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Coverable rings

It is a well-known result that a group cannot be the union of two of its proper subgroups. Scorza seems to have been the first to show that a group is a union of three of its proper subgroups if and only if it has a quotient isomorphic to the Klein 4-group $V = {C_2}^2$. Similar results exist for coverings by four, five, and six proper subgroups, where V is replaced with another finite group in each case. Consideration of a covering by seven proper subgroups yields a result akin to the two proper subgroups case: no group can be written as a union of seven of its proper subgroups.

Few authors have considered to problem of covering a ring by its proper subrings. We say that a ring R is coverable if R is equal to a union of its proper subrings. If this can be done using a finite number of proper subrings, then $\sigma(R)$ denotes the *covering number* of R, which is the minimum number of subrings required to cover R. We set $\sigma(R) = 0$ if R is not coverable, and we set $\sigma(R) = \infty$ if R is coverable but not by a finite number of proper subrings.

Werner worked toward determining when it is possible to cover a ring with proper subrings and completely solved this problem for finite semisimple rings.

In this talk, among other results, we will further explore this concept of coverable rings