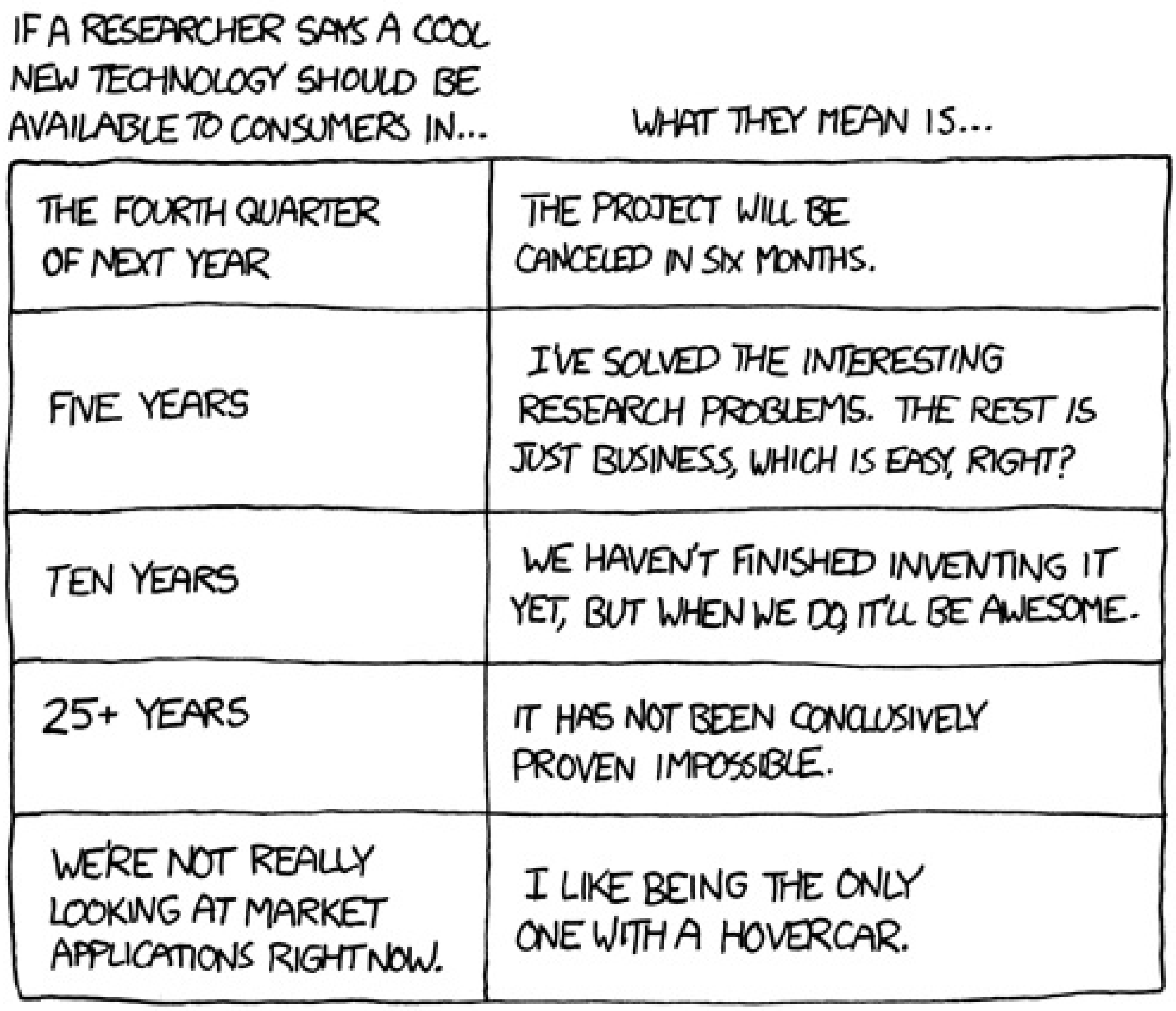
Meeting 23: Objects



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IF A RESEARCHER SAYS A COOL NEW TECHNOLOGY SHOULD BE AVAILABLE TO CONSUMERS IN...	WHAT THEY MEAN IS...
THE FOURTH QUARTER OF NEXT YEAR	THE PROJECT WILL BE CANCELED IN SIX MONTHS.
FIVE YEARS	I'VE SOLVED THE INTERESTING RESEARCH PROBLEMS. THE REST IS JUST BUSINESS, WHICH IS EASY, RIGHT?
TEN YEARS	WE HAVEN'T FINISHED INVENTING IT YET, BUT WHEN WE DO IT'LL BE AWESOME.
25+ YEARS	IT HAS NOT BEEN CONCLUSIVELY PROVEN IMPOSSIBLE.
WE'RE NOT REALLY LOOKING AT MARKET APPLICATIONS RIGHT NOW.	I LIKE BEING THE ONLY ONE WITH A HOVERCAR.

Announcements

- HW6 due 11/17
- Project status due 11/17 (in your project repo)

Class Scoping Puzzle

variable in main scope

```
x = 1

class C:
    print(x)    1
    x = 2
    print(x)    2
```

variable use

assign

"#" explicating

assign

class attribute

class attribute C.x

```
def f():
    print(x)
    x = 2
    print x
```

local x

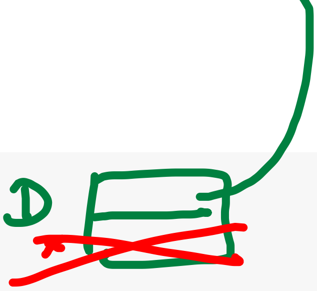
→ error

recall the what are the assigned-to vars at this code

inheritance

```
class D(C):
    print x        1

print C.x          2
print D.x          2
```



class E(D,C,A)

- depth-first,
  left-right

E.foo

```
>>> x = 1
>>>
>>> class C:
...     print x
...     x = 2
...     print x
...
1
2
>>> class D(C):
...     print x
...
1
>>> print C.x
2
>>> print D.x
2
```

class C:

- dynamic scoping

```
x=12
class C: input()!
    if ~~False~~:
        x=10
  print x
```

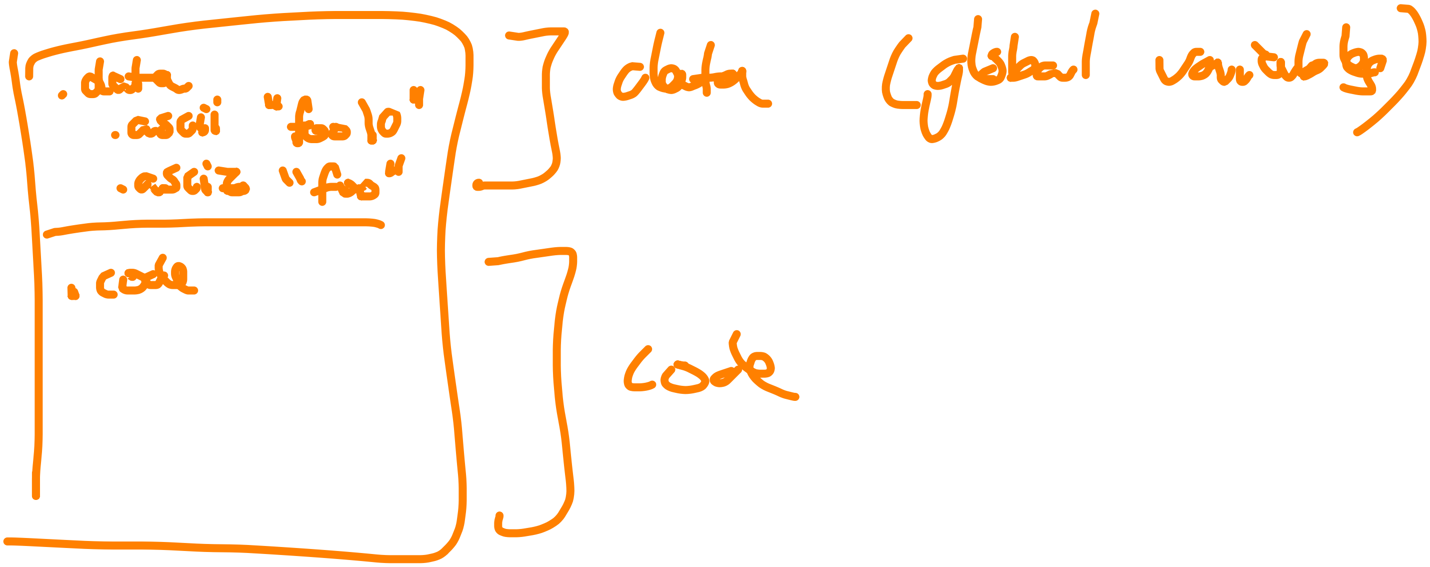
def f():

-static scoping

```
x= 12
def f(): "local x"
      if ~~False~~ input():
         x = 10
      print x   -uninitialized variable
```

Questions

1. Compiling classes 79 ✓
2. Conditions in loops ✓
3. Class attributes ✓
4. Strings in assembly ✓



```
class C:
    ≡
    class B:
        ≡
```

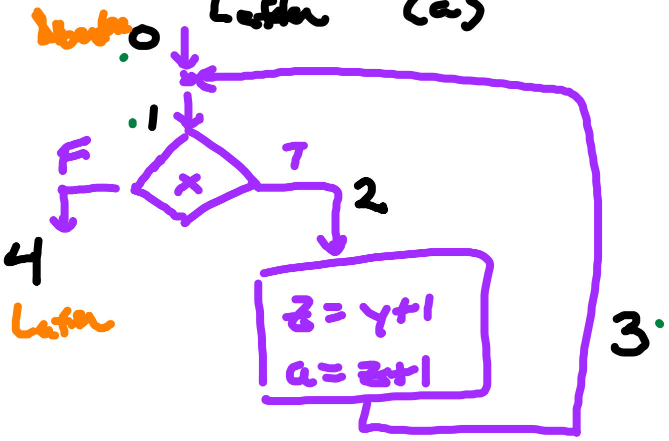
```
tmpC = create_class(...)

    tmpB = create_class(...)

    B = tmpB
    set_attr(tmpC, "B", ...)
```

```
Lbefore 0
         1
    while x:
      2 z = y+1
        a = z+1
      3
Lafter 4
```

Lafter {a}



			1a	1b	1c	2a
L0	∅	∅	{a,x}	{a,x}	{y,x}	{y,x, a}
L1	∅	{a,x}	{a,x}	{a,x}	{y,x,a}	{y,x, a}
L2	∅	∅	∅	{y,x}	{a,y}	{x,y}
L3	∅	∅	{a,x}	{a,x}	{a,x}	{y, x, a}
L4	{a}	{a}	{a}	{a}	{a}	{}

while c:
s_{body} ← body

subject code

```
elif isinstance(n, While):
    L1 = L4 U ... and...  elt(L1) = L1
    while fixpoint:
      ⓐ L3 = ... L1 ...,  L0 = ... L1 ...
      ⓑ L2 = liveness(n.body, L3)
      ⓒ L1 = L1 U L2
```

meta code

$L_{before}\Big({}^{0}\ \text{while}\ {}_{1}\ x_{cond}:$

$\quad {}^{2}\ S_{body}$

$\quad {}^{3}$

${}^{4}\ \ ,\ L_{after}\Big) \overset{def}{=}$

L_{after}

$$\boxed{L_{before}(S, L)}$$

$$\left\{\begin{aligned} &\text{Solve} \\ &L_0 \overset{def}{=} L_1 \\ &L_1 \overset{def}{=} L_2 \cup L_4 \cup \{x_{cond}\} \\ &L_2 \overset{def}{=} L_{before}(S_{body}, L_3) \\ &L_3 \overset{def}{=} L_1 \\ &L_4 \overset{def}{=} L_{after} \end{aligned}\right.$$

and

return L_0