

PREFACE

The galactic and extragalactic background radiation components are of major importance in astrophysical studies of a variety of problems related to galactic structure, interstellar matter, the distribution and evolution of galaxies and intergalactic matter, and cosmology. The background radiation is a unique source of information in cases where the source is of a truly diffuse nature, as with scattering and emission by interstellar dust and gas, or where the discrete emission sources are so faint (e.g., very distant galaxies) that they can be observed only by their integrated emission. The galactic and extragalactic background must be discussed together because they are observationally entangled and their proper separation requires a knowledge of both components. The above points are equally valid for the entire electromagnetic spectrum, from gamma rays to long radio waves. Thus, the study of the galactic and extragalactic background radiation is interdisciplinary in its character, and a multiwavelength approach would appear to be dictated by the nature of the topic.

The proper separation of the galactic and extragalactic background components requires a knowledge of both. In addition, the foreground components, i.e., zodiacal light, airglow, and atmospheric scattered light, must be treated carefully. The problems encountered in distinguishing the individual components remind me of the attempt to restore a fresco, painted by an old master a long time ago but then painted over later by another master, and perhaps even by a third. In restoring the fresco, one has to remove the more recent layers of paint, flake by flake, with painstaking care. Our task in disentangling the several components of the light of the night sky is even more difficult, because we want to restore each one of the different layers of the sky as an individual masterpiece of nature. The only exception is the newest painting in glaring colours over the night sky, that is, the artificial light component produced by humanity itself.

The purpose of this Symposium was to review our knowledge of the background radiation over the whole wavelength range of the electromagnetic spectrum from gamma rays to radio waves. However, because of the vast area to be covered, we limited the more detailed treatment of the background radiation to the domain of the optical, ultraviolet, and infrared wavelengths, extending roughly from the Lyman limit up to a few hundred micrometers. In these wave bands, we are dealing with similar theoretical situations and with closely related observational problems, the main one of which is that a generally accepted detection of the extragalactic background radiation in this wavelength domain is still lacking. Further arguments for selecting these wavelength limits are that there have already been several meetings devoted to the microwave and the X-ray background. This Symposium was the first meeting on the galactic and extragalactic background radiation in the UV-to-IR domain.

There now exist strong "background radiation communities" not only in the optical but also in the UV and increasingly so in the IR. Although there have been contacts between these communities, in part via IAU Commission 21 activities, we felt that many people had been working on similar problems in these different wave bands without full knowledge of each other's work. In addition, there has been rapid development in background radiation research in these wavebands, due largely to the use of new space facilities (e.g., *Pioneer 10* and *Pioneer 11*, *IRAS*, and several UV-background experiments). Thus, it was timely to bring researchers together from these various subfields in order to integrate the most recent developments.

The Symposium had its roots in discussions within IAU Commission 21 (Light of the Night Sky). At its meeting during the Delhi General Assembly in 1985, the commission

decided to propose and sponsor such a meeting. The subsequent three-year period turned out to be a particularly favourable one to secure broad support within the IAU for a symposium on this topic; besides Commission 21, five other IAU commissions were prepared to co-sponsor the Symposium. The Scientific Organizing Committee represented a broad range of nationalities and expertise. A meeting of the committee, held during the IAU General Assembly at Baltimore, provided an excellent opportunity to discuss the topics and speakers of the Symposium.

IAU Symposium No. 139 was hosted by the Max-Planck-Institut für Astronomie and was held in Heidelberg on June 12–16, 1989, in the Max-Planck-Haus, a very pleasant conference building of the Max-Planck-Gesellschaft in the new campus area of the University of Heidelberg in Neuenheimer Feld. The Symposium was opened with greetings from the local hosts and the undersigned. Dr. Christoph Leinert, in his words of welcome, compared the appearance of the conference participants with that of a comet in the sky of Heidelberg: some properties they had in common were the brilliance of both phenomena and the fact that each would disappear after a week or so. In his opening address, Professor Guido Münch, Director at the host institute, reviewed the history of astronomy in Heidelberg, describing especially the many activities during the past 25 years or so that are closely related to the topic of the Symposium. We owe many thanks to Professor Hans Elsässer, Managing Director of the host institute, for inviting the Symposium to Heidelberg. Professor Elsässer was, unfortunately, unable to attend the opening session.

There were 132 registered participants from 19 countries. Because of the breadth of the subject and because this was the first international conference on these topics, emphasis was placed on invited reviews and invited papers, which, together with the two conference summaries, numbered 34. About 80 contributed papers were presented, 13 orally and the others as posters. Considerable time was reserved for discussions, which were often very lively.

On Monday evening the participants were guests at a reception given by the Max-Planck-Institut at Königstuhl, and on Tuesday evening a reception by the Mayor of the City of Heidelberg was organized in the historic town hall. Wednesday afternoon was spent either on an excursion to the historic cathedral in Speyer and the Castle Gardens in Schwetzingen or at a wine tasting session combined with a visit to Steinberg Castle. The conference buffet dinner on Thursday evening on a river boat cruising along the beautiful Neckar was a most memorable experience.

Financial support by the IAU, the Deutsche Forschungsgemeinschaft, the Max-Planck Gesellschaft, the Ministerium für Wissenschaft und Kunst Baden-Württemberg, and by several other organizations and companies was essential to the success of the meeting. This was especially true for those contributions which took the form of travel grants to many of the key speakers and young astronomers.

I wish to express my gratitude to the members of the Local Organizing Committee and the Conference Secretariat as well as to other staff of the Max-Planck-Institut für Astronomie, who made superb local arrangements. I am very thankful to all members of the Scientific Organizing Committee who helped to plan and formulate the scientific program. Finally, I most gratefully acknowledge the contribution of Professor Stuart Bowyer and Dr. Christoph Leinert who, assisted by Ms. Brenda Hatfield and other staff members at the Space Sciences Laboratory at Berkeley, accepted the task of editing the Proceedings.

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