MEASUREMENT OF DARK MATTER IN SPIRAL GALAXIES

Stephen M. Kent
Harvard-Smithsonian Center for Astrophysics

Luminosity profiles and rotation curves for 37 Sb and Sc galaxies have been combined to derive mass/light ratios for the stellar component and scale parameters for a dark halo component.

Galaxies were selected to have optical rotation curves measured by Rubin et al. (1985). Surface photometry was obtained using a CCD on the Whipple Observatory 61-cm telescope. Major and minor axis profiles were derived and, where necessary, decomposed into bulge and disk components.

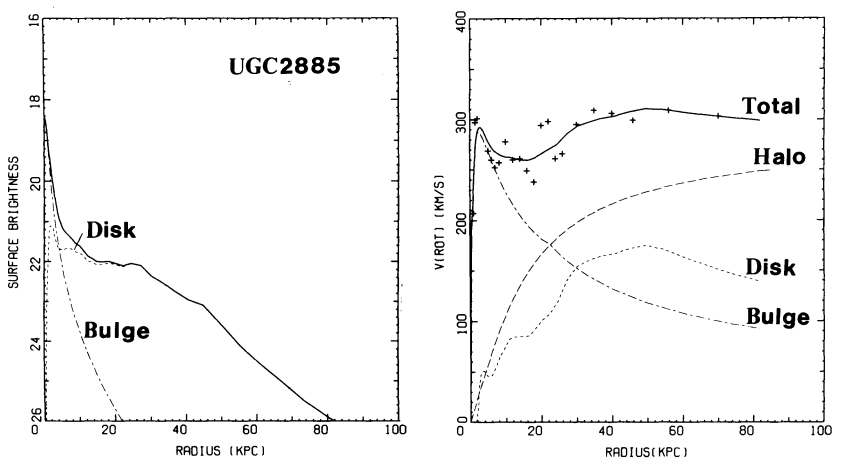
The rotation curves were modeled as the sum of contributions from the bulge, disk, and a dark halo with a density law $\rho=\sigma^2/2\pi G(a^2+r^2)$. The parameter σ was set to match the observed asymptotic velocity. A least-squares fit then yielded 3 parameters: the bulge and disk mass/light ratios and the scale radius a. The solutions were not always well constrained; usually many different combinations of parameters gave equally good fits to the observed rotation curves.

Out of 37 galaxies, 10 could be fit with no halo, 12 had halo-to-stellar mass ratios $M(H)/M(B+D)<1$, 14 had $M(H)/M(B+D)>1$, and 1 could not be fit. The mean M/L's were 3.7 for the bulge, 1.8 for the disk, and 4.7 for the total galaxy (H_o=50, photometry in a Gunn r bandpass with no extinction corrections). The individual parameters showed large scatter; e.g. the scale radius a ranges from 1 to 30 kpc.

A typical decomposition and fit are shown in the figure.

REFERENCE

Rubin, V. C., Burstein, D., Ford, W. K., and Thonnard, N. 1985, Ap. J., **289**, 81.



J. Kormendy and G. R. Knapp (eds.), Dark Matter in the Universe, 137.

https://doi.org/10.1017/S0074180900150090 Published online by Cambridge University Press