XVth IAP Meeting

Dynamics of Galaxies:
from the Early Universe to the Present

Paris, France, 9-13 July 1999

http://www.iap.fr/iapmtg99/

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Preface

This book gathers the contributions to the XVth IAP (Institut d'Astrophysique de Paris) meeting, on *Dynamics of Galaxies: from the Early Universe to the Present*, held in Paris, France, on July 9–13, 1999. The attendance was 135 participants from 20 countries, who more than filled the IAP amphitheater. Unfortunately, it was impossible to welcome the 240 pre-registered people. This large over-subscription was certainly due to the goal of the meeting to bring together such different communities as observers of the distant Universe or of local galaxies, modelers of galaxy formation and/or galaxy dynamics as well as experts of local galaxy physics, such as star formation, hydrodynamics and feedback from stellar winds and supernovae.

New developments on bars and circum-nuclear disks were presented, including the tantalizing possibility that bars are not made by bar instability! Rings are still most likely due to bar resonances. Although bars have been cited for years to be the trigger of gas inflow in Seyfert to fuel the nuclei activity, the data are reluctant to reveal a clear confirming correlation. Bars were not so frequent in earlier times, which means either that disks were more stable, or on the contrary so unstable that the bar themselves were short-lived.

Dark matter was tracked down and proved to follow HI distributions. New and numerous proofs of gas infall into galaxies were described, in the form of polar rings, warps, and perhaps High Velocity Clouds, and it was clear that this had something to do with dark matter.

How are galaxy disks formed? Why is the mass so tightly connected to light, as witnessed in the Tully-Fisher relation? Scaling laws were suggested to come from scale-free formation processes, and semi-analytical models or N-body simulations presented likely scenarios. However, these first attempts are challenged by a serious angular momentum problem. The dissipative baryonic gas is driven inwards much too quickly, and ends up in a very small, low angular momentum disk. Star formation and corresponding feedback help but do not cure the problem.

The formation of bulges and spheroids appear to be plural. They could form rather quickly from monolithic collapse, but most of them appear to be built-up through many merger events. Nuclear black-holes, which account for central density cusps, could regularize the process, in axi-symmetrizing the systems.

Galaxy mergers were followed back in time, and their frequency was shown to increase tenfold when the universe was half its present age. Beautiful and convincing movies were displayed to the participants delight. A large harvest of UV, optical, NIR, FIR and radio observations supported the idea of the formation of globular clusters and elliptical galaxies in galaxy mergers.

In clusters of galaxies, observations now confirm theoretical predictions that galaxies are gravitationally disturbed through rapid galaxy collisions and by the tidal field of the cluster, while their gas is ram-pressure stripped by the intergalactic gas. Galaxy interactions strip stars out of galaxies, and the amount of intra-cluster stars has been estimated comparable to the amount of stars in

galaxies. Observations of clusters at high redshift reveal considerable merging activity in the recent past, pleading against predominant elliptical formation through monolithic collapse at high z.

Deep observations now follow the evolution of the Hubble sequence as a function of time: the star formation rate was at least 10 times higher when the Universe was 3 times younger. The Tully-Fisher relation is conserved, although with an offset in luminosity. Disks were smaller in the past, supporting low density universes.

The conference showed that significant progress is currently being made in galaxy dynamics, thanks to ever increasing observational and computational tools coupled with new ideas and models, and this should continue in the near future.

We are grateful to the members of the Scientific Organizing Committee for their help in the choice of speakers and participants: J. Barnes (IfA, Hawaii, USA), R. Bender (Univ. München, Germany), R. Carlberg (Univ. Toronto, Canada), F. Combes (Obs. de Paris, chair), R. Ellis (IoA, Cambridge), G. Mamon (IAP, Paris, co-chair), D. Pfenniger (Obs. de Geneve, Switzerland), Y. Sofue (IoA, Tokyo Univ., Japan), and S. White (MPA, Garching, Germany).

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This meeting could not have been held so smooth, without the collaboration of the secretary, Brigitte Raban. We also thank Lionel Provost for developing the software for the conference registration, the PhD students (Laurent Chemin, Barbara Lanzoni, and Benjamin Noel) for their efficient help in welcoming the participants, and Frédéric Magnard and Jean Mouette, for taking photographs. Participants have greatly appreciated the support of Senator Loridant in securing the excellent conference dinner at the Senate Palace.

Paris, October, 1999

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Conference Photograph


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