

**PROJECT 1****DoS:** Prof. Francesco Bandello**Title:** New multimodal imaging biomarkers in Retinitis Pigmentosa.**Curriculum:** Experimental and Clinical Medicine**Residency Program:** OphthalmologyLink to OSR/UniSR personal page: <https://www.hsr.it/clinica/specialita-cliniche/oculistica/francesco-bandello/>**Project description** (Number of characters, including spaces: 2.000 - 3.000):

Retinitis pigmentosa (RP) is a relatively common inherited retinal disease, with an estimated prevalence of 1:4000 people. It consists in a progressive retinal rod-cone degeneration leading to a severe visual impairment in the last stages. RP is characterized by a great genetic variability as up to 70 genes has been associated with the disease. Whereas the diagnosis may be easy in typical cases, often it becomes challenging because of the presence of atypical manifestations and overlapping features with several other retinal disorders. Furthermore, the analysis of RP course is very difficult, because of the presence of extremely heterogeneous rates of progression, making the patients' clinical outcome not predictable. Multimodal imaging techniques, including optical coherence tomography (OCT), OCT angiography (OCTA), color fundus, fundus autofluorescence (FAF), fluorescein angiography (FA) and indocyanine green angiography (ICGA) represent very powerful techniques for the evaluation of retinal diseases, including RP. These techniques may be evaluated by means of qualitative and quantitative approaches. The latter analyses are considered the basis for the development of possible biomarkers for the study of disease features and progression.

The main scope of the project is to adopt advanced quantitative approaches, based on multimodal imaging techniques, in order to develop new possible biomarkers correlated both with clinical and functional RP features. Main outcome measures will include the following: structural OCT parameters (retinal layers thicknesses, reflectivity patterns quantification, hyperreflective foci, choroidal thicknesses, choroidal patterns, choroidal vascularity index and stromal index), OCTA parameters (vessel density, vessel tortuosity, vessel dispersion and vessel rarefaction), FAF signal quantification, FA and ICGA images analysis. These data will be correlated with clinical and functional investigations. Post-hoc analyses will be conducted in order to assess the role of the quantitative biomarkers analyzed to predict disease progression rates and to categorize RP patients in different subgroups showing distinct clinical, functional and anatomical features.

In the last years, even more interest is growing in order to develop new diagnostic and therapeutic tools to improve the final outcome of RP patients. In particular, future scenarios will include new drugs and/or technological devices combined with the introduction of diagnostic artificial intelligence-based techniques. In all these perspectives, the results of the present project might have an important role both in research and clinical settings to perform an accurate patients' selection and categorization, which may help in evaluating treatments' effects and achievable outcome. The project will be supported by adequate funding sources.

**Skills to be acquired by the student:**

This project will allow the student to acquire the following skills:

1. To conduct an investigative study in Experimental and Clinical Medicine.
2. To perform statistical analysis & problem-solving.
3. To use advanced approaches of investigation in Ophthalmology.
4. To understand and develop relevant procedures Ophthalmology.
5. To improve team working and collaboration, communication and writing skills.

**References (max. 3)**

- Hartong DT, Berson EL, Dryja TP. Retinitis pigmentosa. *Lancet*. 2006;368:1795–1809.
- Battaglia Parodi M, La Spina C, Triolo G, Ricciari F, Pierro L, Gagliardi M, Bandello F. Correlation of SD-OCT findings and visual function in patients with retinitis pigmentosa. *Graefes Arch Clin Exp Ophthalmol*. 2016;254(7):1275-9.
- Battaglia Parodi M, Cicinelli MV, Rabiolo A, Pierro L, Gagliardi M, Bolognesi G, Bandello F. Vessel density analysis in patients with retinitis pigmentosa by means of optical coherence tomography angiography. *Br J Ophthalmol*. 2017;101(4):428-432.