ABERRATIONS

I. Quantifying aberrations
   I.A Refraction at a spherical surface
   I.B Criteria for evaluating the aberrations
   I.C Approximations
      1.C.1 Paraxial approximation or Gaussian optics
      1.C.2 Third order approximation

II. Seven primary aberrations that lead to imperfect images
   II. A SPHERICAL ABERRATIONS
       Longitudinal and transverse spherical aberration
       Minimizing spherical aberrations
       by optimizing lens’ shape
       by exploiting the existence of conjugate points in spherical lenses (their use in oil-immersion microscope objectives)
   II. B COMA
       Meridional or tangential plane, sagittal plane, tangential coma, saggital comma
       Skew rays
   II.C ASTIGMATISM
       Meridional or tangential focal surface
       Sagittal focal surface
   II.D PETZVAL FIELD CURVATURE
   II.E DISTORSION
   II.F LONGITUDINAL CHROMATIC ABERRATION
II.G LATERAL CHROMATIC ABERRATION
Correcting CA: The design of an “achromatic doublet”

Seven primary lens aberrations that lead to imperfect imagery

"Perfect" lens

Real lens