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Compression is a technique introduced by Macaulay to study Hilbert functions. Using it, we obtain the following results:

1. We prove that the Eisenbud-Green-Harris conjecture holds for ideals containing a monomial regular sequence.
2. We show that Evans' lex-plus-powers conjecture holds for ideals containing the squares of the variables.
3. We find new classes of rings over which lex ideals attain all Hilbert functions.
4. We prove a generalized Green's theorem over a polynomial ring modulo a power of the variables. (The original Green's theorem holds over the polynomial ring.)
5. We provide new proofs of Macaulay's and Clements-Lindström's theorems.
6. We obtain a structure theorem for compressed ideals.

Some of the results are joint with I. Peeva and M. Stillman. (Received February 07, 2006)