# INTRINSIC SHAPES OF ELLIPTICAL GALAXIES FROM A STATISTICAL COMPARISON OF TWO DIFFERENT ISOPHOTES

*G. Fasano*
Astronomical Observatory
Vicolo dell'Osservatorio 5
35122 Padova
Italy

Several statistical attempts were already made to discriminate between oblate forms vs. prolate forms (OF/PF) in elliptical galaxies (Marchant & Olson, 1979; Lake, 1979; Olson & de Vaucouleurs, 1981; Capaccioli *et al.*, 1984). They fell in with the fundamental problem that the observed quantities (*surface brightness, velocity dispersion, flattening etc.*) whose projection should depend on the assumed shapes (OF/PF), could be intrinsically correlated each other. This can mask the simple *projection–effect* (Richstone, 1979; Merritt, 1982).

The approach we have tried consists of two different tests. the first one (T1) is also exposed to the above mentioned problem. It works with both semimajor and semiminor axes of the *effective isophote*, whose behaviour as a function of the line of sight obeys the simple geometrical projection laws, depending on the assumed shapes. We have removed the obvious dependence of the semi–axes on the luminosity and analyzed the distribution of the residuals $\Delta_e$ vs. apparent flattenings (Fig.1a,b). Photometric and geometric data are taken from an homogeneous sample of elliptical galaxies in the central region of the Virgo Cluster (Liller, 1960, 1966; Capaccioli & Rampazzo, 1984). The statistical comparison between the distributions of Fig.1 and the model predictions are performed with a Montecarlo technique by using three different two–dimensional statistics: *Correlation Coefficient*, *Maximum Likelihood* and *Kolmogorov–Smirnov*. The T1 test is able to separate the acceptability ranges of the two hypotheses (OF/PF) on the basis af a parameter $\gamma$ which defines the possible intrinsic correlation between linear size and true flattening (see the curves marked with T1 in Fig.2).

The second test (T2) works in the same way with the semi–axes of the isophote corresponding to the surface brightness $\mu' = 25$, whose behaviour as a function of the line of sight turns out to be almost independent on the choice of the shapes. This test allows us to estimate *a priori* the value of $\gamma$. In particular, the distribution of the residuals suggests that the possible correlation between linear size and intrinsic flattening must be small (see the curves marked with T2 in Fig.2).

By comparing the tests T1 and T2, we conclude that the oblate hypothesis is favoured in comparison with the prolate one. In fact, for $.05 < \gamma < .75$, the oblate hypothesis is consistent, at 90% of significance, with both T1 and T2 test, being the most likely value of $\gamma \approx .3$. On the contrary, at the same significance level, there is no range of $\gamma$ where the prolate hypothesis is simultaneusly consistent with the two tests. More precisely, the prolate hypothesis can be rejected at 96% of significance level.



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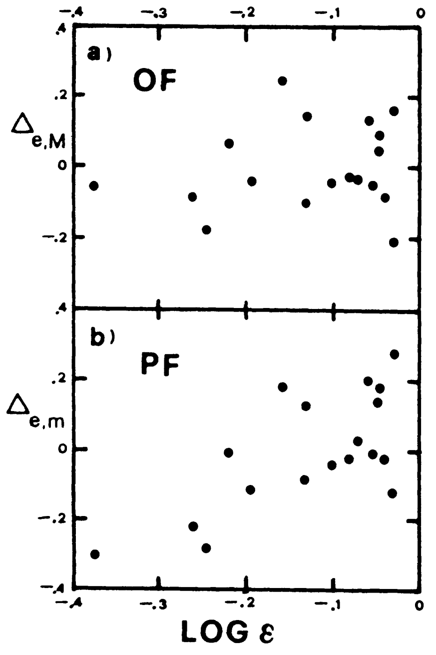


**Fig.1a(b)** - *Test T1. Residuals $\Delta_{e,M}$ ($\Delta_{e,m}$) of the major (minor) axes vs. apparent flattenings, in the oblate (prolate) hypothesis.*

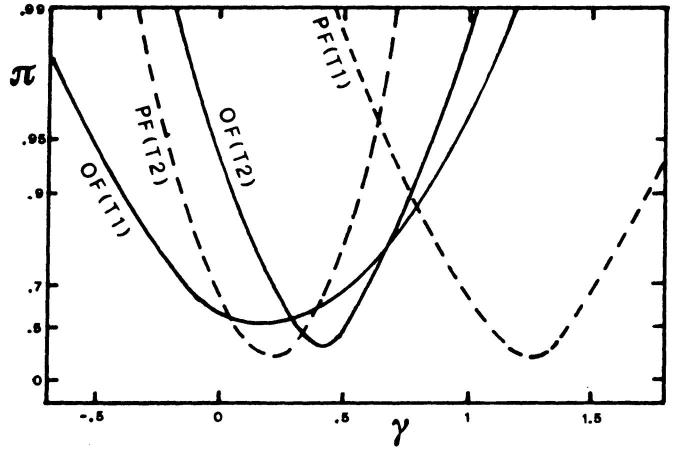


**Fig.2** - *Behaviour of the rejection probability π of the two hypotheses (OF continuous lines; PF dashed lines) as a function of the parameter γ, for both T1 and T2 tests.*

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