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The Misère Mex Mystery

Under the *normal play condition* on an impartial game, the player who makes the last move wins. Under the *misère play condition*, whoever makes the last move loses. It was long ago observed that misère games are vastly more difficult than their normal counterparts.

It was also observed that in the case of Nim, there is a curious correspondence. The strategy for misère Nim is: Follow the strategy for normal Nim until your move would leave no heaps of size greater than one. Then play to leave an *odd* number of heaps of size one.

We will show that this correspondence generalizes to many misère games, including many two- and three-digit octals. For each such game Γ, the strategy for misère Γ is: Follow the strategy for normal Γ as long as the position remains sufficiently rich, in a sense that depends on Γ. Then pay attention to the fine structure of the misère quotient.

This broad strategic principle manifests itself in certain structural properties of the misère quotient of Γ, and is tied to deep questions about how the mex rule generalizes to misère play. We will discuss this relationship and raise a number of intriguing conjectures.

This is joint work with Thane Plambeck.