

JOINT DISCUSSION NO. 2

EVOLUTION IN OLD STELLAR POPULATIONS IN GALAXIES

(Commissions 25, 28, 29, 33, 34, 35, 37, 45, 47)

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THE CONCEPT OF OLD STELLAR POPULATIONS

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Almost 25 years ago Walter Baade told the Vatican conference about the meaning of stellar populations:

"We also understand now why the two stellar populations, either singly or combined, are such conspicuous features in most galaxies. They are age groups which represent two significant phases of the star formation in galaxies."

There appeared a straight-forward picture with an old, metal-poor halo containing stars in elongated galactic orbits and a younger disk population, where the stars have near solar abundances and near circular orbits. The central bulge of the galaxy was considered part of the older system.

New observations have made the picture more complex and also more controversial, indicating that it still might not be fully understood. Stars in the bulge of our spiral galaxy have been shown to have rather high contents of heavy elements. The gas and perhaps also the stars of the disk show a metal content that is decreasing outwards in the disk. The abundances in globular clusters differ widely between individual clusters and even between individual stars of the same cluster. It has become clear that one must discuss separately the different heavy elements; that some abundances may be considered primordial and thus characteristic of the evolution of the stellar population, whereas other abundance differences may be caused by mixing into the stellar envelopes.

Much of the fundamental knowledge about stellar ages and constitutions comes from the study of stars in clusters; globular clusters are in our galaxy the prime example of the old Population II, while open clusters range in age from rather old to very young. Possibly, halo stars and stars in globular clusters can give us some information on the physical conditions when our galaxy was being formed. There have recently been attempts (Bond, 1981) to locate the evasive Population III, stars formed from a gas which had not yet been enriched in heavy elements

by processes of stellar evolution. Are such stars present in our galaxy? Are there reasons why they should not be present?

Several of the topics for today's reviews have been subject of recent controversy. Hopefully we shall be educated on the state of the abundance scale for the globular clusters, maybe we shall learn more about the populations in the nuclei of galaxies and I certainly look forward to hearing a lot about disk evolution in galaxies.

I hope that today's discussion will show that observations may solve some of the present problems, illuminate others and create still others. I also hope that the discussion will throw new light on the evolution of galaxies as such and possibly also specify some of the restraints for realistic cosmological models.

The three sessions will treat haloes of galaxies, nuclei of galaxies and disks of galaxies. Chairmen will be Father Martin McCarthy, Dr John Graham and Professor Bengt Westerlund. Each session will consist of invited reviews followed by an open discussion of half-an-hour duration. Note that there will be no discussion between the individual reviews of each session.

I will hand over to the first session chairman, Father Martin McCarthy.

REFERENCES

- Baade, W.: 1958, Galaxies and their stellar populations. In O'Connell, Stellar Populations; Vatican Observatory, p. 1.
Bond, H.: 1981, Where is Population III? *Astrophys. J.* 248, 606.