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Topology and interactions in a frustrated slab: tuning from Weyl semi-metal to $C > 1$ fractional Chern insulators[1] ZHAO LIU, Department of Electrical Engineering, Princeton University, Princeton, New Jersey 08544, USA, EMIL BERGHOLTZ, MAXIMILIAN TRESCHER, Dahlem Center for Complex Quantum Systems and Institut für Theoretische Physik, Freie Universität Berlin, Arnimallee 14, 14195 Berlin, Germany, RODERICH MOESSNER, Max-Planck-Institut für Physik komplexer Systeme, Nöthnitzer Straße 38, D-01187 Dresden, Germany, MASAFUMI UDAGAWA, Department of Applied Physics, University of Tokyo, Hongo 7-3-1, Bunkyo-ku, Tokyo 113-8656 — We show that a [111] slab of spin-orbit coupled pyrochlore lattice can become a Weyl semi-metal phase with exotic surface states called as Fermi arcs, i.e., these states are localized to different surfaces depending on their quasi-momentum. Remarkably, in this model, these Fermi arcs persists even when there is no Weyl point in the bulk. Considering interacting electrons in slabs of finite thickness, we find a plethora of known fractional Chern insulating phases, including a new discovered higher Chern number state which is likely a generalization of the Moore-Read fermionic fractional quantum Hall state. By contrast, in the three-dimensional limit, we argue for the absence of gapped states of the flat surface band due to a topologically protected coupling of the surface to gapless states in the bulk. We comment on generalizations as well as experimental perspectives in thin slabs of pyrochlore iridates.

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