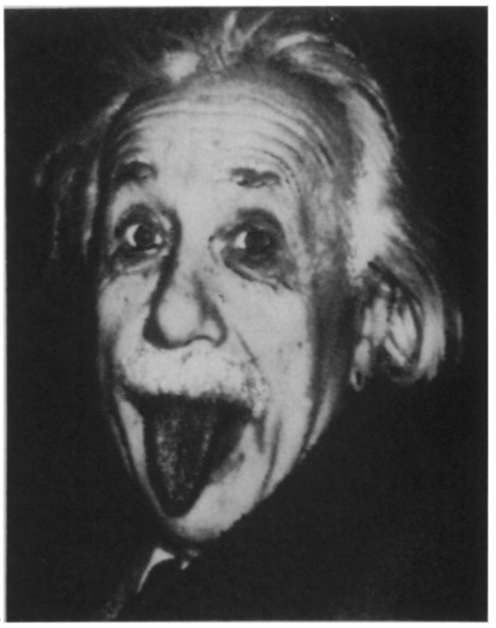
Gravity Refracts

A gravitational lens effect can occur if a black hole, a galaxy or a cluster of galaxies lies between earth and some distant object. The gravity of the black hole or cluster will refract the light from the distant object, multiplying and distorting its image. To show astronomers what to look for, Emilio E. Falco of Massachusetts Institute of Technology and Michael J. Kurtz and Matthew H. Schneps of the Smithsonian Astrophysical Observatory Image Processing Laboratory developed a computer program that simulates gravitational lensing of astronomical objects.



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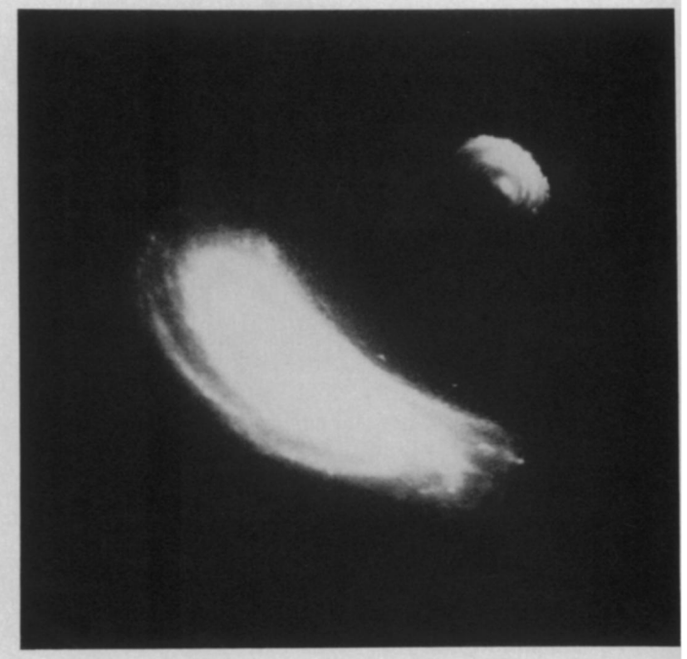
This is Einstein in the absence of black holes. See front cover for the same view refracted.



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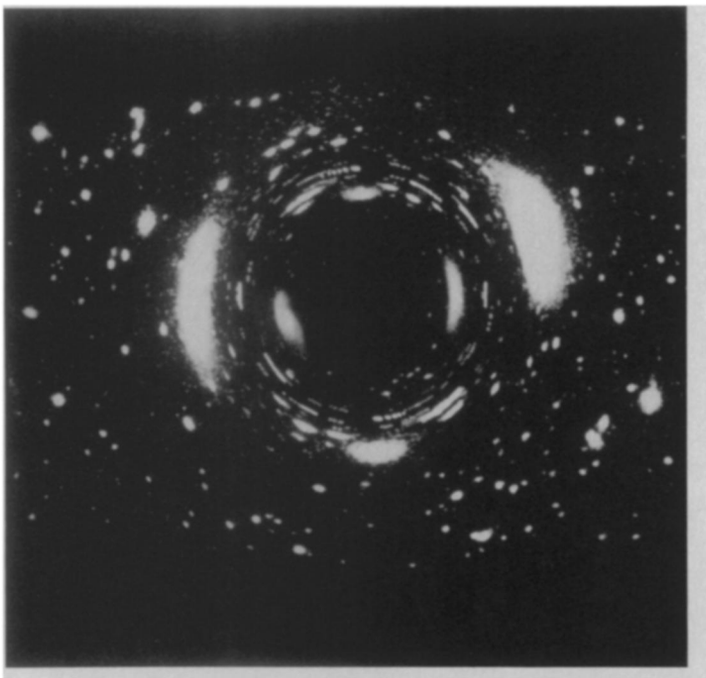
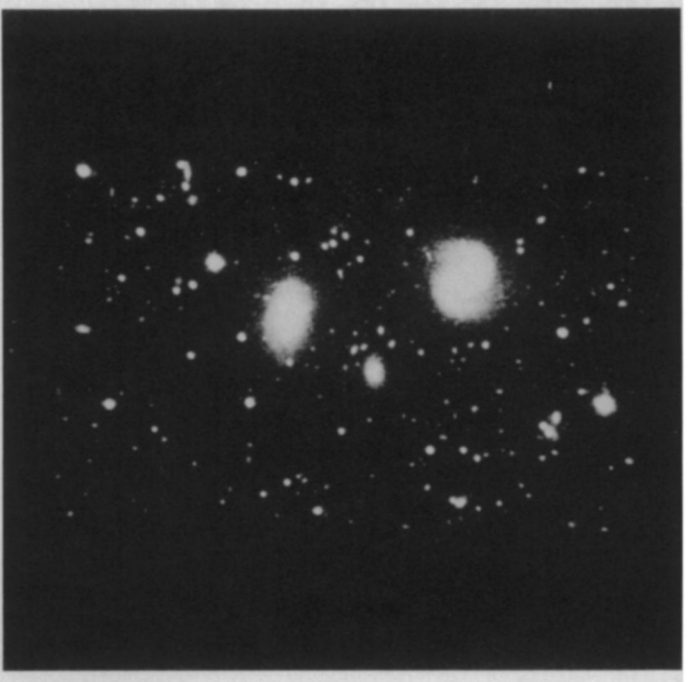
Right: A single galaxy in the foreground would double and distort the image of a more distant galaxy. The galaxy being lensed here is NGC 3992. Above: A cluster of galaxies lensed by a single foreground galaxy. For other views of the cluster see page 62.





Here the same galaxy cluster is imaged by a black hole in the foreground (above). As in Einstein's case (cover) the center of the image is dark and empty. The darkness is not a picture of the black hole; it is an artifact of the black hole's strong gravity. The weaker gravity of the foreground galaxy hardly clears out the center of the image at all (p. 61), but both images show a pronounced circularity. The cluster unrefracted appears at right.