GEOMETRY OF PARAVECTOR SPACE WITH APPLICATIONS TO RELATIVISTIC PHYSICS

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Abstract Clifford's geometric algebra, in particular the algebra of physical space (APS), lubricates the paradigm shifts from the Newtonian worldview to the post-Newtonian theories of relativity and quantum mechanics. APS is an algebra of vectors in physical space, and its linear subspaces include a 4-dimensional space of paravectors (scalars plus vectors). The metric of the latter has the pseudo-Euclidean form of Minkowski spacetime, with which APS facilitates the transition from Newtonian mechanics to relativity without the need of tensors or matrices. APS also provides tools, such as spinors and projectors, for solving classical problems and for smoothing the transition to quantum theory. This lecture concentrates on paravectors and applications to relativity and electromagnetic waves. A following lecture will extend the treatment to the quantum/classical interface.

Keywords: algebra of physical space, Clifford algebra, instruction in the quantum age, paravectors, quantum/classical interface, relativity.