

BIOLESCE WORKSHOP

ISEA 2012

A small jar containing seawater with bioluminescent algae is agitated by a motor, triggered stimulating the algae to emit light.



Agitating Algae Physical Computing and Bioluminescent Displays

A DPrime Workshop, led by Tyler Fox, PhD student, SIAT, SFU

This workshop will provide you an introduction to using bioluminescent algae with physical computing. We will be building small, simple sculptures using motors and sensors coupled to Arduino microcontrollers to explore new ways of engaging with nature through technology.

Our goal is to stimulate curiosity and excitement about the natural world and technology. Technology provides us with another set of

creative tools with which to engage in the world. This pamphlet will guide you through four simple arduino projects, each slightly more complex than the last.

We encourage you to think up new ways to interact with bioluminescent algae. Some suggestions are offered at the end of the pamphlet, along with resources for procuring more algae and learning more about Arduino.

DPrime is a not-for-profit organization based in Vancouver, BC Canada.

Example 1 - "Blink"

<http://arduino.cc/en/Tutorial/>

We start with "Blink," a basic sketch in Arduino that blinks an LED (Light Emitting Diode).

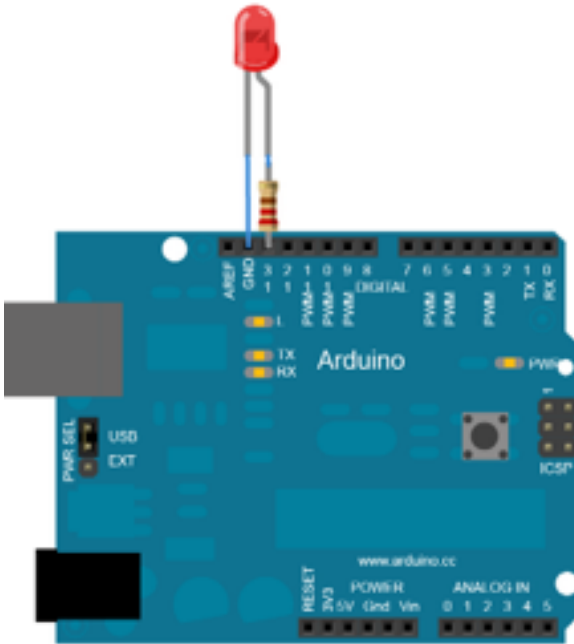


Image from:
http://arduino.cc/en/uploads/Tutorial/ExampleCircuit_bb.png



Image from:
<http://ledshoppe.com/Photo/Product%20photo/PICT0041.JPG>
http://arduino.cc/en/uploads/Tutorial/ExampleCircuit_bb.png

Code

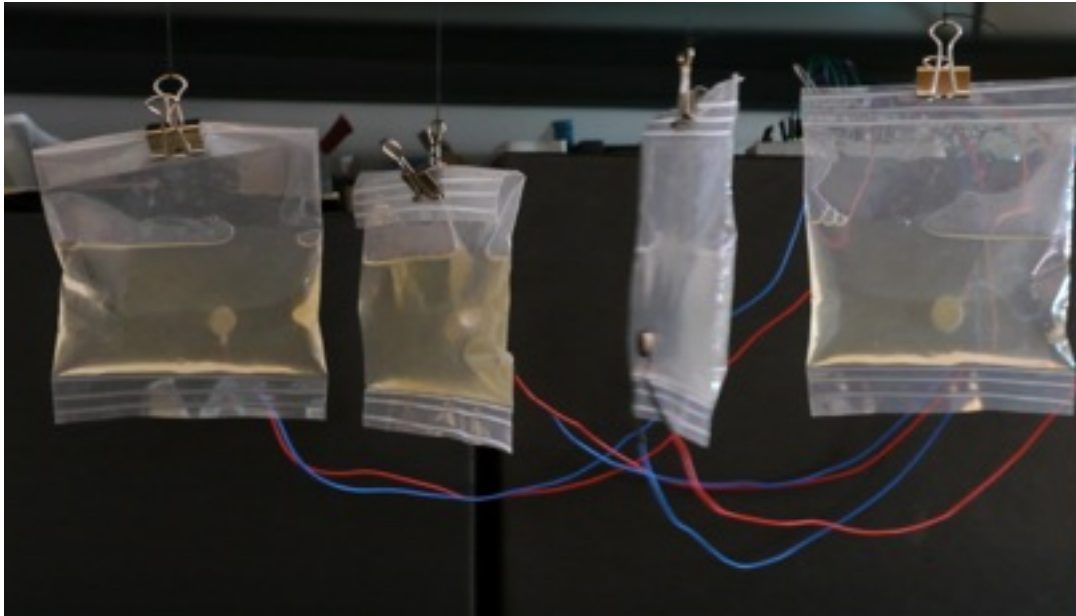
All code examples will be distributed during the workshop.

Explore

Play around with the variables in this example to change the speed of the blinking light.

Example 2 - “Bioluminescent Blink”

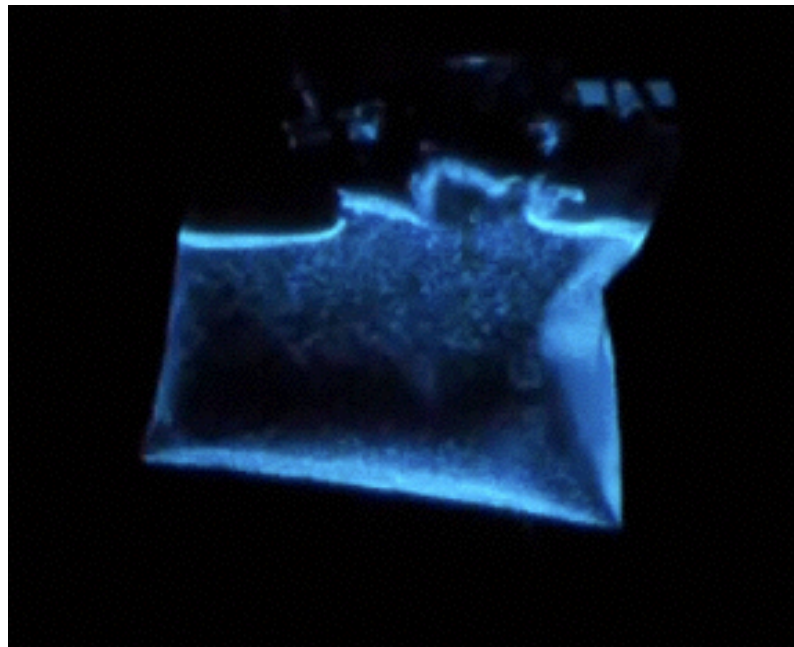
In this example, we switch out the LED with a vibration motor and a packet of bioluminescent algae without changing the code at all.



Explore

Play around with the variables in this example to change the speed of the blinking light.

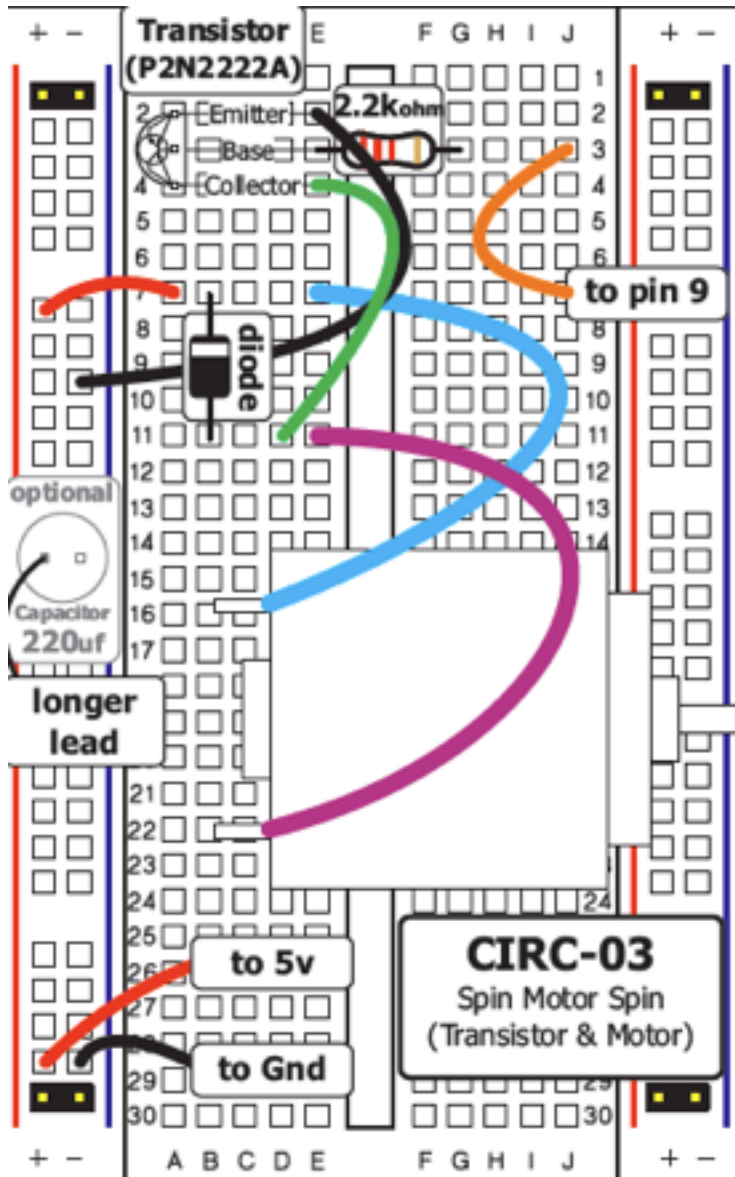
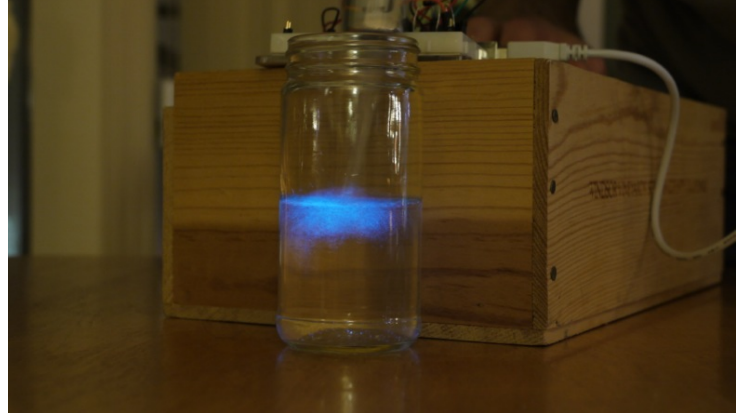
What else can you use to hold the algae? Try attaching motors to jars, test tubes or other containers and add more motors to see what changes you can make.



Example 3 - "Spin a Motor"

<http://www.oomlout.com/oom.php/products/ardx/>

This example, borrowed from the Arduino Experimentation Kit, shows how to spin a motor. Once working, we'll test it out with a jar of bioluminescent algae. Use the schematic below to help you place your components on your breadboard.



Explore
 What else could be used to stir the algae? Many things! Experiment with containers and stirrers. Look up how to build a stir plate (see resources on the back).

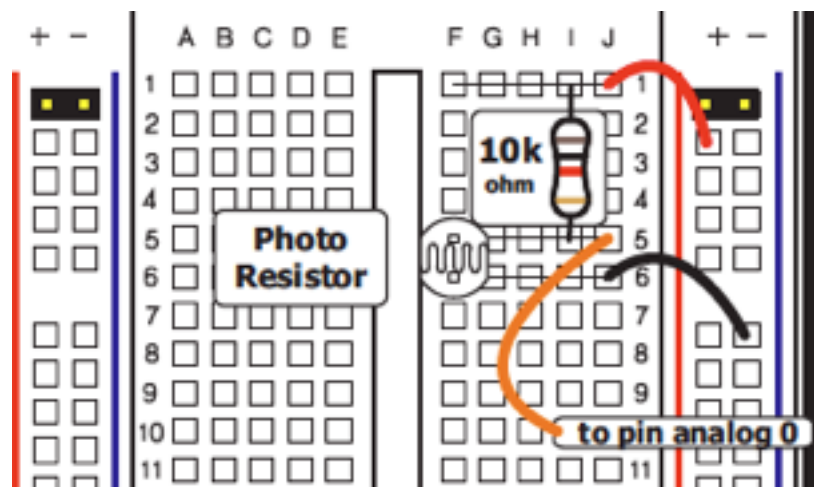
Caution: Using metal with your algae will probably kill it, make sure to use glass or plastic materials only.

Example 3 - “Control a Motor with a Photoresistor

A photoresistor measures light, and provides resistance based on how much light it detects. More light equals greater resistance, which means that the motor will only spin when it is dark. The speed of the motor will match the level of darkness, meaning the darker it is the faster it will spin.

Use the schematic below to add a photoresistor to your breadboard, without changing anything from Example 3.

This example is a combination from two projects in the Arduino Experimentation Kit, numbers (Transistors and Motors and Photoresistors).



Explore

Arduino offers many inputs including: buttons, force sensors, potentiometers, temperature and more. Come up with a new sculpture by adding inputs to your motor, such as a potentiometer (a small knob) that controls the speed of the motor manually.

Resources

Here are a number of resources for you to explore bioluminescent algae and Arduino (together or separately).

Bioluminescence

Sunnyside Sea Farms

(<http://www.seafarms.com>)—This is a great resource for anyone interested in obtaining and experimenting with bioluminescence. Here you can buy bioluminescent algae and the medium needed to grow it at home. Perfect for educators and enthusiasts.

Latz Lab at the Scripps Institution of Oceanography

(<http://siobiolum.ucsd.edu>)—The Latz Lab is a world-leader on bioluminescent algae, with a lot of information on bioluminescence, how to grow algae at home, and where to get supplies.

Creatures of Light, at the American Natural History Museum

(<http://www.amnh.org/exhibitions/current-exhibitions/creatures-of-light>)—A recent exhibit on bioluminescence in the sea and on land. They have a lot of materials on their website, including videos, images and teaching materials.

Arduino

www.Arduino.cc

This is the main website for Arduino, with tutorials, user forums, information on where to buy or even how to make your own microcontrollers! Arduino is open source, which helps foster a vibrant community. Can't figure out why your project doesn't work? Go here and ask the user forums, they are extremely helpful and knowledgeable.

www.Instructables.com

Instructables is a website offering thousands of tutorials, and it is the perfect starting point if you are not sure what to do. Check out "20 Extraordinary Arduino Projects" as one example of what you can do with Arduino.