

Actually using and configuring Avida

Lecture 11
Oct 11, 2010

Basic files

`avida.cfg` – basic configuration (size, topology, etc.)

`events.cfg` – monitoring and actions

`environment.cfg` – resources

`default-heads.org` – default organism

`instset-heads.org` – instruction set / string translation

Your challenge

Frame your LTEE-like experiment in *computational* terms.

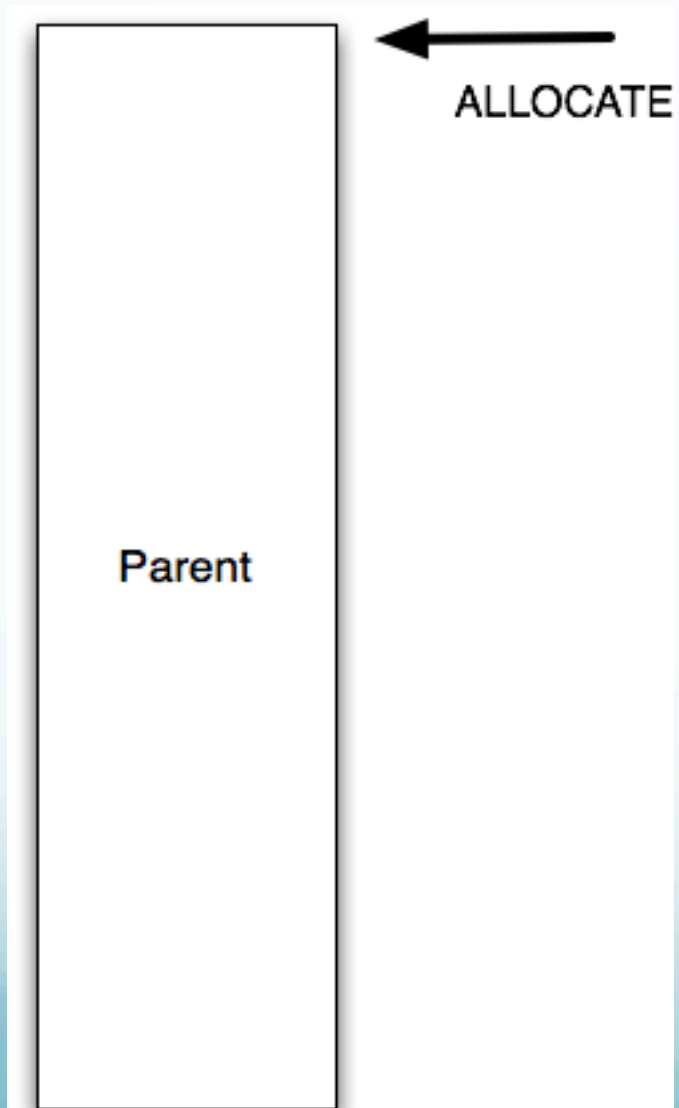
Write down configuration file “deltas” (sets of changes to make to the default configs) and the sequence of actions to perform for your proposed experiment.

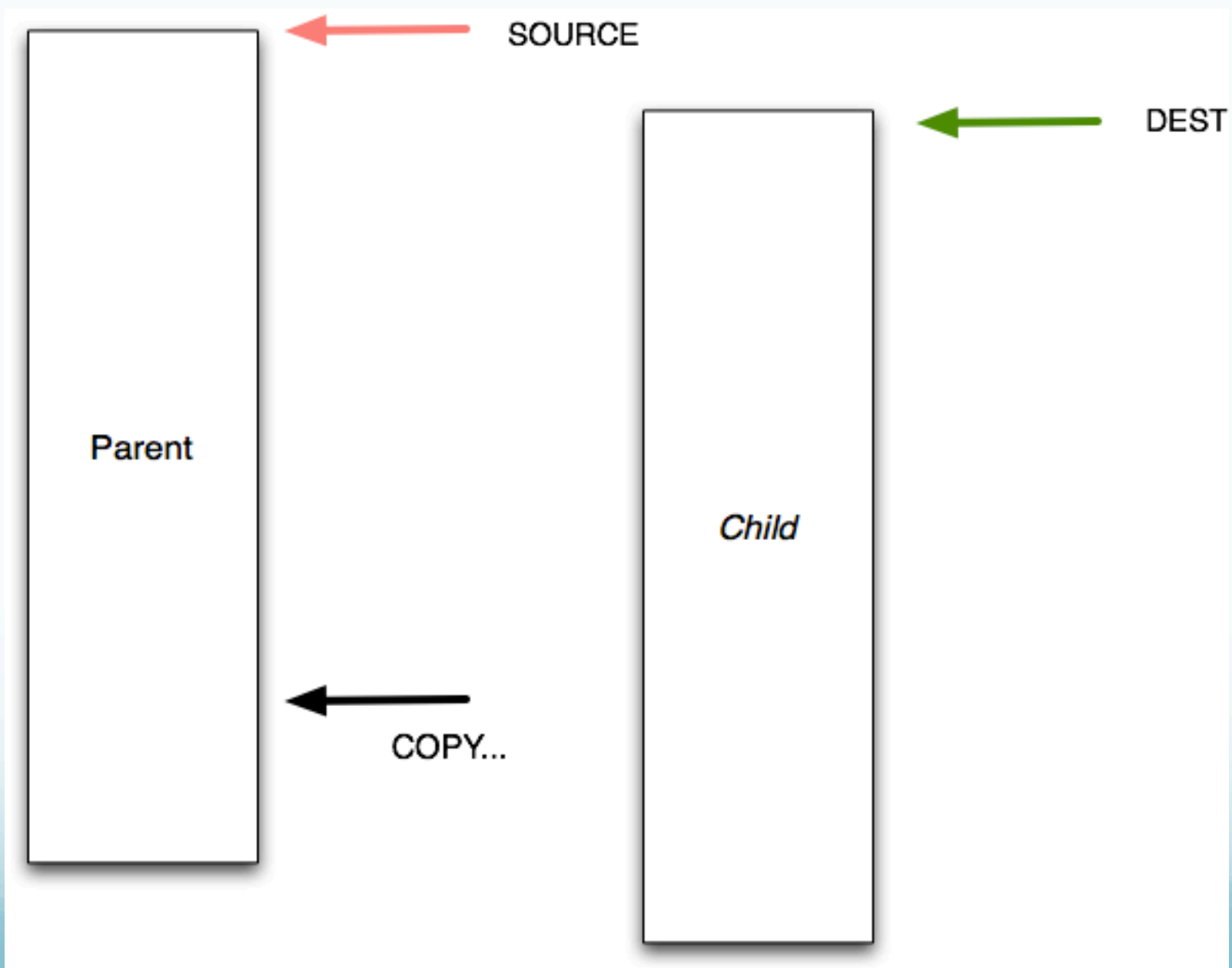
Also think about *measurements*.

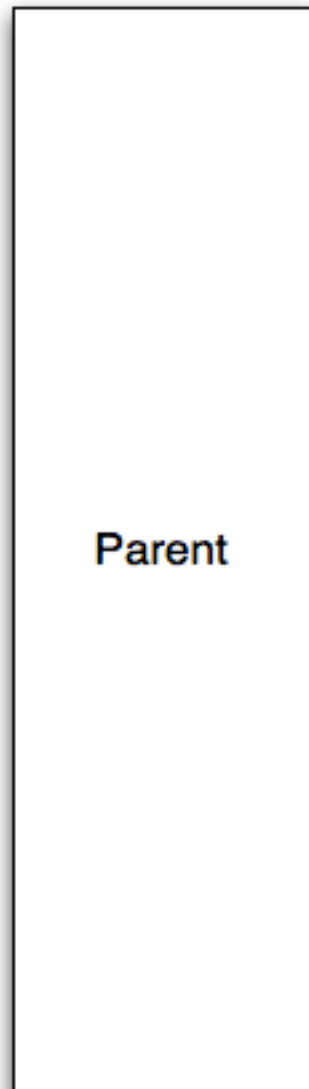
Reference documentation

Available at <http://lyorn.idyll.org/~t/avida/>

The copy loop



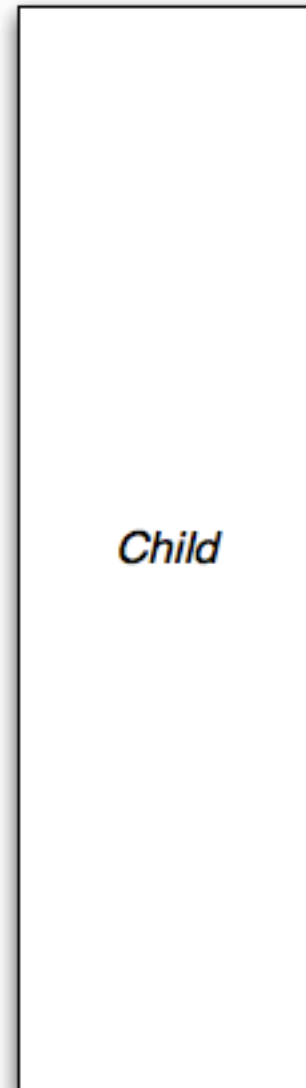




SOURCE



COPY...



DEST

Parent

Child

←
COPY...

← SOURCE

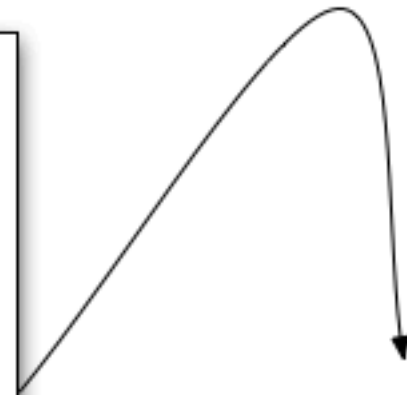
← DEST

Parent

Child

Cold hard world

DIVIDE!



Allocation @ beginning

h-alloc # Allocate space for child

h-search # Locate the end of the organism

nop-C #

nop-A #

mov-head # Place write-head at beginning of offspring.

...

nop-A # End label.

nop-B #

Copy loop (at end)

h-search # Mark the beginning of the copy loop

h-copy # Do the copy

if-label # If we're done copying....

nop-C #

nop-A #

h-divide # ...divide!

mov-head # Otherwise, loop back to the beginning of the copy loop.

Selecting a starting organism, or injecting one

avida.cfg:

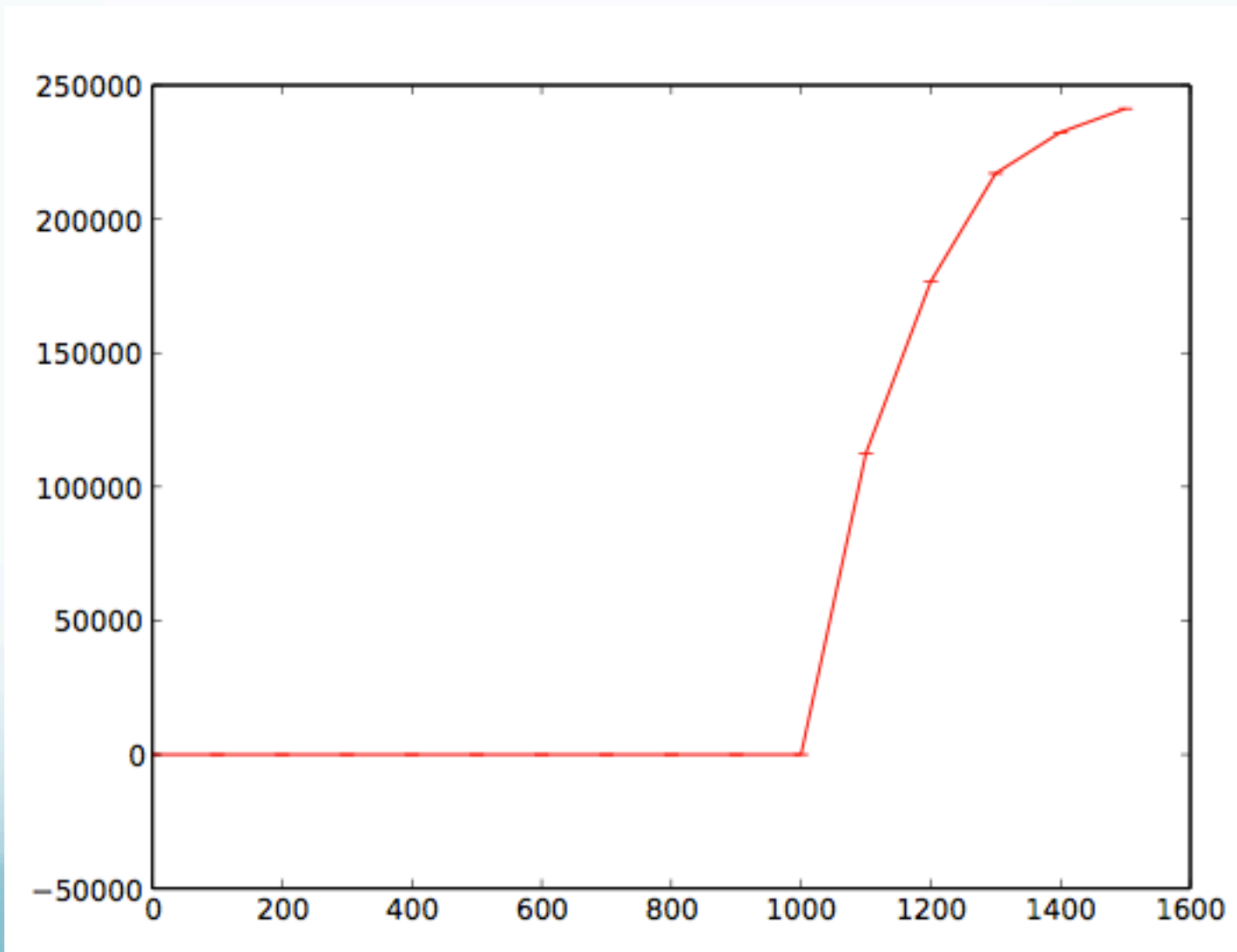
```
START_CREATURE default-heads.org
```

or events.cfg:

```
InjectSequence ...
```

(and other commands)

Injecting “bonecrusher”



events.cfg

syntax: [trigger] [start:interval:stop] [action/event] [arguments...]

u 20000 Exit

u 0:100:end PrintDominantData

See “List of Actions” for more info:

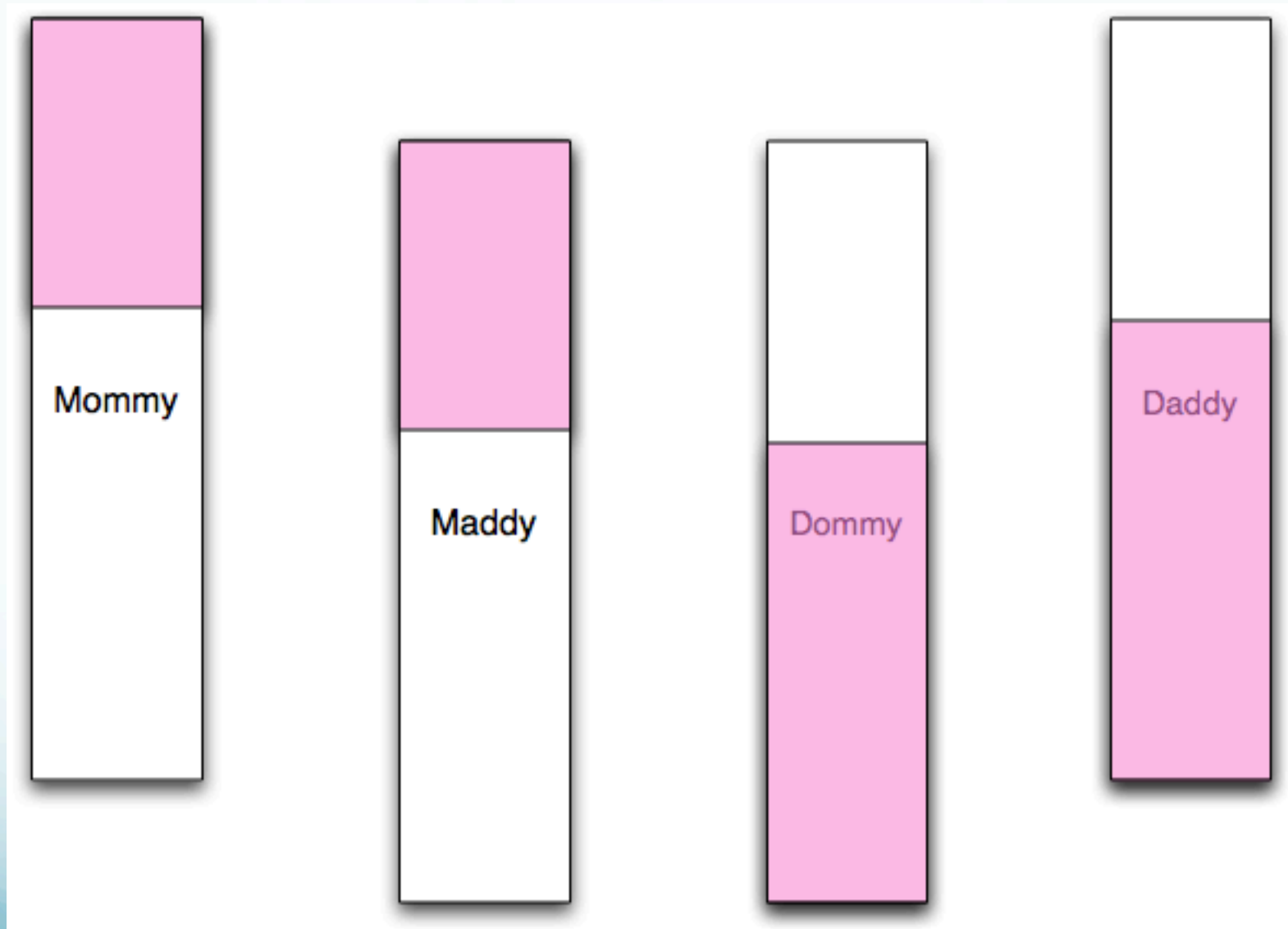
<http://lyorn.idyll.org/~t/avida/events.html>

<http://lyorn.idyll.org/~t/avida/actions.html>

Transferring organisms

- Select from dominant?
 - Look at dominant.dat
 - Retrieve dominant org genotype
 - Configure as starting org, or inject, or whatnot.
- Randomly from population?
 - Use event 'SavePopulation'
 - Write script to randomly choose N critters
 - Inject!

Turning on sex



Turning on sex (recombination)

1. Swap an instruction into the instruction set:

divide-sex instead of h-divide

This allows critters to make use of recombination.

(You can leave both in there, too.)

instset-heads.cfg:

```
nop-A    1  # a
```

```
...
```

```
h-divide 1  # x
```

Turning on sex (recombination)

2. Configure recombination options in avida.cfg:

RECOMBINATION_PROB (defaults to 1.0: 100%
probability of recombination)

TWO_FOLD_COST_SEX (defaults to 2 parents, 2
offspring)

Resources

environments.cfg:

```
RESOURCE glucose:initial=10000
```

```
RESOURCE maltose:initial=10000:inflow=100:outflow=0.01
```

See:

<http://lyorn.idyll.org/~t/avida/environment.html>

Interconversion

environments.cfg:

```
RESOURCE yummyA:initial=1000 RESOURCE yummyB:initial=1000
```

```
REACTION AtoB gobbleA
```

```
    process:resource=yummyA:frac=0.001:product=yummyB
```

```
REACTION BtoA gobbleB
```

```
    process:resource=yummyB:frac=0.001:product=yummyA
```

But you have to *also* have gobbleA and gobbleB tasks...

Default: no depletable resources

environments.cfg:

```
REACTION NOT not process:value=1.0:type=pow  
  requisite:max_count=1
```

```
REACTION NAND nand process:value=1.0:type=pow  
  requisite:max_count=1
```

```
REACTION AND and process:value=2.0:type=pow  
  requisite:max_count=1
```

...

Depletable resources

environments.cfg:

```
RESOURCE glucose:initial=10000
```

```
REACTION NOT not
```

```
  process:resource=glucose:value=1.0:type=pow
```

```
  requisite:max_count=1
```

Interconvertible resources

environments.cfg:

RESOURCE glucose:initial=10000

RESOURCE sucrose:initial=0

REACTION NOT not

process:value=1.0:type=pow:resource=glucose:product=sucrose
requisite:max_count=1

REACTION NAND nand

process:value=1.0:resource=sucrose:type=pow
requisite:max_count=1

More on resources

- Be careful about your setup.
- Run it a few times and figure out what's going on.
- ...maybe with a hand-designed critter?
- Use **PrintResourceData** to monitor (in events.cfg)

Other config parameters

avida.cfg:

WORLD_GEOMETRY – 2D or ..

BIRTH_METHOD – random replacement, or geriatricide, or ...

events.cfg:

Exit

Some example scripts

- Modify a config parameter
- Transfer an organism
- Decode an organism from string to genome

What's next?

- Fit your proposed project to Avida's capabilities.
- Identify starting config parameters
- Describe *process*
- We'll (help) develop scripts for that.