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Synthetic Orthogonality Theory

De Launey and Flannery built their now-canonical field of Algebraic Design Theory upon the base assumption that an $m \times n$ array must have the property that all $2 \times n$ subarrays belong to a collection called an $\mathbf{orthogonality\ set}$, thus abstracting, in an axiomatic fashion, a general category of "orthogonality" pertaining to important classes of designs. This seems an interesting, and inevitable, step in the development of an overarching theory encompassing the disparate objects of design theory: step back, set up axioms and see what worlds those axioms open up for exploration. Those worlds are inhabited, of course, by our old familiar friends in design theory, and many other exotic creatures, as yet unexplored.

The next phase of this work was to develop an algebraic framework that would marry this axiomatic approach with the ongoing questions of conventional design theory. Alternatively, they had an a priori notion of where this path should lead, and deliberately pushed forward in that direction.

But what else might have happened? Backtracking to the axiomatic framework, what dictates that one must follow the path of algebraic development? What might we find by allowing those "ground rules" to inform us what this world looks like? If we are led naturally into algebra, so be it ... but where else might we go?

This talk will summarize an alternative path for exploration, beginning with the De Launey-Flannery approach to orthogonality, and some interesting landscapes of that world that do not lie along their established path.