In the 1970s, Mikio Sato conjectured that Welter’s game, a game played with a Young diagram, is related to representations of symmetric groups. In support of this conjecture, he pointed out that its Sprague-Grundy function, which gives the winning way of the game, can be expressed in a form similar to the hook-length formula.

In this talk, we present a relation between representations of symmetric groups and Welter’s game. Irreducible representations with degree prime to \( p \) play an important role in this context, where \( p \) is a prime. For a Young diagram \( Y \), let \( R_Y \) denote the irreducible representation of \( \text{Sym}(n) \) corresponding to \( Y \). We give a function \( \psi_p(Y) \) such that the restriction of \( R_Y \) to \( \text{Sym}(\psi_p(Y)) \) has an irreducible component with degree prime to \( p \). From this, we prove that \( \psi_p(Y) \) is equal to the Sprague-Grundy function for a \( p \)-saturated Welter’s game, where Welter’s game is a 2-saturated Welter’s game. (Received September 11, 2019)