## **Nuclear Physics in Astrophysics XI**



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## Neutron-capture measurements for s-process nucleosynthesis

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There are three "families" of nuclides with a particular value for s-process studies: s-only nuclei, bottlenecks and branchings. Interestingly, for none of them is the situation satisfactory from an experimental standpoint. This contribution summarizes selected examples utilizing the time-of-flight technique at CERN n\_TOF in combination with detection systems, which have been progressively optimized over the last 25 years. Also, new endeavors combining radioactive-ion beams from ISOLDE with a new cyclic activation station (CYCLING) at CERN n\_TOF NEAR will be introduced as a means to tackle some specific s-branching nuclei. Some of the latest experimental advances in the field will be presented, together with their astrophysical impact on branching points (79Se, 94Nb), branchings leading to s-only nuclei (like 204Tl-204Pb) and very-low capture cross-section nuclei or bottlenecks (140Ce, 209Bi). On the basis of these new exciting results, also current limitations on state-of-the-art techniques will be depicted, thereby showing the pressing need for further upgrades and enhancements on both facilities and detectors. Finally, it will be discussed how the combination of conventional methods, TOF and activation, with complementary novel approaches based on inverse-kinematics experiments, may allow one to go one step ahead toward completing the large puzzle of the s-process data needs.

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