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Relativistic Pseudospin Symmetry and Shell Model Hamiltonians that Conserve Pseudospin Symmetry.

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Professor Akito Arima and his colleagues discovered "pseudospin" doublets forty-one years ago in spherical nuclei [1, 2]. These doublets were subsequently discovered in deformed nuclei [3-5]. We show that pseudospin symmetry is an SU(2) symmetry of the Dirac Hamiltonian which occurs when the scalar and vector potentials are opposite in sign but equal in magnitude [6,7]. This symmetry occurs independent of the shape of the nucleus: spherical, axial deformed, triaxial, and gamma unstable.

We survey some of the evidence that pseudospin symmetry is approximately conserved for a Dirac Hamiltonian with realistic scalar and vector potentials by examining the energy spectra, the lower components of the Dirac eigenfunctions, the magnetic dipole and Gamow-Teller transitions in nuclei, the upper components of the Dirac eigenfunctions, and nucleon –nucleus scattering [8-14].

We shall also suggest that pseudospin symmetry may have a fundamental origin in chiral symmetry breaking by examining QCD sum rules [15].

Finally we derive the shell model Hamiltonians which conserve pseudospin and show that they involve tensor interactions.

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