Report from the Workshop "Physical and chemical processes of astrophysical interest"

held in Saint Florent, France (Haute-Corse)
June 12-15, 2023

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About 300 different molecules have been detected in the interstellar medium or circumstellar enveloppes. The last three years, in particular, have seen an explosion in the number of new detections with 41 new molecules reported in 2021, 23 in 2022, and 14 in 2023 (as of June). A large fraction of these new species are complex organic molecules and they were identified in a few chemically rich astrophysical sources such as the dark molecular cloud TMC-1, the star-forming complex Sagittarius B2 or the envelope of the carbon star IRC+10216. The dark cloud TMC-1, in particular, was the target of two large line surveys (QUIJOTE with the Yebes 40 m telescope and GOTHAM with the Green Banck 100 m telescope) which have revealed the presence of several cyclic molecules.

The seventh Workshop "Processus physico-chimiques d'intérêt Astrophysique" was held in St Florent, France (Haute-Corse), June 12-15 2023, and was devoted to *Towards the detection of new species*. Following the six previous editions, the aim of the workshop was once again to bring together experts from both the laboratory astrophysics and observational communities to discuss the current challenges in the search for new species and in the development of accurate chemical models able to reproduce the observations and predict new discoveries. The scientific program consisted of 36 invited talks (including 13 from young PhD students and post-docs) and many informal discussions. High-resolution spectroscopy, collisional excitation and gas/solid-phase reactivity of radicals, rings, ions, etc. were discussed together with the prospect of identifying new pivotal species in interstellar chemistry. We have identified the following (obviously non-exhaustive) list of topics to be addressed in future observational, experimental and theoretical studies:

- Spectral confusion: need for sources with narrow lines and/or low excitation temperature
- Accuracy of collisional data: need for experiments on "large" non-linear targets (with more than 3 atoms)
- Vibrationally excited rotational transitions: need for rotational and ro-vibrational data (spectroscopy and collisions)
- Grain-surface chemistry: need for elementary experimental data to benchmark the models
- Astrochemical networks: how to combine machine learning with conventional models ?
- Laboratory spectroscopy: need to establish priority targets (e.g. CH_3CO, CH_3^+, protonated methanol)