Title: The complexity of homomorphism and constraint satisfaction problems seen from the other side

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Abstract: We give a complexity theoretic classification of homomorphism problems for graphs and, more generally, relational structures obtained by restricting the left hand side structure in a homomorphism. For every class C of structures, let HOM(C,_) be the problem of deciding whether a given structure A in C has a homomorphism to a given (arbitrary) structure B. We prove that, under some complexity theoretic assumption from parameterized complexity theory, HOM(C,_) is in polynomial time if, and only if, the cores of all structures in C have bounded tree-width (as long as the structures in C only contain relations of bounded arity).

Due to a well known correspondence between homomorphism problems and constraint satisfaction problems, our classification carries over to the latter.

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