# THE STRUCTURE OF GLOBULAR CLUSTERS

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ABSTRACT. We report the preliminary results of a CCD surface photometry survey of a large fraction of all known Galactic globular clusters. About 1/5 of all surveyed clusters show a characteristic post-core-collapse (PCC) morphology. The PCC clusters are on average closer to the Galactic center than the King-model-like clusters.

We have completed a multi-color CCD surface photometry survey of some 113 Galactic globular clusters. Many of the observed clusters had no previous photometry, or density profiles of any kind. The first scientific goal of this survey was to do a complete census of cluster cores, and determine the fraction of clusters which show a post-collapse morphology. Several good reviews of this topic can be found in the volume edited by Goodman & Hut (1985).

This work is a follow-up to the earlier study (Djorgovski & King, 1984). Most data for the present survey were obtained with the CTIO 1.5-m telescope and RCA and GEC CCDs, and with the *UBVRI* filters. Some of the data were obtained with the Lick 1-m telescope and TI and GEC CCDs, and with a special red filter. Several hundreds of cluster exposures were obtained. Most of the data are already reduced to one-dimensional surface brightness profiles, but with little absolute calibration. The full account of the survey will appear in future papers. We supplement our data with reliable surface density profiles from the literature.

There are 21 definite PCC clusters, 6 possible ones, 3 uncertain ones, 97 definite or probably King-model-like clusters. Thus, PCC clusters are about 1/5 of the total.

The PCC clusters are generally not very rich; this may be an additional evidence for their advanced dynamical state: the central, stabilizing binary pumps the energy into the cluster, and thus speeds up its dissolution.

One interesting result emerged from this study; the PCC clusters are on the average much more concentrated toward the Galactic center. For a set of 20 definite or possible PCC clusters, the mean and the median galactocentric radii are 4.2 and 2.7 kpc respectively; for a



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set of 91 King-model-like clusters, the corresonding numbers are 14.8 and 7.6 kpc. The difference is highly significant, and it suggests that the tidal shocks (from disk passages) play an important rôle in the *internal* dynamics of globular clusters, *viz.*, by accelerating their dynamical evolution. This effect was predicted by Chernoff, Kochanek & Shapiro (1985, preprint).

There is one remaining puzzle, however: there are a number of very concentrated clusters with very dense cores, and thus very short relaxation times (a few x $10^7$ yr). They had plenty of time to collapse, but they look like perfect King models. Either they managed to recover completely from the collapse (faster than the current theories would predict), or they *do* have collapsed cores, but they are hidden in the invisible heavy stellar remnants (neutron stars, stellar black holes).

## REFERENCES

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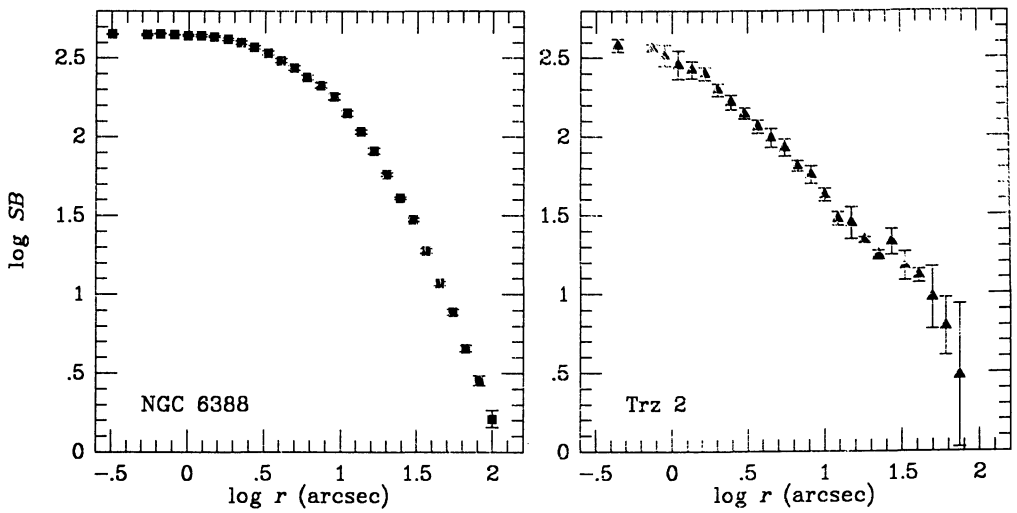


Figure 1. Examples of cluster surface brightness profiles: NGC 6388 (left) is an example of a highly concentrated, King-model-like cluster: note the flat core, and a steep envelope. Trz 2 (right) is an example of a PCC cluster: the light distribution is almost a pure -1 power law. Both profiles were derived from CCD images taken in a B band, at CTIO 1.5-m telescope.

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