Today  Reducibility and undecidable languages.  Ch. 5.
Monday 2013-02-25 Seminar by Gregory Chaitin; 2:10 p.m.  DPC 117.
Next class  Reducibility, continued:  Ch. 5.

1. List the members of your group below. Underline your name.

2. Suppose there is a blackbox program `haltcheck` that, when given the Python source of any program `H` as standard input, writes, to standard output, `yes` if `H` *always* halts (regardless of input given to `H`) and `no` otherwise (if there is some input for which `H` does not halt). Provide the Python source for a program `D` that behaves as follows:
   - It reads two items from standard input (separated by the special token `-----`): Python source of a program `P` and string input `w` for `P`.
   - It writes `yes` to standard output if `P` halts on input `w` with output `yes`; otherwise it writes `no`.
3. The hailstone sequence from $s$, written $h_s(1), h_s(2), \ldots$, is defined as follows for positive integers $s$ and $i$.

$$ h_s(i) = \begin{cases} 
  s & \text{if } i = 1 \\
  1 & \text{if } i > 1 \text{ and } h_s(i-1) = 1 \\
  h_s(i-1)/2 & \text{if } i > 1, h_s(i-1) > 1, \text{ and } h_s(i-1) \text{ is even} \\
  3h_s(i-1) + 1 & \text{otherwise}
\end{cases} $$

Can the program `haltcheck` of Question 2 be used to determine whether the sequences $h_i(s)$ converge to 1 for all $s$? Explain your answer.