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| **Title** | **Development of New Enantioselective Transformations and Application to Asymmetric Synthesis** | |
| **PI** | **ORLANDI Manuel** | |
| **Research Group** | **Molecular Recognition and Catalysis** | |
| **Curriculum** | **Scienze Chimiche** | |
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**Project description:**

Asymmetric reactions relying on chiral transition metal catalysts are powerful synthetic tools in the synthesis of complex molecular targets. Precious metals such as Pd, Rh, and Ir dominated the scene over the last decades due to their efficiency. However, due to the increasingly high cost and low availability of these metals, the development of new catalysts relying on abundant and available first row transition metals (Fe, Ni, Cu, Co) is urgent.

In our group, new chiral ligands are developed that allow the implementation of new enantioselective reactivity with Cu[1] and Co[2] based catalysts. Particular attention is given to C-C and C-B bond forming cross couplings, and C=C bond reductions[3] and hydrofunctionalyzations, which will be explored in the synthesis of complex targets such as natural products and pharmaceuticals.

The focus of the work is also related to the study of the mechanisms of the transformations we develop in our group and to the understanding of the factors affecting the reactions enantioselectivity. To this end, we employ classical and modern tools such as kinetic analysis, linear free energy relationships, isotope labelling, transition state calculations, and multivariate correlation analysis.[4]



**Hosting group(s) for the period abroad**: Prof. David Sarlah (University of Illinois at Urbana-Champaign, IL, USA) or Prof. Fabio Romiti (University of Texas at Dallas, TX, USA).

[1] Escudero-Casao, M.; Licini, G.; Orlandi, M. *J. Am. Chem. Soc*. **2021**, *143*, 3289.

[2] Pugliese, G., Vaghi, F., Lonardi, G., Licini, G., Orlandi, M., *Eur. J. Org. Chem*. **2023**, e202201492.

[3] Lonardi, G., Parolin, R., Licini, G., Orlandi, M., *Angew. Chem. Int. Ed*. **2023**, e202216649.

[4] Orlandi, M.; Hilton, M. J.; Yamamoto, E.; Toste, F. D.; Sigman, M. S. *J. Am. Chem. Soc*. **2017**, *139*, 12688.