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A Direct Construction of the Nuclear Effective Interaction[1] KENNETH MCELVAIN[2], University of California - Berkeley and Lawrence Berkeley National Laboratory — Traditionally the nuclear physics effective interactions problem is attacked in two steps, the encoding of phase-shift information in a rather singular "realistic" NN interaction V_{NN}, followed by a reduction of $H = T + V_{NN}$ to the included or P-space H^{eff} by integrating out numerically the effects of H in $Q = 1 - P$. Here we show that H^{eff} can be determined directly in P, eliminating the need for any knowledge of V_{NN} in Q. The method exploits the Haxton-Luu form of the Bloch-Horowitz equation, in which long and short-range contributions to H^{eff} are separated. This decomposition allows one to build into an effective theory the correct infrared behavior, which for continuum states is governed by the energy-dependent phase shifts $\delta(E)$. The effects of V_{NN} in Q can then be absorbed into a small number of nearly energy-independent low-energy constants (LECs), the coefficients of short-range operators. I show that the experimental knowledge of $\delta(E)$ that traditionally is encoded in V_{NN} can instead be used directly in P to determine the LECs. The method reduces the task of finding a precise H^{eff} to that of solving a self-consistent eigenvalue problem in P.

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[2]Work done in collaboration with W. C. Haxton.

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