Modular and maximal chains in the subgroup lattice of a finite group

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A modular element in a lattice is a lattice-theoretic analogue of a normal subgroup. What structural properties concerning normal subgroups in a finite group can be strengthened to subgroups that are modular in the subgroup lattice? It has for example long been known that a finite simple group admits no non-trivial modular subgroups.

In recent joint work with John Shareshian, we've shown that no finite group admits a chain of modular elements longer than the chief series. We've also shown that the shortest maximal chain in a non-solvable group is strictly longer than the chief series. The combination of these two results gives a new purely lattice-theoretic characterization of solvable groups.

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