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The Diffuse Interstellar Bands: Contributed Papers

Edited by
A. G. G. M. Tielens
Ames Research Center
Moffett Field, California

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Boulder, Colorado
May 16–19, 1994



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PREFACE

On May 16 through 19 1994, a conference on *The Diffuse Interstellar Bands* was held at the University of Colorado, Boulder, Colorado. This conference was made possible by a generous grant from the Astronomy and Relativity Branch of the National Aeronautics and Space Agency. We are also particularly grateful to the support and services rendered by the dedicated staff at NASA Ames Research Center and at the Center for Astrophysics and Space Astronomy without whom this conference would not have been possible.

The discovery of visible diffuse absorption bands in stellar spectra dates back to the pioneering years of stellar spectroscopy. The interstellar origin of four bands at λ 5780, 5797, 6284, and 6614 was already recognized by Paul Merrill in the thirties. Since this early work, the list of Diffuse Interstellar Bands, or DIBs, has grown steadily over the years. These bands appear to be a widespread and a general characteristic of the diffuse interstellar medium. Hence, its carrier(s) should be an ubiquitous component of the interstellar medium. In spite of this, the agent(s) responsible remain unknown. This is not for want of trying. Many carriers have been proposed over the years for these absorption bands. Hitherto, none has withstood general scrutiny. However, this situation may now be changing due to advances in optical techniques (i.e., the widespread availability of CCD arrays), in laboratory studies of astrophysically relevant materials, and in our general understanding of the interstellar medium.

The major goal of this conference was to draw a coherent picture of the observational characteristics of the DIBs and the physical and chemical properties of its proposed carriers. Currently, partly because of the rapid advances, no observational summary is available. Except for those directly involved in the observations, many scientists have therefore ill-defined concepts of the observational properties of the DIBs. Likewise, much experimental data on astrophysically relevant materials is scattered throughout the literature but no overview from a DIB perspective is available. Hence, a major aim of this meeting was to produce conference proceedings which reflect the current situation regarding the DIBs. This book, containing the contributed papers presented at this meeting, represents the first installment. The invited papers will be published separately by Kluwer in the Astrophysics and Space Science Library series.

This conference brought together 70 scientist from 10 different countries. The study of the DIBs is a highly interdisciplinary field where astronomy, physics, and chemistry meet. This is reflected in the varied background of the participants. Besides astronomers involved in observations and/or analysis of the DIBs, chemists and physicists—studying proposed carriers spectroscopically—were active participants. Hopefully, this encounter in Boulder will foster an ongoing, probing dialogue between these scientists with diverse backgrounds but a common interest in the DIBs. In this way, fundamental progress can be expected to be made towards the solution of this problem.

By all accounts the conference was a great success. This was due in large measure to the high level of dedication and commitment of the Local Organizing Committee. In particular, we are very grateful to Ted Snow who smilingly accepted the organizing chores, well knowing the heavy load. I also like to single out Janice Varney of the Experimental Astrophysics Branch, NASA Ames Research

Center, who took care of many of the secretarial duties involved in the organization of this conference. On behalf of all the participants, I thank them for their outstanding efforts.

A. G. G. M. Tielens
[Chairman SOC]

Moffett Field, California, June 1994

SCIENTIFIC ORGANIZING COMMITTEE

H. J. Habing (The Netherlands)

Th. Henning (Germany)

J. Krelowski (Poland)

S. Leach (France)

P. Martin (Canada)

T. Onaka (Japan)

W. B. Somerville (UK)

T. P. Snow (U.S.)

A. G. G. M. Tielens (U.S.)

SCHEDULE

Monday May 16th

Morning

Session 1

DIBs Observational Characteristics

8:30-8:45		Welcome
8:45-9:15	W.H. Smith	Historical and Interdisciplinary Perspectives
9:15-10:15	J. Krelowski	DIBs in individual sightlines
10:15-10:45		<u>coffee break</u>
10:45-11:15	P. Sarre	Ultrahigh resolution spectroscopy of DIBs
11:15-11:45	S. Fossey	DIBs towards southern stars

Afternoon

1:30-2:00	P. Jenniskens	A DIB survey
2:00-2:30	J. Cardelli	DIBs in the UV
2:30-3:00	B. Foing	DIBs in the IR
3:00-3:30		<u>coffee break</u>
3:30-4:10	P. Martin	Interstellar Polarization
4:10-4:40	A. Adamson	Spectropolarimetry of DIBs in HD 197770
4:40-6:00		Poster session

Tuesday May 17th

Morning

Session 2

The collective behavior of DIBs

8:30-9:30	B. Somerville	Collective behavior of the DIBs
9:30-10:00	X. Desert	DIBs and the UV extinction curve
10:00-10:30		<u>coffee break</u>
10:30-11:00	Ehrenfreund	The environment dependence of DIBs
11:00-11:30	W. Pfau	DIBs in the young galactic clusters M16 and M17
11:30-12:00	I. Porceddu	A DIBs and related data hypertextual atlas

Afternoon

1:30-2:00	G. Seab	DIBs and circumstellar shells
2:00-2:30	P. Sarre	Red Rectangle emission bands
2:30-3:00	A. Witt	HAC and the ERE
3:00-3:30		<u>coffee break</u>
3:30-4:00	C. Joblin	Visible luminescence from PAHs and Diffuse Bands in emission
4:00-4:30	D. Rouan	Carrier of the DIBs in the Red Rectangle: constraints on molecular size
4:30-6:00		Poster session

Wednesday May 18th

Morning

Session 3

Laboratory Studies of Proposed Carriers

8:30-9:30	Allamandola	Laboratory studies of DIB carriers
9:30-10:00	J. Maier	Laboratory studies of unsaturated hydrocarbons and the DIBs
10:00-10:30		<u>coffee break</u>
10:30-11:00	F. Salama	UV, visible and NIR absorption spectroscopy of neutral and ionized PAHs
11:00-11:30	d'Hendecourt	Towards the identification of the (single) carrier of the 4430 and 7564Å DIBs
11:30-12:00	B. Donn	A critical assesment of the PAH hypothesis revisited

Afternoon

1:30-2:00	P. Boissel	Photofragmentation of trapped ions towards spectroscopy of truly isolated species
2:00-2:30	B. Rowe	Experimental studies of naphthalene and anthracene reactions
2:30-3:00		<u>coffee break</u>

Session 4

DIBs and Interstellar Dust

3:00-4:00	J. Mathis	DIBs and Interstellar Dust
4:00-4:30	P. Shapiro	Grain carriers and DIB profiles
4:30-5:00	P. Martin	Polarization observations of the 2175Å band

Thursday May 19th

Morning

Session 5

Theoretical Studies of Molecular Carriers

8:30-9:10	S. Leach	Molecular carriers of the DIBs
9:10-9:40	E. Herbst	large molecules in the ISM
9:40-10:00	E. Bakes	Charge variations of PAHs in the ISM

10:00-10:30 coffee break

Session 6

Proposed Carriers

10:30-11:30	T. Snow	Observational characteristics of the DIBs
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Afternoon

1:00-1:20	W. Duley	DIB carriers on grain surfaces
1:20-1:40	F. Johnson	Porphyrins and the DIBs
1:40-2:00	A. Leger	PAHs and the DIBs
2:00-2:20	P. Thaddeus	Carbon chains and the DIBs
2:20-2:40	A. Webster	Fullerenes and the DIBs

2:40-3:10 coffee break

3:10-4:10 Panel Discussion

4:10-4:30	A. Tielens	Summary
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OBSERVATIONS OF DIFFUSE INTERSTELLAR BANDS