aspect of the results. Our interpretation of observational data will heavily depend on the spatial structure of the light absorbing components, and much more refined models than those applied in the tests should be constructed. The simple models used in the test serve to provide some first constraints. How complicated the real situation might be is illustrated by a recent paper by Dickman et al., 1990, in which the spatial structures of some molecular cloud complexes were proposed to be best described by fractals! I for one will be reading with great interest any future papers on this subject.

4. Why Relating to Dark Matter?

The notion of the 'missing mass' in spiral galaxies originates from a comparison of the rotational velocities with the amount of observed light and its spatial distribution. If studies of transparency indicate a drastic re-interpretation of the detected light, then it seems natural to reflect how that would affect such missing mass analyses. Recently, Davies (1990) published a paper anticipating $\tau >> 1$ in the central parts of spiral galaxies, which, as he argued, could lead to a dramatic underestimate of the amount of stellar matter in the bulges of spirals. By accordingly increasing the contribution of the bulges, he computed flat rotation curves, which did not require any additional missing mass. However, as Simien pointed out, $\tau >> 1$ in combination with heavy bulges would inevitably lead to an asymmetric light distribution of such bulges, when the disks are seen under a tilted angle. Such an asymmetry has never been observed and, as he says, would have been noted in the detailed bulge to disk decompositions performed for large numbers of galaxies. Note, that for $\tau = 2$ disks this asymmetry would be much less dramatic.

My own results seem to indicate that at least half of the star light of face-on galaxies is obscured by dust, implying that the true luminosities are at least a factor of two higher. Consequently, the mass-to-light ratios *M/L* of the stellar populations that resulted from the 'missing mass analyses' should be divided by at least a factor of two. The point is, however, that the 'missing mass' analyses that incorporated haloes of dark matter already resulted in quite low *maximum M/L* ratios for the material in the disks. Moreover, most of the studied objects are inclined, which facilitated the mapping of the velocity field. When the new extinction results are applied to the luminosities of these disks the resultant *M/L* values drop well below 1 for almost all cases, which values are significantly lower than found in well studied stellar populations. In other words, the current disk-halo solutions combine an *overluminous* disk with an *underluminous* dark component, and become less credible. This fact, together with the suggestion from the absorption studies that the absorbing medium is more widely distributed over the disks than the stars (implying that the observed M/L decreases with radius from the centre) simply calls into question the evidence for dark haloes, as inferred from a comparison with optical light profiles.

This triggered I. González and myself to compute a new category of mass models, now without dark haloes, to fit the observed rotation curves. Indeed, we could find good fits to the rotation curves, but a substantial fraction of the mass that was labeled as discrepant in previous studies, should now be identified with the obscuring component itself! This has been often misquoted in the press, where it was wrongly said that all the discrepant mass was found to be in the obscured prime stellar component with the same spatial distribution as the observed radial luminosity profile. It can be shown in several ways that such a solution would not work and would not resolve the mass discrepancy at larger radii. To our surprise, we found that if the obscuring component was composed of compact molecular clouds, that they would precisely have the correct mass as required by the fits and at the same time perform the amount of absorption required by the optical extinction studies.

Is this implying that the dark mass in spiral galaxies has been found? The extinction results certainly weaken the evidence for dark haloes, and they directly point to the presence of a baryonic component that has the correct spatial distribution to resolve the discrepancy. But can the agreement with molecular cloud mass be circumstantial? Yes it could, and this suggestion needs verification.

On the other hand, an evaluation of the situation in the Galaxy seems not to contradict this suggestion; recently, a number of papers showed that the CO luminosity $-H_2$ mass conversion factor, on which most of our understanding of the molecular mass is based, might be a factor 4 larger in the outer regions. Apart from a few very nearby galaxies, we can only guess the conversion factor in external galaxies. Next to this, several reports reveal a factor 4 higher virial mass of molecular clouds than deduced from the CO luminosities. It also remains to be seen how many molecular clouds are hidden in the noise of the observations. One team of observers that already observed a quite high spatial density of molecular clouds claim that the deflection of the noise distribution of their observations indicates that 68% of their signal is below their detection limit (Lee et al., 1990).

The final word has certainly not yet been said and the current results only form a starting point. The great number of very interesting studies of molecular gas that are presently conducted at many observatories might shed some light on these very cold and dusty regions of the universe. Or, do we have to wait for the launch of the Infrared Space Observatory in 1993, when new windows will be opened that will allow the attempt to detect some lines of the H_2 molecule?

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Supermassive Disk Galaxies

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Introduction

Supermassive disk galaxies (SDGs hereinafter) are characterized by a high rotational velocity of their gas component ($V_{max} > 350$ km s^{-1}). NGC 1961 (Shostak et al., 1982), UGC 2885 (Burstein et al., 1982) and UGC 12591 (Giovanelli et al., 1986) are the best known examples. As Saglia and Sancisi (1988) pointed out, these galaxies lie at the extreme upper end of the Tully-Fisher relation and are on the average less luminous than expected from their rotational velocity. Their mean mass-to-luminosity ratio M/L is 15 (with H_0= 75 Mpc km s^{-1}), i.e. 1.6 times the value for Sa galaxies (Rubin et al., 1985). In addition, their optical sizes appear to be on the average smaller than those of the normal galaxies.

SDGs have been discovered only recently, since in the past the technical limitations of the 21-cm spectrometers have rendered impossible the detection of the very wide HI profiles that characterize such systems. In effect, none of the galaxies in the Roberts (1978) sample has a rotational velocity greater than 350 km s^{-1}. SDGs are still poorly known: it is not even clear whether supermassive galaxies really form a distinct category of galaxies with definite properties or whether they simply represent the extreme tail of the distribution towards the largest masses. These questions have deep implications on the formation and evolution of galaxies and the amount of dark matter. The observed properties indicate that in supermassive galaxies dark matter may dominate even inside the R_{25} radius, in contrast to what seems to happen in normal spirals (Sancisi and van Albada, 1985).

Observations and Data Reduction

In order to investigate further these properties we have started an extensive optical survey of SDG candidates in the southern hemisphere, using the 2.2-m ESO/MPI telescope at La Silla. In particular, we would like to understand whether SDGs have in general an unusual high content of dark matter in the inner regions or, perhaps, an unusual stellar population. It is important to study SDGs optically, since the distribution of HI often has a hole in the centre and is also affected by a severe beam

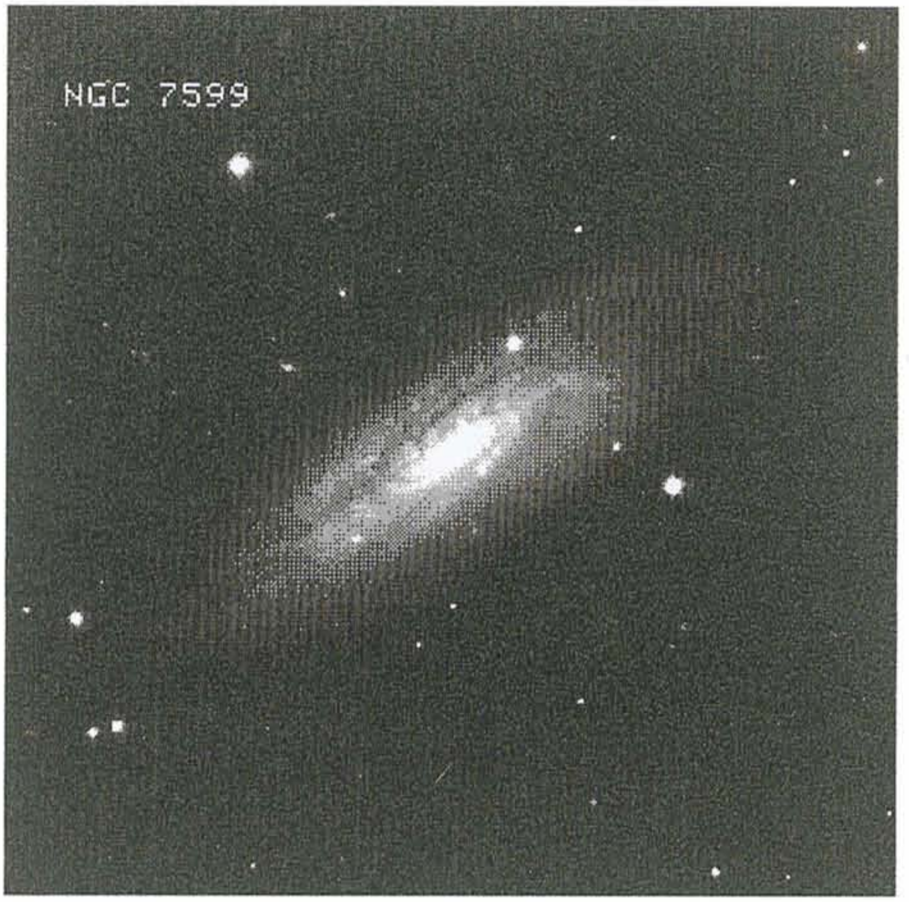

Figure 1: *Red image of NGC 7599 obtained with EMMI at the NTT (kindly taken for us by S.D'Odorico). The field is 6 × 6 arcmin. North is at the top and East to the right.*