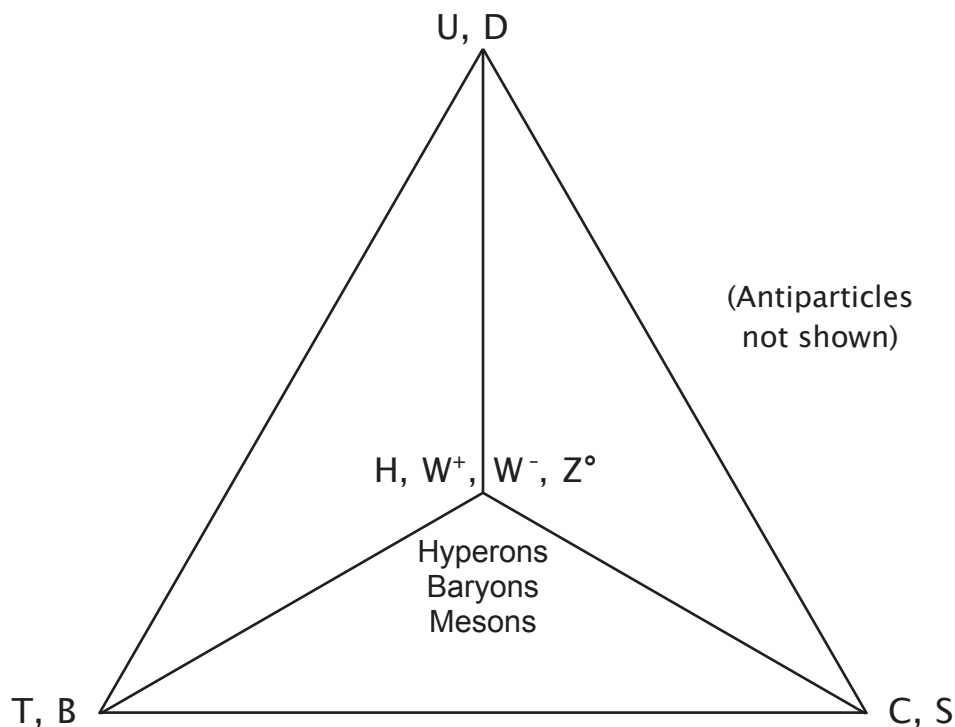


Fig. 3

## THE SYMMETRY GROUPS OF LIGHT: HADRONS—QUARK “FLAVOR” CHARGES



John A. Gowan and August T. Jaccaci

April, 2013

See: <http://www.johnagowan.org/partable.html>  
<http://www.johnagowan.org/weakforce.html>  
<http://www.johnagowan.org/meson.html>

Like the leptons of Fig. 1, the quarks occur in three energy “families”—up, down (U,D); charm, strange (C,S); and top, bottom (T,B). The UCT series carries an electric charge of  $+2/3$ ; the DSB series carries charge  $-1/3$ . All quarks also carry the strong force color charge red, green, or blue (see Fig. 2). The present diagram (Fig. 3) concerns quark “flavor” charges, which are designated by letter abbreviations. Unlike the elementary whole-quantum-unit leptonic flavor charges, quark flavor charges are fractional, sub-elementary, not associated with neutrino “identity” charges, and not strictly conserved. Quarks transform into each other via the mediation of weak force “W” IVBs and alternative charge carriers (leptons, neutrinos, and mesons, Fig. 4)—lines indicate transformation pathways. Quarks occur only in whole quantum unit charge combinations: baryons (quark triplets), or mesons (quark-antiquark pairs). Quarks originate from electrically neutral leptoquarks, which decay asymmetrically into matter-only heavy baryons (hyperons) via the “X” IVB (Fig. 2). Hyperons decay into sub-atomic particles of the “Standard Model” (Fig. 4)—leptons, neutrinos, baryons, mesons.