▶ ZLIL SELA, *The elementary theory of free products of groups.*
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Around 1956 R. Vaught asked the following natural question. Let A,B,C,D be arbitrary groups. Suppose that A and B have the same first order theory (such groups are called elementarily equivalent), and so do C and D. Do A*C and B*D have the same first order theory? (i.e., is elementary equivalence preserved under free products of groups?)

A similar question for (generalized) direct products (of general structures) was answered affirmatively by Mostowski in 1952, and later generalized by Feferman and Vaught in 1959. On the other hand Olin proved in 1974 that the answer to Vaught's question is negative if we replace groups by semigroups.

We develop a geometric structure theory, that is based on the tools that were developed to solve Tarski's problem on the first order theory of a free group, to answer Vaught's problem affirmatively. This structure theory suggests a generalization of Tarski's problem to free products of arbitrary groups, as well as other (somehwat surprising) results in model theory over groups. It suggests open questions, and will probably have generalizations in quite a few directions.