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D. STABILITY AND EVOLUTION

1. Stability of Galactic Disks

The global stability of galactic disks against various kinds of instabilities and oscillations have been analyzed by Abramyan (32.151.085), Aoki (37.151.053), Caimmi and Dallaporta (32.151.012), Chalov (32.151.083), Durisen and Bacon (29.151.059), Hachisu (32.151.047), Ishibashi and Ando (37.151.055), Iye (37.151.028), Iye, Ueda, Noguchi and Aoki (33.151.028, 1984), Morozov (29.151.047), Nishida, Yoshizawa, Watanabe and Inagaki (30.151.084), Nishimoto (33.151.095), Nuritdinov (29.151.083), Tajima (29.151.095), Vandervoort and Welty (29.151.077), Vandervoort (31.151.044, 32.151.022, 34.151.055), Watanabe, Inagaki, Nishida and Tanaka (30.151.083), Wiegandt (31.151.023, 31.151.024), and de Zeeuw, Franx, Meys, Brink and Habing (33.151.053). Local stability criteria which take into account the multi-component nature of galactic disks have been developed by Abramyan (33.151.076), Balbus (33.151.111), Churilov and Shukhman (29.151.048), Grishchuck and Zeldovich (29.151.082), Grivnev, Ivannikova and Maksumov (1984), Jog and Solomon (37.151.013, 37.151.014), Morozov (29.151.009), Ogorodnikov and Osipkov (1980), and Polyachenko and Fridman (29.151.011).

Bar and spiral instabilities of galactic disks under the stabilyzing influence of a nuclear bulge or halo have been investigated by Athanassoula (33.151.051), Athanassoula and Sellwood (33.151.040), Berman and Mark (32.151.023), Combes and Sanders (29.151.040), Efstathiou, Lake and Negroponte (31.151.063, 31.151.081), Nishida (37.151.056), Robe and Leruth (37.151.043), Sellwood (29.151.094, 33.151.039, 33.151.080), Sellwood and Carlberg (1984), Terzides and Michalodimitrakis (33.151.122), and Tohline, Durisen and McCollough (37.151.026).

2. Warps of Galactic Disks

Recent developments of the theory of warps of galactic disks have been reviewed by Toomre (33.151.036). Detailed studies on the warps of galaxies, tilting of galactic disks and vertical disk oscillations have been presented by Blitz, Mark and Sinha (29.155.005), Dekel and Shlosman (33.151.037), Fleck (34.155.015), Johns and Nelson (1984), Nelson (30.151.003), Mark (33.151.073), May and James (37.151.010), Papp and Innanen (32.151.079), Simonson and Tohline (33.151.127), Sparke (37.151.084, 1984), and Yoshii and Fujimoto (30.151.059).

3. Secular Evolution of Galaxies

Reviews on recent progress in understanding the evolution of galaxies have been given by Martinet (30.151.027), and Strom and Strom (31.151.059). The secular evolution of galactic disks due to angular momentum transport and matter accretion has been investigated by Bertin (34.151.038), Gorbatskij and Serbin (34.151.045), Mayor and Vigroux (29.151.065), Norman (37.151.005), and Simonson (37.151.027). The

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evolution of perturbed gaseous disks has been studied by Sorensen (33.151.030). Biermann (29.151.072) has presented a new code to calculate the evolution of galaxies.

Recently, the interaction of stars with fluctuations of the galactic gravitational field due to massive objects or short-lived spiral perturbations, as reviewed by Wielen and Fuchs (1984), has found special interest. The resulting secular evolution of galaxies has been studied by Carlberg (37.151.006), Carlberg and Sellwood (33.151.029), Carlberg, Freedman and Sellwood (34.151.052), Icke (31.151.018), Kamahori and Fujimoto (37.151.061), Lacey and Fall (34.155.006, 1984), Lacey (37.151.007, 37.151.076), Rohlfs and Wiemer (32.151.008), Villumsen (34.151.089, 37.151.102, 1984), Wielen and Fuchs (32.151.072, 32.151.073, 33.151.070, 34.151.104).

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E. COMPUTER SIMULATIONS

Computer simulations provide a powerful tool for investigating the evolution of gravitating systems.

1. Clustering of Galaxies

Using the Monte-Carlo simulation technique, Dodd et al. (31.151.028) and MacGillivray and Dodd (31.160.074, 31.160.075, 32.160.055, 32.160.056) investigated the geometric properties of positions, orientations, shapes, etc. of galaxies in clusters.

Ishizawa et al. (32.151.022), Carnevali et al. (30.151.048), and Guiricin et al. (37.160.078) examined the dynamical evolution of a group of galaxies. Miller (34.151.018) showed that the observed structure of galaxy clusters and superclusters is most easily described in terms of matter being swept away from growing empty regions in an expanding universe. A two-dimensional simulation of the gravitational superclustering of collisionless particles was carried out by Melott (33.161.016). Bhavsar et al. (29.151.085) supported the gravitational instability picture for clustering, in which the multiplicity function depends strongly on the initial density fluctuation spectrum index.

Saslaw and Aarseth (31.162.015) examined the evolution of the velocity distribution of galaxies as they cluster in the expanding universe and showed that the velocity dispersion of extreme field galaxies is a good cosmological indicator of Ω. To estimate Ω, Miller (1984) made also numerical experiments on galaxy clustering in open universes. Shaya (37.160.113) made Monte-Carlo simulations to determine the probability distribution of peculiar velocities and shear velocities of superclusters.

The merging rate of galaxies in an expanding universe for explaining the galaxy mass function was derived by Roos (29.151.035). The evolution of rich clusters

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