Statistically interacting particles with shapes DAN LIU, Physics
Department, University of Rhode Island — Ising spin $s = \frac{1}{2}, 1, \frac{3}{2}$ chains with nearest
and next-nearest neighbor coupling are interpreted as systems of floating particles.
The particles are classified into species according to structure and into categories
according to function. Species are distinguished by motifs consisting of several
consecutive spins that interlink by sharing one or two sites. The four categories
include compacts, hosts, tags, and hybrids. All particles from one set are excited
from a selected Ising product state serving as pseudo-vacuum. Compacts and hosts
float in segments of pseudo-vacuum. Tags are located inside hosts. Hybrids are tags
with hosting capability. All particles are free of binding energies but subject to a
generalized Pauli principle. In the Ising context, all particle energies are functions
of the Hamiltonian parameters. However, the exact statistical mechanical analysis
can be performed for particles with arbitrary energies. The entropy is a function
of the particle populations from each species. Applications to jamming of granular
matter in narrow channels and to DNA overstretching are in the works.

Dan Liu
Physics Department, University of Rhode Island