INFINITE FIELDS WITH FREE AUTOMORPHISM GROUPS

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Shelah proved that a free group of uncountable rank is not isomorphic to the automorphism group of a countable first-order structure. In contrast, Just, Shelah and Thomas showed that it is consistent with the axioms of set theory that there is a field of cardinality $\aleph_1$ whose automorphism group is a free group of rank $2^{\aleph_1}$. Motivated by this result, they ask whether there always is a field of cardinality $\aleph_1$ whose automorphism group is a free group of rank greater than $\aleph_1$.

I will present joint work with Saharon Shelah that shows that the free group of rank 2^κ is isomorphic to the automorphism group of a field of cardinality κ whenever κ is a cardinal satisfying $\kappa = \kappa^{\aleph_0}$. The techniques developed in the proof of this statement also show that the existence of a cardinal κ of uncountable cofinality with the property that there is no field of cardinality κ whose automorphism group is a free group of rank greater than κ implies the existence of large cardinals in certain inner models.

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