ASTROPHYSICAL IMPACT OF ABUNDANCES IN GLOBULAR CLUSTER STARS

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Scientific Organizing Committee

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FOREWORD

Globular Clusters (GCs) are a basic tool for a number of important astrophysical problems (stellar formation and evolution, stellar populations in the galaxies, cosmology). New observations are allowing detailed comparison between the properties of the stars in GCs and those of population II stars in the field, a comparison necessary to obtain the main clusters parameters (distance and age) and, in the end, to use GCs as probes of the properties of galaxies.

We proposed to hold an IAU Joint Discussion on the chemistry of GC stars: important progresses were made in this field in the last few years, thanks to spectroscopic observations at very large telescopes. Our aim was to give an updated overview of both observations and theory, giving insight into these two main areas:

1) the early chemical evolution of GCs: we are progressing in the knowledge of the mechanism(s) of formation of GCs, on the role of self-enrichment, and possible pollution within the clusters. The observations go side by side with better understanding of detailed stellar evolution, for the whole mass range from the massive stars exploding as supernovae (at the basis of the heavy elements abundances of the gas forming the cluster stars) to the intermediate mass stars evolving along the Asymptotic Giant Branch (possibly contributing to pollution), down to the low mass stars presently evolving.

2) the physical processes which affect the surface chemistry of low mass stars: observations of main sequence stars in GCs provide new tests on the efficiency of microscopic diffusion of light elements and metals (which has an impact on the age determination), while extensive samples of red giants reveal the presence of rare but significant objects with peculiar chemical composition, to be explained.

The program was built up around the following topics:

1) Observational results, and the emerging patterns, with a focus also in the reliability of abundance determinations. In this context, the effects of possible errors in the abundance determinations, deriving from the assumptions made on the modelling of the stellar atmosphere have been discussed in a general discussion, chaired by Beatriz Barbuy.

2) Models relevant to the chemical patterns: the role of supernovae, the explosive nucleosynthesis of massive stars, the quiet nucleosynthesis in AGB stars and binary evolution in the determination of the chemical abundances of GCs, and of the abundance spreads, were discussed.

3) Physical processes and surface chemistry: In addition to the possible pollution which is tentatively attributed to the evolution of AGB stars, there are other physical processes which must be examined. Abundances in main sequence stars and constrain the role of atomic diffusion and radiative accelerations, while abundances in red giants constrain 'standard' and non standard mixing processes. The puzzle of the lithium abundance has also been put forward. A second general discussion on these themes has been chaired by Don Vandenberg.

4) Formation and early evolution of Globular Clusters. This section included specific talks on the formation of Globular Clusters and on the observations which lead to believe either in 'pollution' of the primordial gas or stars, or in a 'self-pollution' consisting directly in a second stellar generation formed in the cluster from the ejecta of massive AGB stars. The second point of view resulted the most favourite for many participants (including the writers), although this star formation stage and its modalities are still not clear. A third General Discussion on these topics was chaired by R. Cayrel.

The meeting was extremely successfull, both as number of participants (about 100, with peaks up to 150 for some presentations) and for the lively discussions. We think we have accomplished a good job, and everybody returned home full of ideas... and work to do.

We wish to thank the Scientific Organizing Committee, which worked a lot in the months preceeding the meeting, and contributed to the JD in any requested way; and the Local Organizing Committee for a smooth run of the JD.

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