Why provide more than one constructor?

Sec. 3.1.3, page 110

Doing so is better for the user.
From A1 (we assume you remember the specs):

```
public Organism(int lev, int m, String nn) { …}
```

```
public Organism(int lev) { …}
```

So, the user can write new Organism(4) instead of
new Organism(4, 0, null).

For the programmer,
it'd be great to have the one-parameter constructor call the other:

```
public Organism(int lev) {
   Organism(lev, 0, null);
}
```

this(lev, 0, null);

We wish we could say this!

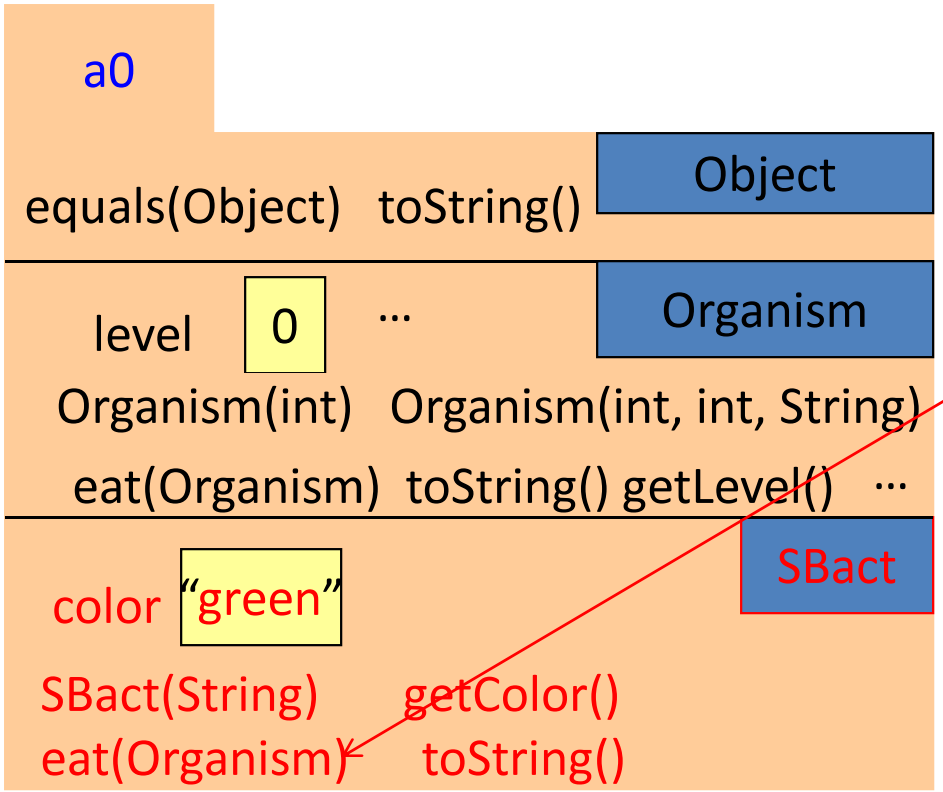
But you HAVE to do it "this" way. Here, **this** refers to the other constructor.

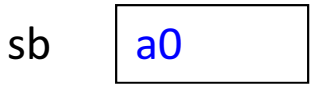
Issues related to sub-classes

The ability to extend existing subclasses to reuse/refine existing behavior is a *terrific* aspect of object-oriented programming.

Example: modeling sulfur bacteria as photosynthesizing organisms that come in purple or green variations.

(Thank you, Wikipedia.)



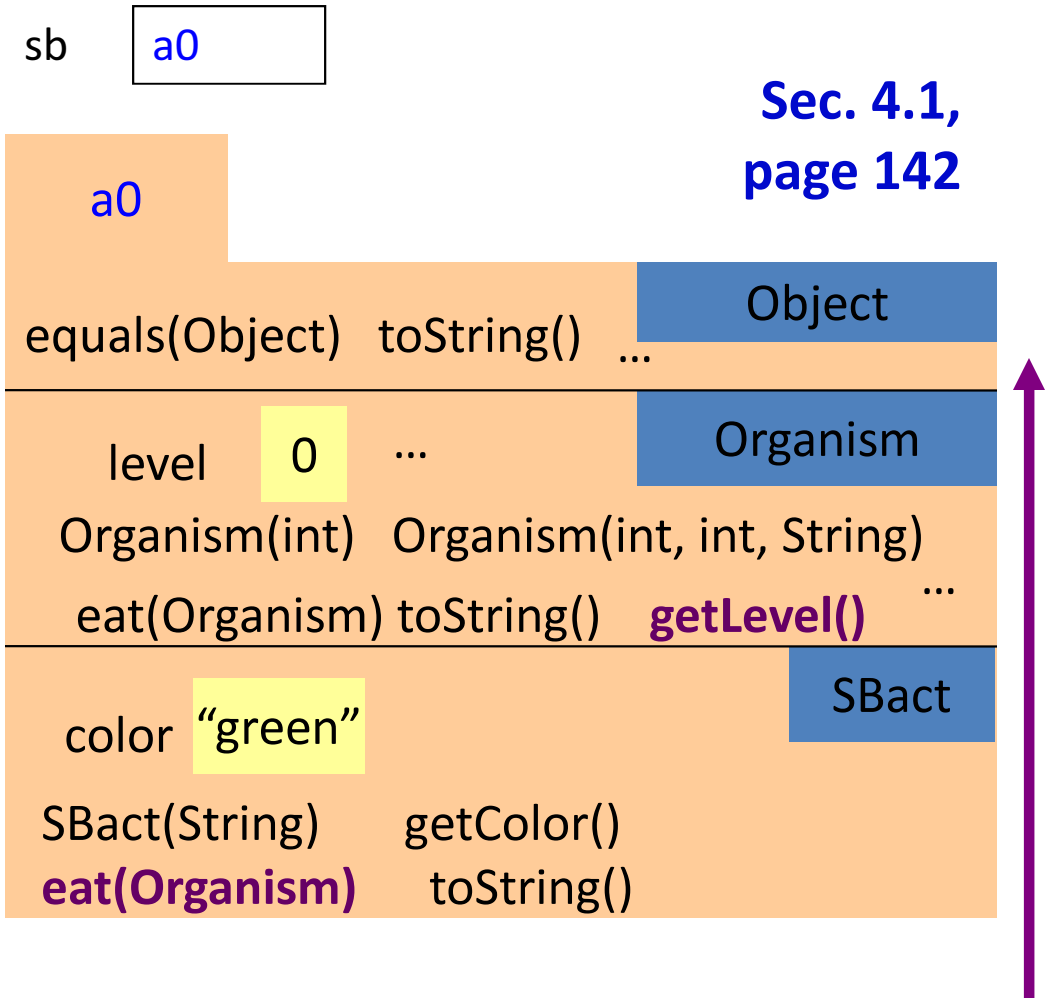


We *want* sb.eat(victim) to have the effect appropriate for sulfur bacteria (i.e., nothing happens) rather than the effect appropriate for generic Organisms.

[Program and tester will be posted to the course website.]

For the call sb.eat(v), which method eat is called?

Overriding rule or bottom-up rule:
Start at the bottom of the folder and search upward until a matching method is found.



Sec. 4.1, page 142

Terminology. SBact **inherits** methods and fields from Organism. Sbact **overrides** eat and toString.

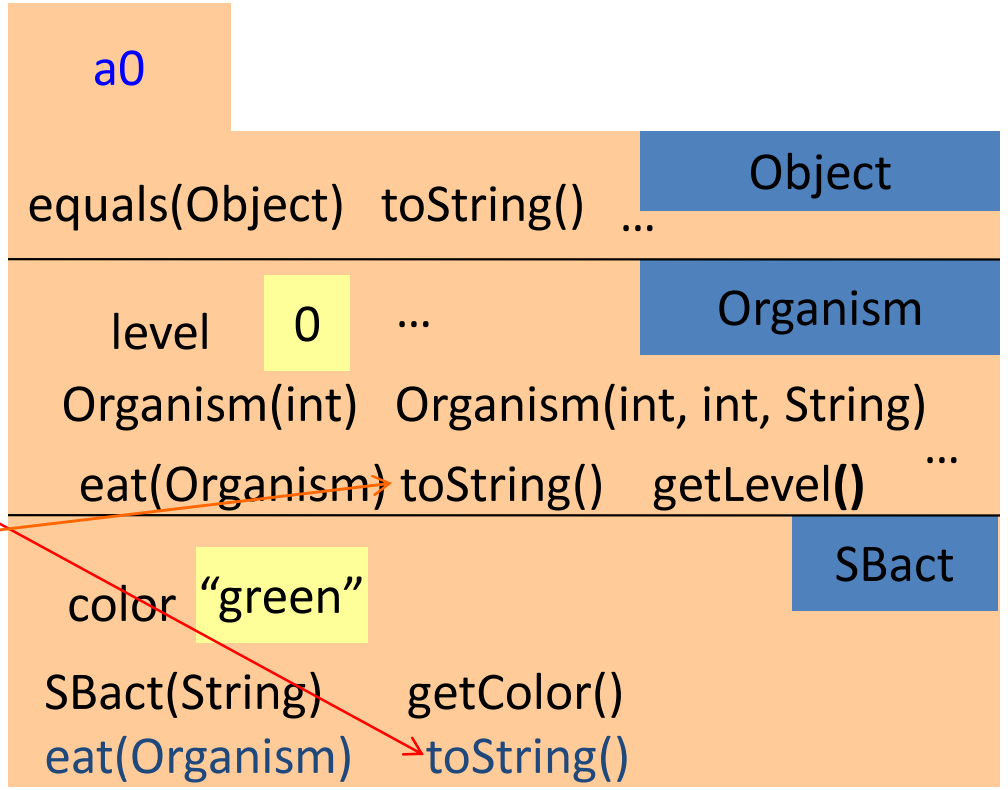
Purpose of super and this

Sec. 4.1, pages 144-145

Suppose we're overriding a method in order to modify it just a bit; so, we'd like to refer to the overridden method.

The word **super** refers only to components in the partitions above it.

```
/** = String like A3 requires for
Organism, but with
"<green/purple> SBact. " in front.
*/
public String toString() {
      return getColor()
        + " SBact. "
        +  super.toString();
}
```

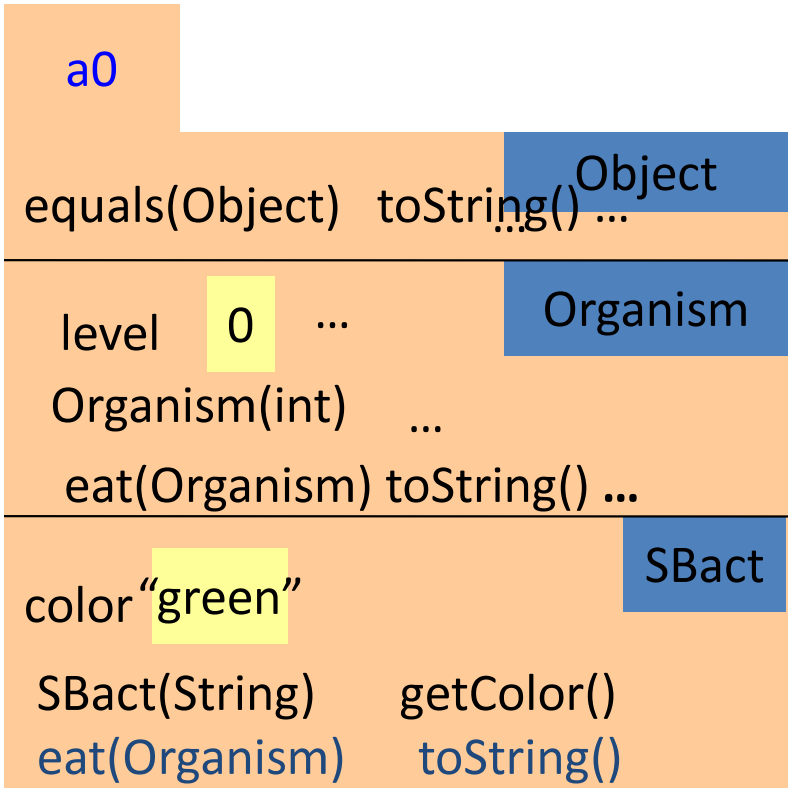


this refers to the name of the object in which it appears.

We could have written **this**.getColor(), but it wasn't necessary to.

Calling (reusing) a superclass constructor from the subclass constructor

Sec. 4.1.3, page 147




```
public class SBact extends Organism {
  private String color;

 /** Constructor: A sulfur bacterium of color c
[etc. Full program will be posted.]*/
  public SBact(String c) {
     super(0); /* default Org. values,
                  * lowest level */
     color= c;
   }
}
```

The first (and only the first) statement in a constructor **has** to be a call to a constructor of the superclass. If you don't put one in, then this one is automatically used:

super();

This corresponds to a natural principle**:** Fill in superclass fields first.

Non-abstract vs. Abstract

```java
/** Instances of subclasses of Car
    represent cars. */
public class Car
{
    private String make; // a make for a car

    /** Constructor: a Car with make x.
        Precondition: x is the car make
        as a String. */
    public Car(String x)
    {
        make = x;
    }

    /** = the make of this car */
    public String getMake()
    {
        return make;
    }

    /** = "ob is a Car that is made
          by a competing company." */
    public boolean isCompetitor(Object ob)
    {
        // Make sure ob is a car.
        if (!(ob instanceof Car)) {
            return false;
        }
        // Is the make of ob different from
        // the make of this car?
        return ((Car)ob).getMake() != getMake();
    }
}
```

```java
/** Instances of subclasses of Car
    represent cars. */
public abstract class Car
{
    private String make; // a make for a car

    /** Constructor: a Car with make x.
        Precondition: x is the car make
        as a String. */
    public Car(String x)
    {
        make = x;
    }

    /** = the make of this car */
    public String getMake()
    {
        return make;
    }

    /** = "ob is a Car that is made
          by a competing company." */
    public abstract boolean isCompetitor(Object ob);
}
```

Non-abstract vs. Abstract

```
/** An instance is a
    Volkswagen. */
public class VW extends Car
{
    /** Constructor: a new VW. */
    public VW()
    {
        super("Volkswagen");
    }
}
```

```
/** An instance is a
    Volkswagen. */
public class VW extends Car
{
    /** Constructor: a new VW. */
    public VW()
    {
        super("Volkswagen");
    }

    /** = "ob is a Car that is made
          by a competing company." */
    public boolean isCompetitor(Object ob)
    {
        // Make sure ob is a car.
        if (!(ob instanceof Car)) {
            return false;
        }
        // Is the make of ob a subsidiary?
        if (((Car)ob).getMake().equals("Audi")
         || ((Car)ob).getMake().equals("Bentley")
         || ...) {
            return false;
        }
        // If not, check as before.
        return ((Car)ob).getMake() != getMake();
    }
}
```