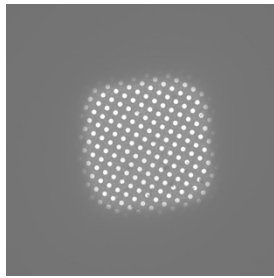
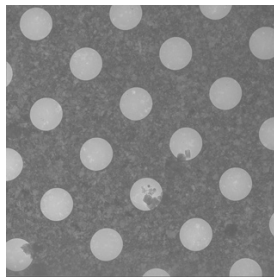


“Hole Finding” with Python

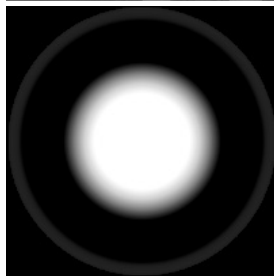
A common task in automated cryo-EM data collection is locating the “holes” in the cryo-EM substrate that are targeted for high-resolution data collection. There are many ways to approach this task, and there isn’t a single solution that works for all samples. We would like you to demonstrate how you would approach this problem by writing a Python program to find the holes in the given images “square.jpg” and “subsquare.jpg”. Information about the images is as follows:



square.jpg – 205 X magnification, 728.4 Å/pixel



subsquare.jpg – 2850 X magnification, 104.8 Å/pixel



holetemplate.jpg – a rotational average of hundreds of images of holes

We would like you to write a program in Python to find the centers of the holes in the “square.jpg” and “subsquare.jpg” images. We would like your code to have the following features.

1. Use object-oriented programming
2. Produce new versions of the images with the center of each hole labeled.
3. Find the region on “square.jpg” that corresponds to “subsquare.jpg”
4. Use a common external library for the computational aspects of your algorithm, e.g. numpy, scipy, matplotlib, etc.
5. Be well-documented