Higher algebraic structures in SUSY QFT

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In a TQFT of homological type, such as arises from the topological twist of a supersymmetric theory, it is well known that the local operators form an algebra, associative in dimension \(d \geq 1\) and commutative in \(d \geq 2\). The product comes from collision of operators. I will explain how modern mathematical formulations of TQFT (in particular, the notion of \(E_d\) algebras) lead to the existence of a “secondary” product in any dimension \(d\), which acts as a generalized Lie bracket, and has a simple physical definition in terms of topological descent. In \(d = 2\), the secondary product is familiar as part of the L-infinity structure of local operators; in \(d \geq 3\) it has been relatively unexplored. I will use the secondary product to give a topological interpretation of the physical idea that “Omega background leads to quantization.” Time permitting, I will explain some generalizations of the secondary product to extended operators, with interesting applications in \(d = 3\) and \(d = 4\).

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