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**Thomas Dunn\*** ([thomas.dunn@ndsu.edu](mailto:thomas.dunn@ndsu.edu)), NDSU Mathematics Dept #2750, North Dakota State University, PO Box 6050, Fargo, ND 58108. *A Linear Formula for the Generalized Multiplicity Sequence.*

For an arbitrary ideal  $I$  in a local ring  $R$  and  $R$ -module  $M$ , Achilles and Manaresi introduced the sequence of generalized multiplicities  $c_k(I, M)$  ( $k = 0, \dots, \dim M$ ) as a generalization of the classical Samuel multiplicity  $e(I, M)$  of an  $\mathfrak{m}$ -primary ideal  $I$ . We prove a formula expressing each generalized multiplicity  $c_k(I, M)$  as a linear combination of certain local multiplicities  $c_0(IR_{\mathfrak{p}}, M_{\mathfrak{p}})$ . As a consequence, when  $M$  is formally equidimensional, we prove that if  $I \subseteq J$  and  $c_k(I, M) = c_k(J, M)$  for all  $k = 0, \dots, \dim M$  then  $I$  is a reduction of  $(J, M)$ . The converse of this statement is also known to be true by a result of Ciupercă. This theorem gives a complete numerical characterization of integral closure, generalizing a well known theorem of Rees. (Received September 03, 2012)