

# Local Space Structure by Geometric Algebra Using the Hurwitz Unit Quaternions

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## Introduction of Prerequisites:

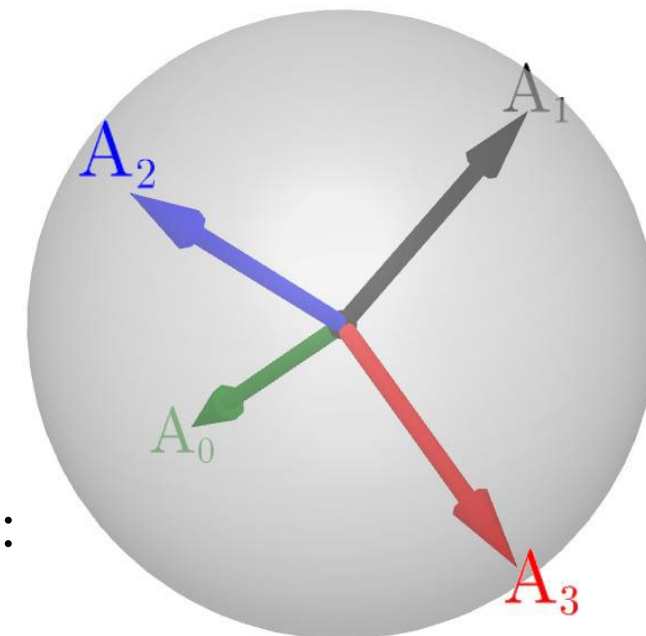
### The Concept of Space

Light bosons propagate free, but *retarded* through space with the speed of light and by that generate *retarded information* of space itself.

### The Concept of Locality

(The Pauli excluding principle)

One fermion is local captured internal in one unit sphere excluding all the external. The unit sphere surface  $S^2$  is in our fiction supported of a minimum of *four directions* as unit spokes from one fictive center out to *four* points on  $S^2$ . This to prevent collapse of the sphere itself. – The local outwards:



Three local *direction* spokes in a Mercedes star  support a plane circle wheel  $S^1$

# The Present GA Study: *Direction* Bivectors Generate Spinors

In Geometric Algebra we know that a bivector is rotation invariant in its own plane. In physics we know that plane area Angular Momentum is a preserved quantity, that as bivectors are generators in cyclic oscillating rotation 1-spinors.

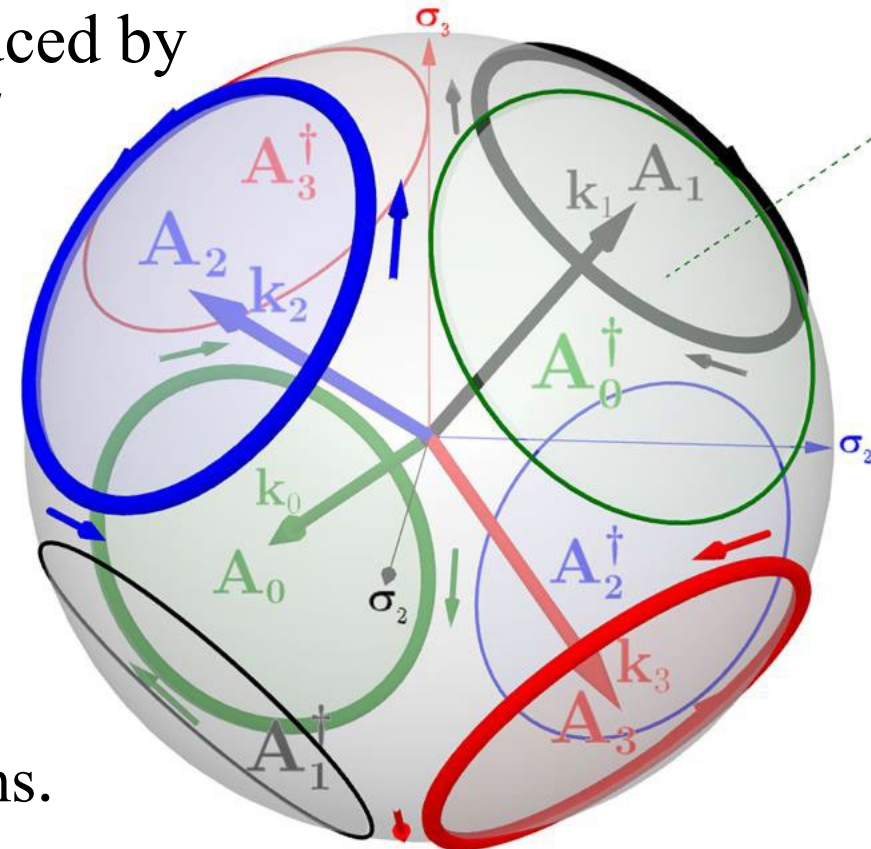
Quantised AM show *interconnected orthogonal* commutator relation as geometric products of bivectors, these superpose linear to *non-orthogonal* generators of quaternion spinors that in structure refer to these introduced by

**Adolf Hurwitz** 1896, using sixteen *interconnected unit half-integer quaternions*

$$Q_\epsilon \in \left\{ \frac{1}{2} (\pm 1 \pm \mathbf{i}_1 \pm \mathbf{i}_2 \pm \mathbf{i}_3) \right\}_{16}.$$

The geometric *direction* of these *quaternion* spinors  $Q_{\kappa\pm} = \pm \frac{1}{2} \pm \mathbf{A}_\kappa$  form *four* faces of a *tetrahedron*.

The *four* cyclic Angular Momenta bivectors  $\mathbf{A}_0, \mathbf{A}_1, \mathbf{A}_2, \mathbf{A}_3$  outwards dextral orientated, and their reversed  $\mathbf{A}_\kappa^\dagger = -\mathbf{A}_\kappa$ , in all *eight* for the superpositions to fluctuating wavefunctions.



Display idea: The tetrahedron *direction* symmetry of 1-spinor cyclic oscillations in a local sphere of one spin $\frac{1}{2}$  fermion.