1047-03-158 **Ross Willard*** (rdwillar@uwaterloo.ca), Pure Math Department, University of Waterloo, Waterloo, Ontario N2L 3G1, Canada. *The complexity of pp-definability.* Preliminary report.

It is known (Friedman, unpublished; Bergman, Juedes and Slutzki, IJAC '99) that the clone membership problem for finite algebras is EXPTIME-complete. The computational complexity of the analogous *relational clone membership problem* for finite relational structures is not yet determined. This problem accepts as input a finite set $\mathcal{R}$ of finitary relations on a finite set A, together with another relation s on A, and asks if s is in the relational clone generated by $\mathcal{R}$ (equivalently, if s is definable by a primitive positive (pp) formula in the structure $\langle A; \mathcal{R} \rangle$). This problem is known in the theoretical computer science community as the existential inverse satisfiability problem ($\exists$-$INVSAT$). We call it the pp-definability problem.

The standard proof connecting clones and relational clones via the usual Galois connection places the pp-definability problem in co-NEXPTIME. Last year at a meeting at AIM, I provided a lower bound by showing that the problem is EXPTIME-hard. In this lecture I will sketch these results and report on efforts aiming to resolve the precise complexity of pp-definability. (Received January 27, 2009)