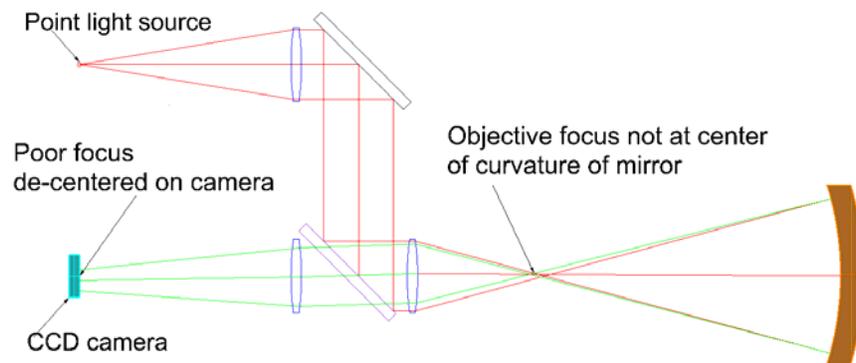


## What is a Point Source, or Autostigmatic, Microscope, (and why is one useful?)

As opposed to an ordinary bright field microscope that uniformly illuminates the full field of view so that a microscopic image of the full field is seen, a point source microscope has a single, very small point of illumination that lies on the axis of the microscope objective. The objective demagnifies this source to produce a diffraction limited spot of light at the objective focus that continues on diverging as a near perfect spherical wavefront. If the objective focus is very near the center of curvature of a concave spherical surface, a reflected spot of light will form near the objective focus and enter the objective and pass through a beamsplitter allowing the light to refocus on a detector such as a CDD array.



The picture illustrates the text above. The red rays come from the point source while the green are reflected from the sphere. Since the outgoing rays do not focus at quite the center of curvature of the sphere, the reflected rays focus at a spot shifted from the outgoing rays and thus form a defocused spot on the detector that is shifted from the center of the detector. If the point source, or autostigmatic, microscope objective focus were perfectly aligned in all three degrees of freedom with the center of curvature of the spherical surface, a centered, well focused spot would appear on the CCD detector. (In an optical sense, stigmatic means a bundle of rays intersecting in a point, so this microscope produces a stigmatic bundle of rays heading toward the sphere which returns a bundle of rays to form a second, or autostigmatic spot that is relayed to the detector.)

Autostigmatic, or point source, microscopes are useful because they are used to locate the optically important data of optical surfaces, namely, their centers of curvature. (Many optical systems are aligned using mechanical data such as edge and seats, but these relate to optical data only via tolerances used in manufacture.) Alignment or centering is defined as placing the centers of curvature of the surfaces on the optical axis of the system. When that axis has been defined, the point source microscope can locate the center of curvature and guide the alignment until the center of curvature is on the optical axis independent of any mechanical reference.

The PSM, or Point Source Microscope, is a commercially available autostigmatic microscope that is manufactured and sold by Optical Perspectives Group, LLC.