

Donald E. Knuth: The Complexity of Songs, SIGACT News 1977, 17-24.

Important aspects of popular culture are best understood in terms of complexity theory.

- Normal Songs of length  $n$ : Space Complexity  $\sim n$   
But: Storage space in brain needs to be minimized in modern times.
- Can be reduced to  $cn$  where  $c < 1$  by verse/refrain scheme
- Improvement by mediaval jewish song "Ehad Mi Yode'a": verse  $v_k$  followed by  $v_{k-1} \dots v_2 v_1$   
→ reducement to  $O(\sqrt{N})$
- *Old McDonald had a farm*: Complexity  $(20 + \lambda + \alpha) \sqrt{n/(30 + 2\lambda)} + O(1)$  with integer  $\lambda, \alpha$  lengths of animals/sounds.
- ultimate discovery: songs of complexity  $O(1)$  (Casey and the Sunshine Band):  
Scheme  $S_0 = \epsilon$ ,  $S_k = V_k S_{k-1}$  with  
 $V_k = \text{'That's the way, ' } U \text{'I like it' } U$   
 $U = \text{'uh huh, uh huh'}$
- Open Problem: Complexity of nondeterministic songs?

