**Abstract.** Coherent Ising Machines (CIMs) are an emerging class of special-purpose computing architectures for quadratic unconstrained binary optimization (QUBO). In contrast to research in quantum computing, working prototypes of CIM processors have been demonstrated at large scale (with all-to-all coupling of up to 100,000 spins) but we still lack a theoretical basis for analyzing performance advantages of CIM over leading heuristic algorithms for QUBO on conventional computing platforms. I will review the current state of CIM research and introduce my group's efforts to understand CIMs as a "meta-architecture" for embedding QUBO in the bifurcation series of polynomial dynamical systems. I will conclude by offering some thoughts on the role of feedback and quantum coherence in generalized CIM architectures.