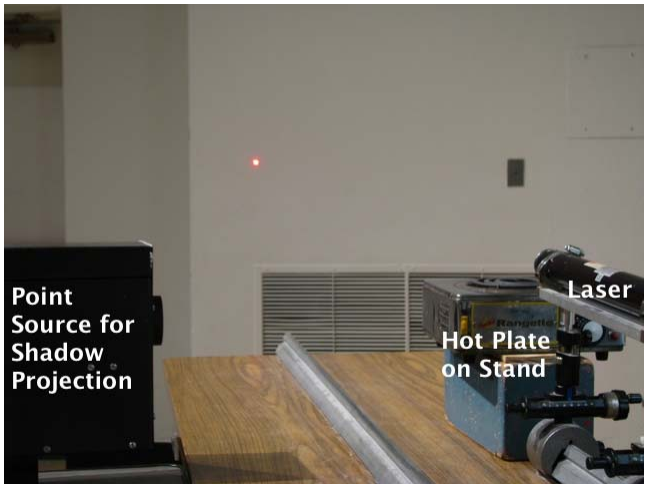
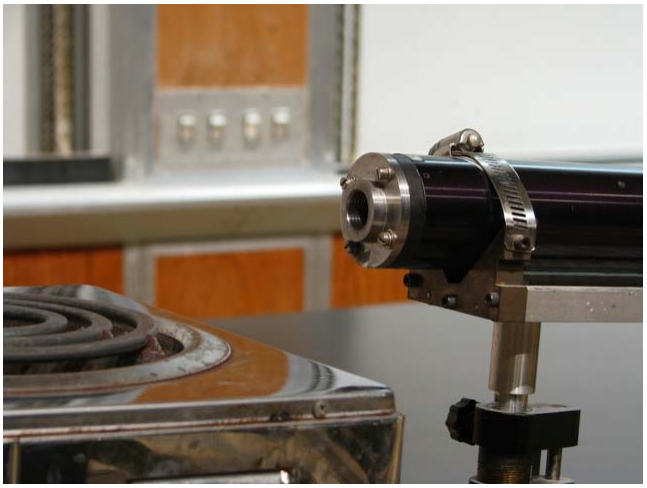
Question #351

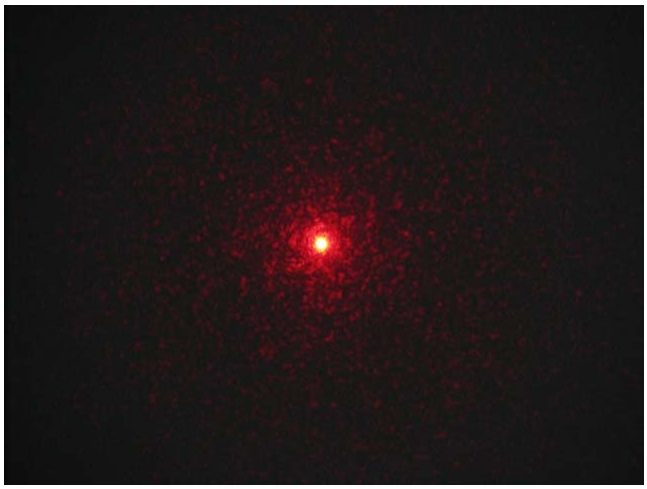
In the spirit of 2009 being the Year of Astronomy, the next few questions will be related to our understanding of planets and the stars. This week we will be investigating how (if at all) air currents affect a beam of light.

A laser beam is directed against the wall and a hot plate is positioned carefully below the beam. A point source is placed perpendicular to the beam, and will be used to observe the otherwise invisible air currents. Below are two views of the apparatus (with the hot plate turned off), which can be shown in more detail by clicking on either of the two photographs.





When the hot plate is off, the laser beam remains stationary on the wall, just as one would expect. For the skeptics, a brief 5-second video of the beam has been taken carefully using a tripod, which can viewed by clicking the image below. (Notice the characteristic laser beam diffraction pattern!)



Alternate high-res version.

Question: When the hot plate is turned on, hot air convection currents will rise from the heater and into the path of the beam. How will the image on the wall be affected?

- (a) The laser beam will shift downward, because the air currents will take energy from the beam when the two collide; this loss in energy will allow gravity to pull the beam further to the ground.
- (b) The laser beam will shift upward, since the currents are rising and pushing the beam towards the ceiling.
- (c) The laser beam will wiggle.
- (d) The laser beam will remain as it was, unaffected by the transparent air currents.
- (e) Other (you must explain).

Click here for Answer #351 after September 28, 2009.

Question of the Week

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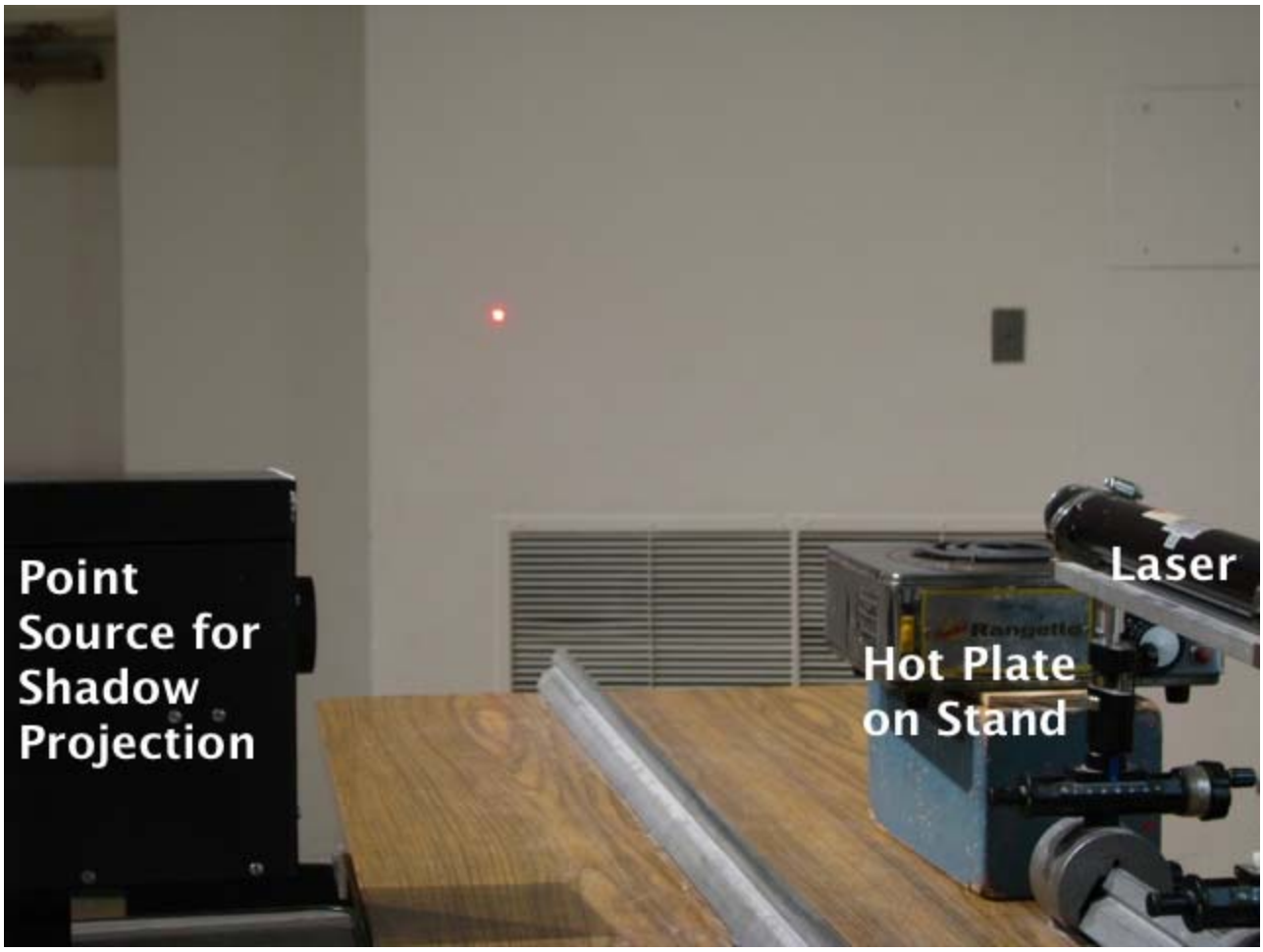
For questions and comments regarding the *Question of the Week* contact Dr. Richard E. Berg by e-mail or using phone number or regular mail address given on the Lecture-Demonstration Home Page.


Point
Source for
Shadow
Projection
Laser
Hot Plate
on Stand