The Central Region of M32 Resolved with HRCAM!

M32, the very compact companion of M31, is the nearest elliptical galaxy. Direct imaging observations with FOCAM at the Cassegrain Focus in December 1989 of its central region revealed two major features. One is the presence of axisymmetric deviations from perfect ellipses in the isophotal contours ('pointed' isophotes), that could be interpreted as the signature of a small central disk. The other is a lack of color gradient at optical wavelengths (from the U to the R band), with a possible hint for one at longer wavelengths (Michard and Nieto, 1991).

M32 was observed again in the 1 μm I and R bands with HRCam during a discretionary night in October 1990, in order to obtain both a higher resolution and a higher signal-to-noise ratio. The resolutions, respectively 0.42, 0.44 and 0.52 arcsec (FWHM) in these three bands, allow to uncover a clumpy structure in the I and 1 μm bands images. The isophote analysis not only confirmed the disk-type deviations in the central 5 arcsec, but also indicated that the amplitude of these deviations increases with wavelength.

To uncover structural details, we have removed the background in two ways using: a) the purely elliptical model resulting from isophote analysis (Figure 7) and the image degraded by a 1 arcsec Gaussian function (Figure 8). The residuals reveal a population of AGB stars (I=18-19), concentrated within the central 5-8 arcsec, and limited in extent within the central 20 arcsec. These AGB stars produce in turn the clear bump in the R-I color profile between 2 and 20 arcsec (Figure 9). Note that the background component is very blue, as it has a R-I color bluer than the average R-I value from photoelectric photometry through large apertures. This "blue" stellar background may result from several specific chemical and/or kinematical properties.

In conclusion, the resolution provided by HRCam at CFHT allowed us to resolve for the first time stars in the center of this very high surface brightness galaxy and to show direct evidence for an AGB population, very likely to be distributed along a disk.

Central disks have been discovered in a large percentage of E galaxies (Nieto et al, 1991), some of them being the famous "counter-rotating cores" (e.g.

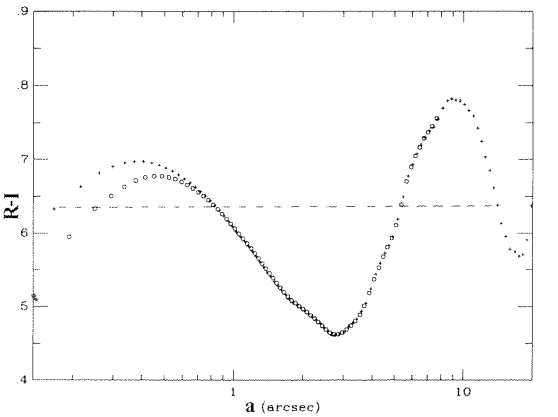

Figure 9: R-I color versus semi-major axis, "a," in arcsec, as derived from the two R and I images. Crosses represent the observed profiles, open circles stand for the profiles after the I image has been degraded to match the resolution of the R image (0.52 arcsec). The dashed line represents the R-I value obtained

Bender, 1988). The origin of such stellar disks in elliptical galaxies is certainly due to a dissipative transfer of gas toward the center, whether internal or external (merging or accretion). In the case of M32, the source of gas is likely to be the gaseous halo of M31.

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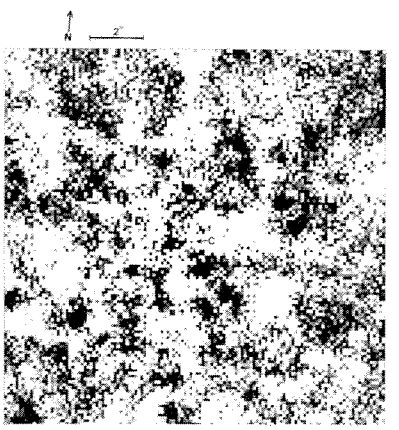

Figure 7: Residuals of the central region of M32 at 1 μm after subtracting a purely elliptical model resulting form isophote analysis. "C" is the center of the galaxy.

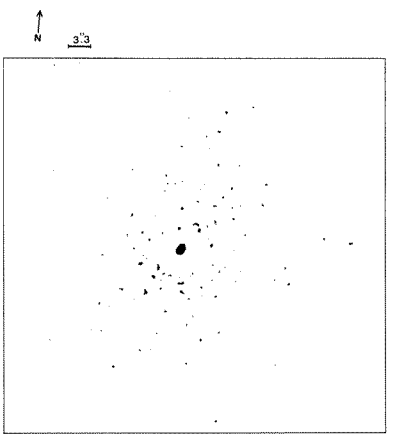

Figure 8: Residuals of the central region of M32 at 1 μm after subtracting the image degraded by a one arcsec Gaussian function. This procedure "hides" any detail in the central 3 arcsec because of the very steep galactic gradient. AGB stars are detected within ~20 arcsec of center.

Dynamique Stellaire du Noyau de M 32 avec le Spectrographe Intégral de Champ TIGRE

Nous avons entrepris d'étudier la dynamique stellaire à haute résolution spatiale des parties centrales des galaxies elliptiques et des bulbes des galaxies spirales. L'objectif principal de cette étude est d'obtenir la distribution de la masse au coeur des galaxies.

Le spectrographe intégral de champ TIGRE est l'instrument le mieux adapté pour cette étude par son aspect bi-dimensionnel et son échantillonage spatial de 0.4 arcsec. L'information bi-dimensionnelle est particulièrement importante pour rechercher le découplage du noyau par rapport au reste de la galaxie, ou mettre en évidence une géometrie particulière du noyau (disque, ellipsoïde triaxial, etc...).