

# Lecture Notes in Physics

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## Atmospheric Diagnostics of Stellar Evolution: Chemical Peculiarity, Mass Loss, and Explosion

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## PREFACE

IAU Colloquium No. 108, *Atmospheric Diagnostics of Stellar Evolution: Chemical Peculiarity, Mass Loss, and Explosion*, was attended by 63 participants from Japan and 65 participants from 20 other countries. In all, 34 invited talks, 32 contributed talks, and 49 poster papers were presented, and the meeting was widely regarded as a great success.

This colloquium was organized with the following original intention: Recent detailed observations and extensive theoretical modeling, both of the stellar atmosphere and the stellar interior, have opened up new possibilities of establishing evolutionary models of the chemical and dynamical behavior of stars that are unified from the central core to the outermost layers. In particular, there is a common interest in the atmospheric phenomena of chemical peculiarities, mass loss, and explosion, all of which are strongly related to the hydrodynamical evolution of the stellar interior. Instead of analyzing these phenomena separately for specific stellar types or masses, we intended to gain a sequential view of the different evolutionary paths of stars of various masses by bringing researchers of different specialities together.

On 23 February 1987, a supernova was observed in the Large Magellanic Cloud. This supernova (SN 1987A) has revealed many new exciting features and provided us with a unique and excellent opportunity to chart the evolution and explosion of massive stars. Our colloquium greatly benefitted from this timely occurrence, and became the first IAU meeting to discuss intensively SN 1987A. In the session on *explosion*, historic underground neutrino observations, ground-based optical observations, and satellite observations of SN 1987A were collected and compared with theoretical models. Among the highlights was the exciting announcement of the detection of x-rays from the supernova, which was much earlier than the theoretical prediction.

The progenitor of SN 1987A was, surprisingly, a B3 supergiant. The mass loss and the change in the surface abundances during the progenitor's evolution were directly related to the discussion of the two other major topics of the colloquium, *chemical peculiarity* and *mass loss*. In these, there were extensive discussions on the interaction between the evolving stellar interior and the atmosphere for various types of stars that exhibit peculiar surface abundances and a loss of mass. Abundance anomalies of He, Li, CNO and s-process elements in main-sequence stars, AGB stars, OB supergiants, Wolf-Rayet stars and interacting binaries were interpreted by the combined effects of diffusion, meridional circulation, convection, and mass loss. Mass loss mechanisms and self-consistent atmospheric models with stellar wind were discussed in the light of new observations over all wave bands for a wide range of stars in the HR diagram.

Every evening, ample time for discussion (and a beer !) was provided, which proved to be very popular among participants. At the banquet, we celebrated the 80th birthday of Yoshio Fujita and his pioneering work on *carbon stars*.

Tokyo

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