DESTRUCTION OF BARS BY DISSIPATIVE PROCESSES

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ABSTRACT. A mechanism for the destruction of rotating stellar bars by dissipative processes accreting mass at the center[1] is tested by means of 3D N-body simulations ($N \approx 2 \cdot 10^5$)[2,3]. One or two ILR, originated from the growth of central mass concentration, cause the main elongated plane orbit family supporting the bar to be replaced by plane orbit families perpendicular to the bar, which can then no longer be sustained. The gas is represented in a crude way by a small (9%) set of particles contracting their phase-space with an ad-hoc friction law $\dot{v} = -\alpha v$, where α is the inverse of a dissipation time scale. Typically, in a few Gyr an otherwise steady bar is transformed into a shorter, faster and weaker triaxial ellipsoid, similar to many bulges of normal spirals. These might be relics of destroyed bars. An example is shown in Fig. 2 where, after 8 Gyr, dissipation has brought 1.3% of the total mass inside 0.2 kpc, increasing the local average density by a factor of 14. The conservative case is represented in Fig. 1. The $a/b/c$ axis ratios change from 1/0.54/0.55 to 1/0.74/0.60 at 1 kpc, and from 1/0.55/0.35 to 1/0.89/0.51 at 5 kpc. With a stronger dissipation (larger α) or equivalently at later time, the complete bar destruction seems unavoidable.

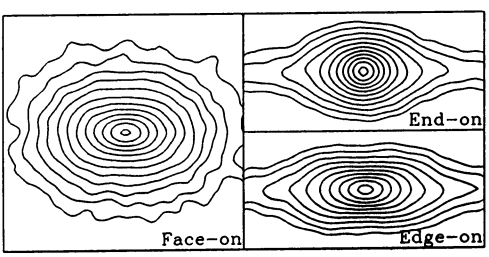

Fig. 1. *Projected final density of a stable N-body bar when* $\alpha = 0\,\mathrm{Gyr}^{-1}$.

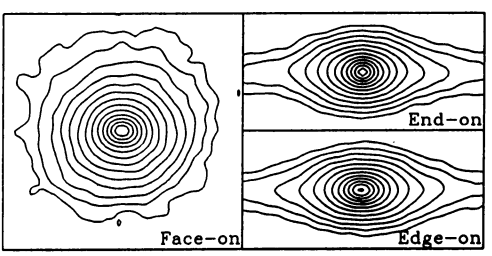

Fig. 2. *When* $\alpha = 1/2.5\,\mathrm{Gyr}^{-1}$ *the bar is destroyed into a triaxial bulge.*

[1] Pfenniger, D., Norman, C.: 1990, *Astrophys. J.*, Nov. 10, in press
[2] Friedli, D., Pfenniger, D.: 1989 in *Dynamics of Astrophysical Discs*, ed. J.A. Sellwood, Cambridge University Press, Cambridge, p.179
[3] Pfenniger, D., Friedli, D.: 1990, in preparation

F. Combes and F. Casoli (eds.), Dynamics of Galaxies and Their Molecular Cloud Distributions, 362.