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.