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Exotic nuclear structure and origin of the heavy nuclei with covariant density functional theory JIE MENG, Peking University — The covariant density functional theory with a minimal number of parameters allows a very successful description of nuclear ground state as well as excited state properties all over the nuclear chart. Firstly in this talk, its recent progresses, including the deformed relativistic Hartree-Bogoliubov theory in continuum and the fully self-consistent proton-neutron quasiparticle random phase approximation newly developed based on the relativistic Hartree-Fock-Bogoliubov theory, are briefly reviewed. The halo phenomenon in deformed weakly bound nuclei and the beta-decay half-lives of the neutron-rich nuclei are discussed. With mass table and the beta-decay half-lives of the neutron-rich nuclei obtained, the speeding-up of the r-matter flow is suggested which thus produces higher r-process abundances of elements with A $\sim$ 140 and help us to understand the origin of heavy elements in the universe. The constraints of nuclear mass model and astrophysical condition by the observed Solar abundance are discussed.

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