

Lecture Notes in Physics

D. Breitschwerdt M. J. Freyberg  
J. Trümper (Eds.)

# The Local Bubble and Beyond

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# Lecture Notes in Physics

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D. Breitschwerdt M. J. Freyberg  
J. Trümper (Eds.)

# The Local Bubble and Beyond

Lyman-Spitzer-Colloquium

Proceedings of the IAU Colloquium No. 166  
Held in Garching, Germany, 21–25 April 1997



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# Preface

The last International Astronomical Union (IAU) Colloquium that was solely dedicated to the physics of the local interstellar medium (LISM) took place in Madison, Wisconsin 4 – 6 June, 1984. The editors of the proceedings (F. Bruhweiler, Y. Kondo, and B. Savage) justified the timeliness of their conference, because “... there has recently been substantial improvement in our knowledge of the local interstellar medium [...] due to the availability of X-ray and ultraviolet observations from space.”

Thirteen years later we are in a similar situation, since now the sensitivity, low background and high spatial resolution of ROSAT and the high spectral resolution capabilities of DXS and EUVE have enabled us to enter a new era of observational and theoretical study of our local environment. Further satellite missions that have revealed new insights and challenged our previous concepts of the LISM are HST, ISO and ULYSSES, as well as a number of small payloads of EUV spectrometers. Also the availability of HIPPARCOS data on distances and proper motions of stellar sources has led to a considerable improvement in absorption line studies. As to ground-based observations, the new Leiden/Dwingeloo Survey has provided an excellent data basis for the absorbing HI column in the northern hemisphere in order to give a more precise interpretation of soft X-ray background observations. It combines good spatial resolution with a large coverage of velocity space ranging from  $-450$  to  $+400$  km/s.

Shadowing experiments, which became possible with the ROSAT PSPC instrument, have taught us that the Local Bubble as the largest coherent structure embedded in the local interstellar medium is not the only contributor to soft X-ray emission in the  $1/4$  keV band. Instead, there can be a sizeable fraction from outside. Thus it seemed quite straightforward to extend our view to what happens “beyond”. In this context we also felt that we had to restate the “Copernican” problem: is the LISM a typical and common place in the Galaxy or is it rather unique? If the former were true, then we might be in the fortunate position of having a laboratory for the study of the interstellar medium just in front of our doorstep. We think that many of us felt like that after the conference, although it goes without saying, that we still need more and better information before we can give a conclusive

answer. Nevertheless, we are quite pleased to state that we have made substantial progress during the past few years.

The idea for this conference came from a meeting on “The Heliosphere in the Local Interstellar Medium” that was organized by the International Space Science Institute (ISSI) at Bern in the fall of 1995. Priscilla Frisch and one of us (DB) were co-chairing a working group on the Local Bubble. We had excellent contributions and lively discussions which were, however, heavily controversial, mainly due to the lack of information on various subjects. Thus, during one of the lunch breaks, together with James Lequeux and John Vallergera, we came to the conclusion that it was time for a full-fledged conference addressing a much wider range of topics. Subsequently, we applied to the IAU and received full support from the commissions 34 (Interstellar Matter), 40 (Radio Astronomy) and 44 (Space and High Energy Astrophysics).

The conference was extremely well attended with about 150 scientists and students from 16 different countries from all over the world. The scientific programme consisted of 24 invited papers, which were divided into review (8) and highlight (14) talks, supplemented by an opening lecture and a conference summary. There were 81 contributed papers, comprising both oral and poster presentations. The latter were displayed for the whole length of the conference and each advertised by one transparency during the meeting. The policy to treat poster and oral contributions as equally as possible was very well received. Hence we do not make any distinction in the proceedings either.

The plenary presentations were grouped into eight sessions with Wednesday afternoon being reserved for our “Discover Munich tour”, which even attracted quite a few locals and continued into the “Bavarian evening” in the Hofbräuhaus. No losses or casualties were reported the next day and most of the participants were present at the conference dinner, which took place in the candle-lit vaults of the traditional 15th century Bavarian restaurant “Altes Hackerhaus”. Despite the free drinks and many after-dinner speeches, all participants reassembled the next morning for the last session.

For the organizers of the conference some of the most remarkable and rewarding experiences were the lively and stimulating discussions throughout the meeting. This enthusiasm and the unbroken high spirits of the participants manifested themselves quite impressively in the spontaneous organization of a “Workshop for Continued Discussion of the Local Bubble” on Friday afternoon, which was convened by Wilt Sanders and attended by more than 50 scientists. A summary by Wilt Sanders and Priscilla Frisch is included in the proceedings. All scientific, social and cultural activities are well documented by photographs and a selection of them can be found scattered throughout the book at the beginning of each part. This was only possible because of the efforts of Petra Nass who was always on the spot to take good pictures.

Shortly before the conference, Lyman Spitzer, who was invited to give the opening lecture, died. There was unanimous agreement between all the

members of the Scientific Organizing Committee, that this conference on the local and general interstellar medium, for the development of which he had been a key figure, should be dedicated to him. We have received the official permission of the president of the IAU, L. Woltjer, to henceforth subtitle IAU Colloquium No. 166 as the *Lyman Spitzer Colloquium*. Lyman Spitzer's outstanding achievements and his warm and friendly personality are commemorated in a short contribution by F.D. Kahn<sup>1</sup> in this volume.

That we live in a hot environment was impressively demonstrated by a fire which broke out shortly before the conference. Despite the high sound speed in such an environment, the information of a complete switch-off of the electricity in the building that hosts the lecture theatre at the Institut für Plasmaphysik (IPP) on Monday morning did not reach the organizers. After some hectic activities, we managed to move to the seminar room at ESO with only half an hour delay. We would like to thank the staff at ESO for their efforts and also the IPP, which otherwise ensured a smooth run of the conference. Our apologies to the participants, who always remained calm and civilized throughout the incident.

Financial support for the meeting was provided by the IAU, whose Assistant General Secretary J. Andersen we would like to thank for his many valuable suggestions and his unbureaucratic help in preparing the meeting. We further acknowledge support by the DFG (Deutsche Forschungsgemeinschaft), the DARA (Deutsche Agentur für Raumfahrt-Angelegenheiten) and the Max-Planck-Institut für extraterrestrische Physik (MPE).

Space does not allow us to thank all the individuals who directly or indirectly contributed to the success of the conference. We would like to express our sincere gratitude to all the staff at MPE, and also to Bernie Tucker and Renate Lange who assisted at the conference desk, and to Dietmar Heise who did all the printing. We are also grateful to Lin Kayser from outside MPE, who spent many hours in designing the conference poster. If everything ran smoothly and efficiently then this was certainly due to the tireless efforts of the Local Organizing Committee. Specifically, we would like to thank Roland Egger, Lynn Falke, and Petra Nass for the many problems they solved so elegantly prior to and during the conference.

We also thank our publisher, Springer-Verlag, for their help and advice during the publication process and, last but not least, all the authors who have, apart from the inevitable exception to the rule, handed in their manuscripts in time and in the desired format. All contributions are *fully refereed* for which we are indebted to the numerous referees who took their job very seriously, as can be judged by the high quality of all the articles. We are also proud to state that we have received all contributions, except for a handful of short papers which were included in a review and a contributed talk.

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<sup>1</sup> While these proceedings were in press, the sad news of Franz Kahn's sudden death had reached us.



## VIII

We hope that the contributions, which are listed in chronological order as they were presented at the conference, will serve as a standard reference on the subject of the local and general interstellar medium for the next couple of years.

Garching, February 1998

D. Breitschwerdt  
M.J. Freyberg  
J.E. Trümper

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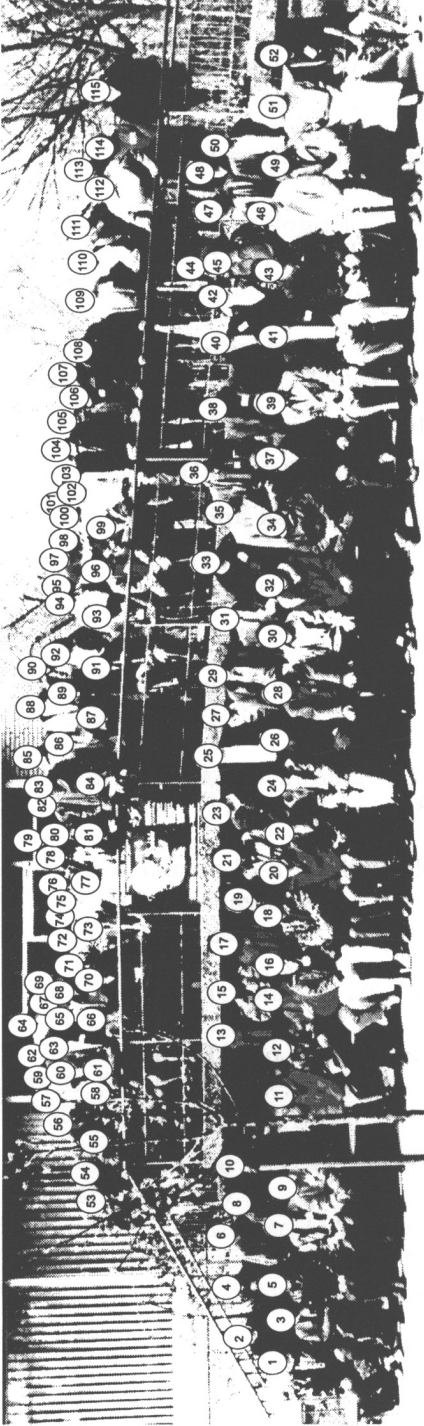
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