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**Thomas Marley\*** (tmarley1@unl.edu) and **Marcus Webb**. *Artinian modules of finite flat dimension and the Frobenius functor.*

We investigate the behavior of the Frobenius functor on Artinian modules over a  $d$ -dimensional Noetherian local ring  $R$  of characteristic  $p > 0$ . Let  $R^f$  denote the ring  $R$  equipped with an  $R - R$  bimodule structure whose left action is via the identity map and whose right action is via the Frobenius map from  $R$  to  $R$ . We let  $F_R$  denote the functor  $R^f \otimes_R -$ . For an Artinian module  $M$ , let  $s(M)$  denote the least integer  $i$  such that  $\text{Tor}_i^R(R/m, M) \neq 0$ . One of our main results is the following:

**Theorem 0.1** *Let  $M$  be a nonzero Artinian  $R$ -module. The following are equivalent:*

1.  $\text{Tor}_i^R(R/m, M)$  is zero for all but one integer  $i$ .
2.  $F_R(M) \cong M$  and  $\text{Tor}_i^R(R^f, M) = 0$  for  $1 \leq i \leq s(M)$ .
3.  $R$  is Cohen-Macaulay and  $M \cong H_m^d(R)^n$  for some  $n > 0$ .
4.  $F_R(M) \cong M$  and  $M$  has finite flat dimension.

In this talk, we will discuss this theorem and several related results. (Received September 15, 2014)