PROFILE OF A KEY PROGRAMME

Coordinated Investigation of Selected Regions in the Magellanic Clouds

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The greatly enhanced observational possibilities for research in the Magellanic Clouds, such as bigger telescopes and the CCD as detector, has led the way to studies hitherto unimagined. The possibility to reach 60 kpc distant stars of fifth absolute magnitude (i.e. down to main-sequence stars fainter than the Sun) or to obtain stellar spectra to do a fine-analysis of atmospheric temperature and composition has mightily raised the importance of the astrophysical laboratory called Magellanic Clouds. In particular the study of the intricately interwoven processes of formation of stars from progenitor gas clouds and the evolution of stellar complexes can in our times superbly be investigated by observing the Magellanic Cloud constituents.

However, in spite of all new possibilities, correlation of the individual achievements does only slowly provide deeper insight into the history and evolution of the Magellanic Clouds. The practical reason for that is that most programmes have accumulated moderate amounts of data aimed at a limited scientific goal. The net effect has been that intrinsically valuable building blocks for structural understanding could not be fitted together, e.g. because they came from disjunct regions of the Magellanic Clouds.

Research on the Magellanic Clouds has been fairly strong in Europe but was mostly based in separate institutes. We are much obliged to Dr. H. van der Laan for inviting those of us who had indicated their interest to intensify Magellanic Cloud investigations under the Key Programme scheme to München. As Dr. van der Laan mentioned in his account of the beginnings of the Key Programme process (1988, *The Messenger* No. 55), we met upon his invitation in September and explored the directions of our research. It soon became obvious that what each of the participating groups had in mind would benefit greatly from the results to be obtained by the other groups, and it was realized that joining forces would enhance the value of each individual project.

Our coordinated programme aims at obtaining a deeper insight into the stellar populations of the Magellanic Clouds by addressing the history of the various star types in relation with spatial structure. The road to this lofty goal will be marched in parallel by our groups, with observational programmes as follows. We have defined 6 regions in the Magellanic Clouds (4 in the LMC, 2 in the SMC) in which a large variety of observational projects will be carried out. These regions have been selected based on both existing knowledge and on the expected returns from the coordinated investigation. They have been defined in such a way that they contain a mixture of young and old field population, are gas-dusty or very clear, and contain young and old clusters. They measure $30' \times 30'$ and comprise the field of NGC 330 and N 27 in the SMC and fields containing NGC 1818, N 159, NGC 1978 and N 49, and SN 1987 A in the LMC. In all they cover less than 1 % of the Magellanic Clouds.

In each of the 6 regions spectroscopic surveys will be completed to classify stars down to approximately 15th magnitude. This will account for the more massive stars in the regions. Furthermore, faint Planetary Nebulae and HII regions will be searched for. In two small fields (with a size of about 6 CCD frames) within each region, CCD photometry in many colours will be obtained to as faint a limit as possible in order to investigate the nature and mass function of the stars over a large range of masses.

The aspects of chemical and structural evolution are addressed with spectroscopy at high dispersion. The luminous hot and cool stars of the field as well as of clusters will provide metal abundances. Related information will come from the analysis of emission lines from emission-line nebulae. HII regions and SNR will show abundances of the present, while the analysis of Planetary Nebulae will result in abundances from a past epoch. Very important is the measurement of interstellar absorption lines. On the one hand, they will provide additional information on the abundances in the Magellanic Cloud interstellar medium, while the strength of the various absorption components will give insight into the depth structure, in particular one related to the information from radio lines, such as HI 21-cm and CO from the ESO SEST Magellanic Cloud survey.

The end product of the programme will be a coherent body of data on stellar populations, chemical composition, and spatial structure, showing likely similarities as well as differences between the defined regions. Data of this kind will allow us and others to gain insight into the history of star formation and structural evolution of the Magellanic Clouds.

One aspect of our key programme, we feel, deserves some emphasis in this description. The decision to do coordinated research in a collaborative effort of a large number of groups at different institutes in Europe requires a fairly high degree of organization of time plans and exchanges between the participating groups. We hope that our cooperation at a wide European level will stimulate much intensified contacts between many more research groups in Europe.

Also in view of these aspects it was decided to organize a European Colloquium on "Recent Developments of Magellanic Cloud Research". The colloquium was held in Paris in May this year and aimed at reviewing the progress made since the IAU Symposium of 1983. The proceedings will be distributed by the Observatoire de Paris.