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An overview of planar semimodular lattices

The Jordan-Hölder theorem for groups goes back to 1870. However, the real reason of this theorem lies in the theory of planar semimodular lattices. This discovery led G. Grätzer and J.B. Nation [2010] to a strengthening of the Jordan-Hölder theorem, which was strengthened further by G. Czédli and E.T. Schmidt [2011]. These results together with earlier papers by G. Grätzer and E. Knapp initiated an intensive study of planar semimodular lattices; finiteness is always assumed.

A particular interest is paid to the slim ones; a lattice is slim if the order (= poset) of its join-irreducible elements contains no three-element antichain. Firstly because the description of all planar semimodular lattices reduces to that of the slim ones. Secondly, because it is the slim semimodular lattices that are associated with two composition series of groups. Thirdly, because they are the ones we can really describe.

In the talk, several structural descriptions of slim semimodular lattices, due to G. Grätzer, E. Knapp, E.T. Schmidt and G. Czédli, will be presented. These descriptions led G. Czédli, T. Dékány, L. Ozsvárt, N. Szakács, and B. Udvari to enumerative combinatorial results on these lattices.

This talk could be an appetizer to the "Planar Semimodular Lattices and Their Diagrams" chapter, which we are writing with G. Grätzer to the "Lattice Theory: Special Topics and Applications" book (planned to appear in 2013).