1077-05-1804 **Keenan Monks** (monks@college.harvard.edu), **Ken G. Monks*** (monks@scranton.edu), **Ken M. Monks** (monks@math.colostate.edu) and **Maria Monks** (monks@math.berkeley.edu). *On the Distribution of Arithmetic Sequences in the* $3x+1$ *Graph.* Preliminary report.

In a previous paper, K. M. Monks proved that every arithmetic sequence intersects every connected component of the digraph $\mathcal{G}$ of the famous $3x+1$ dynamical system $C(x) = \begin{cases} x/2 & x \text{ is even} \\ 3x+1 & x \text{ is odd} \end{cases}$ on the positive integers. In this talk, we study the specific distribution of arithmetic sequences in $\mathcal{G}$ to obtain stronger results for certain arithmetic sequences. In particular, we determine the structure of groups first constructed by K. M. Monks and use them to the find short paths in $\mathcal{G}$ from an arbitrary positive integer x to an element of a given arithmetic sequence. We show that every nontrivial infinite back-tracing path in $\mathcal{G}$ must contain an integer congruent to $2 \bmod 9$. We then use similar methods to show that every nontrivial cycle and every divergent orbit in the positive integers contains an integer congruent to $20 \mod 27$. (Received September 21, 2011)