1086-13-2739 **Amanda Croll***, Dept. of Mathematics, University of Nebraska-Lincoln, P.O. Box 880130, Lincoln, NE 68505. *Periodic modules over a Gorenstein local ring.* Preliminary report.

In 1990, Avramov posed the following problem: characterize the rings that have a periodic module, which is defined to be a module with a periodic minimal free resolution. It is proved that a complete Gorenstein local ring has such a module if and only if there is nontrivial torsion in a certain $\mathbb{Z}[t, t^{-1}]$-module associated to the ring. This module, which we denote $J_R(t)$, is the free $\mathbb{Z}[t, t^{-1}]$-module on the isomorphism classes of finitely generated R-modules modulo relations reminiscent of those defining the Grothendieck group of R. The main result is a structure theorem for $J_R(t)$ when R is a complete Gorenstein local ring; the link between torsion and existence of a periodic module is a corollary. (Received September 25, 2012)