

Towards a mathematical theory of substitution

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The notion of substitution is ubiquitous in mathematics. However, there is as yet no theory that treats this commonsense notion in full generality. This talk is a step in this direction. Specifically, through an analysis of the concept and role of substitution in algebra, combinatorics, type theory, *etc.* I will synthesise a general unifying framework for defining and studying substitution. Along the way, I will use the theory to extract correct substitution algorithms, provide initial-algebra semantics that respect substitution, establish the admissibility of the cut rule in type theories, initiate the reduction of type theory to algebra, *etc.* Overall, the mathematical development will touch upon models of algebraic, combinatorial, logical, computational, and physical structures.