# Focusing the WormBot Camera

The first time you setup the WormBot you will need to focus the camera prior to collecting data.

1. First stop the controller if it is running, open a terminal and type:

   sudo killall controller

   ```
   jpitt@jpitt-PowerEdge-T30:/wormbot$ sudo killall controller
   jpitt@jpitt-PowerEdge-T30:/wormbot$ ▮
   ```

2. Next turn of the power to the stepper motors...the switch is located on the microcontroller board here:
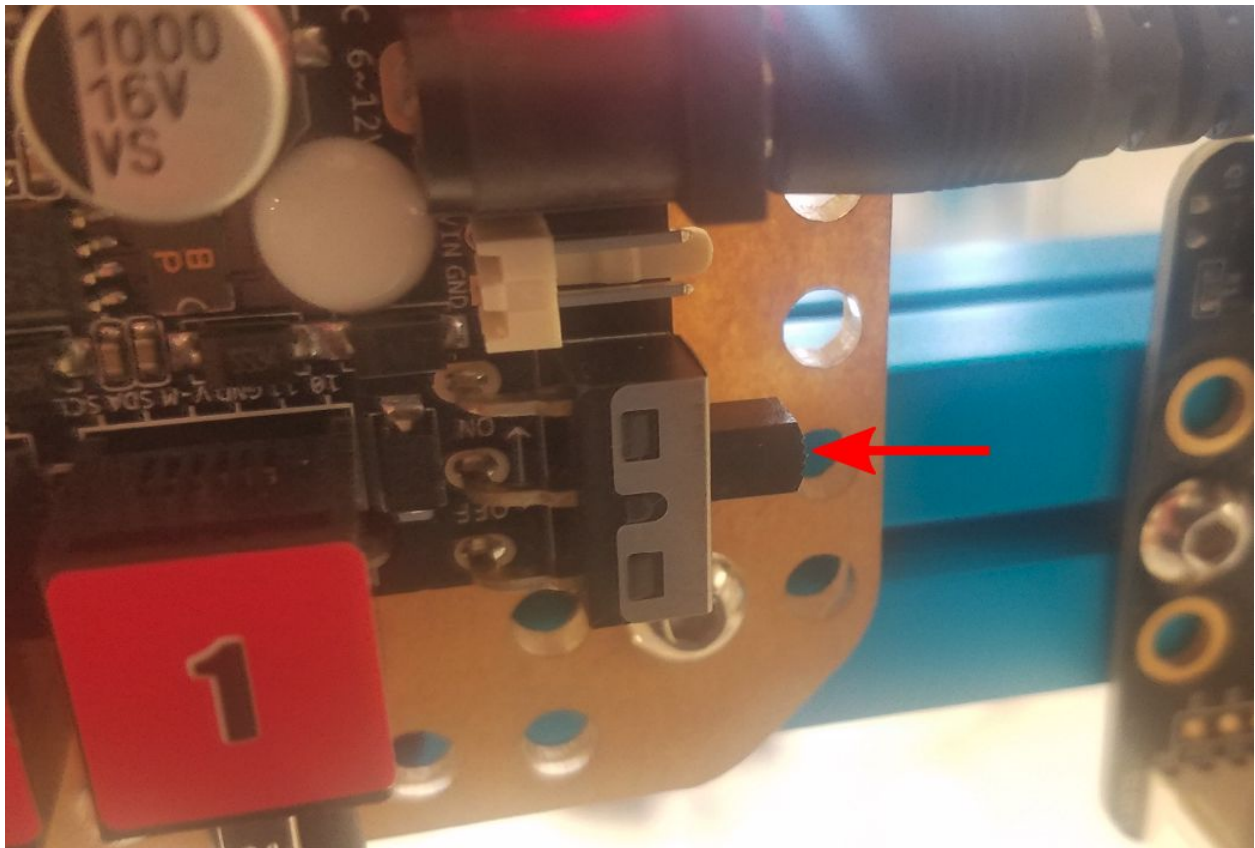
3. Place a 12-well plate with some worms in a well on the robot and manually move the camera over the well. Note: This is discussed in other areas but the agar volume in the well should be 3mL. It is important to keep this volume fixed, although the camera has a decent depth of field and the worms will still be in focus even with some evaporation.

4. In the terminal start GUVCview:

```
jpitt@jpitt-PowerEdge-T30:/wormbot$ sudo killall controller
jpitt@jpitt-PowerEdge-T30:/wormbot$ guvcview
GUVCVIEW: version 2.0.2
V4L2_CORE: (UVCIOC_CTRL_MAP) Error: No such file or directory
```

You should see an out of focus image in GUVCview
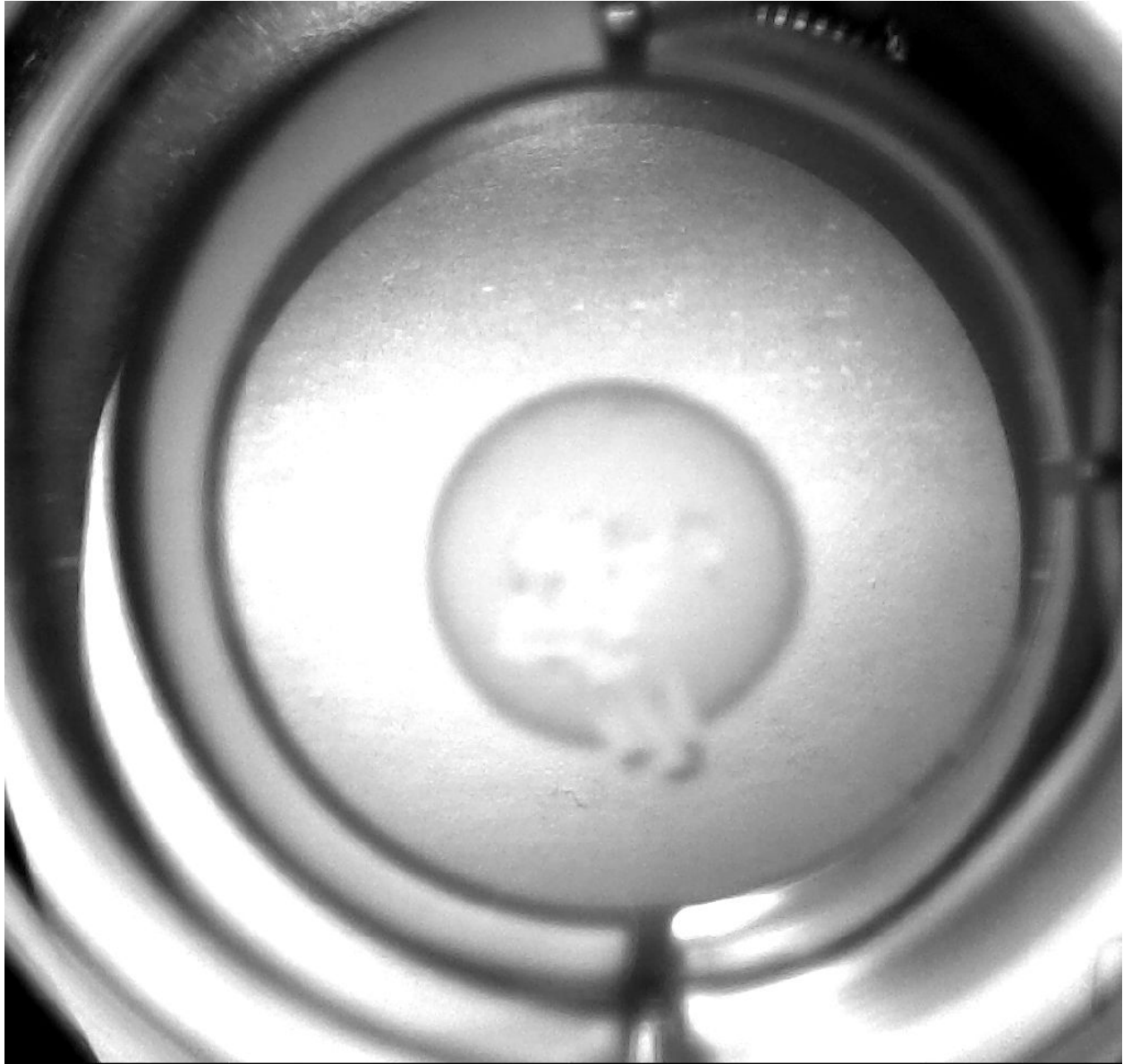
5. Center the camera head over the well and then rotate the camera lens to focus on the worms so that they are in sharp focus in the GUVCview window

Note: this is also a good time to adjust your reflector angle to make sure you have optimal contrast and illumination. You can also adjust the brightness and contrast settings in GUVCview until the image looks optimal and then update the values in /wormbot/camera.config

6. Turn the motor power switch back on, close GUVCview and restart the controller:
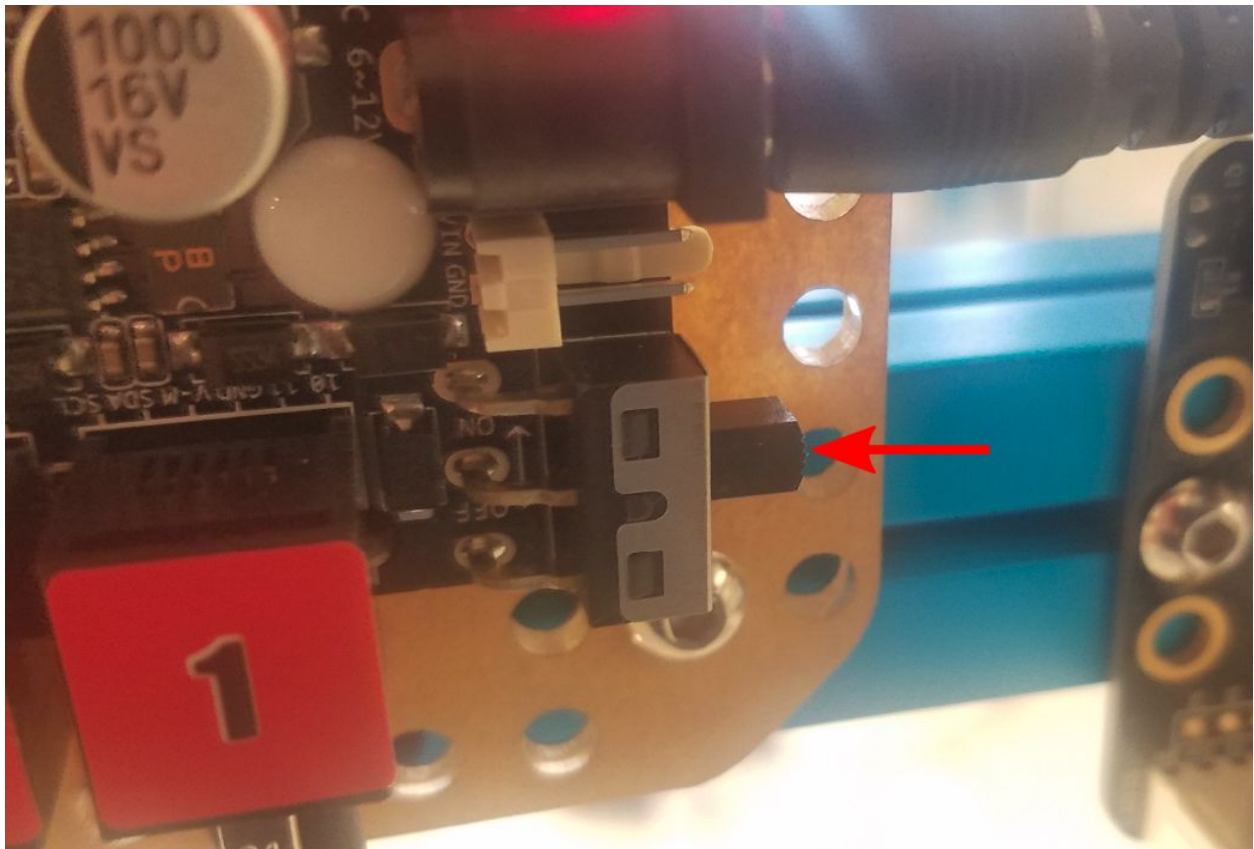

```
jpitt@jpitt-PowerEdge-T30:/wormbot$ sudo /wormbot/controller
[sudo] password for jpitt:
Sorry, try again.
[sudo] password for jpitt:
not tracking dots, no daemon
OpenCV 3.3
**************************************************************************
Kaeberlein Robot controller
Jason N Pitt and Nolan Strait : Kaeberlein Lab : http://wormbot.org
**************************************************************************
setting camera parameters
brightness=-3
contrast=23
gamma=105
sharpness=7
saturation=0
camera number:0 /dev/video0
Set baud rate 9600 and char size 8 bits
 Waiting for Robot to be ready.
```