

Abstract Submitted  
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**James Franck and the 1919 Discovery of Metastable States** CLAYTON GEARHART, St Johns Univ — Today physicists associate metastable states in atoms with theoretical selection rules and transition probabilities. But these states were first discovered experimentally, at a time when such theories were in their infancy. In 1914, James Franck and Gustav Hertz published their experiments on inelastic collisions of slow electrons with helium and mercury vapor atoms. Famously, they thought they were measuring ionization energies, and not, as we understand it today, excitation energies. During the Great War, experimentalists in North America showed that Franck and Hertz had not seen ionization, and also measured the correct ionization energy of mercury vapor atoms. As Franck resumed work after the war, he and his associates at Fritz Haber's Institute for Physical Chemistry returned to experiments on and theoretical analyses of the collisions of slow electrons with helium atoms, in brisk competition with others in England and America. They were able to measure the ionization energy and to throw new light on the non-combining singlet and "doublet" (later found to be triplet) spectral series in helium. In the process, they proposed for the first time the existence of metastable states, first in helium, and later in mercury.

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