

## Even SIMP miracles are possible

*Wednesday 16 April 2025 09:30 (30 minutes)*

Strongly interacting massive particles  $\pi$  have been advocated as prominent dark matter candidates when they regulate their relic abundance through odd-numbered  $3\pi \rightarrow 2\pi$  annihilation. We show that successful freeze-out may also be achieved through even-numbered interactions  $XX \rightarrow \pi\pi$  once bound states  $X$  among the particles of the low-energy spectrum exist. In addition,  $X$ -formation hosts the potential of also catalyzing odd-numbered  $3\pi \rightarrow 2\pi$  annihilation processes, turning them into effective two-body processes  $\pi X \rightarrow \pi\pi$ . Bound states are often a natural consequence of strongly interacting theories. We calculate the dark matter freeze-out and comment on the cosmic viability and possible extensions. Candidate theories can encompass confining sectors without a mass gap, glueball dark matter, or  $\phi_3$  and  $\phi_4$  theories with strong Yukawa or self-interactions.

**Presenter:** PRADLER, Josef (University of Vienna & Austrian Academy of Sciences (AT))