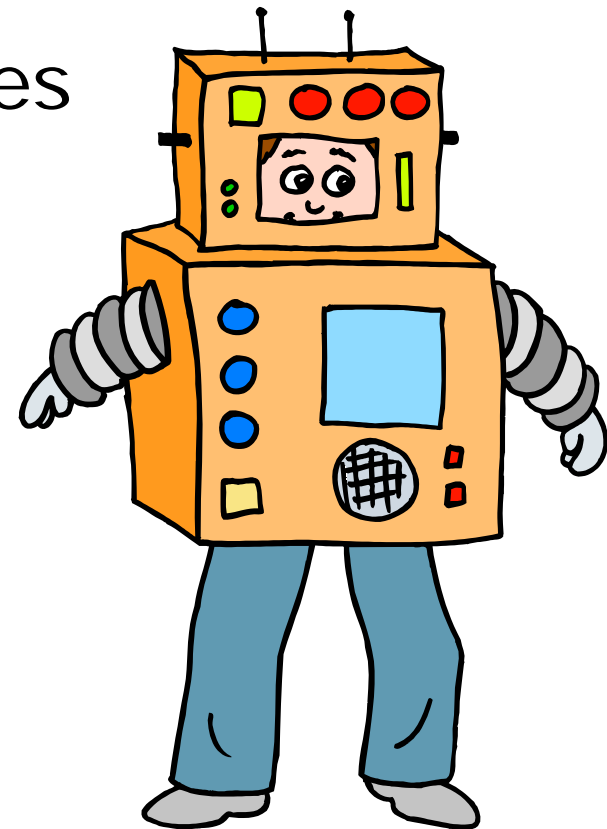


# ADVANCED ROBOTS

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Different Kinds of Vehicles



# Now that I can dance...

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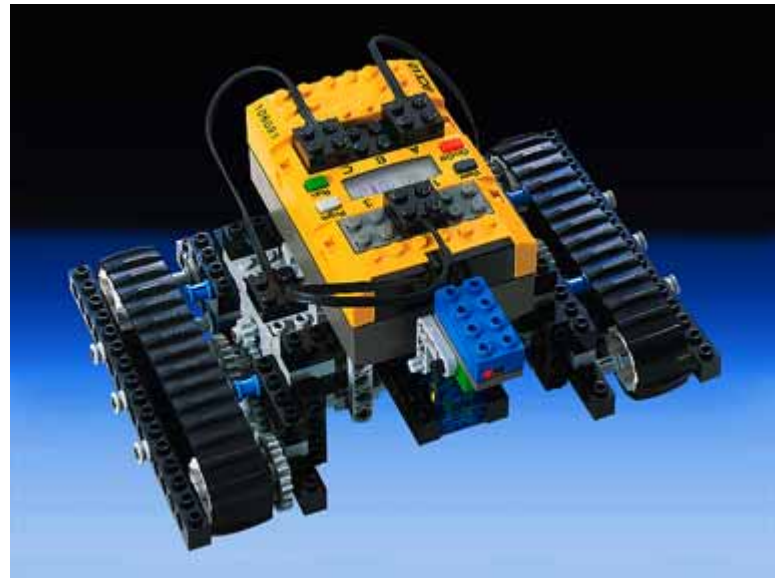


- While it is very fun to watch a robot dance, the purpose of robots is to respond to the environment
- Today we will make our robots respond to their environment

# Response

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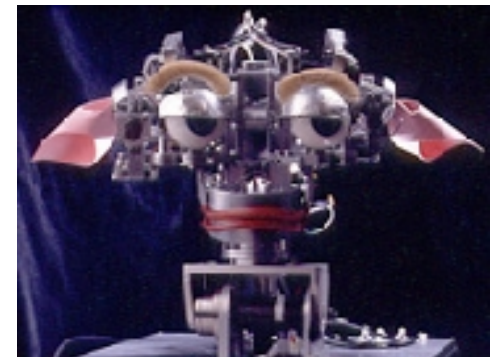
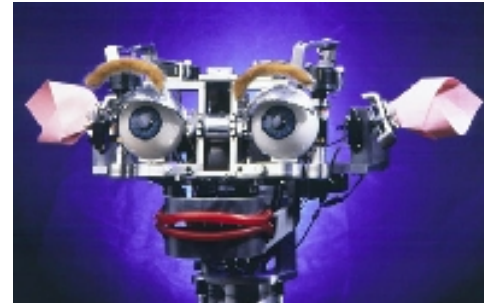
- To make the robots respond we will
  - Use the commands we learned last week
  - Add light sensors



# Emotion

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- Robots can project emotion
- We saw this at the AI Lab with
  - Cog
  - Kismet



# Different Emotions

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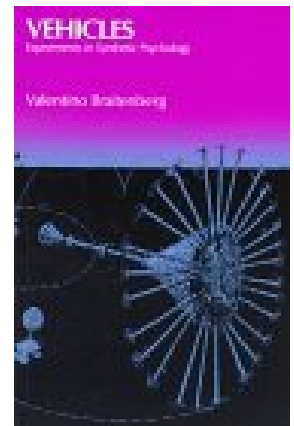
- Robots don't *actually* have emotion
- It is our personification of their reactions to events that makes us think they are expressing emotion
  - A robot that moves towards an object seems to *like* or *love* that object
  - A robot that moves away from it seems to *dislike* or *fear* that object

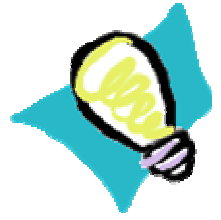


# Vehicles

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- Valentino Braitenberg explains this phenomenon in the book *Vehicles*.
- In your groups, you will read summaries of 3 different vehicles (robots) and build simple models that test what he wrote in words.





# Constructing Vehicle One

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- Attach one light sensor to the front of your robot.
- Write a program so that the vehicle will move at a speed corresponding to the value read by the sensor.
  - Hint: The values read will all be around 25-40. Speeds range from 0-10. Try subtracting 25 from the light value.
- Use a flashlight to control the light.
- Take note of what it does in response to the light.





# Things to Think About – Vehicle 1

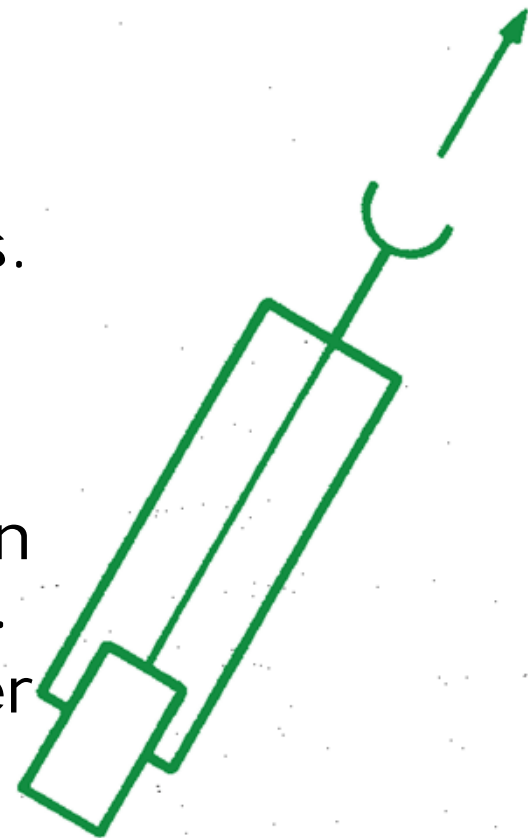
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- Draw a picture of what the robot does when it senses light.
- Does the robot like light?
- Does it ever stop moving?
- What adjectives would you use to describe this robot?

# Vehicle One - Explanation

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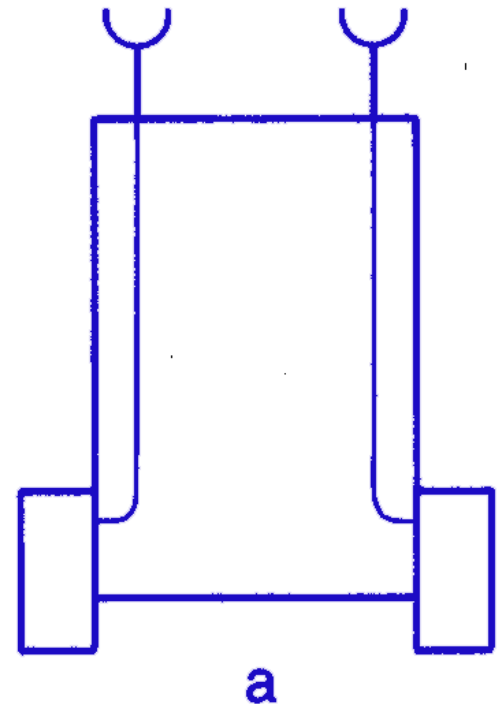
- Vehicle 1 has one light sensor.
- The more light there is, the faster the motor goes.
- The vehicle will move no matter where it is (we can't get absolute darkness), in the direction it happens to be pointing.
- It will slow down in darker regions and speed up in lighter regions.



# Constructing Vehicle Two - A

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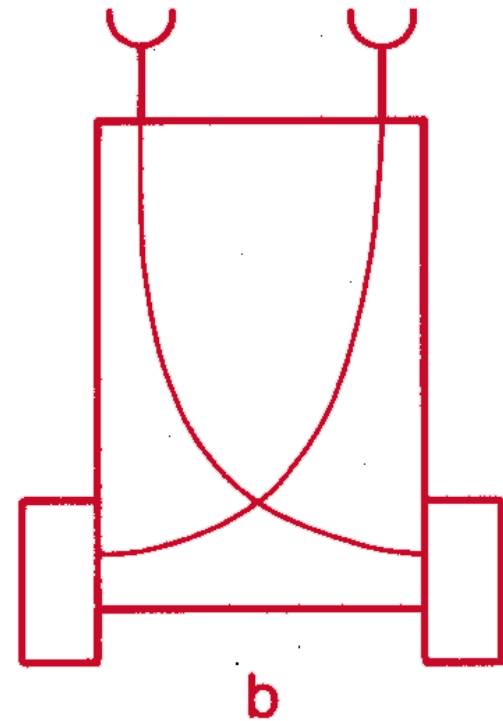
- Attach two light sensors to the front of your vehicle.
- Write a program so that the *left motor* will go corresponding to the value of the *left light sensor* and the right motor will go corresponding to the value of the right light sensor.
  - Important: This time you'll need to set the speed of each side separately. Use `leftSpeed(speed)` and `rightSpeed(speed)`



# Constructing Vehicle Two - B

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- Now switch the wires on your robot
  - the left light sensor will make the right motor go faster.
  - the right light sensor will make the left motor go faster.





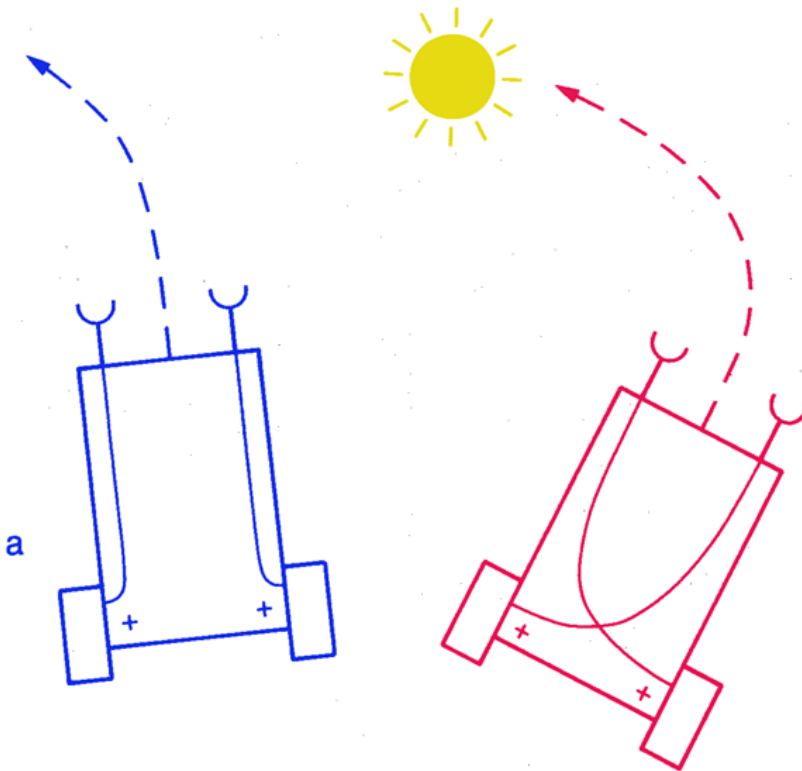
# Things to Think About – Vehicle 2

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- Draw a picture of what each robot does when they sense light.
- Does A like light? Does B?
- What effect does crossing the wires have?
- What adjectives would you use to describe these robots?

# Vehicle Two - Explanation

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- Instead of one light sensor, Vehicle II has two.
- Again, the more light that is read in, the faster the motor will go.
- There are two types of Vehicle II. Think of them as brother and sister.

# Vehicle 2a vs. 2b

---



a)

- Each sensor is connected to the motor on the *same* side.
- A stays in places with less light and speeds up in better lit areas.
- It will head directly towards the light.
- Light on the left will cause the left motor to move more quickly, thus turning the vehicle *away from* the light.

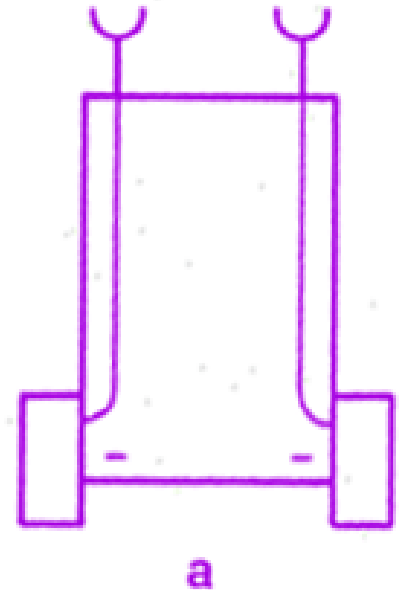
b)

- Each sensor is connected to the motor on the *opposite* side.
- B works the same as A if the light is directly ahead.
- If light is to the left, the right motor will go faster thus turning the vehicle *towards* the light.
- B will eventually find the source of light.

# Constructing Vehicle Three - A

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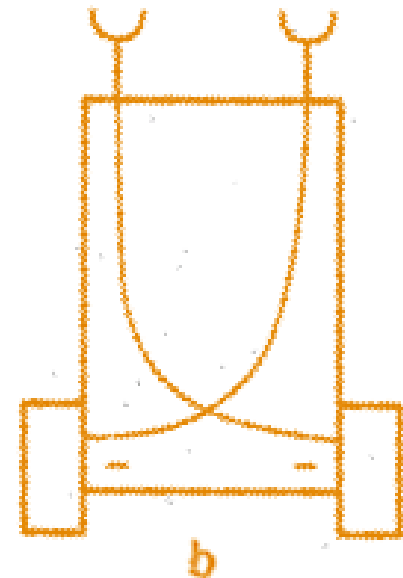
- Attach two light sensors to the front of your vehicle.
- Write a program so that the *higher* the left light sensor value, the *slower* the left motor and the *higher* the right light sensor value, the *slower* the right motor.
  - Hint: Your speed should never be negative. You may need to subtract the light value from something.



# Constructing Vehicle Three - B

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- Now switch the wires on Vehicle IIIa so that
  - a higher value read by the left light sensor will make the right motor go slower.
  - a higher value read by the right light sensor will make the left motor go slower.





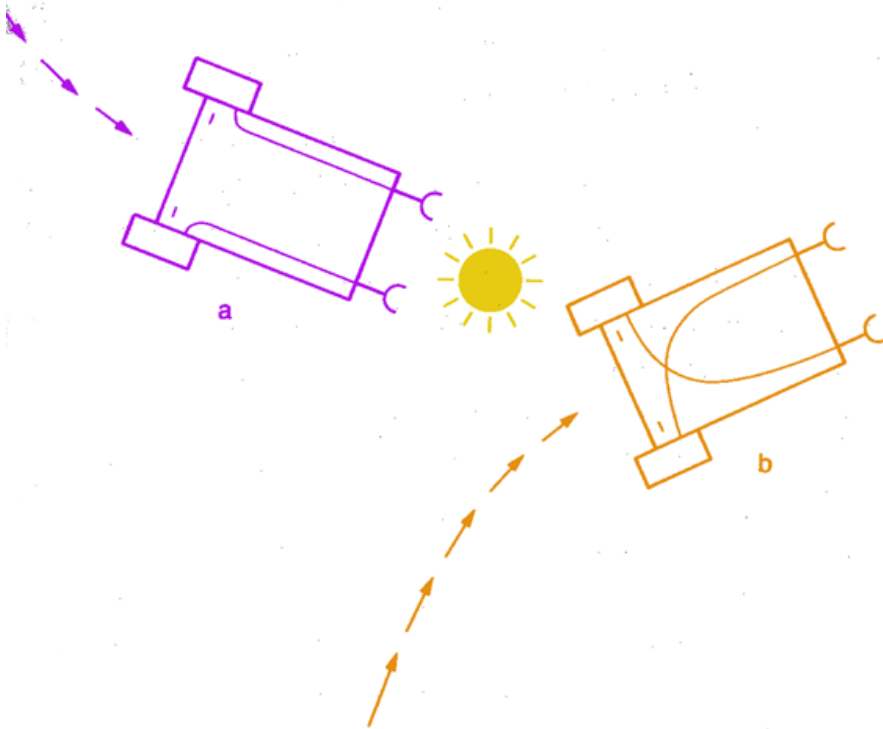
# Things to Think About – Vehicle 3

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- Draw a picture of what each robot does when they sense light.
- Does A like light? Does B?
- Why does B *not* stop in the light but A does?
- What adjectives would you use to describe these robots?

# Vehicle Three - Explanation

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- Like Vehicle II, Vehicle III has two light sensors.
- This time, the more light there is, the slower the vehicle will go.
- Both vehicles initially move towards the light unlike Vehicle II.

## Vehicle 3a vs. 3b

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a)

- Each sensor is connected to the motor on the *same* side.
- When A approaches light, it will turn towards it since the motor on that side slows down.
- A will stop (or nearly stop) in a very bright area.

b)

- Each sensor is connected to the motor on the *opposite* side.
- B will face away from the light because the motor away from the light will be going faster.
- B likes the light, but will keep moving to find more.