Instructors’ names:
O. Reinaud (coordinator)

Pedagogical objectives:
Discovery of the structures, mechanisms and reactivities of major classes of metallo-enzymes (Fe, Cu) involved in redox processes
Activation of small molecules (H₂O₂, O₂)
Biomimetic systems

Course pre-requisites:
Basic knowledge in biological chemistry and bio-coordination (amino-acid residues).

Program:
1st part: For each class, the student will have to prepare an oral presentation on a metallo-enzyme considered as a prototype of a specific family, mainly oxidase or oxygenase. The major types of related Fe and Cu enzymes will be covered, with a major insight into the catalytic mechanism at the active site associated to key spectroscopic studies.

2nd part: The student will present a research article and organize a discussion
Finally, articles with questions related to biomimetic systems aimed at modeling the enzyme active site will be given and the students will have to answer these questions (related to the research methodology, the validity of the results, the interpretation etc...)

Non-heme Fe-enzymes
catechol dioxygenase, aromatic-hydroxylase, alpha-ketoglutarate enzymes, pterine dependent enzymes etc...

Copper proteins
- Types 1 et A : electron transfer
- Type 2 : oxidase (with a co-factor) or monooxygenase (with a reductant) activity
- Type 3 : from O₂ transport O₂ activation (hemocyanine, catecholase, tyrosinase)
- 4 electron reduction of O₂: laccases, cytochrome c oxidase

Corresponding Biomimetic systems

Acquired skills:
Knowledge and understanding at the molecular level of redox reaction catalyzed by metallo-enzymes and design of biomimetic systems
Be able to propose a new experiment for gaining new insights into the catalytic mechanism
Be able to propose and write a mechanism for an unknown enzyme
Be critic vs. proposed mechanisms

Evaluation:
Final exam (50%) + continuous monitoring (participation to the discussion, oral presentations 50%)