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AN OUTER DISK IN THE 'COMPACT ELLIPTICAL' GALAXY M32

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The surface brightness profile, velocity dispersion measurement, and estimated supermassive black hole (SMBH) mass in the prototype 'compact elliptical' galaxy M32 are inconsistent with the galaxy having, and probably ever having had, an $r^{1/4}$ light profile. Instead, the radial surface brightness profile is described almost perfectly with an inner bulge and outer exponential disk model.

M32's major-axis, R-band surface brightness profile (Kent 1987; resampled here to give an equal spacing in radius, courtesy of Peter Erwin) is modelled with a seeing-convolved combination of Sérsic $r^{1/n}$ bulge plus exponential disk, see Figure 1. The data is considered to be reliable as the curvature in the profile agrees remarkably well with the recent B- and I-band data presented in Choi et al. (2002). The well-known central (r<10-15″) excess is also clearly visible. The bulge-to-disk size and luminosity ratio (r_e/h=0.20, log[B/D]=0.22) are typical of early-type disk galaxies (Graham 2001). The effective radius of the bulge is 27″ (∼100 pc). The disk scale-length is, however, less well determined and due to possible tidal-stripping of the outer profile beyond 220-250″ (which may be the source of the tidal stream of metal rich stars recently discovered in the halo of M31) may be as large as 1.3 kpc.

It is unlikely that M32's surface brightness profile is so disturbed that the outer exponential envelope is due to material pulled off from what was once a one-component $r^{1/4}$ (i.e. n=4) elliptical galaxy. Recently it was discovered that the central velocity dispersion of a bulge correlates strongly (r=0.8) with the *shape* of the bulge light profile (Figure 2). The central velocity dispersion of M32 (76±10 km s^{-1}; van der Marel et al. 1998), which is unlikely to be affected by tidal stripping, is exactly what one would expect from a structural profile having n=1.5, not n=4. Furthermore, M32's SMBH mass ([3.4±0.7]$\times10^6 M_\odot$; van der Marel et al. 1998) agrees with the tight correlation between SMBH mass and n (if n=1.5) reported in Graham et al. (2001) and this conference proceedings.

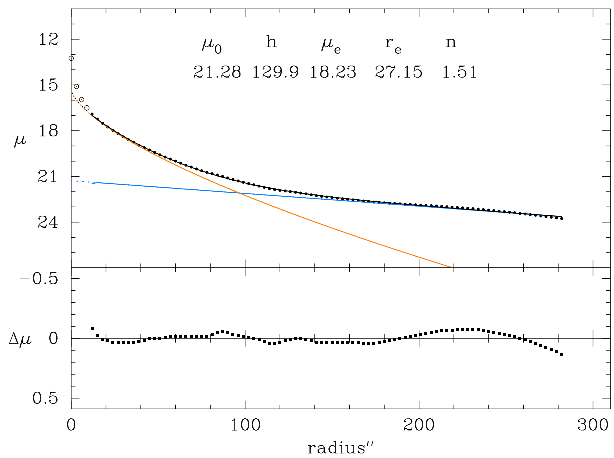

Fig. 1. M32's major-axis R-band surface brightness profile (Kent 1987) is modelled as the sum of a seeing-convolved $r^{1/n}$ bulge plus exponential disk.

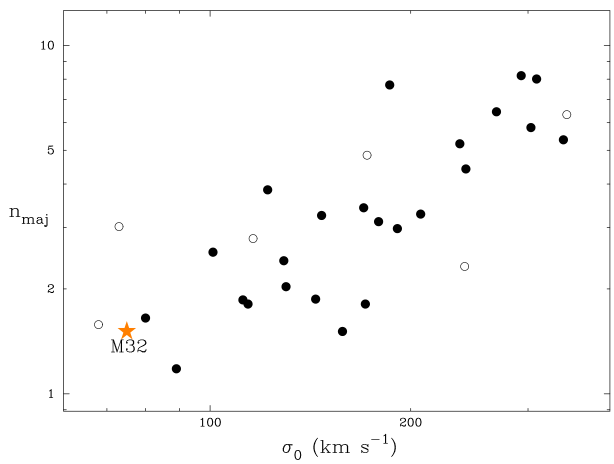

Fig. 2. Major-axis Sérsic index n versus central galaxy velocity dispersion. Elliptical galaxies (filled circles) and S0 galaxies (open circles) from Graham (2002).

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