▸ IAN HODKINSON, *Algebras of relations: some results and methods.*
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An algebra of relations on a set U consists of a non-empty set of relations on U of some fixed arity, endowed with (and closed under) the boolean operations and some choice of further operations, such as identity, converse, and composition for binary relations, or diagonals (equalities) and cylindrification (quantification) for n-ary relations.

Algebras of relations are a part of algebraic logic. Their modern development began with Tarski and his colleagues in the 1940s, although earlier work can be traced back to Boole and De Morgan. They form an algebraic counterpart to classical first-order logic, and techniques devised in work on them have been applied in areas such as modal and temporal logic: for example, the so-called cylindric relativised set algebras were the origin of the well known 'guarded fragment' of first-order logic [1].

However, the study of these algebras in their own right is of interest. The main problems are to do with characterising the class of abstract algebras that are isomorphic to genuine algebras of relations. For example, is this class closed under various algebraic operations? Is it definable by equations? If so, are finitely many equations sufficient, and how complex do they need to be? How can one test whether an algebra is in the class? For finite algebras, is there an algorithm to decide this? Can we approximate the class? Are there variants with different behaviour? These problems are difficult and a range of methods have been used to solve them, including universal algebra, duality, model-theoretic forcing, undecidable tiling problems, and combinatorics (such as probabilistic constructions of graphs).

My talk will survey some of the known results and go into more detail on a few of the proofs. Some of them have appeared in [2] as joint work with Robin Hirsch.

[1] H Andréka, J van Benthem, and I Németi, *Modal logics and bounded fragments of predicate logic*, ***Journal of Philosophical Logic***, vol. 27 (1998), pp. 217–274.

[2] R Hirsch and I Hodkinson, ***Relation algebras by games***, Studies in Logic and the Foundations of Mathematics, North-Holland, 2002.