Review and new concepts for neutron-capture measurements of astrophysical interest

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The idea of slow-neutron capture nucleosynthesis formulated in 1957[1, 2] triggered a tremendous experimental effort in different laboratories worldwide to measure the relevant nuclear physics input quantities, namely (n, γ) cross sections over the stellar temperature range (from few eV up to several hundred keV) for most of the isotopes involved from Fe up to Bi. A brief historical review will be presented to illustrate how, advances in the instrumentation have led, over the years, to the discovery of many new aspects of *s*-process nucleosynthesis and to the progressive refinement of theoretical models of stellar evolution. A summary will be presented on current efforts to develop new detection concepts, such as the Total-Energy Detector with γ-ray imaging capability (i-TED). The latter is based on the simultaneous combination of Compton imaging with neutron time-of-flight (TOF) techniques, in order to achieve a superior level of sensitivity and selectivity in the measurement of stellar neutron capture rates.

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[1] E.M. Burbidge et al., Review of Modern Physics **29**, 547 (1957).

[2] A. Cameron, Tec.Rep. Chalk River RCL **41**, 1 (1957).