

Research Topic for the ParisTech/CSC PhD Program
(one page maximum)

***Field (cf. List of fields below):** 2. Chemistry, Physical Chemistry and Chemical Engineering

Subfield: Chemistry

Title: Ruthenium Complexes against Cancer

ParisTech School: Chimie ParisTech

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Short description of possible research topics for a PhD:

Currently, cisplatin and its other Pt(II) derivatives are involved in more than 50% of chemotherapeutic treatments against cancer. However, despite these impressive numbers, cisplatin still suffers from several important drawbacks which include severe side-effects. *There is therefore a need for novel, metal-based, anticancer drug candidates.* The phenomenal success of cisplatin has boosted the research directed at novel metal-based anticancer drugs beside Pt complexes. Among the potential metal-based candidates, Ru complexes have emerged as leading players by showing extremely promising results, with three such compounds in clinical trial. Our group has notably shown, over recent years, that Ru(II) polypyridine complexes are extremely active against cancer both *in vitro* and *in vivo*. In this project, we plan to undertake a structure-activity study to unveil novel lead compounds against cancer.

The applicant will have to first synthesize and characterize (NMR, MS, X-ray crystallography, electrochemistry) new metal compounds. She/he will then have to assess the stability in biological media (i.e. human plasma) of these compounds as well as perform metabolic studies to understand the fate of the compounds in the presence of different enzymes. The biological experiments will then be undertaken in our laboratory.

Required background of the student: The applicant should have a sound knowledge (theoretical and practical) in both inorganic and organic chemistry and be proficient with analytical techniques such as NMR and MS. The applicant must be fluent in English since it is the language spoken in the Gasser group. Practical knowledge in biology would be an asset.

A list of 5(max.) representative publications of the group:

- 1. Monomeric and Dimeric Coordinatively Saturated and Substitutionally Inert Ru(II) Polypyridyl Complexes as Anticancer Drug Candidates** A. Notaro and G. Gasser,**Chem. Soc. Rev.*,**2017**, *46*, 7317-7337.
- 2. The Medicinal Chemistry of Ferrocene and its Derivatives** M. Patra* and G. Gasser,**Nat. Rev. Chem.*,**2017**, *1*, 0066.
- 3. Molecular and Cellular Characterization of the Biological Effects of Ruthenium(II) Complexes Incorporating 2-Pyridyl-2-Pyrimidine-4-Carboxylic Acid** V. Pierroz, T. Joshi, A. Leonidova, C. Mari, J. Schur, I. Ott, L. Spiccia,* S. Ferrari* and G. Gasser,**J. Am. Chem. Soc.*, **2012**, *134*, 20376-20387.
- 4. Bis(dipyridophenazine)(2-(2'-pyridyl)pyrimidine-4-carboxylic acid)ruthenium(II) hexafluorophosphate: A Lesson in Stubbornness**

T. Joshi,* V. Pierroz, S. Ferrari and **G. Gasser**,**ChemMedChem*,**2014**, 9, 1419-1427.