Abstract Submitted
for the NWS18 Meeting of
The American Physical Society

Angular Momentum in Continuum and Quantum Mechanics
ROBERT CLOSE, Clark College — Classical angular momentum is usually defined relative to a specific origin as the cross product of the radial vector with linear momentum. This definition is useful for analysis of rigid body motion. However, the local spin density ($\mathbf{s}$) defined by its curl ($\nabla \times \mathbf{s} = 2\mathbf{p}$) is more appropriate for analyzing continuous media since it is an intrinsic physical property of the system independent of any choice of coordinate origin. The equation of evolution of spin density is derived from the physical principle that changes not attributable to translation and steady rotation are due to torque. We discuss application to a viscous fluid and ideal elastic solid. A second-order wave equation describing perturbations of an elastic solid may be transformed into a first-order Dirac bispinor equation. The result is a mechanistic interpretation of relativistic quantum mechanics, with stationary matter interpreted as standing waves. We discuss dynamical operators, the Pauli exclusion principle, interaction via potentials, and quantization, including space quantization. The existence of spin angular momentum in elementary particles, consistent with classical wave theory, provides evidence for the solid nature of the vacuum.

Robert Close
Clark College

Date submitted: 20 Apr 2018 Electronic form version 1.4