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Coulomb dissociation - another Trojan Horse

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I start with my experience for the quasi-free process, which is on the 1H(d,2He)n reaction, where 2He denotes a system of two protons in their unbound singlet S state. The data taken at Saturne in late 1980s were analyzed with plane-wave impulse approximation. The tensor analyzing powers and even the absolute magnitudes of the differential cross sections have been successfully explained. That was my surprise, because nucleon rearrangement reactions are not always described by such a simple treatment.
The second time when I encountered such unexpected (to my view) success is the occasion when I heard a talk by Prof. Spitaleri on the Trojan Hourse determination of astrophysical reactions. The process is a "quasi-free reaction"leaving a three-body final state with a particle-unbound subsystem. A remarkable agreement between the excitation functions of the original and extracted reaction of interest was demonstrated, at least, in that case, for their relative energy-dependence. It should be noted that the incident energy is not very high and complicated processes could contribute.
These observations lead me a "feeling": the quasi-free mechanism can naturally find a way to particle-unbound final state, while population of discrete bound-states requires more kinematically restricted conditions and may allow for complicated mechanism to be involved. That is only my prejudice, but we should thank this favorable situation.
The Trojan Hourse method can indirectly access particle rearrangement reactions of astrophysical interest. Another indirect method that can study radiative capture, often of importance in nucleosynthesis, is the Coulomb dissociation. I conducted several experiments in the period when Prof. Spitaleri vigorously studied and were establishing the Torojan Hourse method. Coulomb dissociation, that is inelastic scattering exciting a nucleus to its unbound state, is often explained in terms of virtual photons created when the two colliding nuclei come close to each other. In fast collisions, the breakup process involves a single photon and can therefore be understood as a Trojan Horse reaction, where the photon serves as a "soldier". Several radiative capture reactions of astrophysical interest have been studied. Especially with fast radioactive-isotope (RI) beams, processes involved in explosive nuclear burning, such as the hot CNO cycle and rp-process, could be accessed.

Primary author: Dr MOTOBAYASHI, Tohru (RIKEN Nishina Center)

Presenter: Dr MOTOBAYASHI, Tohru (RIKEN Nishina Center)

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