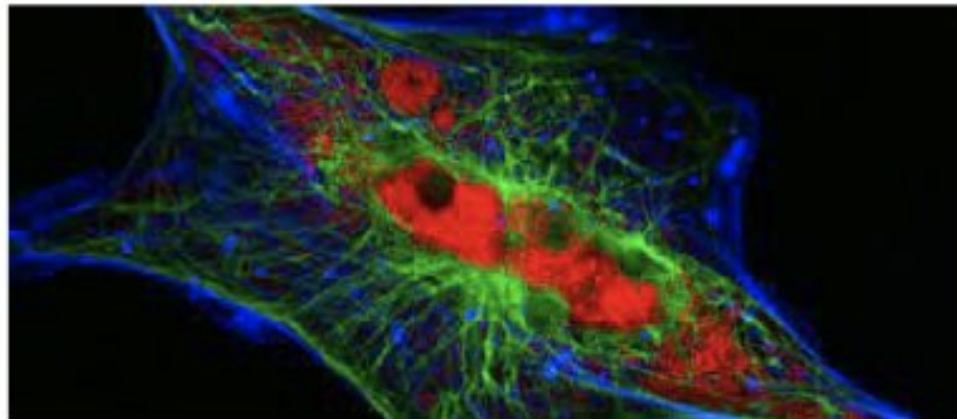
****SPOILER** DO NOT READ WHAT IS COMING IF YOU DO NOT WANT TO KNOW YET**

false



Introduction to Image Processing

- Images are tables of pixels/numbers.
- Image processing is everywhere : robot vision, satellite images, medical or biological images.
- Goal : extract automatically most important information from images as shapes, region of interest....



Minor Mathematics

- Semester 1 - Linear Algebra - Edoardo Provenzi
- Semester 2 - Euclidian Spaces - Philippe Jaming
- Semester 3 - Probability and Statistics - Edoardo Provenzi
- Semester 4 - Integration & Differential Equations - Bernhard Haak

Linear Algebra

- **Course Goals**

- Introduce the core concepts of linear algebra
- Highlight their importance through real-world applications

- **Course Structure**

1. Abstract Vector Spaces: Generalize familiar geometric ideas (collinearity, decomposition on axes) to n -dimensional spaces
2. Linear Maps: Study the most natural transformations between vector spaces
3. Systems of Linear Equations: Learn general computational methods to solve them

- **Applications**

- Examples drawn from physics, chemistry, biology, and visual perception

- **Pedagogical Approach: Flipped Classroom**

- Complete lecture notes and videos available on Moodle
- You are expected to watch videos before class and post questions on Moodle
- In-class sessions will focus on your remarks, doubts, and active discussion

Euclidean Spaces

- **Course Goals**

- Representing linear maps in different basis
- Exploring angles, orthogonality, and projections

- **Course Structure**

1. Matrices as representations of linear maps
2. Scalar products and “angles” between vectors. Orthogonal projections.
3. Gram-Schmidt algorithm and its consequences
4. “good” and “numerically robust” representations of linear maps: diagonalization of symmetric matrices

- **Applications**

- Examples from Physics, Chemistry, and numerical schemes.

- **Pedagogical Approach**

- “traditional & flipped classroom”. Homework
- Coding in python

Probability and Statistics

- **Course Goals**

- Introduce the mathematical foundations of probability as the study of chance in random phenomena using a bottom-up teaching style: motivational examples first, general principles afterwards
- Emphasize its role as the basis for modern statistics and data interpretation
- Show how probability helps quantify confidence in hypotheses and predict future behavior

- **Course Structure**

1. Introduction to Probability: History, motivation, and basic concepts
2. Random Variables and Distributions: Laws, cumulative distribution functions, expectation, variance
3. Fundamental Theorems: Law of large numbers, central limit theorem, and their implications

- **Applications**

- Examples and case studies from gambling, data analysis, natural sciences, and everyday decision-making

- **Pedagogical Approach: Flipped Classroom**

- Complete lecture notes and videos available on Moodle
- You are expected to watch videos before class and post questions on Moodle
- In-class sessions will focus on your remarks, doubts, and active discussion

Integration and Ordinary Diff. Equations (ODE)

- **Course Goals**

- Understanding and programming numerical tools to solve problems
- Developing an intuition how a solution “should look like” : do not trust blindly any algorithm !

- **Course Structure**

1. Approximations of “the area under a curve” by numerical schemes.
2. Study of simple ODE's that we can solve in closed form
3. “qualitative analysis” – what can be done “on paper” if we cannot solve an ODE in closed form?
4. Numerical methods: – what can be done “by computer” if we cannot solve an ODE in closed form?

- **Applications**

- A “project phase”: you re-code in python some claims made in scientific publications and verify their findings.

- **Pedagogical Approach**

- “traditional classroom” focusing on intuition, homeworks & coding in python in small groups”.

Minor Épistémologie, Histoire et Communication des Sciences

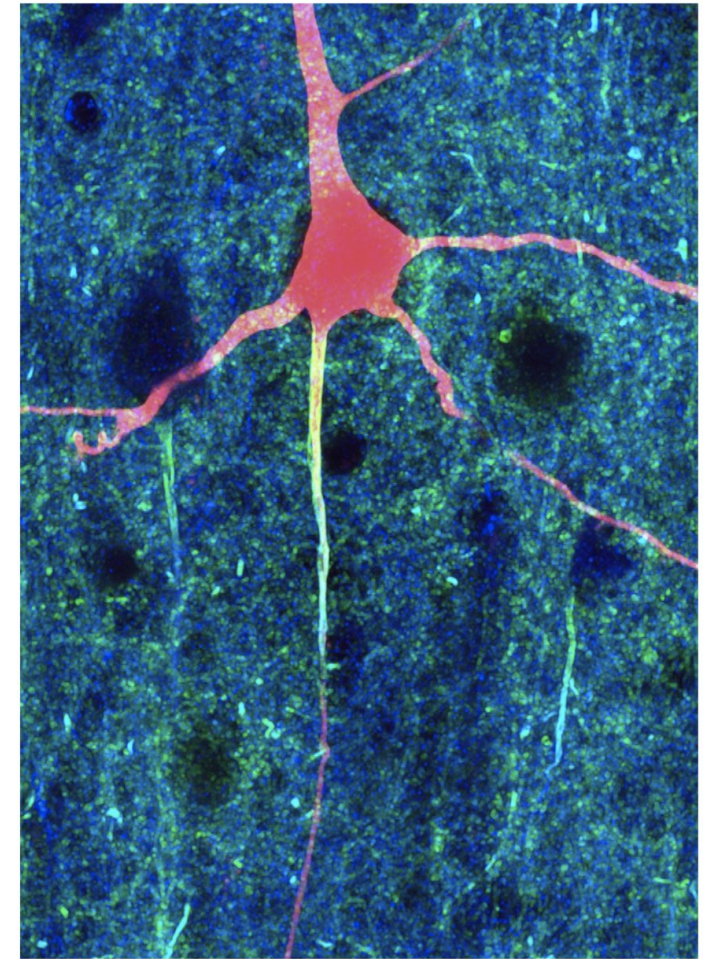
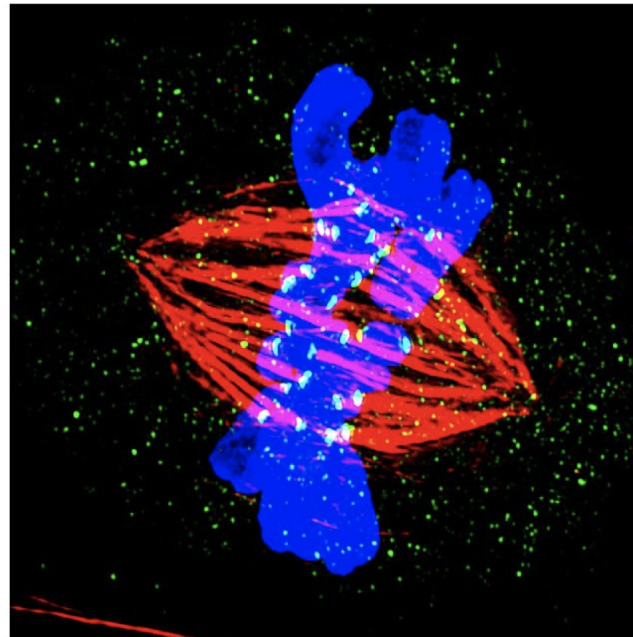
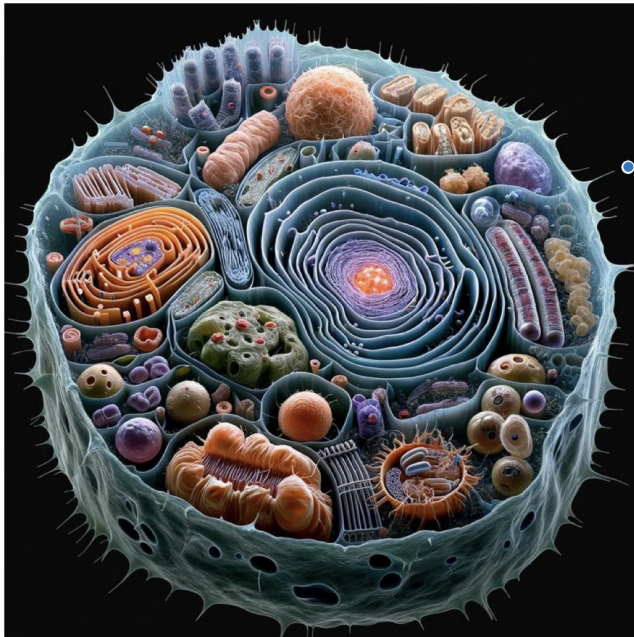
- Semester 1 - History of science 1 - Jérôme Pierrel
Research institutions from Middle Age to XXst century
- Semester 2 – Science communication 1 - Raphaëlle Bats
Technics of science popularization
- Semester 3 - Philosophy of science - Jérôme Pierrel
General and regional
- Semester 4 - Science communication 2 - Axel Hohnsbein
History of science popularization (from the XIXst century)
- 6 ECTS each

Minor Biology - Experience Life Sciences in an Integrated Way

- Semester 1 - Biology of Cells - Arne Battefeld
- Semester 2 – Cell to cell communication - Arne Battefeld
- Semester 3 - Genes & genetic disorders – Sophie Javerzat
- Semester 4 - Hot topics, Ethical concerns, Critical thinking, Interdisciplinarity - Sophie Javerzat

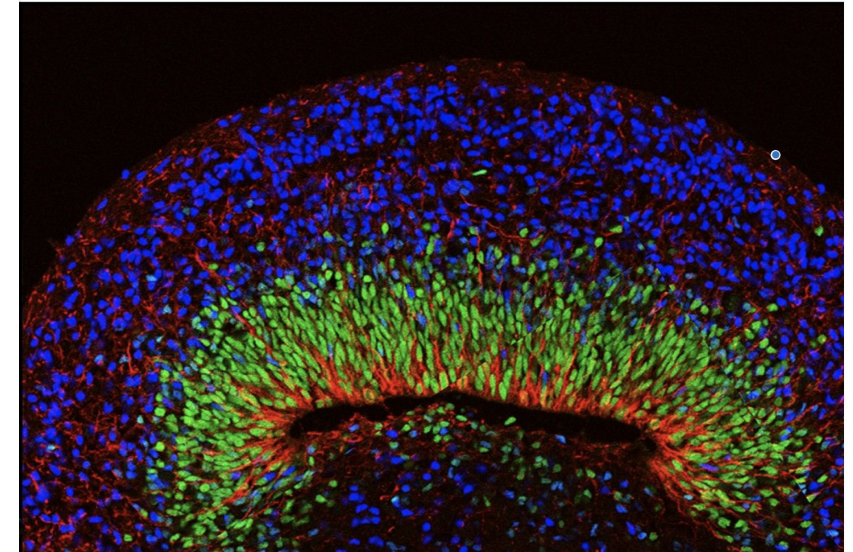
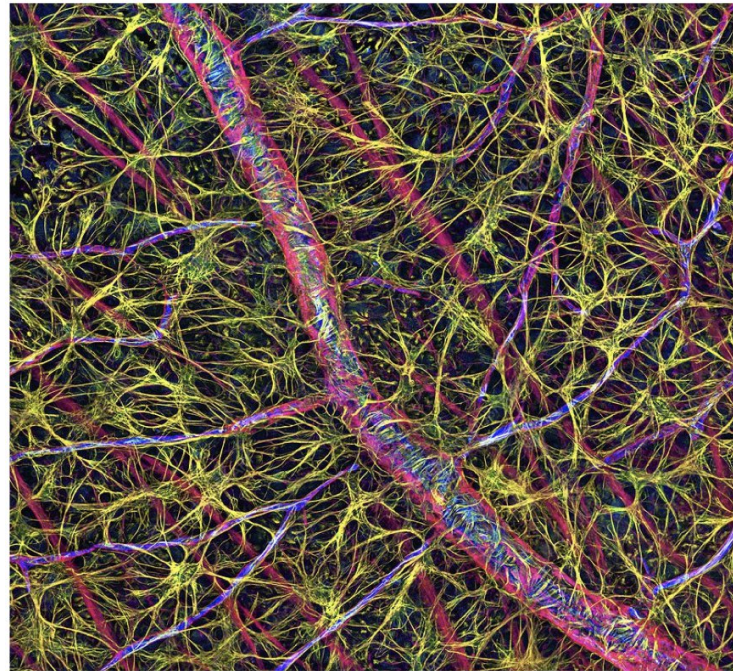
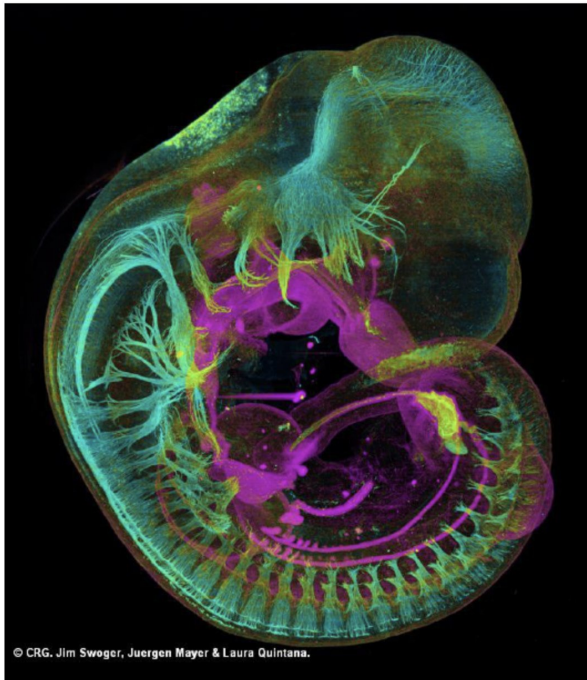
Biology of Cells

- Learning objectives :
 - Basics in cell and molecular biology
 - Integrating biology to your own major (example-based)



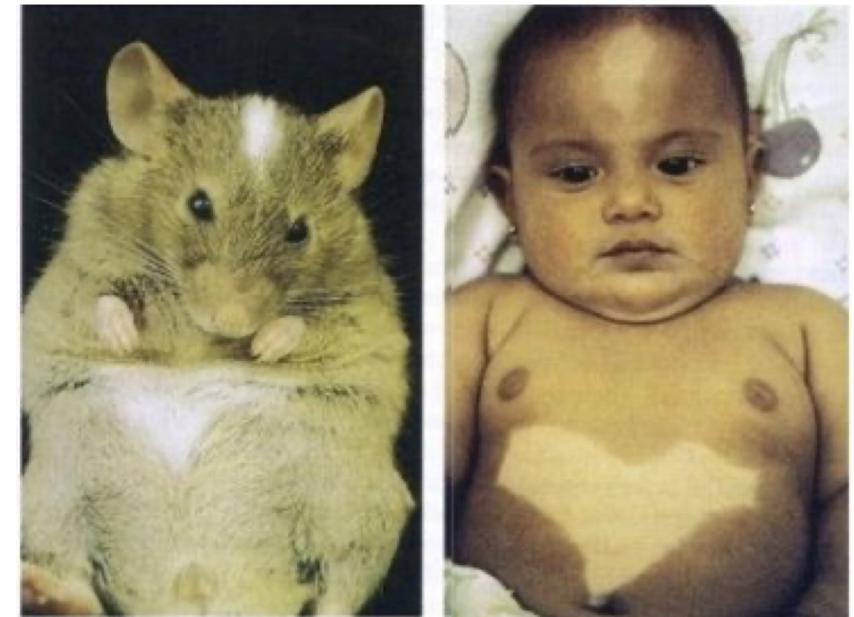
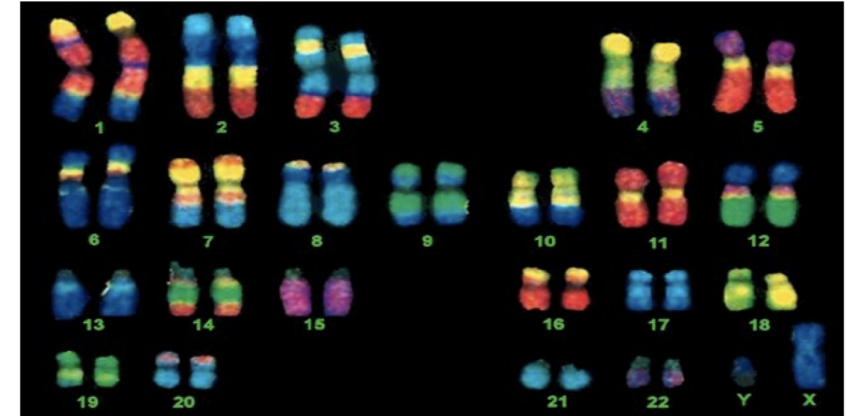
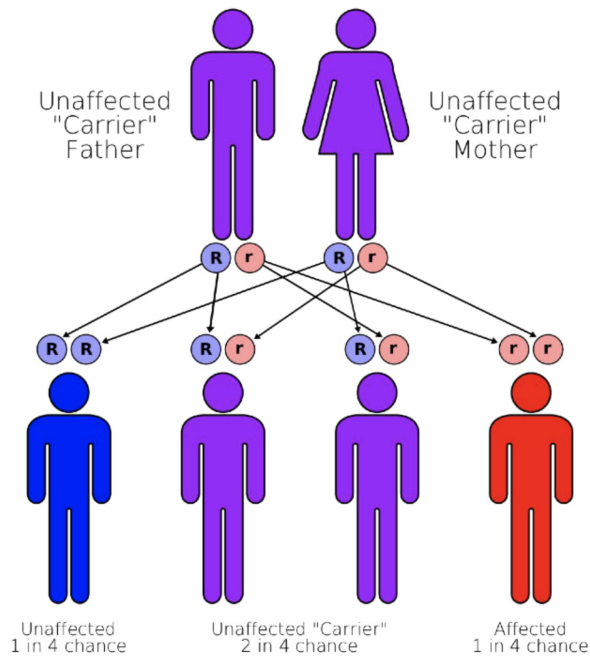
Cell to cell communication

- Learning objectives :
 - Understanding cell diversity
 - How do cell work together to achieve essential functions ?



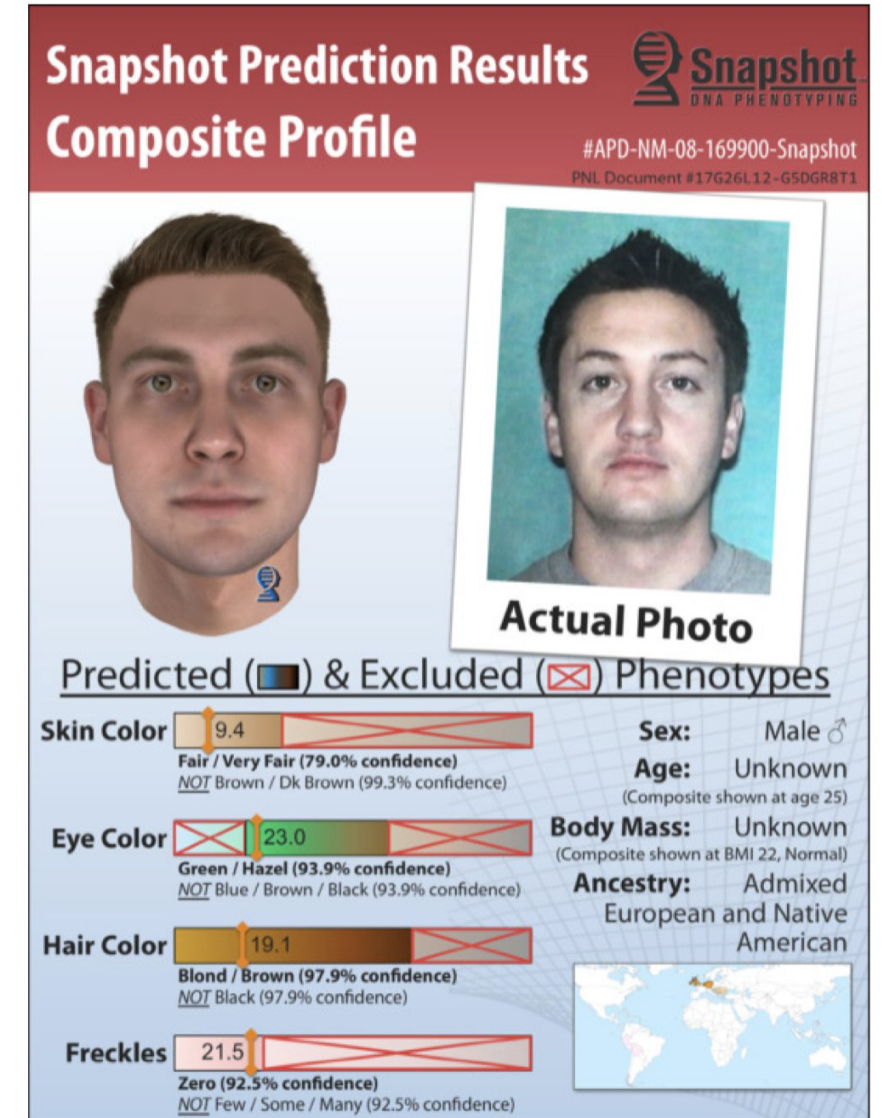
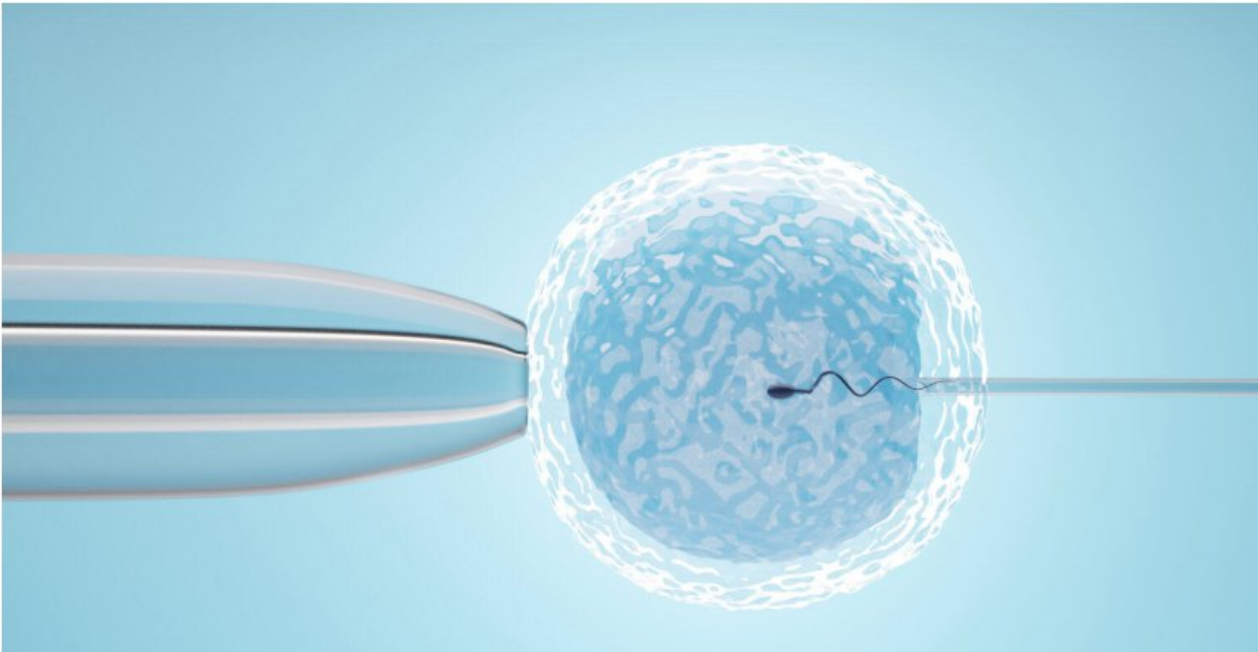
Genes & genetic disorders

- From Genes to Traits
 - Rules of transmission
 - what do we learn from mutations ?
 - Are we « just » chemical entities ?



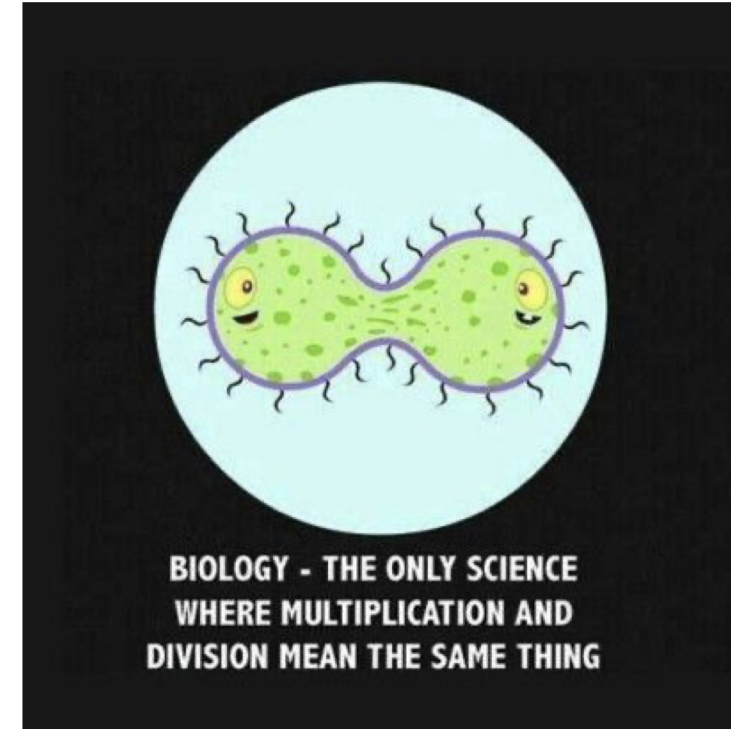
Hot topics, Ethical concerns, Critical thinking, Interdisciplinarity

- When Biology matters for Society
- Forensic Sciences, genetic engineering, GMOs, human embryo modification...



How do we teach? How do you gain skills?

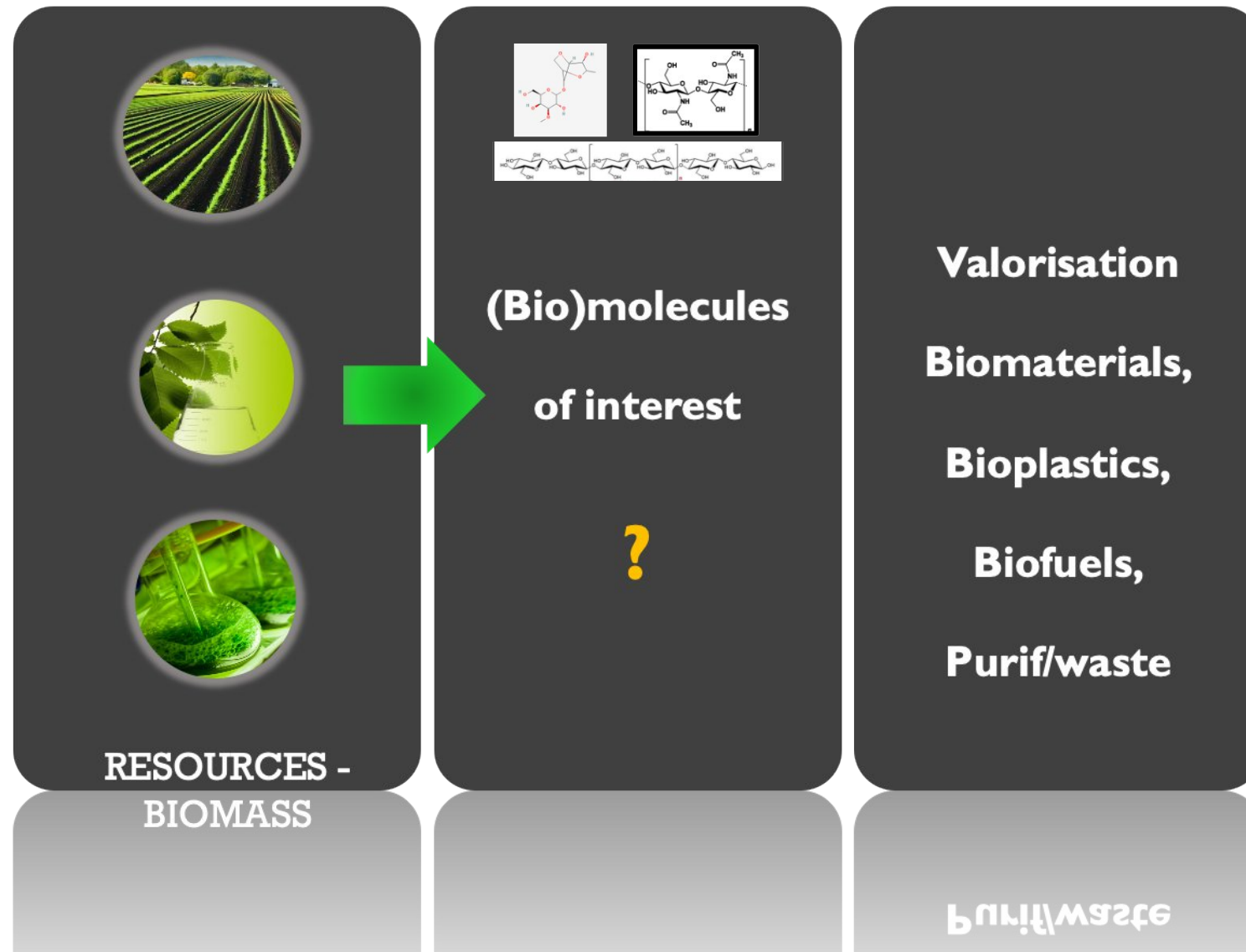
- Our teaching methods :
 - Problem-based learning
 - Flipped classrooms
 - Collaborative project
 - Debates
- Your skills :
 - Deal with scientific knowledge in english with different means of communication
 - Search for relevant sources on a topic
 - Understand and contribute to multidisciplinary projects : bio-informatics; bio-physics; bio-chemistry aso...



Minor Biosourcing- use and transformation of bioresources

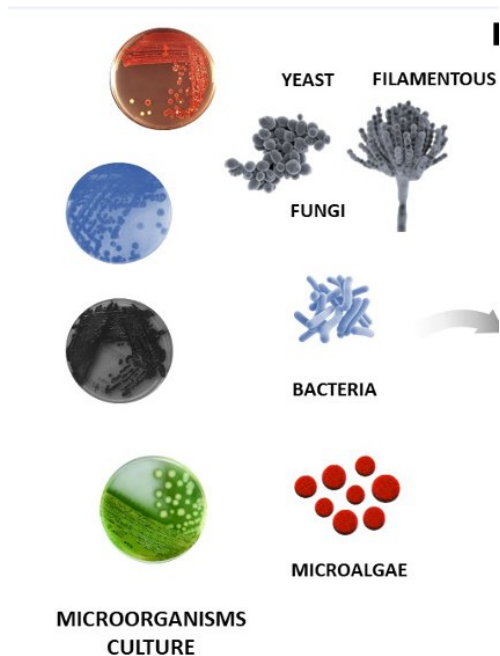
- Semester 1 - Resource management and renewable resources - Véronique Coma and Guido Sonnemann
- Semester 2 - An introduction to biological systems - Véronique Coma
- Semester 3 - Methods and tools for biosyntheses ; Innovative project – Véronique Coma
- Semester 4 - Environmental impact and resource efficiency – Guido Sonnemann

Resource management and renewable resources



An introduction to biological systems

- Introductory knowledge on micro-organisms and algae, in order to provide students with an understanding of how these organisms can be used as producers of (macro)molecules of interest



How these organisms can be used as producers of (macro)molecules of interest. ?



BIOMOLECULES
BIOPOLYMERS
PHA, Cellulose, Hyaluronic acid, pigments, ...

INDUSTRIES
Chemistry, Materials,
Cosmetic, Biomedical,
Medical, ...

Methods and tools for biosyntheses

Innovative project with an industrial partner

IDENTIFY REAL-WORLD PROBLEMS

EXPLORE EMERGING TECHNOLOGIES

COLLABORATE AND BRAINSTORM



SELECTION OF A QUESTION FROM one INDUSTRIAL PARTNERS

Answer the selected question

Use the content of the 3 previous semesters in collaboration with the partner

Well-defined working plan, defined by a "Project Management" document.

Analysis of the work to be done, and the schedule to be followed will be described through the concepts of Work Packages, Tasks, Deliverables, and Milestones. Introduction to the SWOT analysis (Strength, Weakness, Opportunities, Threats) nomenclature will be provided ...

Environmental impact and resource efficiency

- Environmental impact
- Life Cycle Assessment

