This conclusion may apply only to I Zw 18 among the known compact galaxies. Lequeux and Viallefond would propose that other galaxies, such as II Zw 70–71, which are more complex, rotating, and which have had time to become relaxed systems, are older than I Zw 18.

4.3. The Primordial Helium Abundance

Let us denote by Y the fractional helium abundance by mass. A comparison between the helium and the metal content implies that the corresponding galactic enrichments ΔY and ΔZ are proportional: $\Delta Y = \alpha\, \Delta Z$ with $\alpha \approx 3$. Again such a high value for α can only be reproduced in models of chemical evolution involving important stellar mass loss. Without mass loss, the α coefficient would only be at most 0.5 to 0.1. This can be easily understood if one recalls that helium can be reproduced by low-mass stars, while in massive stars the metal enrichment increases more than the helium enrichment.

Recent studies have been devoted to the determination of the primordial helium abundance by extrapolating Y to $Z = 0$. Lequeux et al. (1979: *Astronomy and Astrophysics*, **80,** 155) and, more recently, Kunth and Sargent (1981: in preparation), on a wider sample of blue compact galaxies, have discussed this relation (Y, Z), out of which the "primordial" value seems to converge to about $Y_p = 0.235 \pm 0.010$ with the value quoted above, and by adopting the canonical[1] Big Bang theory to account for the early phases of the Universe, one can deduce an upper limit for the present density of the Universe $\varrho \leqslant$ 3–5 10^{-31} g cm^{-2} (see e.g. Yang et al. 1979: *Astrophysical Journal,* **227,** 697).

Therefore, the Universe is expanding for ever (it is open!); the primordial nucleosynthesis is able to account for the observed abundances of deuterium. Moreover, it provides a quite strict limit on the number of possible different families of leptons, which should be $\leqslant 3$. If the discovery of the tau lepton is confirmed, one should not find any new type of leptons unless the canonical Big Bang models do not apply. From such conclusions, the observations of the blue compact galaxies are of prime importance in cosmology.

5. Conclusion

Significant progress has been made on this class of quite unevolved galaxies.

(i) their primordial content of helium now seems to be well established $Y = 0.233$ and is consistent with an open Universe, a canonical Big Bang model and no unknown type of leptons.

(ii) The helium over metal enrichment is about 3 and seems to indicate that the stellar mass loss plays an important role in fixing this ratio at this value.

(iii) The blue compact galaxies are quite unevolved: one galaxy, I Zw 18, has an oxygen abundance about 40 times lower than the solar value. They are well described by the simple models with instant recycling approximation. This means that their primordial metallicity might have been equal to zero. The value of the yield, deduced from the comparison of the metallicity with the gas content, implies that stellar mass losses should operate. Moreover, there is a correlation between the metallicity and the total mass of these galaxies, for which nitrogen appears to be partially secondary.

(iv) These objects have very different morphological aspects although they have rather low masses, high intrinsic luminosities, conspicuous hot H II regions and blue colours. Some of them are isolated, while a few others, like II Zw 70, belong to interactive systems. One of the most intriguing object is I Zw 18, which seems to be made of several interacting debris which have just experienced a very recent burst of star formation. The differences between some of the blue compact galaxies might come from the time when the bursts of star formation occurred.

The advent of forthcoming UV missions, like the space telescope or the post IUE projects, will obviously reveal more characteristics of these very important galaxies: their actual nature and why their rate of star formation is sudden rather than continuous. It would allow better determinations of mass loss effects, and measurements of the composition in carbon. As it has been seen for I Zw 18, the far UV luminosity provides some information on the occurrence of the stellar bursts. Moreover, if (as it is expected in UV projects like Magellan) the 900–1100 Å wavelength is observable, a direct measurement of the deuterium abundance in such unevolved objects would be of utmost interest for cosmological models.

[1] In such models one assumes that:
(i) the early Universe was homogeneous and isotropic,
(ii) there was no significant amount of antimatter,
(iii) General Relativity accounts well for the gravitational interactions,
(iv) the leptons are non degenerated,
(v) there were no unknown elementary particles, and
(vi) the early phases of the Universe were dense and hot ($T > 10^{11}$ K)

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