Non-obvious controls:
- Use **Plot** to make plots of intensity vs. angle. You can compare snapshots of this plot for different settings to see the effects of changing the **Atom Separation** or **Velocity**.
- You can **Pause** the sim and then use **Step** to incrementally analyze.
- There is a feature to increase the **Resolution** in the **Options** menu, but this will slow things down. Increasing the **Time Step** will help speed things up by skipping frames.
- Use the **UI** option in the **Options** menu to change the color scheme and fonts.
- If you are doing a lecture demonstration, set your screen resolution to 1024x768 so the simulation will fill the screen and be seen easily.

Important modeling notes / simplifications:
- To illustrate the interference of electrons as they hit the atoms, we focus on a near-field view. The commonly used equation for the Bragg condition, $D\sin\phi = n\lambda$, is an approximation for the far-field limit, and thus breaks down here.
- This simulation solves the wave equation for light or the 1D Schrodinger equation for particles using the units given on the stopwatch and the ruler, so the behavior is exactly what you would see on this scale.

Insights into student use / thinking:
- This simulation was developed because we noticed that many students did not understand the main point of the Davisson Germer experiment after instruction. Students remembered that electrons were only detected at certain angles, but could not explain why. They viewed the electrons as particles that happened to bounce off at certain angles for some reason they could not understand, rather than recognizing how the observations could be explained by the wave nature of electrons. By providing a visual model of electron interference leading to constructive interference at the angles where electrons are detected and destructive interference at the angles where they are not, this simulation helps address this difficulty.
- Instructors may wonder why the simulation allows the user to vary the **Atom Radius**, since this does not affect the angle of peak intensity. We have observed that many students don't know this, and are as likely to assume that the angle depends on atom radius as on atom separation. By manipulating both atom separation and atom radius, students can see for themselves how each does or does not affect the angle.

Suggestions for sim use :
- For tips on using PhET sims with your students see: **Guidelines for Inquiry Contributions** and **Using PhET Sims**
- The simulations have been used successfully with homework, lectures, in-class activities, or lab activities. Use them for introduction to concepts, learning new concepts, reinforcement of concepts, as visual aids for interactive demonstrations, or with in-class clicker questions. To read more, see **Teaching Physics using PhET Simulations**
- For activities and lesson plans written by the PhET team and other teachers, see: **Teacher Ideas & Activities**
- Use this sim to help students see *how* electron interference leads to electrons being detected only at certain angles when they scatter off a lattice.
- Use this sim to explore qualitatively how the angle of peak intensity varies with atom spacing and electron wavelength.