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**Generalizations and applications of Bethe's treatment of photoionization** P.W. LANGHOFF, UCSD, J.C. ARCE, Univalle, C.L. WINSTEAD, Caltech — Extensions and elaborations are reported of the late Hans Bethe's non-stationary or initial-value treatment of photoionization based on Dirac variation-of-constants solution of the time-dependent Schrödinger equation [Ann. Physik, 5, 433 (1930)] . His method is applied to complex anisotropic targets, including molecules both randomly oriented and fixed in space, and to more general dynamical aspects of the time evolution of photo-excitation and ionization processes. Explicit expressions are derived for photoionization cross sections differential in ejected electron direction for polyatomic molecules in terms of a minimal set of body-frame angular distribution functions for incident dipole radiation of arbitrary polarization. A generalization of the familiar Bethe-Cooper-Zare expression for atomic anisotropy factors applicable to randomly-oriented molecules and other aggregates is obtained which provides useful connections with experiments performed on fixed-in-space molecules. Some representative applications are provided as illustrations of the formalism, including study of the kinematics of elementary excitation and ionization processes and of the natures of the associated transient Ehrenfest's forces operative in these cases. The conceptual and computational advantages of the approach that Bethe developed in such connections are indicated.

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