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WORKING GROUP ON ABUNDANCES IN RED GIANTS

(GROUPE DE TRAVAIL SUR LES ABONDANCES DANS LES GÉANTES ROUGES)

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1. Formation of WG

This WG was formed in 2001 to concentrate specifically on red-giant abundances, which was one aspect of the previous WG on Peculiar Red Giants. With the development of abundance insights from analysis of pre-solar grains and the continued puzzles presented by globular cluster stars, it was thought that a WG specifically dedicated to red-giant abundances was timely. In addition, the ongoing puzzles of post-AGB stars, planetary nebulae compositions, mass-exchange binaries (with AGB descendants) and the Galactic chemical evolution of s-process elements as well as light elements (from CNO isotopes through to Si and beyond) requires a more quantitative understanding of the stellar yields from red-giants. Inspired by recent observations of very low metallicity objects, the independent determination of r-process residuals from the s-process occurring in AGB stars also makes these stars of key interest to better infer the nature of explosive nucleosynthesis in more massive objects.

2. Organisation of WG

The WG has 10 members, and we have established a WWW page with news and links to relevant databases (see `http://www.maths.monash.edu.au/~johnl/wgarg/`). We have also established a mailing list of over 30 names (and growing).

3. Meetings

The main activity of the WG during the past year was the preparation of a proposal for a Symposium entitled "Astrophysics from the Shoulders of Red Giants", which we proposed to be held at the IAU-GA in Sydney in 2003. Although our proposal was not selected, we are now exploring possibilities for a meeting in 2004. At the GA, this WG is involved in the planning for JD4 on "Astrophysical Impact of Abundances in Globular Cluster Stars" (our Chair is on the SOC). We are also involved in a workshop on astrophysics with pre-solar grains, to take place in Australia in December, 2002.

4. Scientific Developments

4.1. Globular Clusters

Large telescopes (see below) are enabling abundance analyses in globular cluster stars below the giant branch, and in many cases the observed anti-correlations seen on the giant branch are present at much lower luminosities as well. This argues strongly for a pollution mechanism and the challenge is to identify unambiguously which elements vary with evolution (C and N are confirmed in some clusters) and to determine the source of the pollution (AGB stars being highly favoured).

4.2. Pre-Solar Grains

The growth of laboratory analysis of pre-solar grains is stimulating much work on detailed nucleosynthesis as well as nucleation and even galactic chemical evolution. This analysis supplements spectroscopy and can also give isotopic information which is often unavailable spectroscopically.

4.3. Mira Models

Abundance analysis is traditionally most difficult for the coolest and most variable of the red giants, such as Mira variables. While this is still the case, good progress has been made toward a more realistic hydrodynamical modeling of the spectrum forming region of such stars. Also hydrostatic modeling has been improved during the period, including progressively more realistic physics and input data.

4.4. High Resolution Spectroscopy

Access to high resolution spectroscopy of faint stars, made possible by large telescopes, is challenging our understanding of internal mechanisms as well as providing valuable information about earlier generations of stars. Data from the VLT high-resolution echelle, and the Phoenix IR high resolution spectrometer on Gemini South, are enabling study of chemical compositions in samples of red giants in extra-galactic systems such as the Magellanic Clouds, the Sagittarius dwarf galaxy, Sculptor, or Carina. These studies probe both internal red giant nucleosynthesis through the CNO isotopic abundances and s-process abundance distributions, as well as using the red giants to study chemical evolution in these other galaxies (such as [O/Fe] versus [Fe/H], or [s-process/Fe] versus [Fe/H]). This will be a very active field over the coming years, as sampling red giants in other galaxies will provide some of the first insights into the details of chemical evolution in other galactic environments.

John Lattanzio
Chair of the Working Group