Squeak- a Free Computer Application to Enhance Math and Science Learning

HASTI 2006

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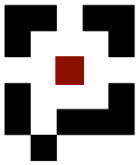

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Outline

(distrib copy of Squeak?)

- Collective “thank you”
- My/Lab’s background and interests
- Intro to Squeak – with demos
- Interactive – with you
- Your thoughts and ideas

Speaker's background

- **B.S. Comp Math, Eastern Illinois U.**
- **M.S. Comp Science, U. of Utah**
- **M.A. Mathematics, Arizona State U.**

- **25 yrs scientific programming**
- **Scientific data visualization/analysis**
- **2 children (ages 9 and 5)**

- **SDA Lab: improve science understanding**

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If you need to leave early

- http://squeakland.org
- http://sda.iu.edu/K-12

- heiland@iu.edu

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Squeak

- What is it?
- How can you get it?
- What can it do?
- What can't it do (easily)?

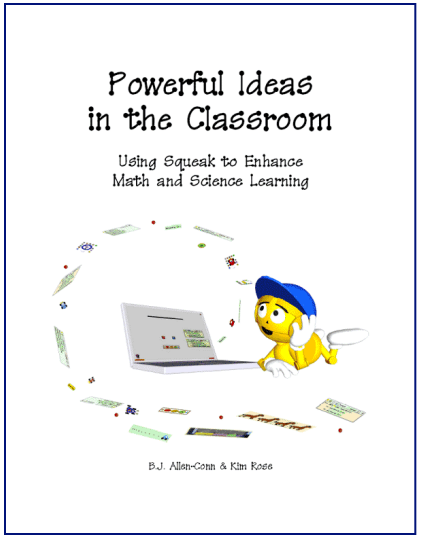
Squeak – what is it?

- 2-D graphics application
- Open source (=free) (for Windows, Mac, Linux)
- Multimedia authoring environment
- Drag & drop programming environment
- Constructivist learning environment

Squeak – how can you get it?

- Download from squeakland.org
  (installer ~=6M ; virus-free)
- a.k.a. Etoys=Educational toys

Optional media ($)
Book,DVD



Squeak – what can it do?

- Let children be artistically creative
- Let children create dynamic “stories”
- Let children create [mathematical] games and artwork
- Teach (object-oriented) programming
- Let children create math & science simulations

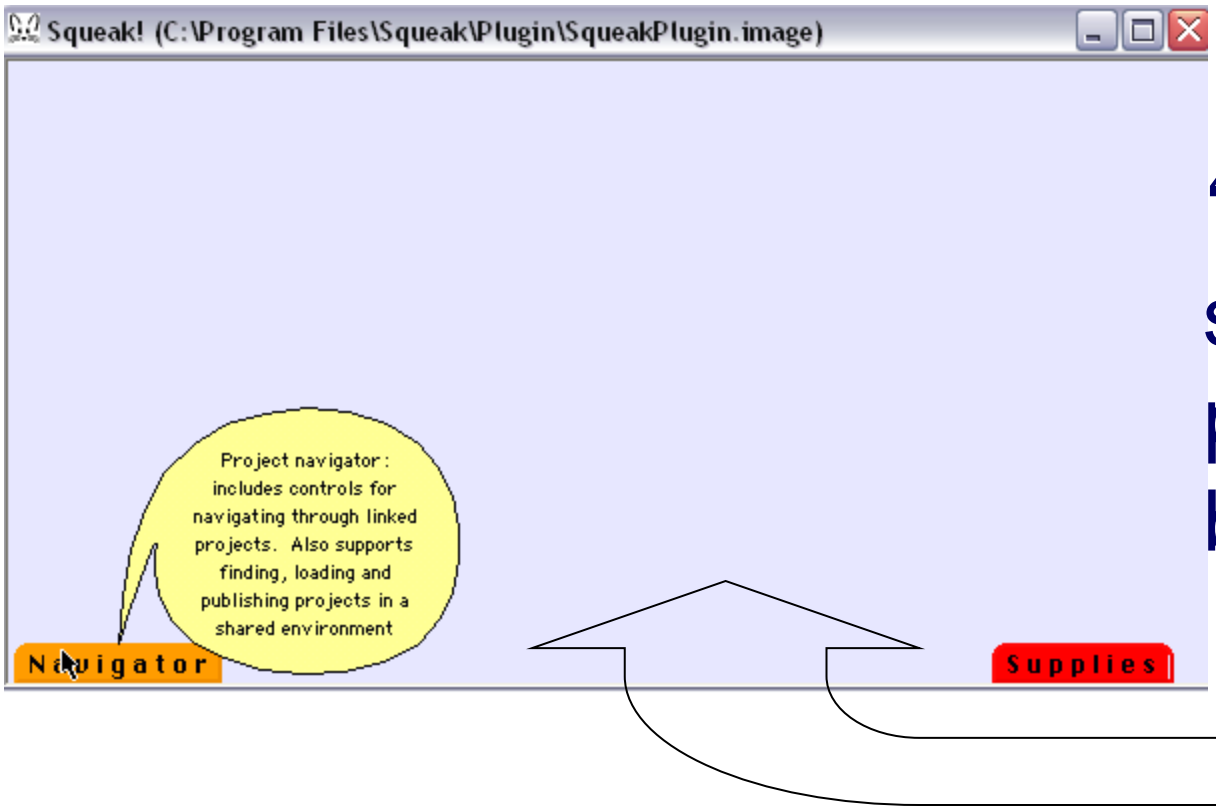
Squeak – what can't it do (easily)?

- 3-D graphics
- Automatic graphing of data (it's not a spreadsheet application)
- Image editing (it's not Photoshop)
- Sharing over the Internet
- Custom sounds/music

Demos…

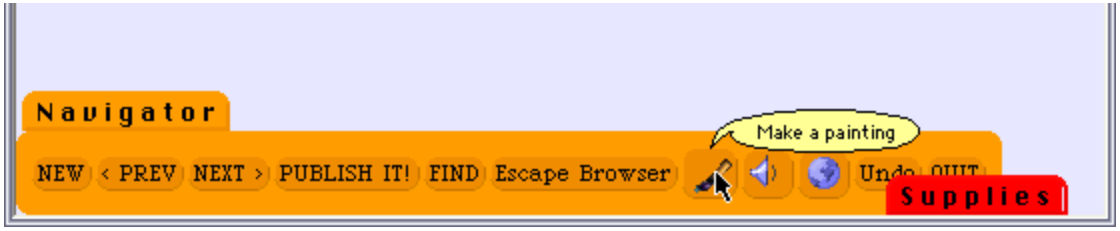
- Getting started
- Paint a sketch
- Program (script) a sketch
- Math/Science simulations

Getting started



"Mousing over" something often produces balloon help.

Open region = "World"



Click on the paintbrush

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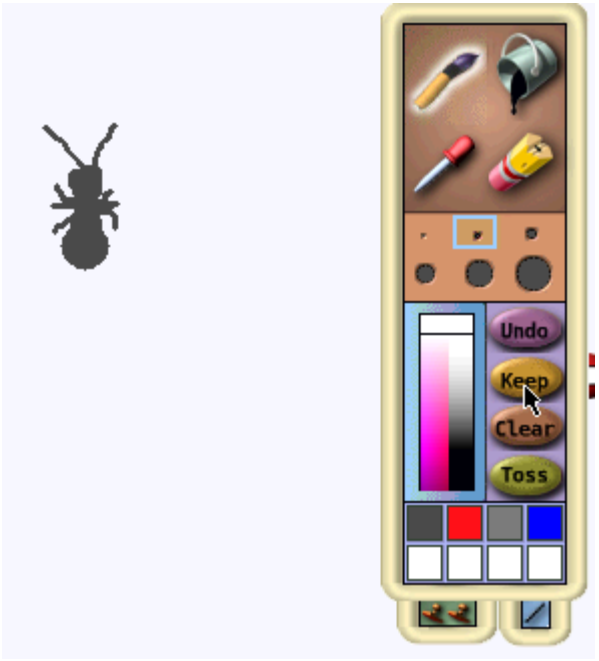
Paint a sketch



Experiment with the paint tools to create a sketch. When you're done, 'Keep' it.

→ Observe your world.

"Mousing over" your sketch will show its halos.

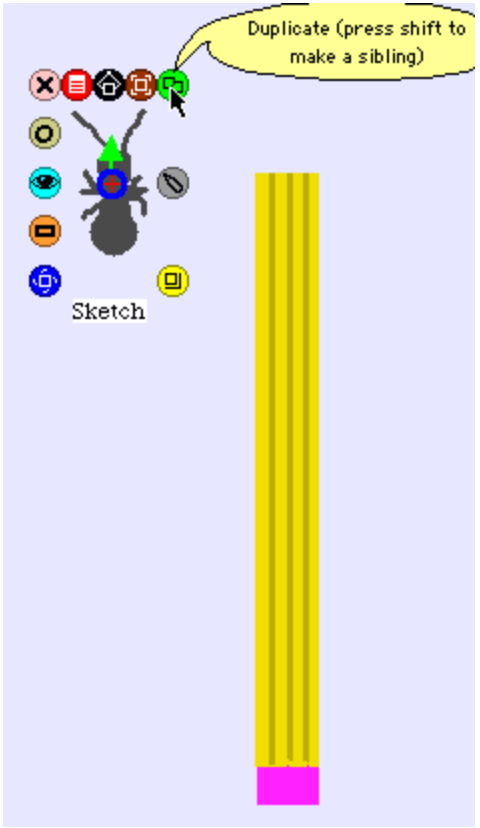
(Or Alt-click while cursor on the sketch)

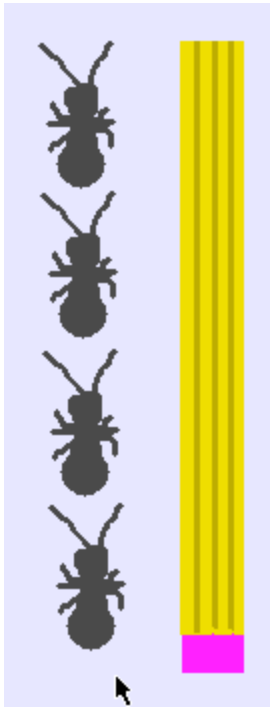
A sketch's default orientation is 'up' (green arrow).

You'll directly edit your sketch via the halos.

Paint another sketch: pencil

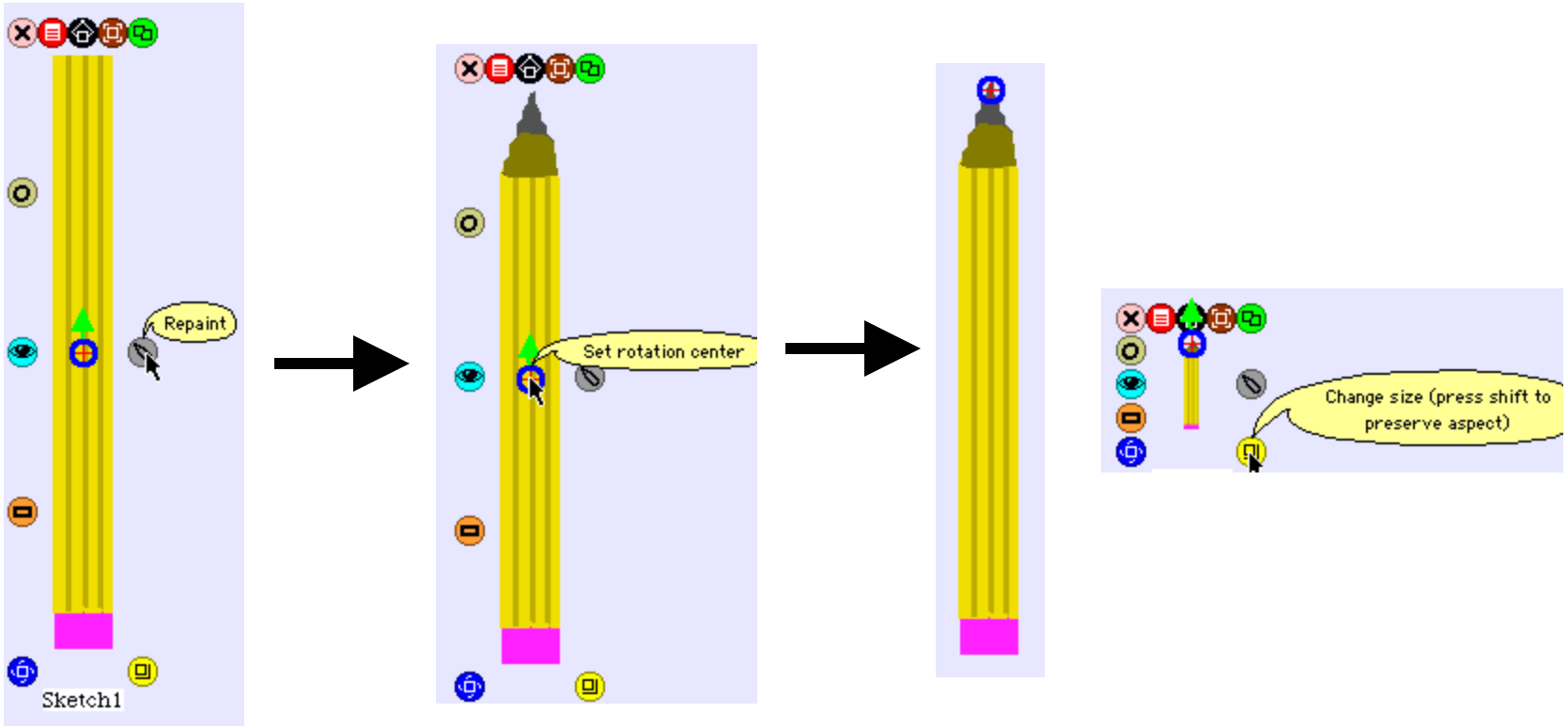
- Q: how many ants is the same length as a pencil?





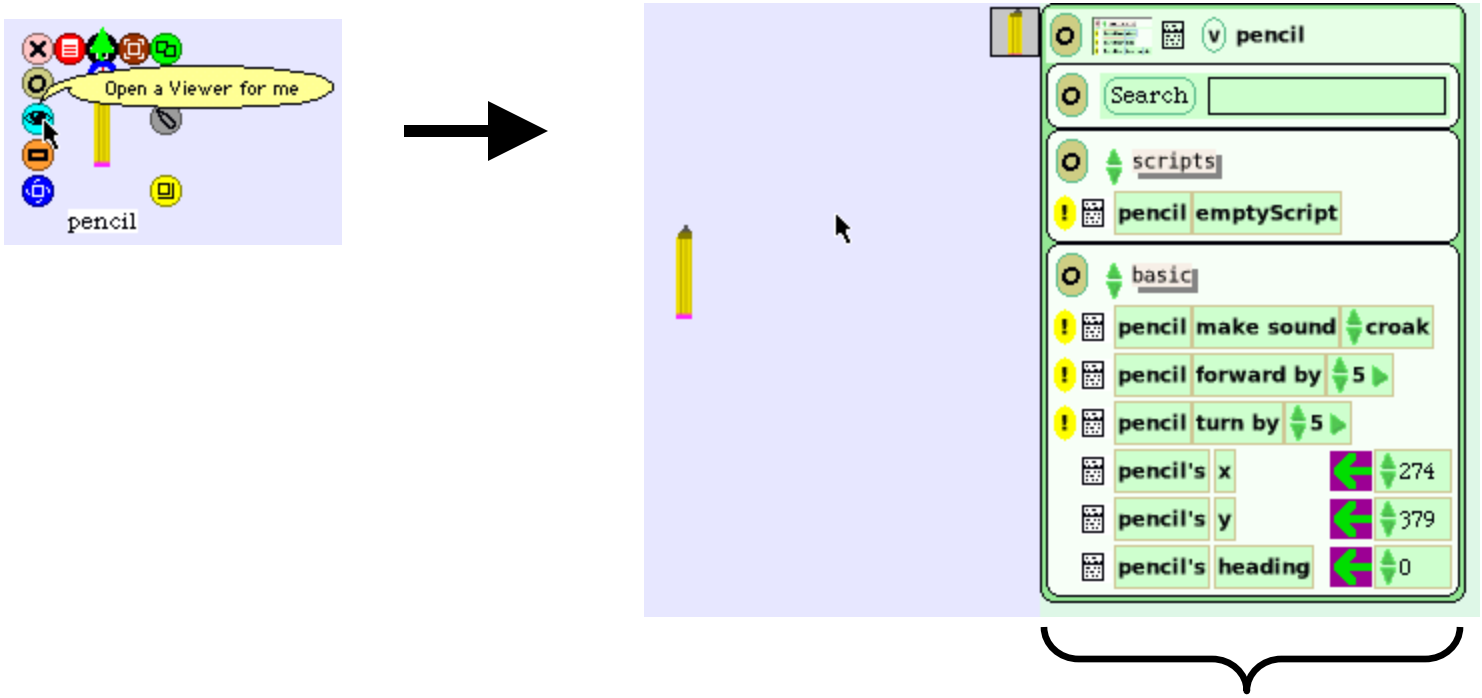
→ Counting, estimation

Repaint: “sharpen” the pencil



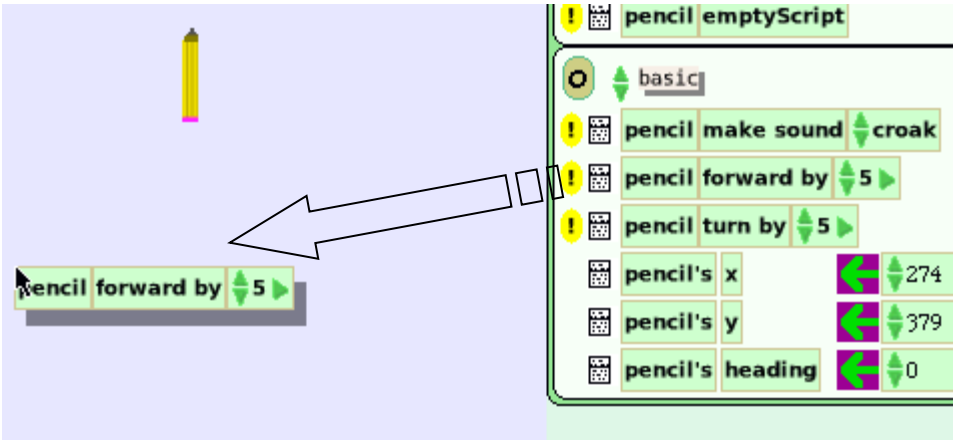
After repainting/Keep, move its rotation center to the tip (hold **Shift** key to move it) then shrink the pencil.

Program (script) a sketch

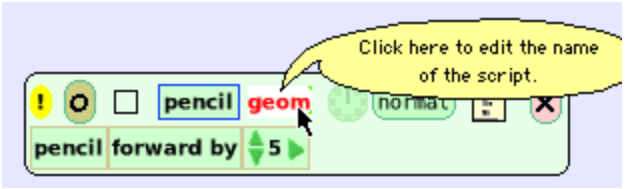


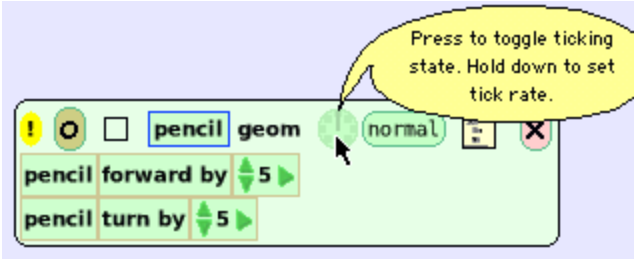
A viewer contains tiles
(in categories/blocks)

Program a sketch (2)



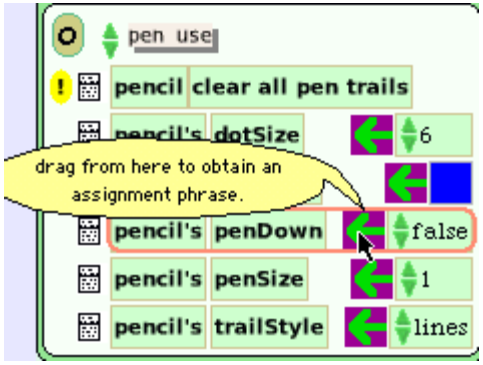
Drag/drop a tile into the World to create a script.

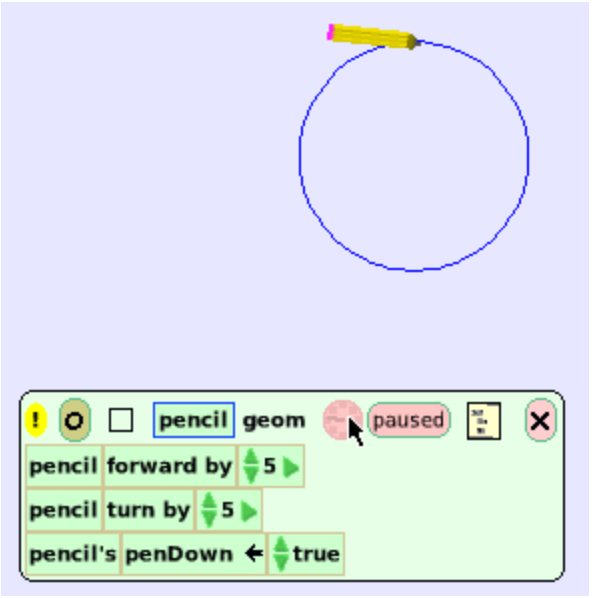


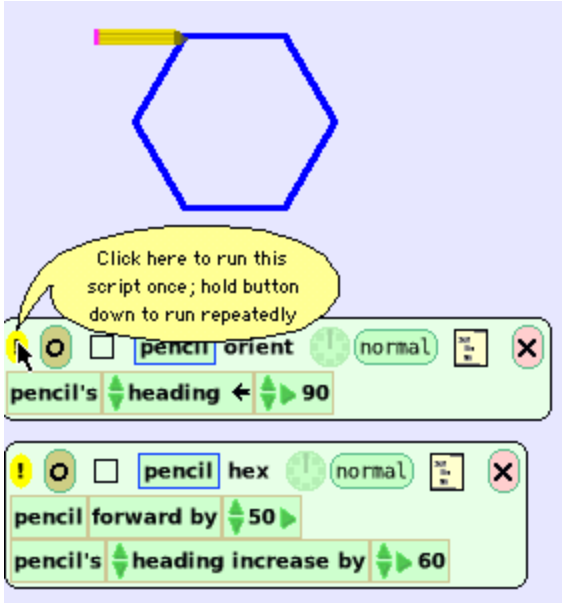


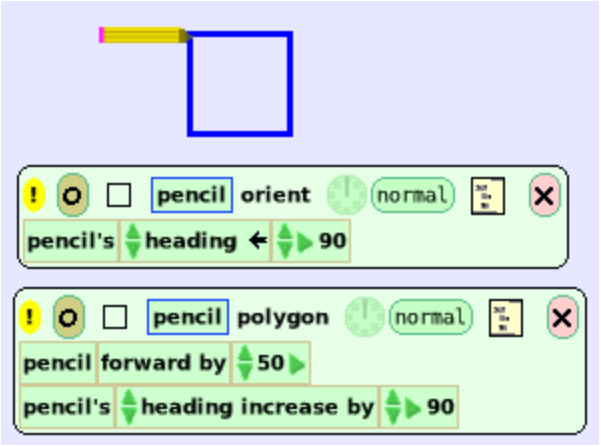
Click on the timer clock to run the script (toggle on/off)

Simple geometry



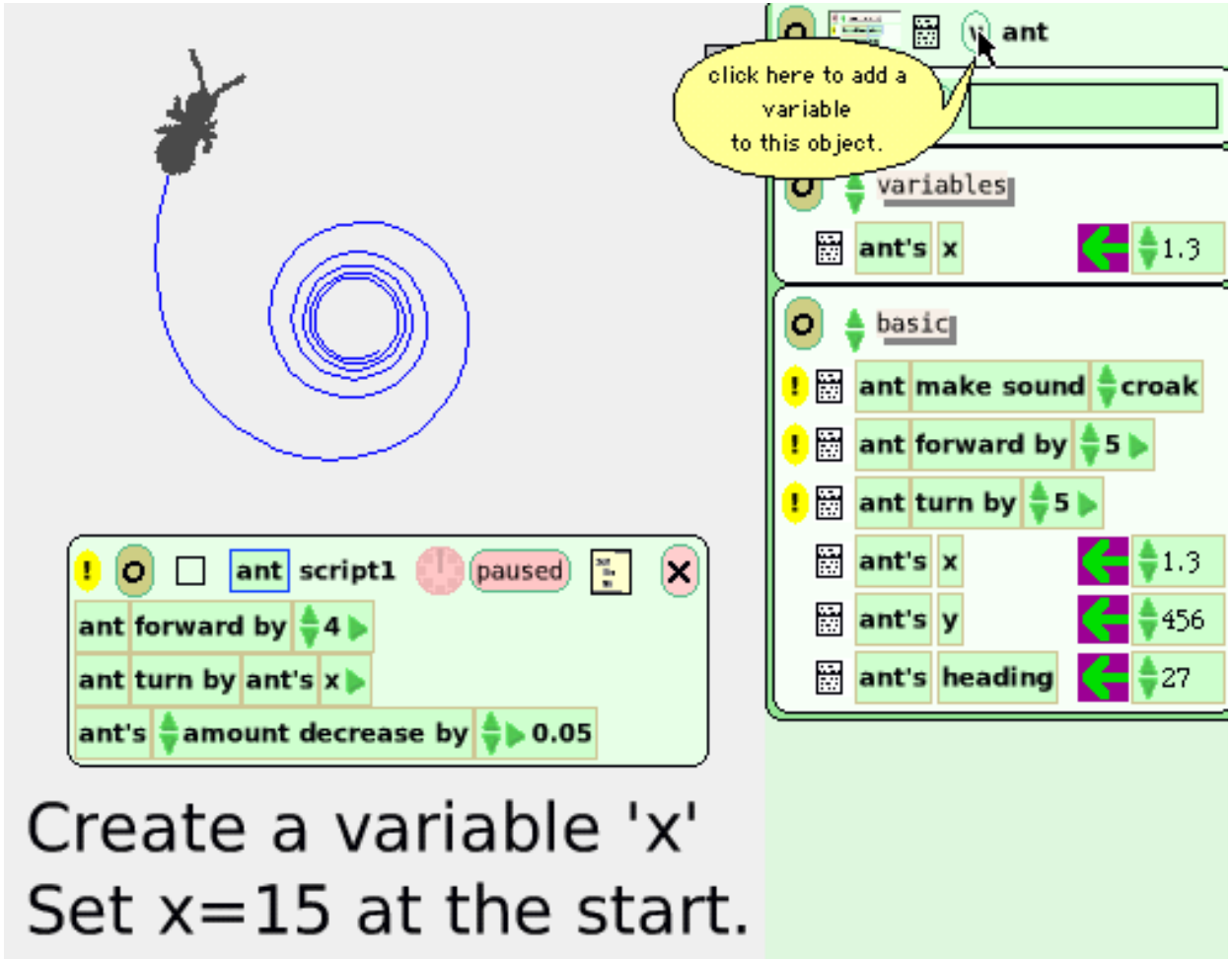






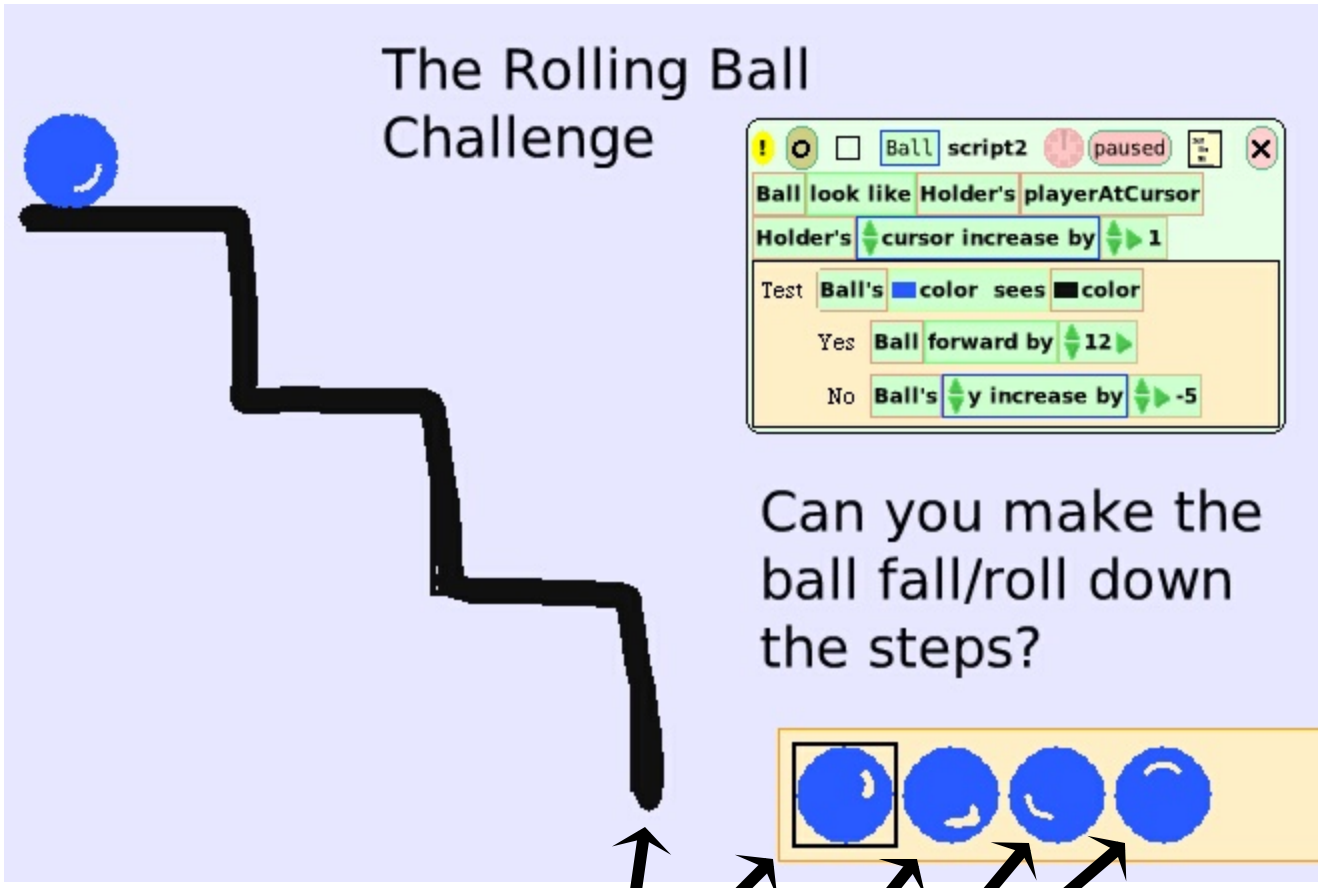
Visually seeing effect of direct manipulation of numbers (+/-)

More geometry + algebra



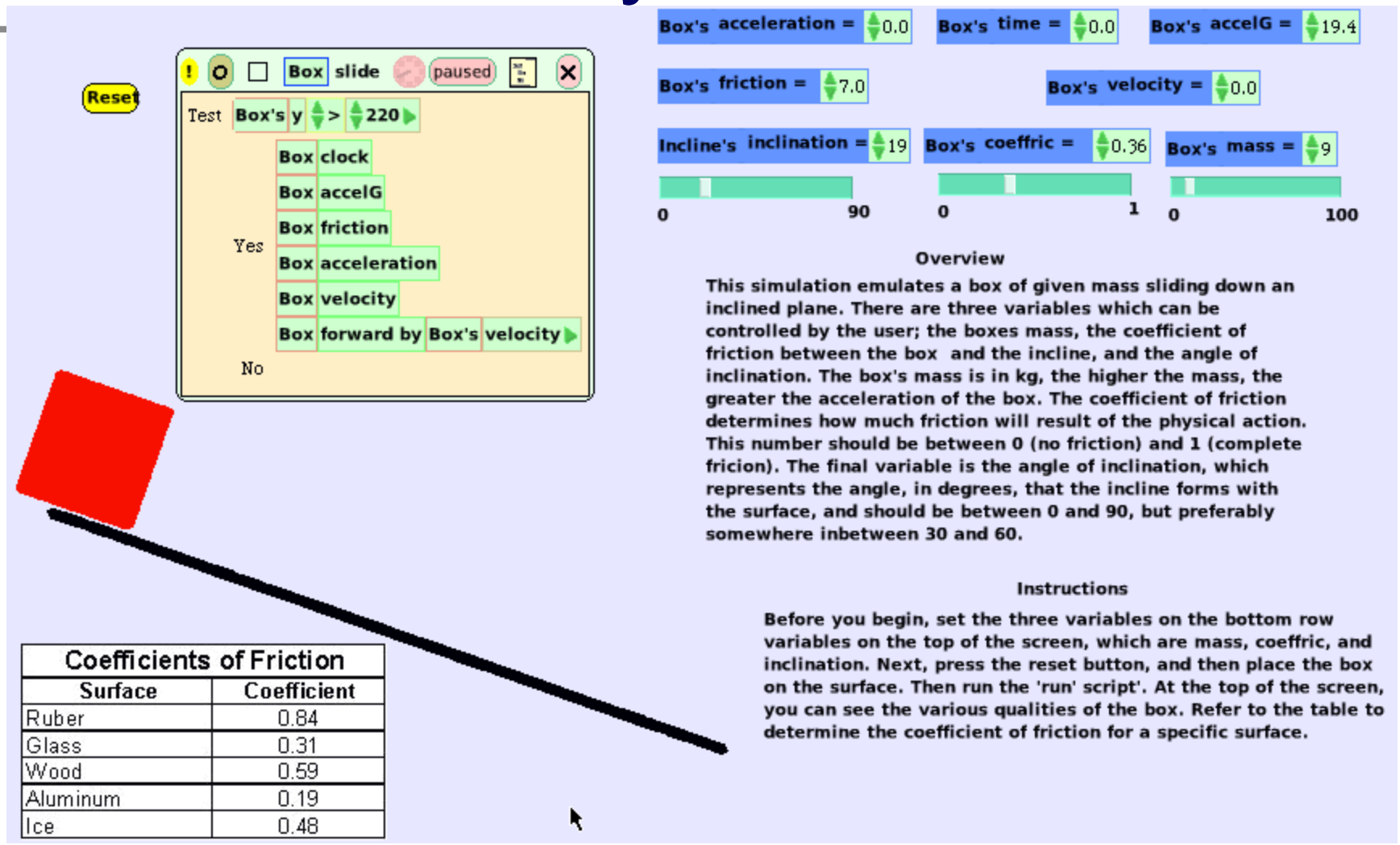
What happens if you keep 'turn by' fixed but change the 'forward by' (speed) ?

Animations: logic and programming



(5 separate sketches)

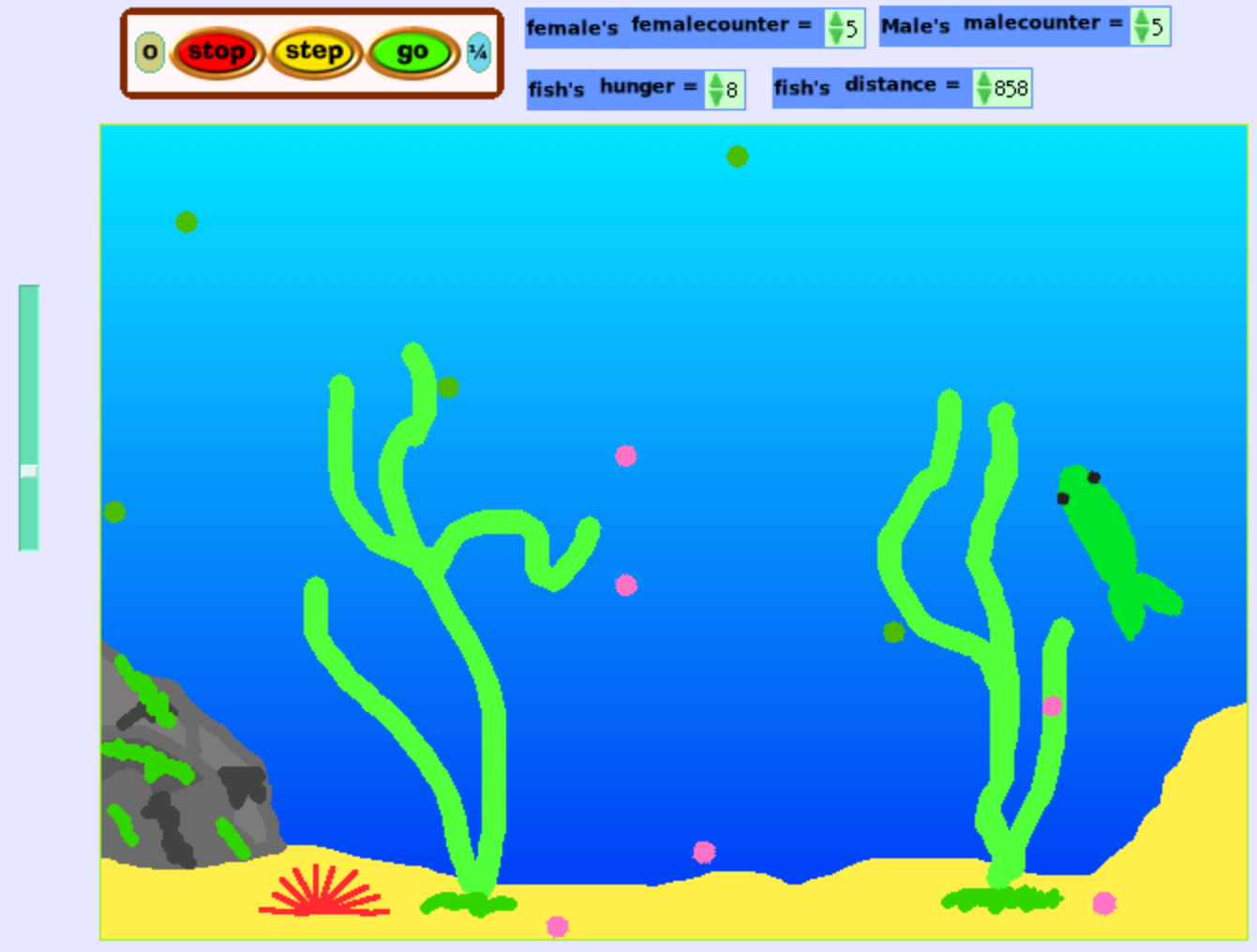
Physics



Coefficients of Friction	
Surface	Coefficient
Ruber	0.84
Glass	0.31
Wood	0.59
Aluminum	0.19
Ice	0.48

From squeakland.org →kids play →Etoys

Ecology

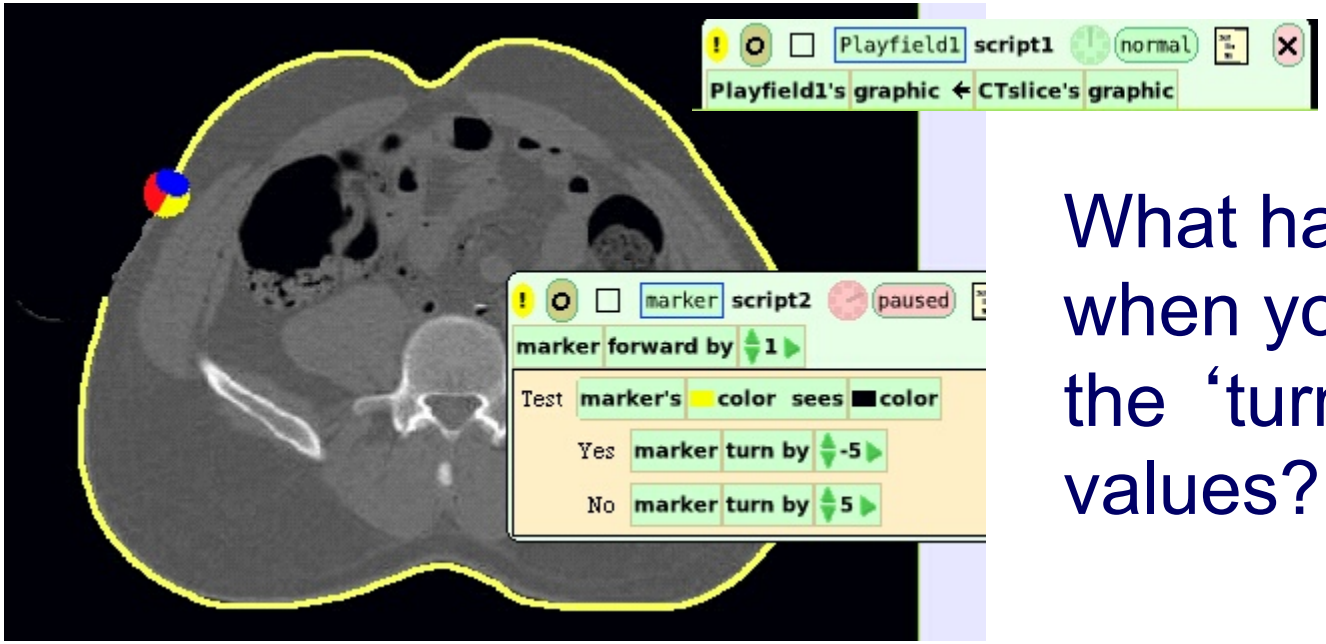


From squeakland.org →kids play →Etoys

Medical image analysis

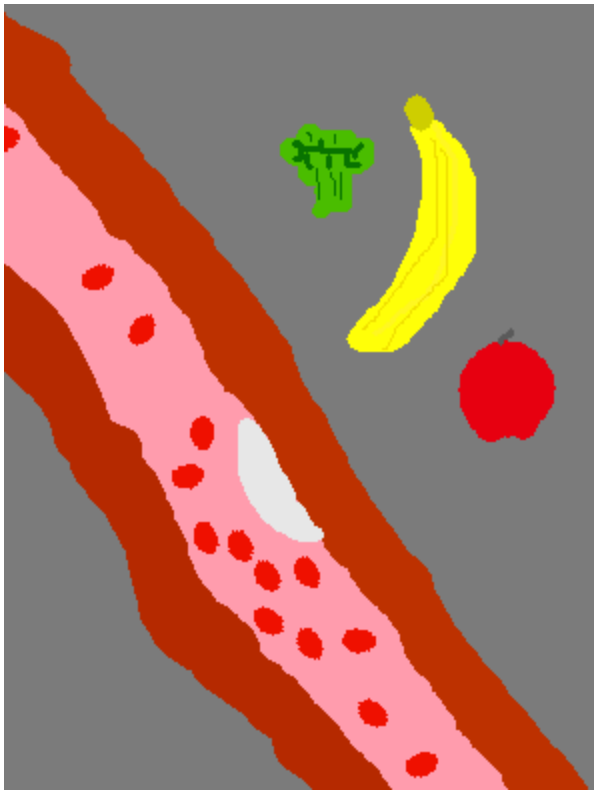
Simply drag/drop images from your computer into Squeak's World

Image segmentation:



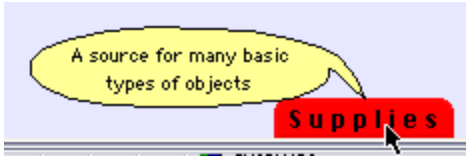
What happens when you change the 'turn by' values?

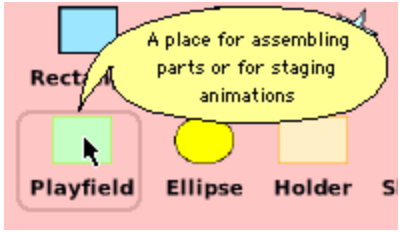
Health education



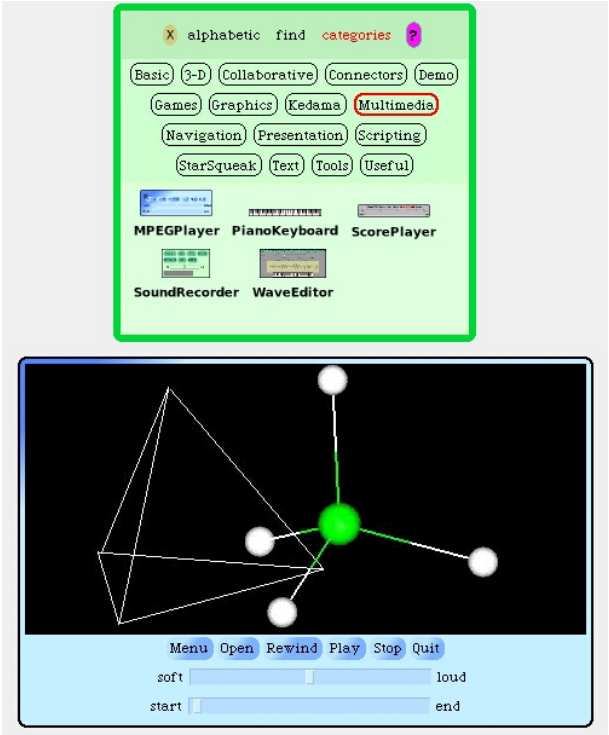
A simulation that shows blood cells flowing through a vein but getting clogged by plaque (in white).
The plaque decreases as more fruits and vegetables are consumed.

Misc: ‘Supplies’ tab

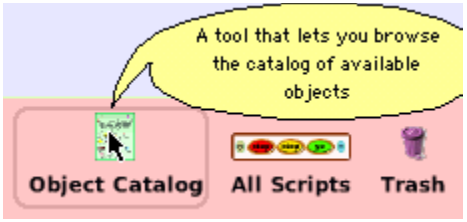




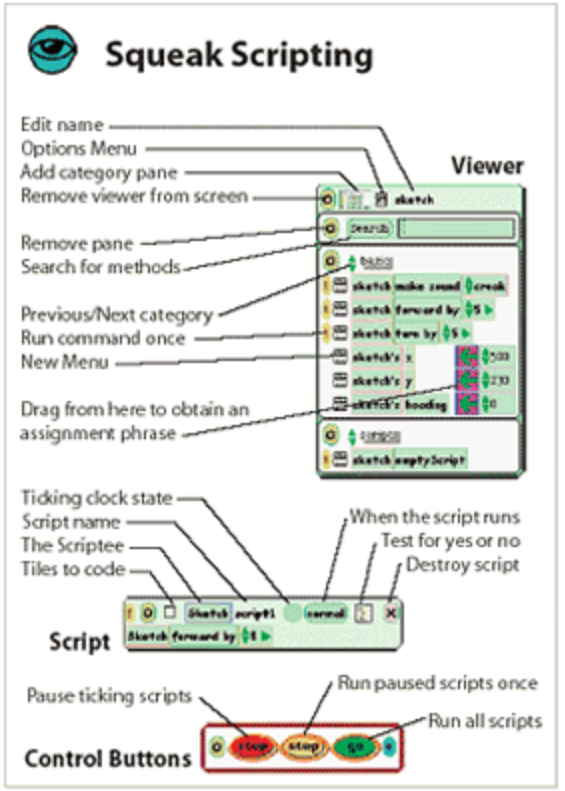
Drag a ‘playfield’ into the World to provide a fenced in region for sketches.



Mpeg player



Help at squeakland.org



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