

# Finite simple groups embedded as subgroups with trivial centralizer

Kıvanç ERSOY

B. Hartley asked the following problem:

PROBLEM 1. [2, Problem 3.15]

Let  $F \cong PSL_m(q)$  and  $G \cong PSL_n(q)$  be two finite simple groups such that  $F \leq G$  with  $q = p^k$  for some  $k$  and  $C_G(F) = 1$ . Does it follow that  $n$  is bounded in terms of  $m$ ?

He suggested several versions of the above problem in [2]. In this talk we answer the above problem by constructing a counter example. In particular we prove the following:

THEOREM 2. [1] For any odd  $n$  and for any  $p \geq n$  with  $q = p^k$  for some  $k$ , there is an embedding  $\varphi_n : PSL_2(p) \longrightarrow PSL_n(q)$  such that  $C_{PSL_n(q)}(\varphi_n(PSL_2(p))) = 1$ .

In particular, we prove that  $n$  should be bounded by only  $p$ , not by  $m$ . We will also discuss some of the other versions of the problem related to centralizers in simple locally finite groups.

## References

- [1] K. Ersoy, “Simple groups embedded as subgroups with trivial centralizer”, in preparation.
- [2] B. Hartley, “Simple Locally Finite Groups”, in *Finite and Locally Finite Groups*, Kluwer Academic, Dordrecht, 1995, 1-44.

DEPARTMENT OF MATHEMATICS, FREIE UNIVERSITÄT BERLIN, ARNIMALLE  
7, 14195, BERLIN, GERMANY

*Email address:* `ersoy@zedat.fu-berlin.de`