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Recent Progress and Future Outlook of r -Process Studies

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Nucleosynthesis via rapid neutron capture, the r -process, is responsible for approximately half of the solar abundances of the nuclei with mass numbers $A > 100$. Five decades after this process was proposed, two outstanding issues remain: (1) which astrophysical environments can provide the conditions required for the r -process? and (2) what is the detailed nuclear physics input that governs the yield pattern of nuclei from an r -process? Both issues are crucial for a full understanding of this process. This talk will review recent astrophysical models of r -process nucleosynthesis in core-collapse supernovae and neutron star mergers, discuss the implications of elemental abundances observed in metal-poor stars, and describe the interplay between astrophysical environments and nuclear systematics in determining the final r -process yield pattern. An outlook of future developments will be provided.