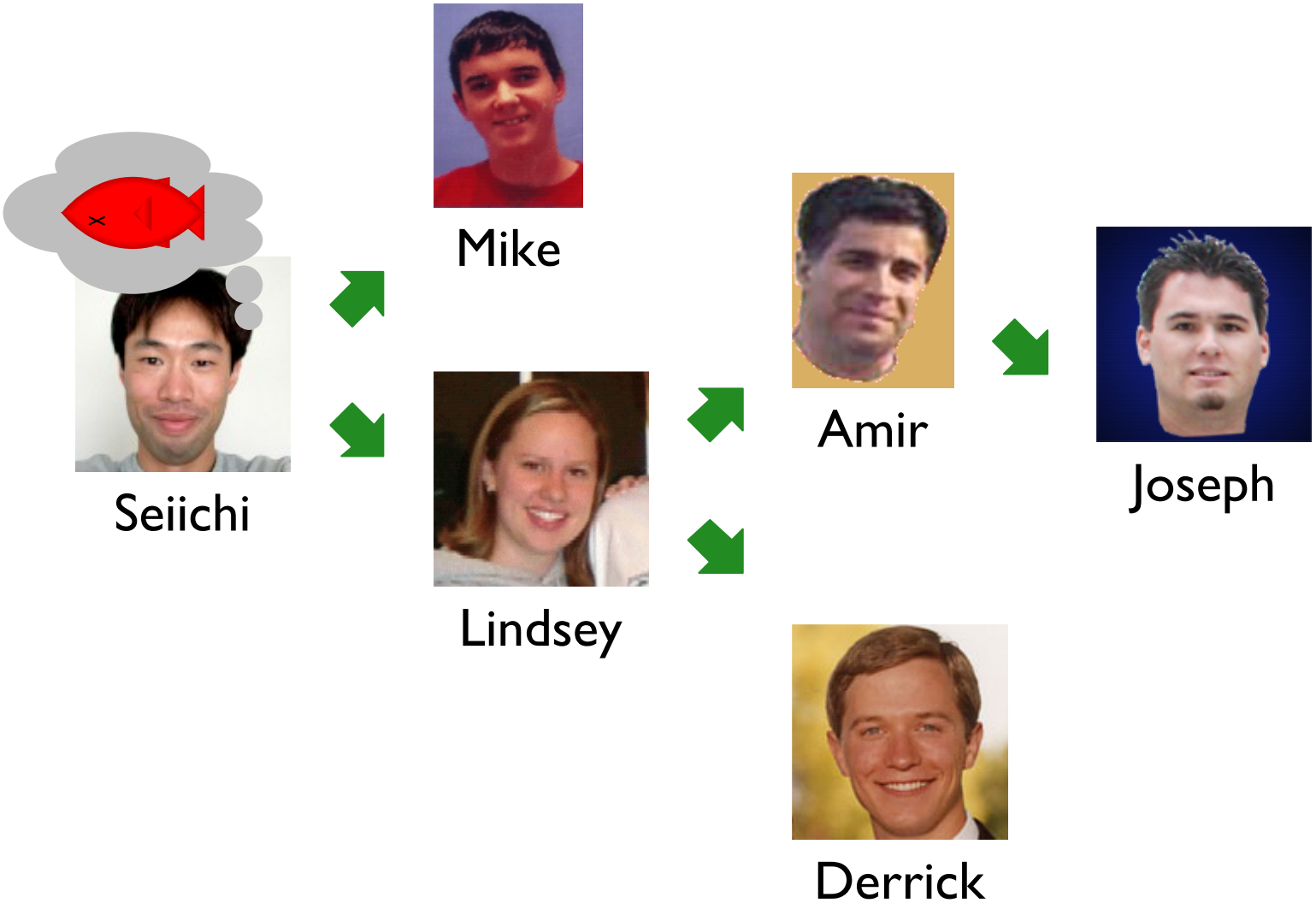
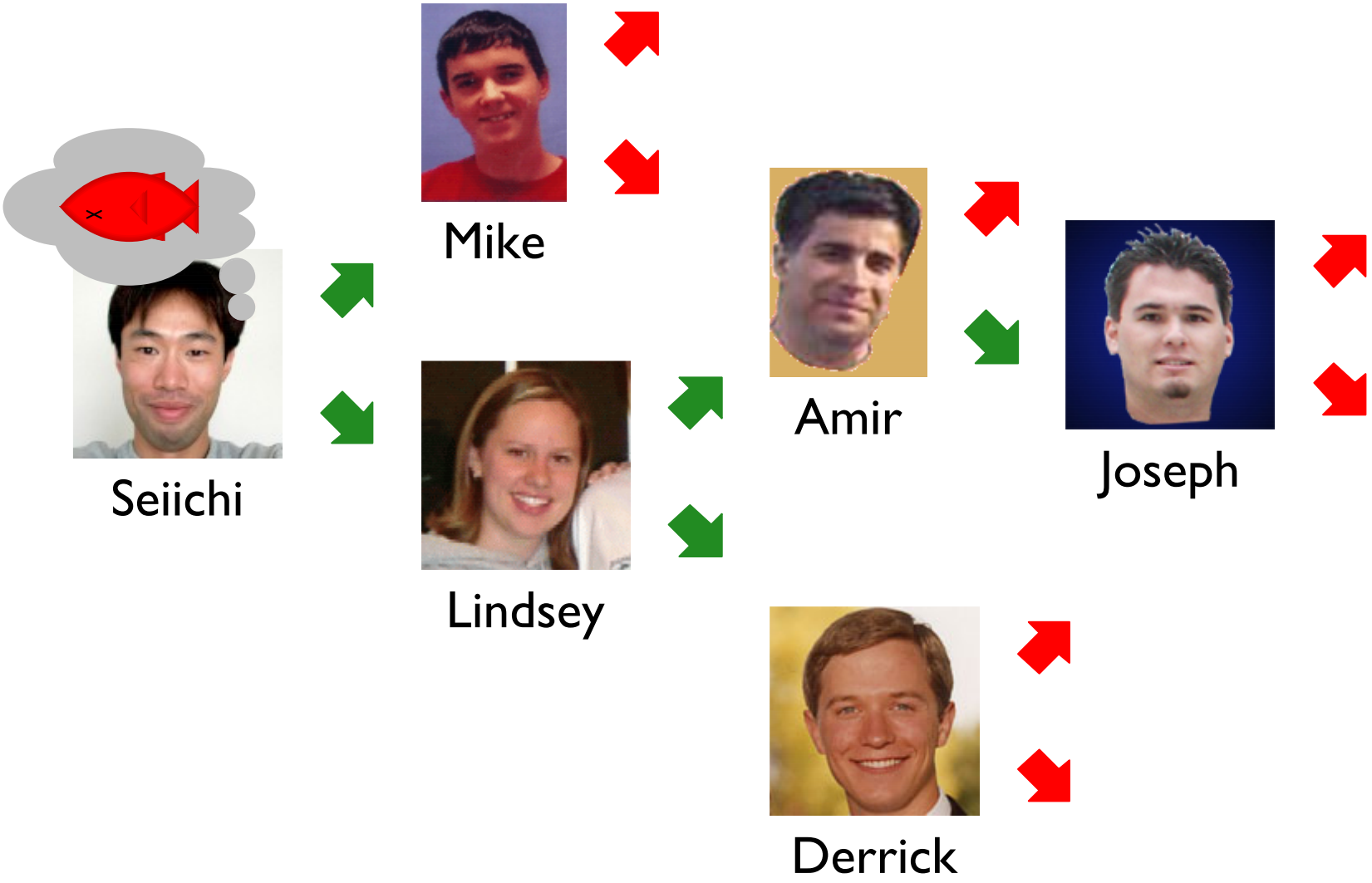
Tracking Rumors

Suppose that we want to track gossip in a rumor mill

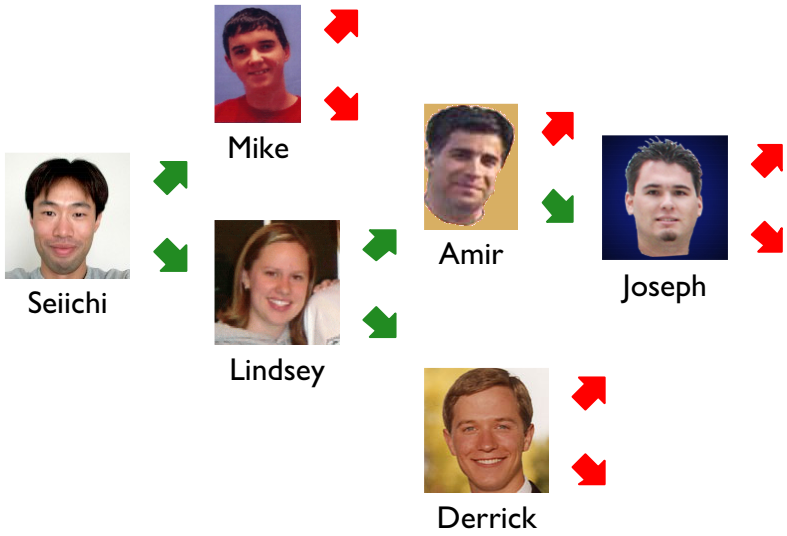


Tracking Rumors

Simplifying assumption: each person tells at most two others



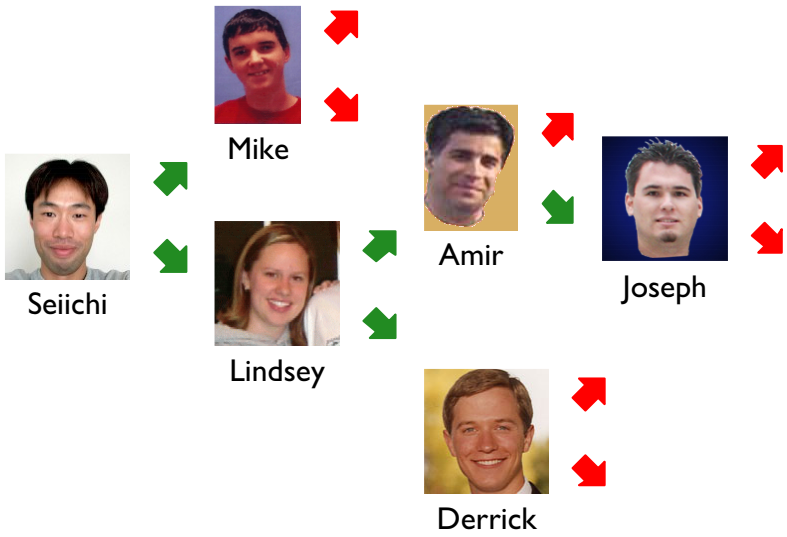
Representing Rumor Mills



Is a rumor mill simply a list of people?

No, because there are relationships among people

Representing Rumor Mills

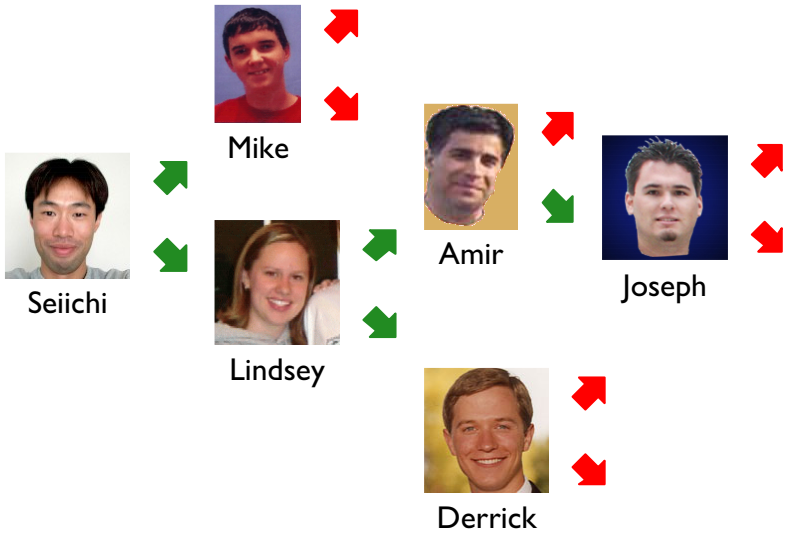


How about this?:

```
; A person is
;    (make-person image person person)
```

No, because some people don't gossip to anyone else—or they gossip to an empty rumor mill...

Representing Rumor Mills



How about this?:

```
; A rumor-mill is either
;   - empty
;   - (make-gossip image rumor-mill rumor-mill)
(define-struct gossip (who next1 next2))
```

This looks promising...

Example Rumor Mills

```
; A rumor-mill is either
;   - empty
;   - (make-gossip image rumor-mill rumor-mill)
```

```
empty
```

Example Rumor Mills

```
; A rumor-mill is either
;   - empty
;   - (make-gossip image rumor-mill rumor-mill)
```

(make-gossip  empty empty)

Joseph

Example Rumor Mills

```
; A rumor-mill is either
;   - empty
;   - (make-gossip image rumor-mill rumor-mill)
```

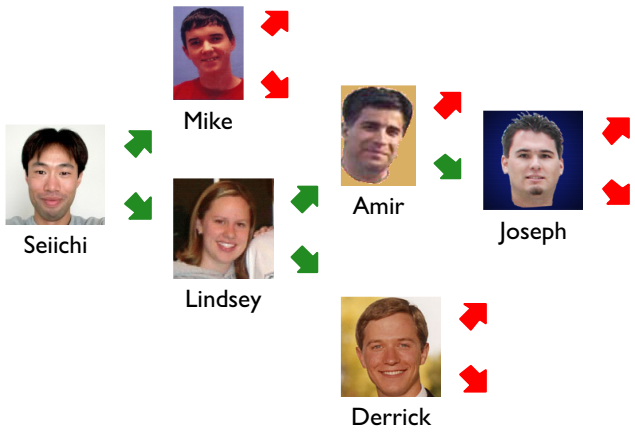
```
(make-gossip 
             empty
             (make-gossip 
                          empty empty))
```

Amir

Joseph

Example Rumor Mills

```
; A rumor-mill is either
;    - empty
;    - (make-gossip image rumor-mill rumor-mill)
```



Example Using Constants

```
(define joseph-mill
  (make-gossip  empty empty))
(define amir-mill
  (make-gossip  empty joseph-mill))
(define derrick-mill
  (make-gossip  empty empty))
(define lindsey-mill
  (make-gossip  amir-mill derrick-mill))
(define mike-mill
  (make-gossip  empty empty))
(define seiichi-mill
  (make-gossip  mike-mill lindsey-mill))
```

Programming with Rumors

```
; A rumor-mill is either
;   - empty
;   - (make-gossip image rumor-mill rumor-mill)
```

```
(define (func-for-rumor-mill rm)
  (cond
   [(empty? rm) ...]
   [(gossip? rm)
    ... (gossip-who rm)
    ... (func-for-rumor-mill (gossip-next1 rm))
    ... (func-for-rumor-mill (gossip-next2 rm)) ...]))
```

Rumor Program Examples

Implement the function **`informed?`** which takes a person image and a rumor mill and determines whether the person is part of the rumor mill

Implement **`rumor-delay`** which takes a rumor mill and determines the maximum number of days required for a rumor to reach everyone, assuming that each person waits a day before passing on a rumor

Implement **`add-gossip`** which takes a rumor mill and two person images —one new and one old— and adds the new person to the rumor mill, receiving rumors from the old person; the old person must not already have two next persons

Implement **`rumor-chain`** which takes a person image and a rumor mill and returns a list of person images representing everyone who must pass on the rumor for it to reach the given person; return **`false`** if the given person is never informed

More Pipes

A pipeline has faucets (opened or closed), straight parts (copper or lead), and branches

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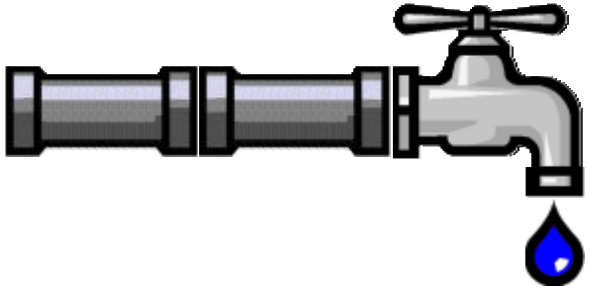
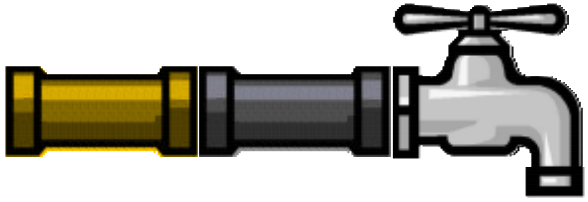


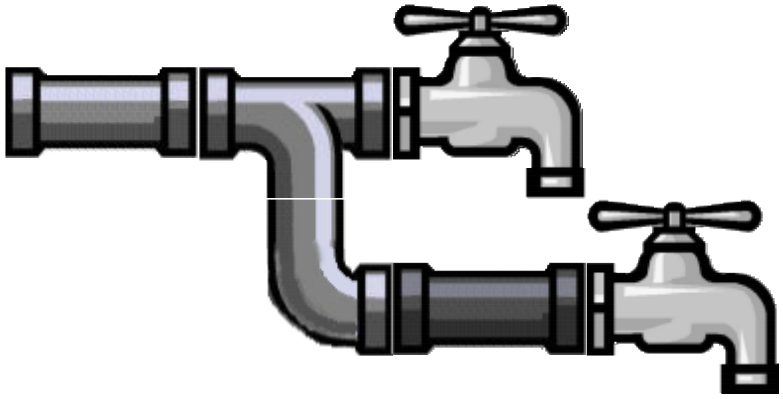
More Pipes

A pipeline has faucets (opened or closed), straight parts (copper or lead), and branches



More Pipes

A pipeline has faucets (opened or closed), straight parts (copper or lead), and branches



```
; A pipeline is either
;  - bool
;  - (make-straight sym pipeline)
;  - (make-branch pipeline pipeline)
(define-struct straight (kind next))
(define-struct branch (next1 next2))
```

Example Pipelines

```
; A pipeline is either
;   - bool
;   - (make-straight sym pipeline)
;   - (make-branch pipeline pipeline)
```

```
false
```

Example Pipelines

```
; A pipeline is either
;   - bool
;   - (make-straight sym pipeline)
;   - (make-branch pipeline pipeline)
```

```
true
```

Example Pipelines

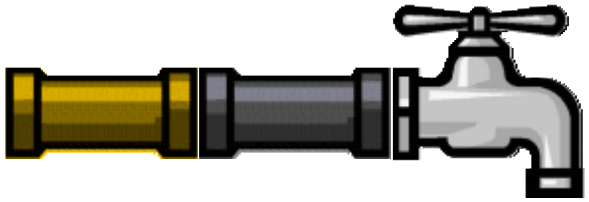
```
; A pipeline is either
;  - bool
;  - (make-straight sym pipeline)
;  - (make-branch pipeline pipeline)
```

```
(make-straight 'copper false)
```

Example Pipelines

```
; A pipeline is either
;  - bool
;  - (make-straight sym pipeline)
;  - (make-branch pipeline pipeline)
```

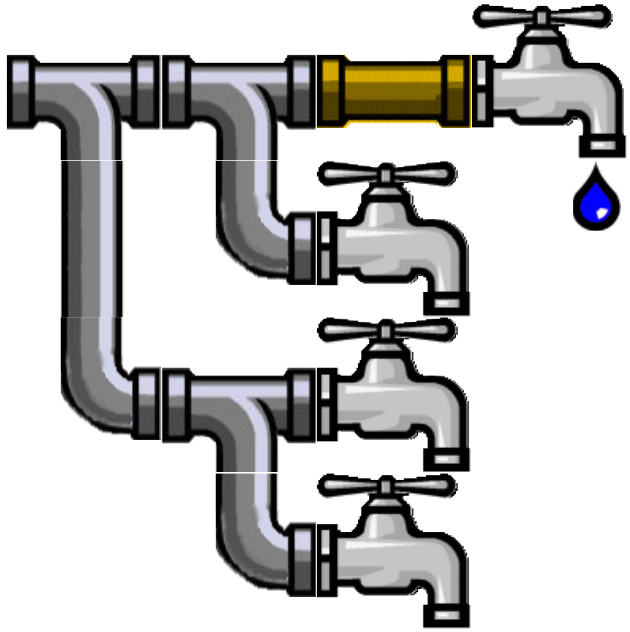
```
(make-straight 'copper
               (make-straight 'lead false))
```



Example Pipelines

```
; A pipeline is either
;  - bool
;  - (make-straight sym pipeline)
;  - (make-branch pipeline pipeline)
```

```
(make-branch
 (make-branch (make-straight 'copper true)
              false)
 (make-branch false
              false))
```



Programming with Pipelines

```
; A pipeline is either
;   - bool
;   - (make-straight sym pipeline)
;   - (make-branch pipeline pipeline)
```

```
(define (func-for-pipeline pl)
  (cond
   [(boolean? pl) ...]
   [(straight? pl)
    ... (straight-kind pl)
    ... (func-for-pipeline (straight-next pl)) ...]
   [(branch? pl)
    ... (func-for-pipeline (branch-next1 pl))
    ... (func-for-pipeline (branch-next2 pl)) ...]))
```

Pipeline Examples

Implement the function **`water-running?`** which takes a pipeline and determines whether any faucets are open

Implement the function **`modernize`** which takes a pipeline and converts all **`'lead`** straight pipes to **`'copper`**

Implement the function **`off`** which takes a pipeline and turns off all the faucets

Implement the function **`twice-as-long`** which takes a pipeline and inserts a **`'copper`** straight pipe before every existing piece of the pipeline