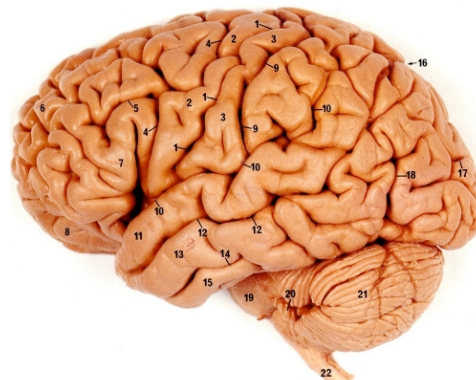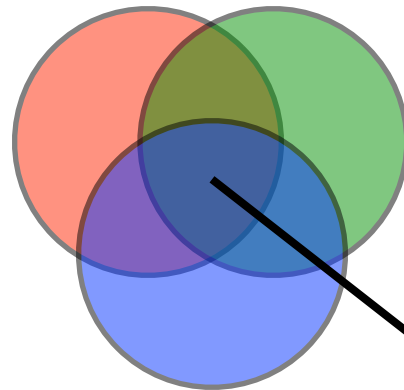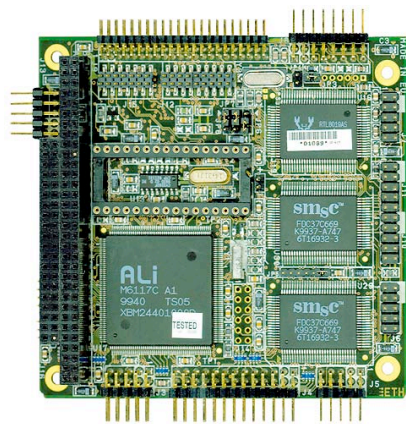# The Computational Creativity Curriculum

Lee Spector, Chris Perry & Jaime Dávila
Hampshire College, Amherst, MA

Computational Creativity Systems

User-Guided Variation

- Generate/refine variations with a user-driven computational model of creativity

- Interdisciplinary art/sci/tech student/faculty development (piloted in *Computing Concepts: Creative Machines?* and *Radical Innovation in Digital Arts*)

- Use existing art-making software (*Maya, RenderMan, Shake, Photoshop, MaxMSP, Processing, ...*)

- Browser interface, cluster back end

- Community college and high school outreach

Real Creativity
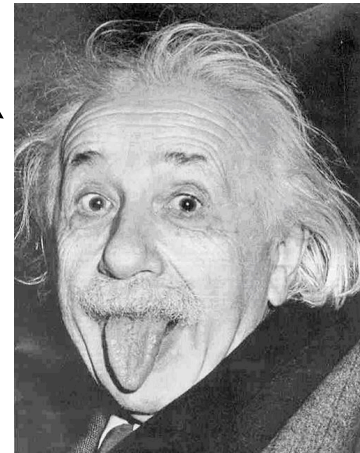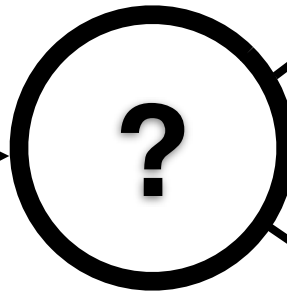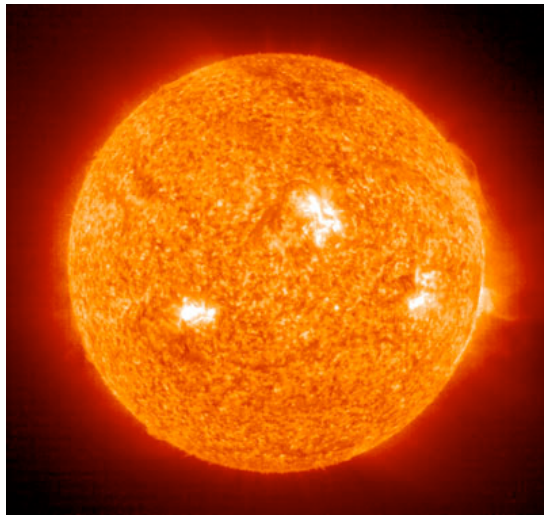
Genetic Programming
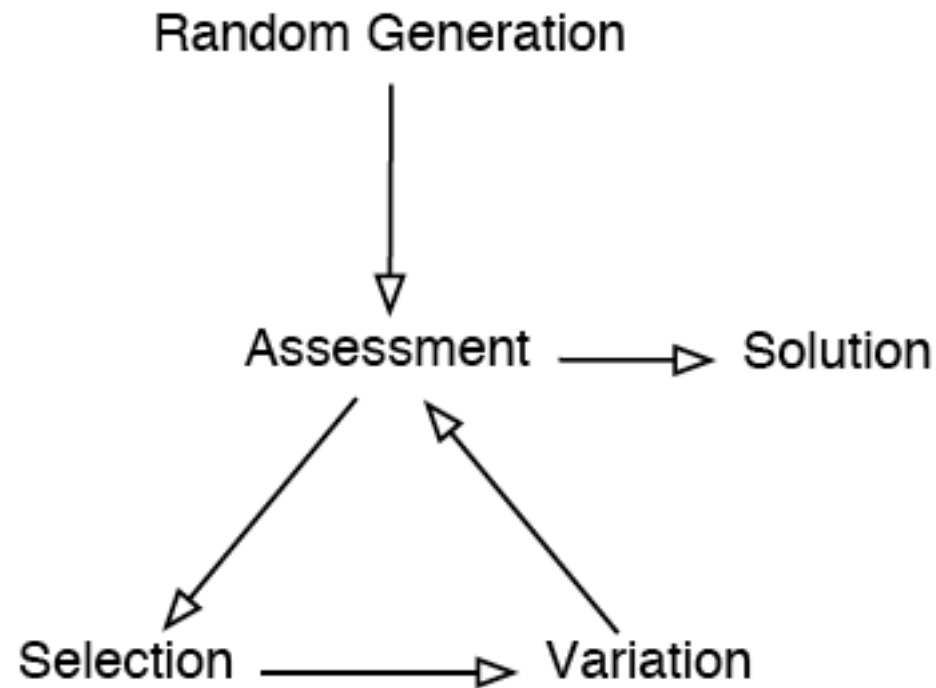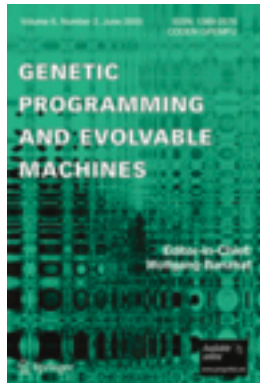
Numerical Example
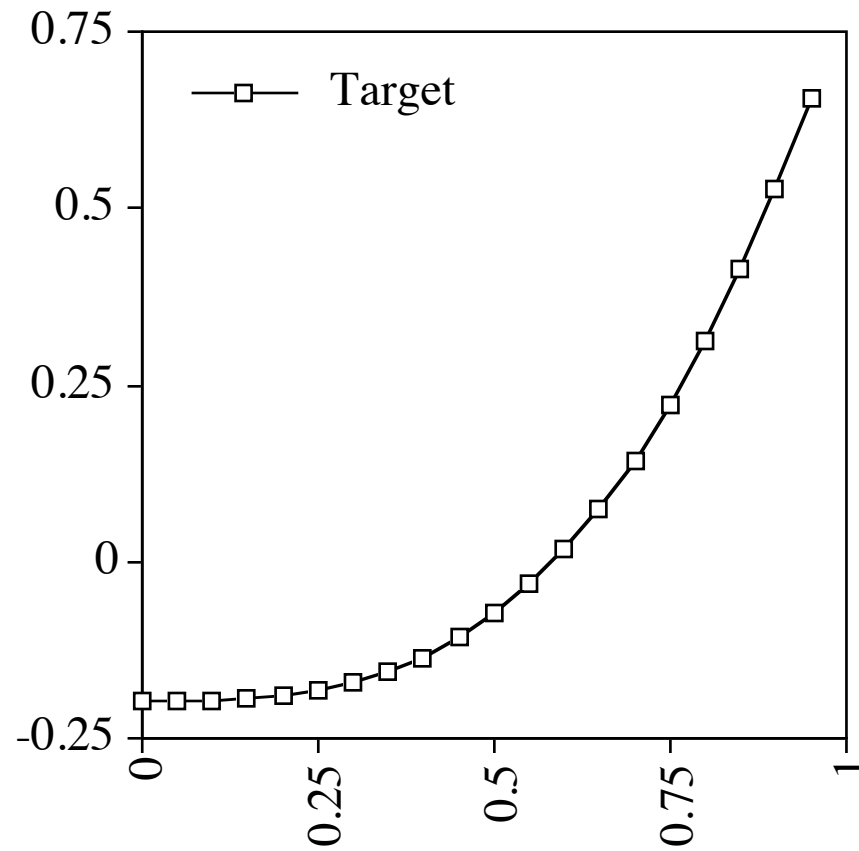
Given a set of data points, evolve a program that produces *y* from *x*.

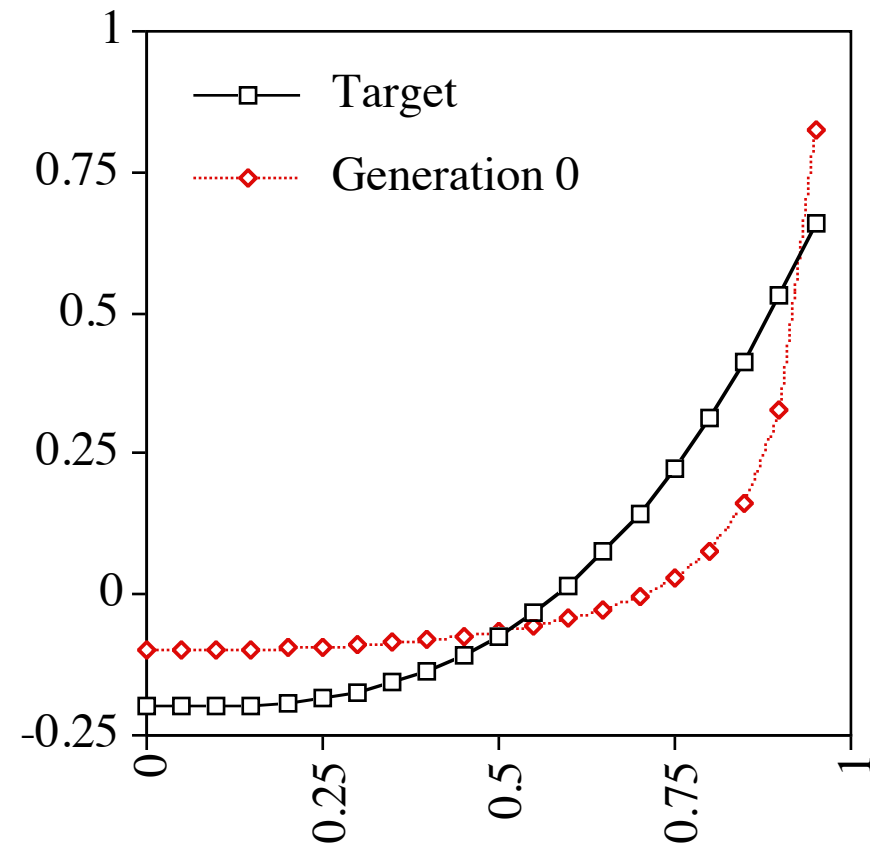Primordial ooze: +, -, *, %, *x*, 0.1

Fitness = error (smaller is better)

Evolving $y = x^3 - 0.2$
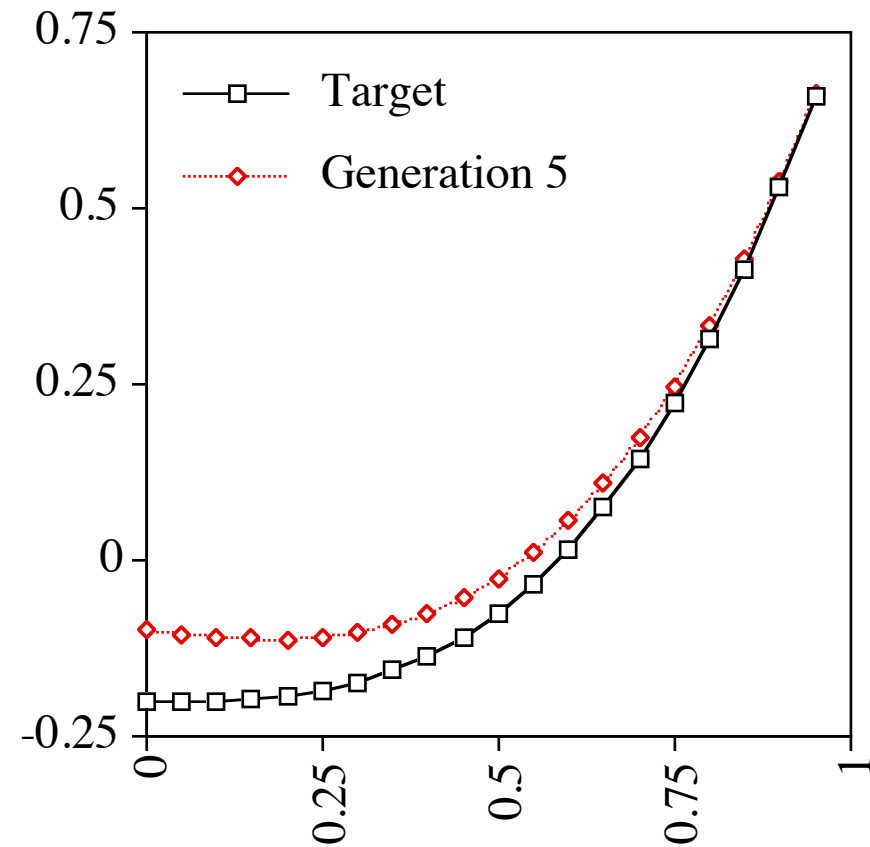
Best Program, Gen 0

```
(- (% (* 0.1
        (* X X))
      (- (% 0.1 0.1)
         (* X X)))
   0.1)
```

Best Program, Gen 5

```
(- (* (* (% X 0.1)
         (* 0.1 X))
      (- X
         (% 0.1 X)))
   0.1)
```
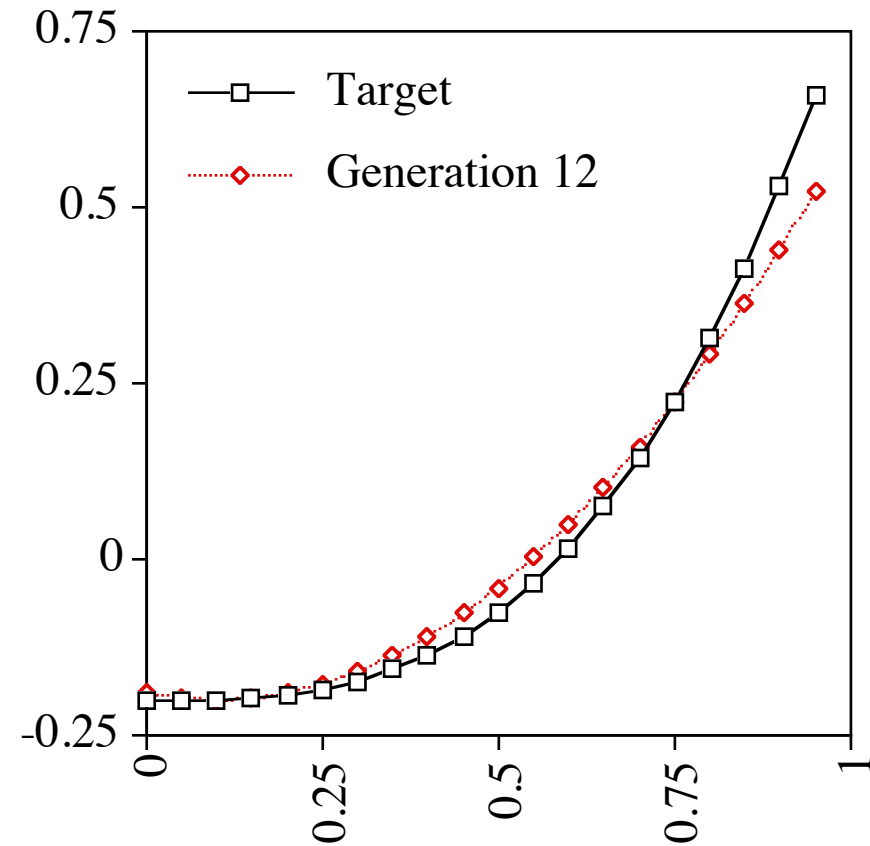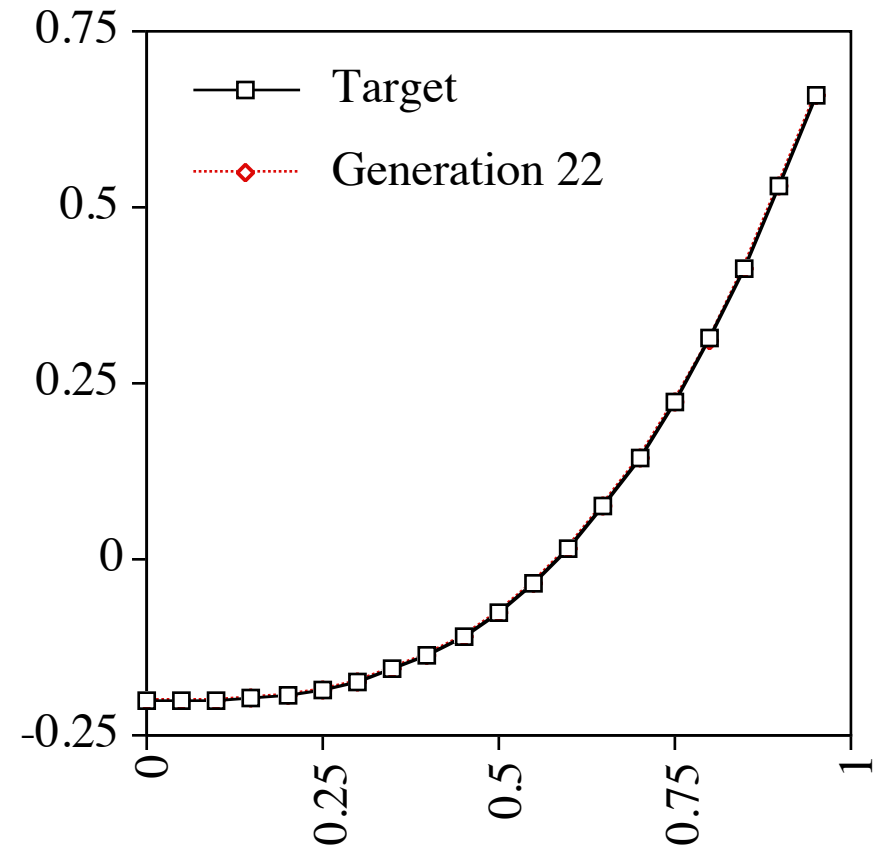
Best Program, Gen 12

```
(+ (- (- 0.1
       (- 0.1
          (- (* X X)
             (+ 0.1
                (- 0.1
                   (* 0.1
                      0.1))))))
   (* X
      (* (% 0.1
            (% (* (* (- 0.1 0.1)
                     (+ X
                        (- 0.1 0.1)))
                  X)
               (+ X (+ (- X 0.1)
                       (* X X)))))
         (+ 0.1 (+ 0.1 X)))))
   (* X X))
```

Best Program, Gen 22

```
(- (- (* X (* X X))
      0.1)
   0.1)
```

Best Program, Gen 22

"... removal of any one of the parts causes the system to effectively cease functioning."

= "irreducably complex" (Behe)

= Evidence for an intelligent designer!

Produced by 100% Darwinian means!

(Reductio ad absurdum)

Evolution, the Designer

Apparent "irreducible complexity" is actually an expected product of Darwinian mechanisms, not evidence for a non-Darwinian "designer."

"Darwinian evolution is itself a designer worthy of significant respect, if not religious devotion." *Boston Globe* OpEd, Aug 29, 2005

WHAT WOULD DARWIN SAY? | LEE SPECTOR

**And now, digital evolution**

The Boston Globe

By Lee Spector | August 29, 2005

RECENT developments in computer science provide new perspective on "intelligent design," the view that life's complexity could only have arisen through the hand of an intelligent designer. These developments show that complex and useful designs can indeed emerge from random Darwinian processes.
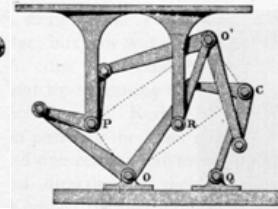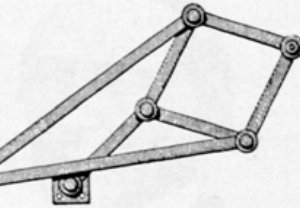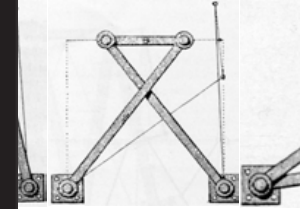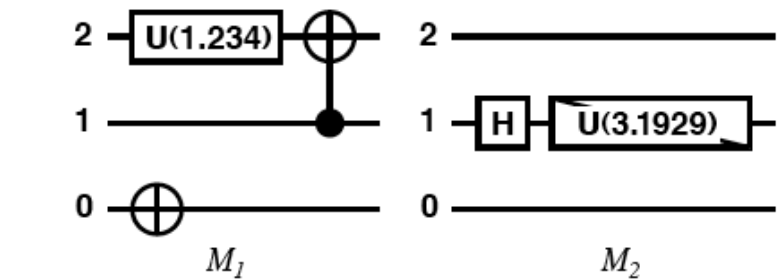
GECCO Humies
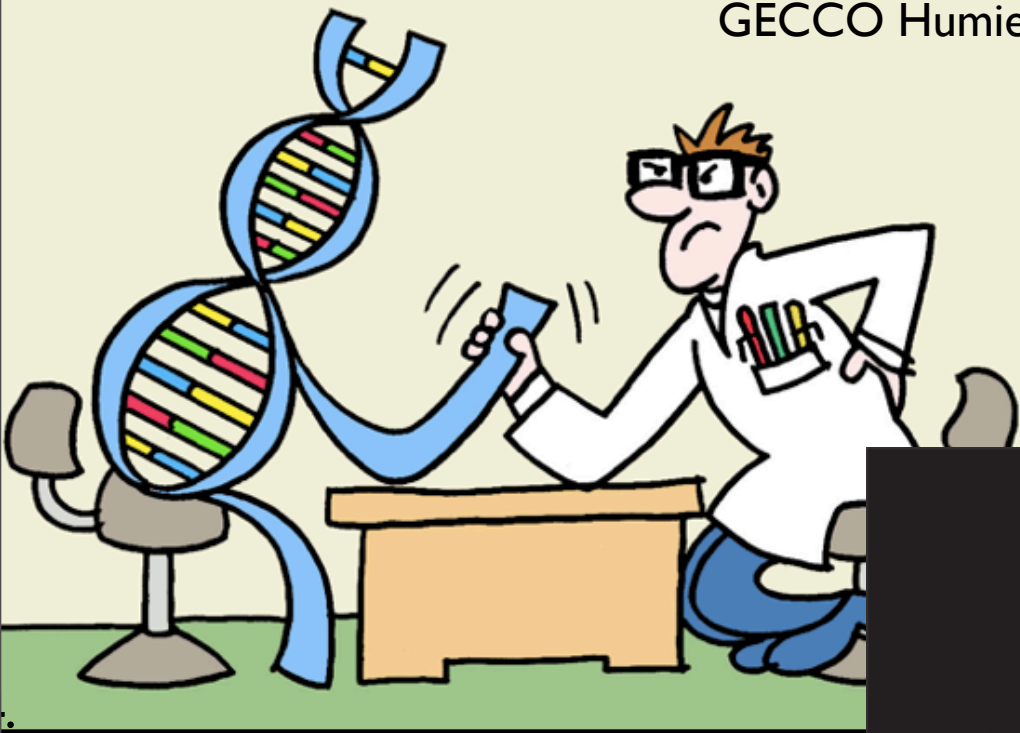
Lipson
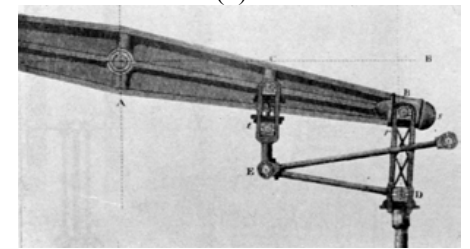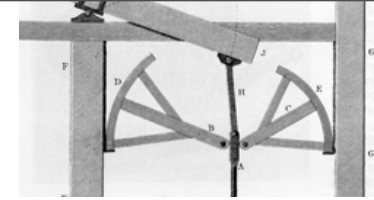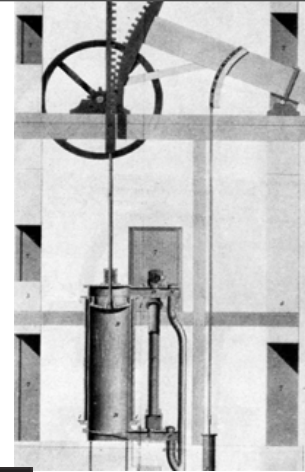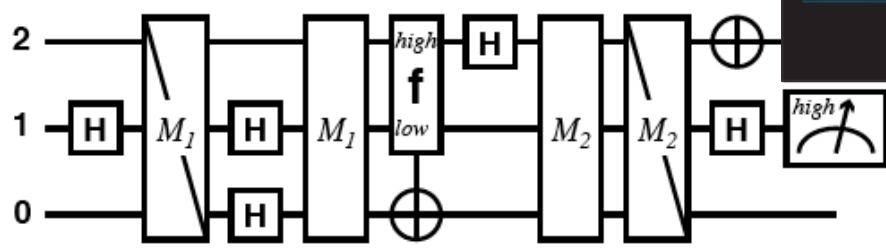
Spector
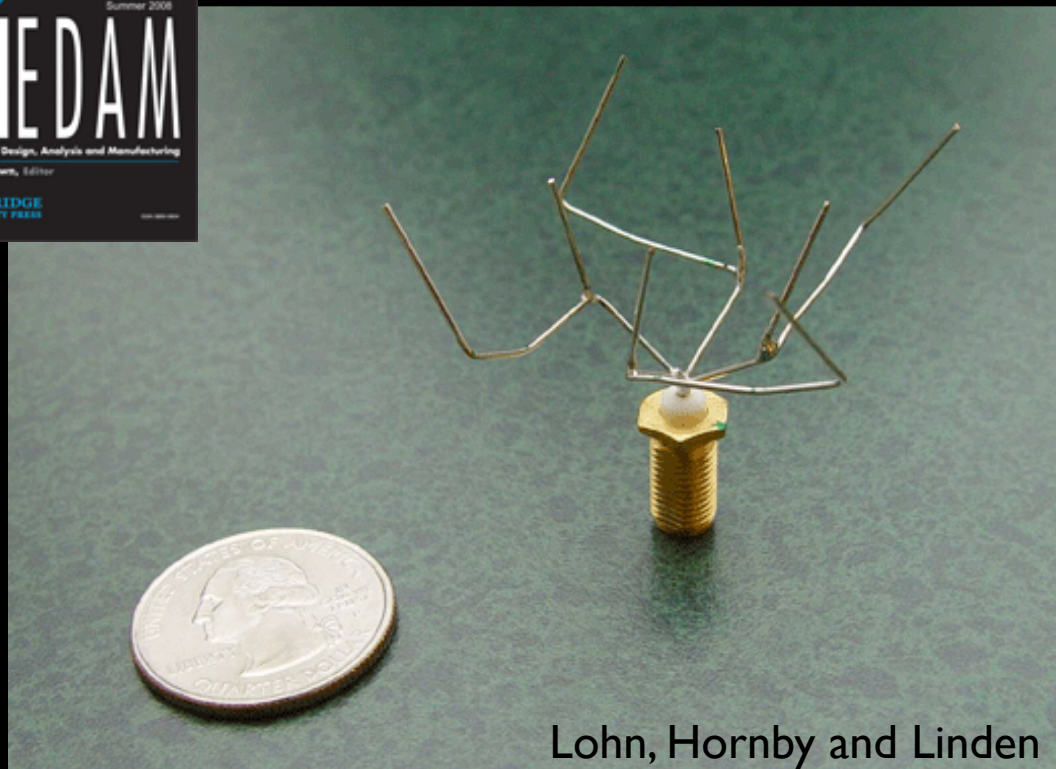
Lohn, Hornby and Linden

select to remove/breed
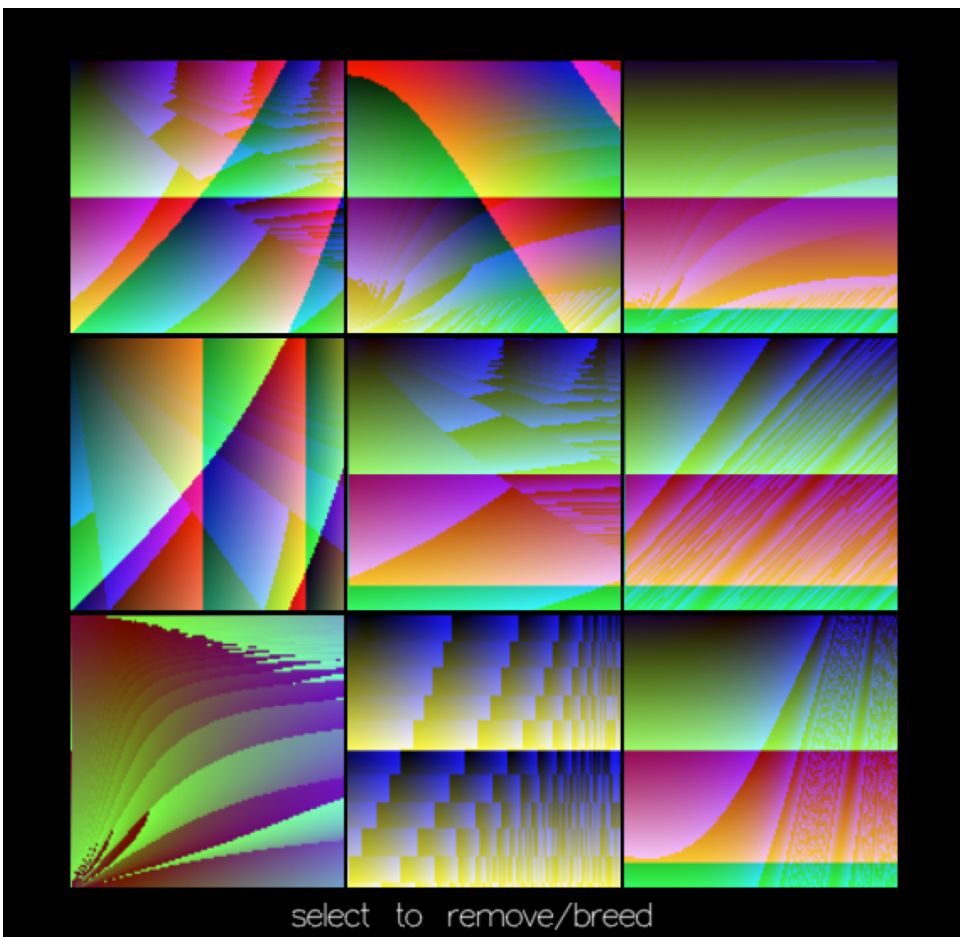
http://anim.hampshire.edu/wc/viewshot.php?shot_id=8   Google

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HELGA
PROJECT MANAGMENT

Shots

General   Models Farm myHELGA Admin Producer Tools   Log Out **Switch Show:** Tower 37

Back to browsing shots | **Previous Shot** | **Next Shot**

Anim Fix   Compositing   Film-out

Edit Shot Info

Side of the water tower as Mule and Leed climb
up the tower and past the camera.

Shot Name: u2_01
Shot Type: Medium
Duration: 350 frames (24fps)

Edit Watch List

Textbox

omment

Igor Web UI

http://anim.hampshire.edu/igor/   G-

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Receiving new individuals...   Session ID : 75   Gen ID : 1   Indivs In : 70   Settings   End Session   New Generation

15   14   12   15   9   4   1