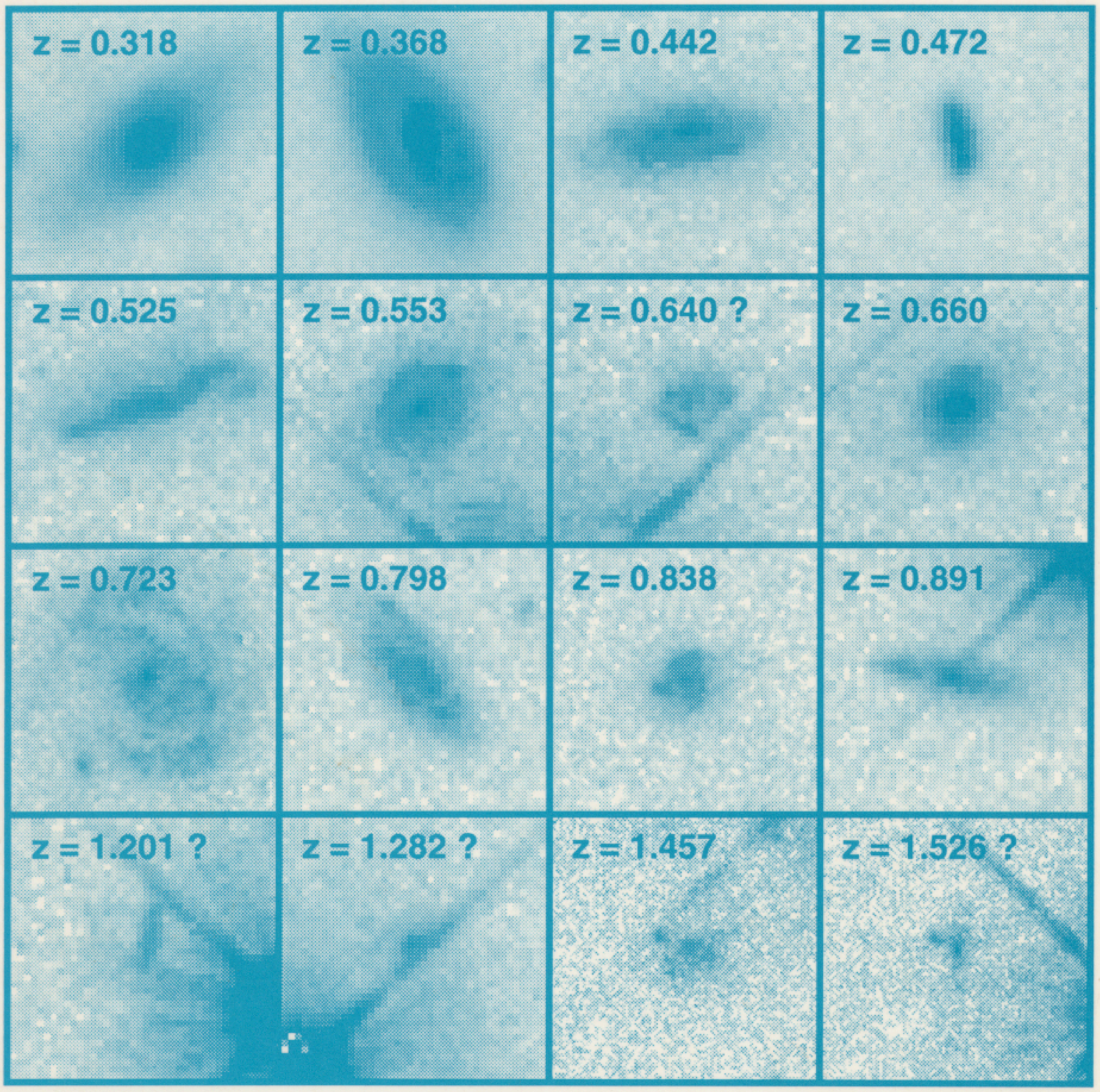
INTERNATIONAL ASTRONOMICAL UNION

SYMPOSIUM No. 171

NEW LIGHT ON GALAXY EVOLUTION

Edited by RALF BENDER and ROGER L. DAVIES



INTERNATIONAL ASTRONOMICAL UNION

KLUWER ACADEMIC PUBLISHERS

IAU SYMPOSIUM No. 171

NEW LIGHT ON GALAXY EVOLUTION

RALF BENDER and ROGER L. DAVIES (EDS.)

The study of the evolution of galaxies has made remarkable progress in recent years and is currently undergoing a transformation arising from the application of new observational and theoretical tools. Twenty-one invited reviews, twenty-six contributed papers and 137 poster papers cover the wide variety of recent developments, present new insights and demonstrate the rapid increase in our knowledge about galaxy evolution and formation.

ISBN 0-7923-3976-2

KLUWER ACADEMIC PUBLISHERS IAUS 171 9 780792 339762

INTERNATIONAL ASTRONOMICAL UNION

UNION ASTRONOMIQUE INTERNATIONALE

NEW LIGHT ON GALAXY EVOLUTION

PROCEEDINGS OF THE 171ST SYMPOSIUM OF THE
INTERNATIONAL ASTRONOMICAL UNION,
HELD IN HEIDELBERG, GERMANY,
JUNE 26–30, 1995

EDITED BY

RALF BENDER

Universitäts-Sternwarte München,
Germany

and

ROGER L. DAVIES

University of Durham,
United Kingdom

KLUWER ACADEMIC PUBLISHERS

DORDRECHT / BOSTON / LONDON

RECOVERING THE INTRINSIC METALLICITY DISTRIBUTION OF ELLIPTICAL GALAXIES

L. CIOTTI
Osservatorio Astronomico di Bologna
via Zamboni 33, I-40126 Bologna

M. STIAVELLI
Scuola Normale Superiore
P.zza de' Cavalieri 7, I-56126 Pisa

AND

A. BRACCESI
Dipartimento di Astronomia, Università di Bologna
via Zamboni 33, I-40126 Bologna

We present a simple recipe to derive the metallicity distribution of galaxies as a function of their integrals of the motion. Elliptical galaxies are known to possess metallicity gradients that frequently show variations of a factor of 2 from the center to the effective radius (Peletier, 1989). The observed gradients are the result of *projection* and *orbital mixing*. Orbital mixing arises because stars at a given radius may have their apocenters spanning a wide range of radii. Thus, the mean metallicity at any given point inside the galaxy is the result of the metallicity distribution in phase space weighted by the galaxian distribution function. We have proposed (Ciotti, Stiavelli & Braccesi, 1995) a simple inversion procedure allowing one to derive the dependence of metallicity on the integrals of motion for a spherical galaxy. The ideas of this paper can be generalized to oblate two-integrals models following the Hunter & Qian (1993) technique.

References

Ciotti, L., Stiavelli, M., and Braccesi, A., (1995), in press on *M.N.R.A.S.*
Hunter, C., Qian, E., (1993), *M.N.R.A.S.*, **262**, 401
Peletier, R., (1989), *PhD Thesis* (Groningen)

THE TILT OF THE FUNDAMENTAL PLANE OF ELLIPTICAL GALAXIES: DYNAMICAL AND STRUCTURAL EFFECTS

B. LANZONI
Dipartimento di Astronomia, Università di Bologna
Via Zamboni 33, 40126 Bologna, Italy

L. CIOTTI
Osservatorio Astronomico di Bologna
Via Zamboni 33, 40126 Bologna, Italy

AND

A. RENZINI
European Southern Observatory,
Garching b. München, Germany

We explore several structural and dynamical effects on the projected velocity dispersion as possible causes of the fundamental plane (FP) tilt of elliptical galaxies (Ciotti, Lanzoni & Renzini, 1995). Specifically, we determine the size of the systematic trend along the FP in the orbital radial anisotropy, in the dark matter (DM) content and distribution relative to the bright matter, and in the shape of the light profile that would be needed to produce the tilt, under the assumption of a constant stellar mass to light ratio. Spherical, non rotating, two-components models are constructed, where the light profiles resemble the $R^{1/4}$ law. For these we can exclude orbital anisotropy as the origin of the tilt, while a systematic increase in the DM content and/or concentration may formally produce it. Also a suitable variation of the light profile can produce the desired effect, and there may be some observational hints supporting this possibility. However, fine tuning is always required in order to reproduce the tilt, while preserving the tightness of the galaxies distribution about the FP.

References

Ciotti L., Lanzoni B., and Renzini A., 1995, submitted to *M.N.R.A.S.*

THE ENERGETICS OF FLAT AND ROTATING EARLY-TYPE GALAXIES AND THEIR X-RAY LUMINOSITY

S. PELLEGRINI
Dipartimento di Astronomia
via Zamboni 33, I-40126 Bologna

AND

L. CIOTTI
Osservatorio Astronomico di Bologna
via Zamboni 33, I-40126 Bologna

1. The problem and the results

A multivariate statistical analysis of data measuring the optical and X-ray properties of the *Einstein* sample of early-type galaxies (Eskridge *et al.* 1995) showed that: 1) on average S0s have lower X-ray luminosity L_X at fixed optical luminosity L_B than do Es; 2) at fixed L_B the X-ray brightest galaxies are also the roundest; this correlation holds for both morphological subsets of Es and S0s. We investigate whether a flat and partially rotationally supported galaxy is expected to host a different gas flow phase (and so a largely different amount of hot gas) with respect to a spherical pressure supported galaxy of the same L_B. This is accomplished using the global energetic balance of the hot gas flows, and axisymmetric two-component galaxy models (Ciotti and Pellegrini 1995).

It results that, for a general stellar system, the critical variations in the energy budget can be produced only by a change in the galaxy structure, not by rotation, independently of the problem of the unknown amount of thermalization of the ordered stellar motions. Reasonable flattenings at fixed L_B can make the gas less bound, even when the central stellar velocity dispersion is comparable to or higher than that of the round galaxy.

References

Eskridge, P., Fabbiano, G., and Kim, D.W., (1995), *Ap. J. Suppl. Ser.*, **442**, 523
Ciotti, L., and Pellegrini, S., 1995, submitted to *M.N.R.A.S.*