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## **Sp(2N) gauge theories on the lattice: status and perspectives**

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Among novel strong interactions beyond the standard being currently investigated, the  $Sp(4)$  gauge theory with two fundamental and three antisymmetric fermions is compatible with the pseudo-Nambu-Goldstone-Boson (pNGB) mechanism of electroweak symmetry breaking and the implementation of partial top compositeness. Unlike in QCD, the lack of a manifest experimental counterpart and the scarcity of related works in the lattice literature require a cautious and safe approach to numerical studies of  $Sp(4)$  and, more in general,  $Sp(2N)$  gauge theories. This has resulted in recent wide explorations of the parameter space of  $Sp(2N)$  theories that also include regimes not directly connected with the original motivations related to the pNGB mechanism. In this contribution, I discuss previous calculations of  $Sp(2N)$  theories in pure gauge, in the quenched limit and with single-representation dynamical matter. I shall focus on the function of those investigations in connection with studies of the pNGB mechanism of electroweak symmetry breaking and partial top compositeness, highlighting the key milestones in our journey towards current calculations aimed to approach the phenomenologically relevant regime of the system. Potential applications to the SIMP origin of dark matter are also briefly discussed.

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