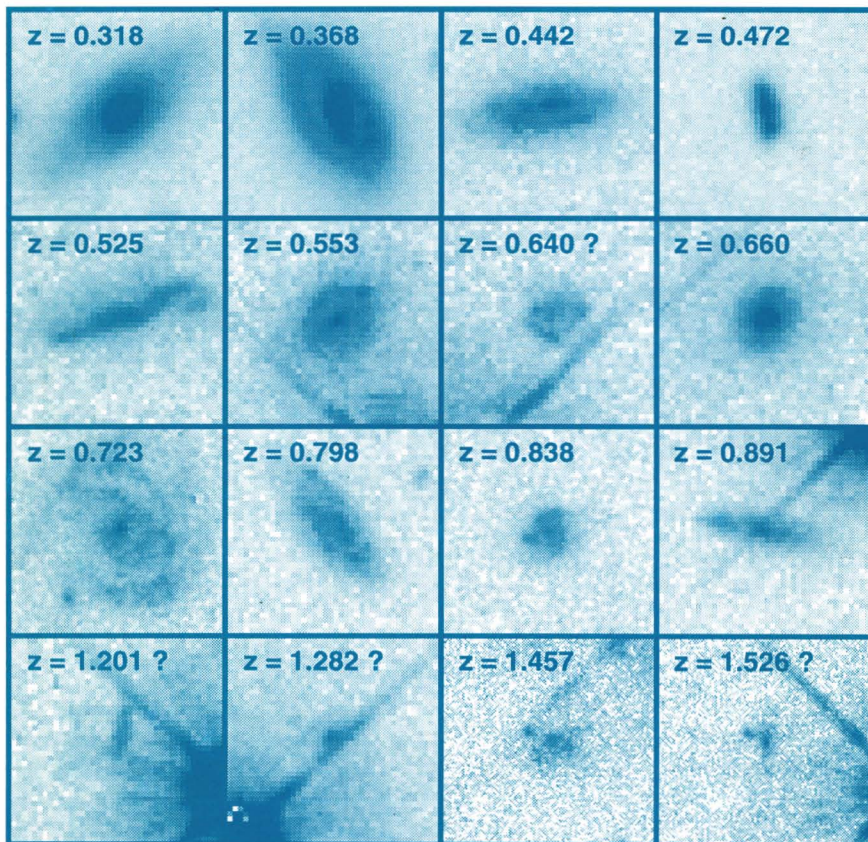


INTERNATIONAL ASTRONOMICAL UNION

SYMPOSIUM No. 171

# NEW LIGHT ON GALAXY EVOLUTION

Edited by RALF BENDER and ROGER L. DAVIES



INTERNATIONAL ASTRONOMICAL UNION

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## NEW LIGHT ON GALAXY EVOLUTION

INTERNATIONAL ASTRONOMICAL UNION  
UNION ASTRONOMIQUE INTERNATIONALE

# NEW LIGHT ON GALAXY EVOLUTION

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INTERNATIONAL ASTRONOMICAL UNION,  
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JUNE 26–30, 1995

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## PREFACE

The IAU Symposium 171 *New Light on Galaxy Evolution* was held at the Max Planck Haus in Heidelberg, Germany from 25th-30th June 1995. It was attended by 214 registered participants from 24 countries. The meeting was organised under the auspices of Sonderforschungsbereich 328 *The Evolution of Galaxies* and sponsored by Commissions 28 (*Galaxies*) & 33 (*Structure and Dynamics of the Galactic System*) of the International Astronomical Union.

The seed of the idea for a wide ranging IAU Symposium on Galaxy Evolution germinated in late 1993. We had in mind a meeting that would provide a 1990s perspective on the topics covered at the influential meeting held in Santa Cruz in 1986 : *Nearly Normal Galaxies from the Planck time to the Present*. This agenda proved popular and we were fortunate to recruit an outstanding scientific organising committee for this project. You will find in these proceedings less emphasis than was given in Santa Cruz on the physics of the early universe and the connection to the large scale structure. This is not to deny the importance of these fields but simply a practical consequence of the limited time available, indeed both topics could be the subject of meetings in their own right. Conversely other topics, which have more recently come into prominence, have been emphasised, for example the controversy over the ages of elliptical galaxies and the impact of high resolution imaging with HST and spectroscopy with the Keck, on the study of intermediate redshift galaxies. An important development since the mid-80's is the role of high performance computing. This has made possible, for example, the inclusion of gas physics and stellar evolutionary effects in the cosmological simulations of galaxy evolution, as well as increasing the sophistication, and the ease of visualisation, of simulations of the dynamical interactions between galaxies. While starting from the broad topics covered in Santa Cruz you will find in these pages our own cocktail mixed from the currently topical ingredients of galaxy research.

The first two days of the programme concentrated on those clues to the principal processes occurring in galaxy evolution that emerge from the study of nearby galaxies. We began by considering the star formation history of spirals (starting with the Milky Way!). Panoramic near infrared imaging now offers the possibility of disentangling the effects of reddening from those of real stellar population changes in spirals. Discussion of stellar populations dominated the session on elliptical galaxies.

In the session on small stellar systems an attempt was made to account for the differences in the globular cluster populations of spiral and elliptical galaxies by forming ellipticals in mergers, turning on its head an argument regularly used to undermine the merger hypothesis. The HST data are close to forcing us to accept that black holes are common in the cores of giant galaxies, although the best case for a BH arises from the velocities of water masers in the core of NGC 4258. Studies of the interstellar medium in galaxies at X-ray wavelengths have now

matured with the advent of the spectroscopic ASCA satellite and more surprises, such as the low iron abundance found in the IGM, can be expected. In the session on dark matter, while the halos around spirals were universally accepted, we heard that the challenge now is to detect halos around elliptical galaxies with the same confidence.

In the final session on nearby galaxies our physical understanding of the process and consequences of galaxy merging was dramatically illustrated. It appears that the global properties of galaxies can be accounted for and the effects of *galaxy harassment* have been both simulated, and observed, in the Coma cluster.

In the last two days we moved to galaxies at high redshift. Discussions were dominated by the the spectacular HST images, both in pointed observations and the serendipitous Medium Deep Survey. Attempts to characterise the morphologies and global properties of galaxies in intermediate redshift clusters were reported.

Understanding the evolution of galaxies through cosmological simulations including gas physics, star formation and stellar evolution is just beginning and results from this work are likely to be highly influential for many years. Refreshingly, the development of analytical models of galaxy formation, will give us an alternative view of what-happens-when, as galaxies form. The final sessions covered new techniques to detect galaxies in formation and what we can infer about the physical conditions in the IGM at high redshift from quasars.

There is very little in astronomy that does not have some bearing upon the evolution of galaxies, after nine years our survey of the subject, extending from our local neighbourhood to early epochs, has revealed how new facilities and techniques, from large ground based telescopes to models of stellar atmospheres, have developed our understanding of galaxy formation. Looking at Jim Gunn's summary of the '86 conference he gives seven observational and two theoretical tasks in his pet list. Of these we reckon good progress has been made on four or five of the former but perhaps only one of the latter remains relevant. How will we fare over the next decade? A two week conference will be essential by then.

We were fortunate indeed to be presented with a sunny and dry week in Heidelberg for IAU 171. The 21 reviews and 26 contributed papers were delivered in the auditorium of the Max Planck Haus, which was the scene of lively discussions both in the sessions and in the periods set aside to peruse the 137 posters. The week proved to be an intensive exploration of the subject of galaxy evolution with animated discussions being observed throughout the evenings by the casual Heidelberger strolling through the Old City. As a break from these rigors, the good weather enabled the participants to enjoy a wonderful cruise up the Neckar River and a hike to the castles at Neckarsteinach. Our thanks go to all that made this celebration of our subject so successful.

Roger Davies

Ralf Bender



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