MCAS: A Multichannel Algebraic Scattering theory of low energy nucleon-nucleus reactions.

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Low energy cross sections from the collision of nucleons with light mass nuclei show sharp as well as broad resonances upon a smooth, energy dependent background. Those resonances may correlate to states in the discrete spectrum of the target. To interpret such scattering data then requires use of a complex coupled channel reaction theory. Such a theory has been developed and forms the MCAS, a Multi-Channel Algebraic Scattering theory. The prime information sought, the scattering matrices, are determined therefrom by matrix methods built using sturmian-state expansions of the relevant nucleon-nucleus potential matrix. The important ingredient found is the matrix form of the Green function for the scattering. The matrix structure of those Green functions not only facilitates extraction of the sub-threshold (compound nucleus) bound-state spin-parity values and energies but also readily gives the energies and widths of resonances in the scattering regime. Applications for both proton and neutron scattering will be presented.

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