Nuclear and astrophysics aspects of the nucleosynthetic r- and p-processes

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The r-and p-processes of nucleosynthesis are called for to explain the origin of a large fraction of the neutron-rich and neutron-deficient nuclei heavier than iron observed in nature. Nuclear and astrophysics aspects of both processes are discussed. A special attention is paid to the large amount of nuclear data required to model these processes. This concerns in particular the neutron-, proton- and alpha-capture reaction, as well as the photoreaction cross sections for thousands of nuclei. Although important effort has been devoted in the last decades to measure reaction cross sections, theoretical predictions play a crucial role to fill the gaps. The nuclear ingredients to the reaction models should preferentially be estimated from microscopic global predictions based on sound and reliable nuclear models which, in turn, can compete with more phenomenological highly-parametrized models in the reproduction of experimental data. The latest developments made in deriving such nuclear inputs are reviewed. It mainly concerns nuclear structure properties (atomic masses, deformations, radii, etc...), nuclear level densities, and γ-ray strength functions. Implications for the r- and p-processes of nucleosynthesis are discussed.