ter, and the synchrotron spectrum associated with the evolved particle distribution is computed throughout the flow. We assume that the magnetic field is frozen into the plasma and that the entire medium is optically thin.

Calculations are carried out for a variety of incident particle distributions and a range of flow parameters. Diffusion seems necessary to avoid a radio structure that is too centrally peaked. We compare our results with radio maps of the Perseus cluster, and conclude with a discussion of the plausibility of the scenario and its attendant assumptions.

42.09

Can Gravitational Lensing Produce Luminous Arcs?

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We investigate the hypothesis that the luminous arcs recently found in two cluster cores are gravitationally lensed images of background galaxies. A galaxy lying behind a circularly symmetric lens can produce a pair of tangentially elongated images or a radially elongated image. Neither of these image configurations is consistent with the observations. However, introduction of asymmetry in the lens by the addition of a quadrupole in the gravitational potential causes a qualitative change; in particular, a diamond-shaped caustic with four cusps appears in the source plane behind the center of the lens. Galaxies lying near this caustic are seen as single arcs; the biggest arcs occur for galaxies near the cusps.

Encouraged by the above result, we have carried out extensive numerical simulations of lensing by realistic clusters. We model the clusters as non-singular isothermal spheres ($\sigma = 1250$ kms^{-1}) with quadrupole and octopole perturbations. Even though we introduce granularity by including individual galaxies in the lens, we find that the lensed images are not significantly distorted. In a sample of 303 clusters which we have simulated so far, we obtain images longer than 10" in 12% of the cases and longer than 20" in 2% of the cases. The images longer than 10" are all tangential with respect to the cluster center, are mostly single, have a median radius of curvature of 25", and a median axial ratio of 6. Because we use a somewhat optimistic distribution of cluster core radii based upon X-ray data, we may have overestimated the frequency of arcs. On the other hand, we consider only background galaxies with luminosities $L \geq 0.1L_*$, while a posteriori we find that galaxies with $L < 0.1L_*$ do have a significant cross section for producing arcs. On balance, we conclude that the lensing hypothesis for the observed arcs has merit and deserves further investigation.

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42.10

Gravitational lensing by a dipole mass distribution and the giant luminous arcs

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The gravitational lensing properties of a distribution of point masses consisting of two distinct centers of concentration is modeled using the ray-shooting method. We apply the result to the two clusters (Cl 2244 and Abell 370) discovered to have large luminous arcs (R. Lynds and V. Petrosian, 1986, B.A.A.S., **18**, 1014). These clusters share the common property of having a dipolar projected distribution of galaxies. We assign appropriate masses to the relevant galaxies in these clusters and are able to model the Lynds-Petrosian arcs by assuming a source close to a critical line. This model has the advantage of spreading the large mass necessary for the bending of the light over a number of galaxies. We obtain images which closely match the observations.

42.11

The Role of Tidal Encounters as the Trigger for Star Formation in Dwarf Galaxies

N. D. Tyson (Univ. of Maryland)

It has been suggested by several studies that close and more distant tidal encounters may play an important role as the trigger for star formation in starburst galaxies and such well-studied galaxies as M82 and the LMC. In this study, we investigate whether random tidal encounters can be held responsible for the overall star-forming features of a magnitude limited sample of gas-rich dwarfs extracted from the literature. In our models, we link a burst of star formation to every tidal encounter and we estimate the burst strength via the energy exchange as computed using the impulse approximation (Spitzer 1958). This computation requires the mass, relative velocity, and impact parameter of every perturber in a galaxy's history which we obtained throught the Monte Carlo sampling of plausible distribution functions. After following the burst history, and corresponding luminosity and surface brightness of every galaxy in the simulation, we distribute them randomly in space and subject them to the observational selection effects found for the real data.

Our results show that while close tidal encounters can produce bursts of remarkable strength, they are nonethelesss extremely rare. The drop-off in strength with large impact parameter and small galaxy size appears to be so significant that to match the mean luminosity and surface brightness of the real data requires a very high galaxy density ($n \geq 10{,}000$ Mpc^{-3}), and a relatively shallow galaxy radius distribution (logarithmic slope ≥ -2.5; cf. slope ≈ -4.2 from Tyson and Scalo 1987). These conditions, however, force thousands of times as many simulated galaxies to fall within the established selection criteria as are truly detected. We conclude, therefore, that while tidal encounters can be invoked to explain isolated instances of star formation bursts, they are unlikely to be the dominant trigger for the general dwarf galaxy population.

Spitzer, L. 1958, *Ap. J.* **127**,17
Tyson, N. D. and Scalo, J. M. *Ap. J.* 1987, submitted.

WEDNESDAY

42.12

Decomposing Binary Galaxies–Analytically

A. C. Porter (NOAO)

Suppose that in an image I, the light distributions of two galaxies, f_1 and f_2, overlap. If the two galaxies have point reflection symmetry about their respective centers (a_1, b_1) and (a_2, b_2), the surface brightness of one of the galaxies can be written as

$$f_1(x,y) = \sum_{n=0}^{N} A_2(x + 2n(a_1 - a_2), y + 2n(b_1 - b_2)),$$

where

$$A_2(x,y) = I(x,y) - I(2a_2 - x, 2b_2 - y),$$

and N is a suitably large truncation index. A similar formula gives the light distribution of the other galaxy.

This method has been applied to images of bright binary ellipticals, and the results are being displayed here. The decomposition works well even on low surface brightness objects and galaxies which have been imperfectly cleaned of additional companions. It is sensitive to centroid drift, which violates the symmetry assumption, but this is rare. The major advantage of the present formula over the simultaneous ellipse fitting method of Lauer (1986, **Ap.J. 311** 34) is that it can be applied to some spirals and any other centrally symmetric objects. Its major drawback is that it cannot easily be generalized to more than two galaxies.

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