Preface

The importance of the stratification of chemical elements inside stars, due to atomic diffusion, was recognized as early as the beginning of the 20th century by the pioneers of stellar physics: in his wellknown book "The internal Constitution of Stars", published in 1926, Sir Arthur Eddington already discussed this process in some detail. He predicted chemical differences between stars, which were not observed at that time. From then on, atomic diffusion in stars was nearly forgotten by stellar astronomers. When the first "abundance anomalies" were observed in the so-called "chemically peculiar stars", they were first interpreted in terms of nuclear reactions. Nuclear processes could not however reproduce the details of the observations, which became more and more precise. Some attempts to revive atomic diffusion in order to account for the observations failed (as discussed in this book by Françoise Praderie) until Georges Michaud arrived and, in a fundamental paper published in 1970, pointed out the importance of selective radiation pressure. Many students and confirmed scientists followed working on that subject, and no one doubt, at the present time, that atomic diffusion is responsible for a large part of the abundance variations observed in stars. As presented by George Preston in this book, the number of papers on the subject of diffusion increased drastically after 1970!

Atomic diffusion is now recognized as a "standard process", which must be taken into account in every star, including the Sun. The overall time scales of the abundance variations are related to competing transport processes like convection, turbulence, meridional flows, mass loss, and it strongly depends on the presence of magnetic fields. Helio and asteroseismology came recently as new tools which can be used to test atomic diffusion in several ways.

June 2005 was an excellent date to gather the present knowledge on this subject. The meeting "Element stratification in stars: 40 years of atomic diffusion" was held in honour of Georges Michaud, who turned 65 after 40 years of scientific work, as he began his PhD thesis in Cal Tech in 1965. Many scientists working on these topics joined enthusiastically and presented high quality scientific reviews together with their recent work. The sessions took place in the beautiful site of "Château de Mons", in the south west of France, in a very friendly environment: the "Armagnac country", in the middle of vines!

We are confident that the proceedings of this meeting will become an important tool for students who will go on developing this important subject in the future.

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