ON THE DIFFERENCE IN FORMATION HISTORY BETWEEN BULGES AND ELLIPTICALS

B.ROCCA-VOLMERANGE[1], O.K.SIL'CHENKO[2]

[1] *Institut d'Astrophysique de Paris, 98bis Boulevard Arago, F-75014,Paris.*
[2] *Sternberg Astronomical Institute, University av. 13, 119899 Moscow.*

Abstract. On the diagram (Fe5270, Mg5175) ellipticals and bulges of disk galaxies (from S0 to Sc) maintain a very different position: E's seem to be overabundant in Mg, bulges seem to have a solar ratio Mg/Fe, except several ones who are overabundant in Fe.

Key words: Galaxies - Chemical evolution - Evolutionary synthesis

Recently Faber et al.[1] have claimed that on the diagram ($Fe5270$, Mg_2) evolutionary models with different ages and metallicities represent a common sequence, according with galactic globular clusters as well. But most ellipticals seem to be shifted to the right from this sequence so being enriched in magnesium relative to Fe.

We have checked this conclusion with our models [3] and observations [4,5]. Indeed, on the diagram ($Fe5270$, $Mg5175$) all the models with solar metallicities, but with different ages and star formation histories, represent an universal sequence which is in accordance with some galactic globular clusters; and some ellipticals of various luminosities (a compact dwarf NGC 4486B among them) are shifted to the right (Fig.1). So, we have confirmed the Mg overabundance in a significant part of ellipticals.

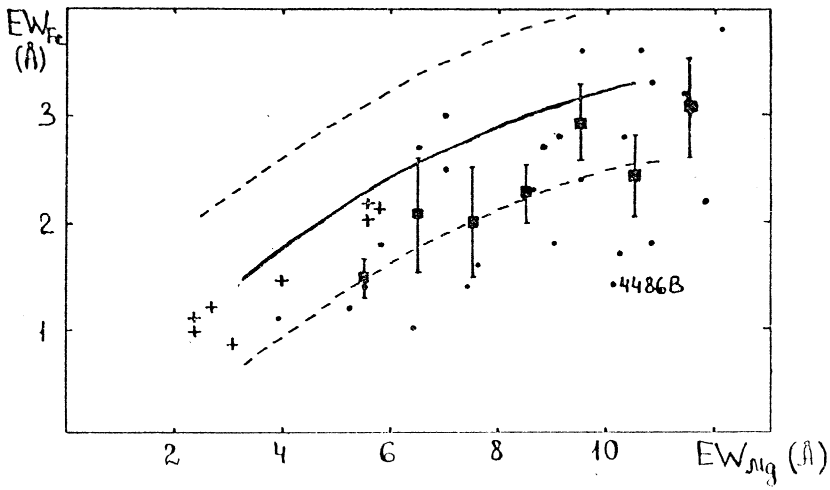

Fig. 1. The diagram (Fe5270, Mg5175) for the ellipticals: the solid line represent the theoretical sequence for varying age and star formation history, crosses – galactic globular clusters, dashed lines roughly mark the range in EW_{Fe} "theoretical sequence+/-one observational mean error", dots – observational data for galaxies, squares – the averaged values for each one-angstrom EW_{Mg} interval.

H. Dejonghe and H. J. Habing (eds.), Galactic Bulges, 431–432.

But when we compare the location of bulges of disk galaxies (from S0 to Sc) with the theoretical sequence, we see that the most bulges follow the sequence very well, with the dispersion fully explained by our observational equivalent width accuracy (Fig.2). Moreover, few galaxies (among them 4 S0–Sa galaxies from the nearby Leo group – NGC 3368, 3384, 3412, 3489) in a very narrow range of EW_{Mg} – from 5 to 6 A – have significantly stronger Fe–lines, than the bulk of galaxies, and not only $Fe5270$, but also $Fe4383$ and $Fe4528$. So, for some bulges we establish a Fe overabundance relative to Mg.

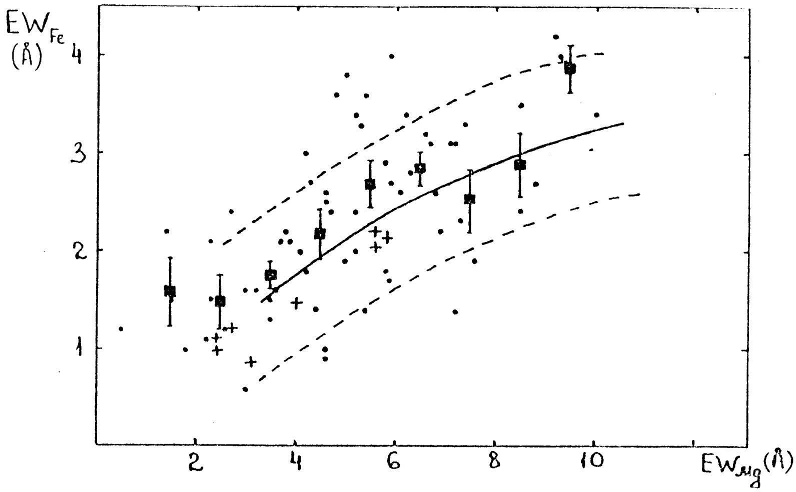

Fig. 2. The same as Fig.1, but for the bulges of disk galaxies.

The above mentioned difference between bulges and ellipticals may be explained as a difference of their star formation histories. For more detailed hypotheses on ellipticals – see [1]. Here we briefly summarize. There may be a difference in early Initial Mass Function (IMF) – in the sense that in ellipticals the IMF must be enriched in massive stars, and in Fe–overabundant bulges the IMF must have a lower upper limit. The second, even more attractive possibility is to utilize the time delay for the Fe production keeping in mind that Mg is produced by SNII, and Fe – by SNIa. If most ellipticals have only one initial star formation burst rather short to give stars with a lot of magnesium but without a bulk of Fe; and if some bulges have several star formation bursts with an interval of some billion years between them – we would obtain a Mg overabundance for the first [1] and Fe overabundance for the latter [2].

References

[1] Faber, S.M., Worthey, G., Gonzalez, J.J., 1991. In *Stellar Populations of Galaxies*, IAU Symposium 149, Eds. B.Barbuy & A.Renzini (Dordrecht: Kluwer), p.255.

[2] Gilmore, G., & Wyse, R.F.G., 1991. *Astrophys. J.*, **367**, L55.

[3] Guiderdoni, B., & Rocca–Volmerange, B., 1987. *Astron. Astrophys.*, **186**, 1.

[4] Sil'chenko, O.K., & Shapovalova, A.I., 1989. *Soobshch. Spets. Astrofiz. Obs.*, No.60, 44, or *Preprint SAO RAS* No.37.

[5] Sil'chenko, O.K., 1990. *Soobshch. Spets. Astrofiz. Obs.*, No.65, 75, or *Preprint SAO RAS* No.42.