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## **Focusing x-rays to a one micron spot using elastically bent, graded multilayer mirrors**

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The focused beam spot size at the fluorescence microprobe beamline at the Advanced Light Source has been improved using new focusing mirrors. Previously we have used a pair of spherical mirrors in the Kirkpatrick-Baez configuration to demagnify a beam of x-rays to a small spot. The mirrors were coated with multilayer reflectors to increase reflectivity and to limit the bandpass of the x-rays striking the sample. The size of the spot obtained was limited to about 5  $\mu\text{m}$  by the spherical aberration of the mirrors, which were required to work at a demagnification of several hundred. This aberration has now been largely corrected by the use of a plane mirror which is elastically bent, by a combination of end couples, into an approximation of an ellipse. A pair of such mirrors was constructed and used to upgrade the microprobe optical system. In addition, the multilayer coatings were laterally graded so that the Bragg condition was satisfied for the same energy along the length of each mirror. The aperture of the compound mirror system was increased and the energy bandpass was reduced. Using these mirrors, a focused spot of dimensions 1.2  $\mu\text{m}$  x 1.6  $\mu\text{m}$  was achieved at 8.5 keV and 12.5 keV, with a bandpass of 6%.