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A model is proposed for the formation of a complicated compound-nucleus state by a sequence of two nucleon collisions inside the nucleus, each of which can increase the number of "excitons" (particles plus holes) by at most two. "Precompound" decays may occur when nucleons are scattered into continuum states during this process. Their energy distribution can be simply calculated in terms of the partial level densities for n-exciton (particle plus hole) states. The result agrees with the neutron energy distributions observed in (p,n) reactions. [The *SCI*® indicates that this paper has been cited in over 320 publications since 1966.]

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During the academic year 1965-1966, while I was a visiting lecturer at the University of Wisconsin, I undertook a theoretical study of some (p,n) reaction data then being gathered there.[1,2] It soon became clear that the data did not fit into the then-conventional nuclear-reaction theory: the observed energy distributions could be described neither by the compound-nucleus nor by the direct-reaction theory.

On the other hand, the compound-direct dichotomy was already yielding to the future with the active discussion of doorway state resonances,[3] reflecting the direct excitation of bound states in the continuum, and the suggestion of "hallway" states that could be excited from the doorway states by one additional two-nucleon interaction to yield an "intermediate structure" in the energy dependence of certain relevant nuclear reactions.[4] In this context, it seemed natural to think of the compound-nucleus state as the result of this sequence of many two-body interactions (later to become the "chaining hypothesis" for these "multi-step" reactions)[4,5] and to incorporate the physics of such a sequence into a statistical model that could describe a smooth, averaged version of the resulting reactions. The "Statistical model of intermediate structure" emerged easily and naturally from these ideas. It provided separate, closed algebraic expressions for the energy distributions of compound and of "precompound" (later to become "pre-equilibrium")[6] particle emissions, and these combined to yield an excellent description of the Wisconsin (p,n) data.

In subsequent years, progress in nuclear experimental capacity enormously expanded the quantity of data to which the theory could be applied and drove an ongoing theoretical elaboration of the basic idea of a sequential reaction process. The original theory was generalized to encompass the angular distributions of the emitted particles,[5,7] the emission of multi-nucleonic particles,[8] and the statistical fluctuations associated with the successive reaction stages.[9] In recent years, practical applications of pre-equilibrium processes have been addressed in a series of international conferences.[10] Most recently, the pre-equilibrium viewpoint is seeing application to nuclear heavy-ion reactions.

References 6, 8, 9, and 11 present reviews of the subject at various stages in its evolution. The large number of citations to my paper reflects the ongoing ramification and expansion of relevant data and a continuing evolution of the theory that such growth sustains.

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