HIGH-RESOLUTION NARROW-FIELD VERSUS LOW-RESOLUTION WIDE-FIELD OBSERVATIONS OF GALAXIES

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Introduction

There is an increasing evidence that small-scale phenomena occuring in the inner regions of galaxies are related to large-scale phenomena such as, e.g., merging or violent interactions between galaxies. Plausible scenarios (e.g. Rees, 1978) involve, for instance, accumulation of material from the outside along the accretion disk of a black hole and subsequent ejection in two opposite directions into the intergalactic medium. Active galaxies and QSO's may be the extreme examples of the link between large-scale phenomena contributing to the evolution of galaxies. Moderately active or even normal galaxies are also submitted to entangled events on both scales. The aim of this communication is to illustrate the complementarity between high-resolution, small-field telescopes and Schmidt-type telescopes for the study of this phenomenology, and to stimulate further research by a few challenging examples.

1. NGC 3379 and normal elliptical galaxies.

a) de Vaucouleurs and Capaccioli (1979) reported some evidence for the existence of a spike of light at the center of NGC 3379. This was subsequently confirmed by observations at higher resolution (Nieto and Vidal, 1983) which ruled out Kormendy's (1982) interpretation of the central region of NGC 3379 in terms of an isothermal core. But the shape of the spike of light, its total luminosity, and therefore its physical interpretation, strongly depend on the model assumed to fit the rest of the galaxy.

b) Another possible correlation between both scales is found in the wavy residuals with respect to any smooth luminosity profile of the main body of the galaxy (de Vaucouleurs and Capaccioli, 1979; Nieto and Vidal, 1983), detectable on medium-scale material, and in the shells revealed with wide-field material (see Malin, this volume).

c) A further aspect is the dependence of geometry on radius possibly due to triaxiality: is a phenomenon intrinsic to the galaxy or is it due to

M. Capaccioli (ed.), Astronomy with Schmidt-Type Telescopes, 379–382.

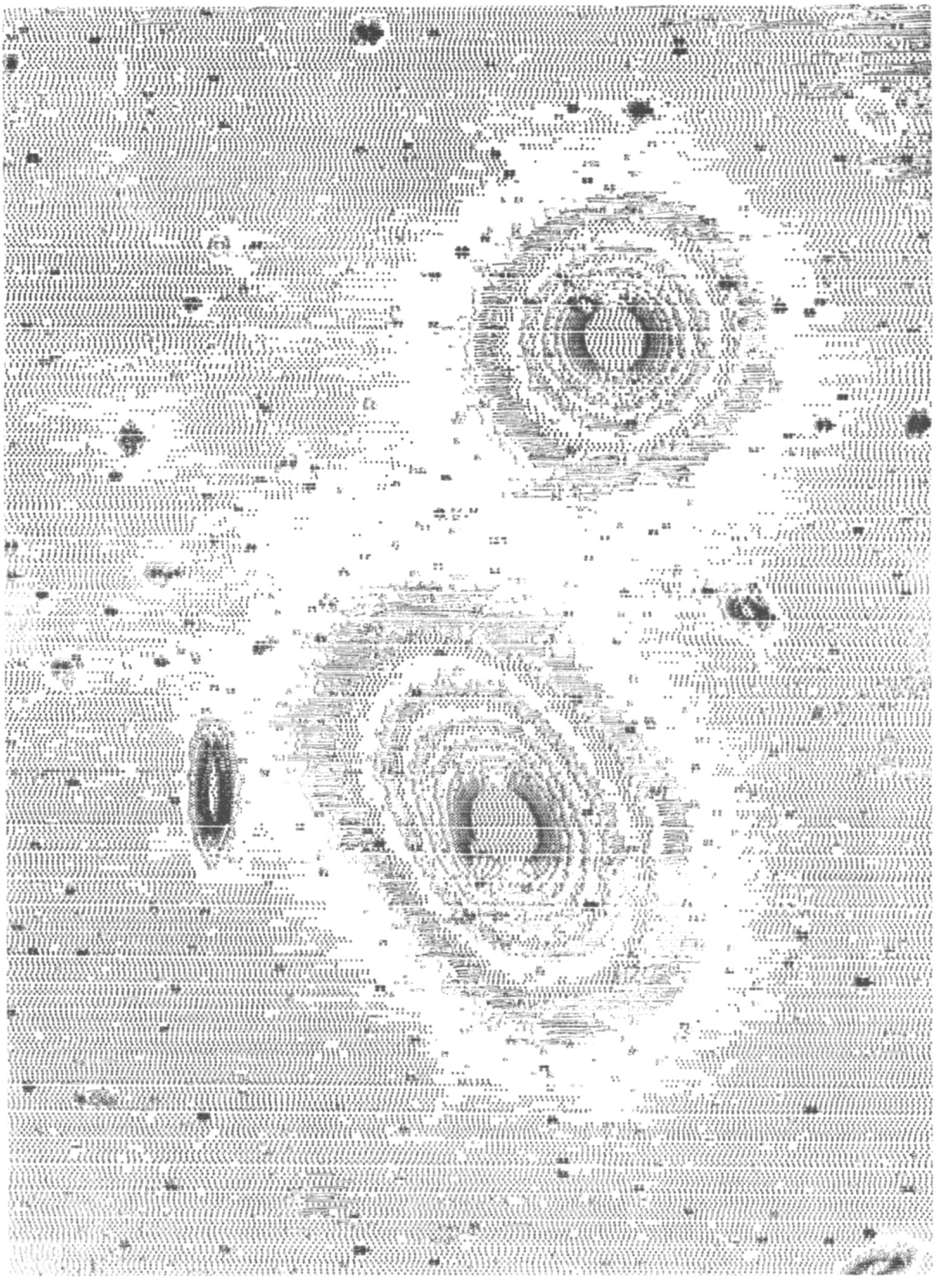

Figure 1: Joyce-Loebl isodensity tracings of the halo surrounding the two galaxies NGC 4374 and 4406, from a one hour exposure on IIIaJ emulsion taken by J. Sulentic with the Palomar 48-inch Schmidt telescope. (North at left, East at top).

https://doi.org/10.1017/S0252921100106906 Published online by Cambridge University Press

perturbations produced by massive neighbours or both ? Evidence for gravitational interactions must be searched for with small-scale telescopes whereas the study of the changing geometry (at least in the inner parts) requires the use of large-scale observations at least for technical reasons (Capaccioli, 1983).

2. Substructures and the case of NGC 3384.

Polar rings in lenticular galaxies (e.g. A0136-0801) could be either intrinsic or due to interactions with the environment. Schweizer et al. (1983) favor the second possibility; but NGC 2685, the prototype of the subclass, is an isolated object. In a high-resolution study of NGC 3384, Davoust, Lelièvre and Nieto (1983) detected an elongated feature perpendicular to the main body of the galaxy for which several arguments prompted to assume that it is a polar ring and not a weak bar. In addition, Malin (this volume) showed a well defined spiral arm at the N.E. end of this galaxy. Although there is no definite evidence that this outer arm is due to interaction with the companion galaxy NGC 3379, the presence of both peculiar features detected via small-and large-scale observations deserves further attention. Note also that several SO's (e.g. NGC 4036) present unexplained structures in the outerparts (see, e.g., Barbon, Benacchio and Capaccioli, 1978).

3. The encounter of NGC 4374 and NGC 4406.

Benacchio et al. (1983) reported a very poor agreement between photographic photometry (for which the large field allowed an accurate determination of the sky background) and photoelectric aperture photometry from the catalogue of Longo and de Vaucouleurs (1983). The sky determination was suspected to be the cause of the discrepancy. A study of an extensive collection of small-scale plate material taken at different telescopes (Palomar-Schmidt, Tautenburg, UKST) reveals that a huge halo surrounds the two galaxies (Fig. 1). We suggest that *i*) intergalactic material was accreted by NGC 4406 (V_o= -419 kms^{-1}) during its high velocity passage through the center of the Virgo cluster ($V_o \cong$ +1000 kms^{-1}) and *ii*) forced star formation induced by stripping of gas due to ram pressure as suggested by the similar morphologies of the X-ray and stellar haloes (Jones and Forman, 1981) and by the existence of a type I supernova (Smith, 1981). Evidence for interaction between the two galaxies suggests, and time scale arguments are consistent with, the hypothesis that the close passage of NGC 4406 in the center of the Virgo cluster has produced a sudden dumping of gas in the nucleus of NGC 4374 of which the inner dust lane is a tracer (Fig. 2), able to supply material to the jet point source.

Acknowledgements:

We wish to thank Dr. J. Sulentic for allowing us the use of a very deep 48" Palomar-Schmidt plate, and Prof. G. de Vaucouleurs for his critical reading of the manuscript.

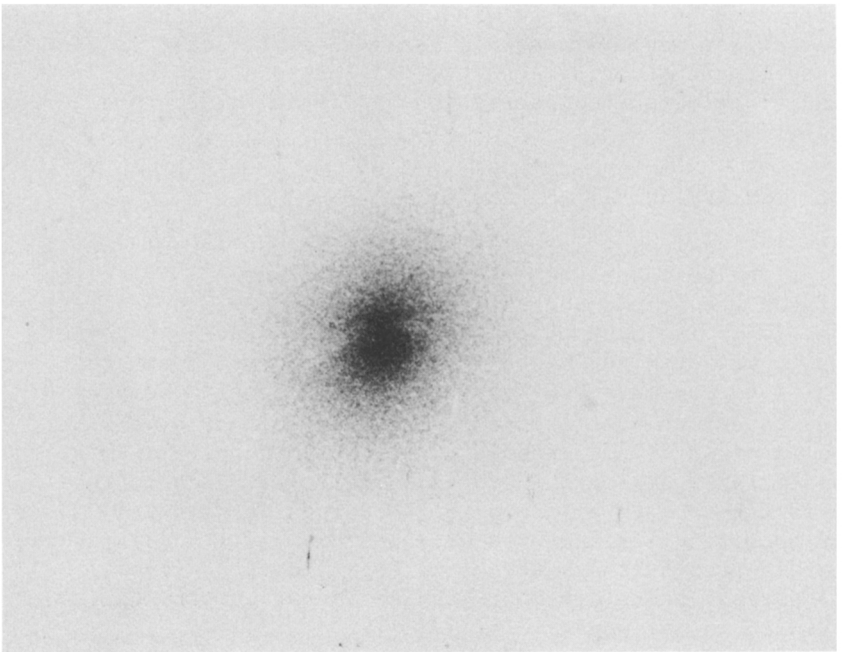

Figure 2: The dust complex in the nuclear region of NGC 4374, from a high-resolution (FWHM ∿ 0".75) photograph taken at the prime focus of the CFH Telescope (exp. time 5 minutes).

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