Session 41: Active Galaxies and Quasars Display Session, Exhibit Hall

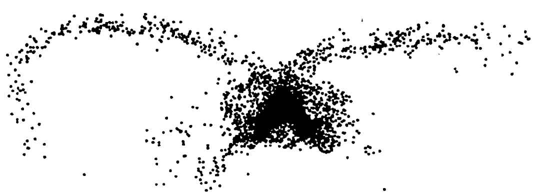
41.01

Encounters and Mergers of Disk/Halo Galaxies

J. Barnes (Institute for Advanced Study)

Galactic collisions have long been suspected to play a major role in the formation of peculiar systems and perhaps even ordinary ellipticals, but there is little numerical evidence on such questions. Here I present the first N-body models of interacting galaxies in which all dynamical components are modeled in three dimensions with thousands of particles each and the equations of motion are integrated by a completely self-consistent algorithm. These technical developments permit far more realistic models of interacting galaxies than previously possible.

Encounters between disk galaxies embedded in massive dark halos can produce impressive tidal tails while permitting the visible galaxies to merge on a short timescale. Halos soak up binding energy and angular momentum from the bulge and disk components. After the ensuing merger, these luminous components form slowly-rotating remnants with de Vaucouleurs' luminosity profiles and effective radii, shapes, and velocity dispersions typical of ellipticals.



A model of the Antennae, NGC 4038/9.

41.02

L-Band VLA Snapshots of Interacting Galaxies

M. J. Claussen (Naval Research Laboratory) and
J. S. Young (Five College Radio Astronomy Observatory)

We report on a project to produce 20-cm radio continuum maps of a sample of 52 interacting and disturbed galaxies selected from the Arp Atlas of Interacting and Peculiar Galaxies (Arp 1966). The sample was chosen to be relatively nearby (v < 3000 km/s) and relatively strong IR sources (determined from the IRAS survey; Beichman et al. 1985).

We have detected 43 sources in the radio continuum; 29 of these show extended emission (with respect to the 10" beam) which presumably trace out regions of massive star formation (the L-band radio continuum is expected to be indicative of non-thermal radiation provided by young SNR). We find that several of these extended sources have bridges of radio emission which connect the two interacting galaxies; these sources will be highlighted.

The detection of only pointlike structure in 14 of the sources suggest that some fraction of the interactions produce very strong nuclear radio sources indicating the presence of active nucleii. We present correlation studies with infrared and molecular observations which will allow comparison with previous studies of 'normal' and 'active' galaxies.

41.03

The nature of nebulosity around quasars

Y.P. Varšhni (U. Ottawa)

In recent years a number of observers (Hutchings et al. 1984, Ap. J. Suppl. 55, 319; Wyckoff et al. 1981, Ap. J. 247, 750; Gehren et al. 1984 Ap. J. 278, 11; Malkan et al. 1984, Ap. J. 280, 66; Malkan 1984, Ap. J. 287, 555) have carried out high-sensitivity imaging studies of quasars. Most of the objects selected were such that their apparent "redshifts" were less than 0.7. In most of these cases a nebulosity has been found around the quasar. Assuming the cosmological hypothesis, these investigators have interpreted the nebulosity as starlight from the underlying galaxy in which the quasar nucleus resides. On the other hand, the author has proposed a theory of quasars according to which the quasars are stars which are undergoing high-speed mass loss and have no redshifts (Varshni 1974 Bull. A.A.S. 6, 213, 308; 1975 Astrophys. Space Sci. 37, L1; 1977 ibid 46, 443; 1985 ibid 117, 337). According to our theory we interpret the nebulosity as an envelope of ionized and neutral gases which have been ejected from the quasar. Some dust may also be present. We further predict that similar nebulosities should occur around some of the Wolf-Rayet stars, planetary nuclei (which have WR type of spectra) and Be stars. We request that observations be carried out to test this prediction. The detection of nebulosity depends on the plate scale, limiting magnitude, and quality of the observations. Clearly these should be similar to those in the quasar studies. A good sample size would be desirable. The stars should not be in a crowded or obscured field.

THURSDAY

41.04

The Extended Emission-Line Gas and Obscured Seyfert 1 Nucleus in the Spiral Galaxy NGC 4388

J.C. Shields, A.V. Filippenko (U. C. Berkeley)

The highly inclined X-ray galaxy NGC 4388 ($cz = 2490$ km s^{-1}) contains a bright, unresolved nucleus that is somewhat displaced from its geometric center and has an emission-line spectrum similar to those of type 2 Seyfert nuclei (Phillips and Malin 1982, *MNRAS*, **199**, 905). Unlike the case in most Seyferts, however, these lines display strong red wings. Filippenko and Sargent (1985, *Ap.J. Suppl.*, **57**, 503) discovered an extremely weak, broad component of Hα (FWZI $\approx$ 5600 km s^{-1}) in the apparent nucleus, suggesting that it is a very low-luminosity Seyfert 1. There is also significant resolvable ionized gas in, and extending out of, the disk of the galaxy (Pogge 1988, *BAAS*, **19**, 1068; Hummel, van Gorkom, and Kotanyi 1983, *Ap.J. Lett.*, **267**, L5).

New, long-slit CCD spectra covering $\lambda\lambda$6130–6940 Å and taken at multiple slit positions have been obtained with the 3-m Shane reflector at Lick Observatory. These confirm the red asymmetric profiles in the apparent nucleus. Directly south of it, on the minor axis, the emission lines bifurcate into double-peaked profiles indicative of two distinct kinematic components of gas. The kinematic signature and spatial coincidence of this gas suggests that NGC 4388 is ejecting material from its nucleus in a manner similar to NGC 3079 (Filippenko and Sargent, in preparation).

The emission lines in spectra taken $\sim 5''$ NE of the apparent nucleus, approximately at the geometric center of NGC 4388, do not exhibit prominent red asymmetries. In addition, there is a broad component of Hα (FWZI $\gtrsim$ 4500 km s^{-1}) that is considerably stronger than the one in the bright apparent nucleus. The location of this broad emission suggests that the true nucleus may be near the apparent nucleus, but is blocked by a thick circumnuclear torus (e.g., NGC 1068; Antonucci and Miller 1985, *Ap.J.*, **297**, 621). Another, perhaps more likely, possibility is that the true nucleus is at the geometric center of NGC 4388, heavily obscured by the disk of the galaxy. Spectropolarimetry of the regions emitting broad Hα should determine which of these alternatives is correct.