

A BIBLIOGRAPHY OF PAPERS ON THE DIFFUSE INTERSTELLAR BANDS

THEODORE P. SNOW

SUSAN BARNES

MARIBETH HEITZMANN

Center for Astrophysics and Space Astronomy, University of Colorado

ABSTRACT. We present a compilation of publications on the diffuse interstellar bands, found in the literature dating back to the first known mention of the bands. We have attempted to make this list complete, but recognize that some papers may have eluded us. Judgement was required in some cases where the diffuse bands are mentioned but are not a central theme of a paper; in most instances we kept such papers in our list, rather than omitting them.

1. INTRODUCTION

The diffuse interstellar bands have been largely a curiosity, as opposed to a legitimate area of astrophysical research, for most of the more than 70 years since they were first mentioned in the literature (Heger 1922). Only in the past thirty years or so have the features begun to attract serious attention, and only in the past decade or less has the problem of their identification become recognized as potentially important for other areas of astrophysics or chemistry.

The recent conference on the diffuse interstellar bands, held in Boulder, Colorado, May 16-19, 1994, provided an opportunity for researchers interested in the diffuse band problem to come together and compare data and hypotheses. Through this interaction, and through the observation that many scientists, particularly chemists, are now becoming active in diffuse band research but lack a broad background in the astronomical literature on the diffuse bands, it appears useful to provide an updated and complete bibliography of publications in which the diffuse bands are discussed. This paper is an attempt to provide such a bibliography.

2. SELECTION OF REFERENCES

In choosing papers to be included in the bibliography, we necessarily had to be somewhat subjective, particularly when considering papers that make only passing references to the diffuse bands, as opposed to those devoted to the bands as their primary topic. In general we tended to err on the side of inclusion of a paper when in doubt, with the result that some of the papers in the list are aimed at quite different objectives than solving the diffuse band problem. But all of the papers listed do include some mention or discussion of the features. Some of the older papers listed

have only minor mention of the diffuse bands, but in many cases these are very interesting and significant, nevertheless. For example, Henry Norris Russell (1935) devotes only a sentence or two to the diffuse bands in his treatise on astronomical spectroscopy, but is later credited by people such as Swings (1937) for the assertion that the source of the bands must be molecular. Similarly, Herbig (1966), in a paper on FU Orionis, mentions the diffuse bands in the context of their weakness relative to extinction; this may be the first statement in the literature pointing out that the diffuse bands are not seen in circumstellar environments, something that was rediscovered by Snow and Wallerstein (1972) a few years later.

The first known reference to the diffuse bands in the literature is that of Heger (1922), who lists the 5780 and 5797Å bands as possibly stationary. This mention appears in a table of stellar spectral features. Heger also cites an earlier paper on the Wolf-Rayet star γ^2 Velorum as showing dark lines that coincide approximately with these two bands, so it might be tempting to cite this paper (in 1897, in the *Annals of the Harvard College Observatory*) as the true first reference to the diffuse bands. But according to Herbig (1994; private communication), who has reviewed the 1897 paper, the dark bands seen in the spectrum of γ^2 Velorum are actually due to the complex structure of the stellar emission lines, and are not diffuse interstellar bands. Therefore, unless something further is brought to our attention, we conclude that the 1922 paper by Heger represents the first mention in the literature of the diffuse interstellar bands.

In our listing we have excluded papers that discuss the 2175Å ultraviolet extinction bump (unless they also mention the diffuse bands), on the grounds that this feature is generally considered to be a distinct phenomenon, and that there is now a growing consensus that the UV feature and the diffuse bands arise from different sources (see the paper by Mathis in the Proceedings of the Diffuse Interstellar Bands conference, to appear in 1995). Similarly, we have excluded papers on such candidate species as polycyclic aromatic hydrocarbons (PAHs) and fullerenes such as C₆₀, unless they specifically include discussion of the possible role of these molecules as diffuse band carriers.

The citations given below were gleaned from: (1) the reference lists of recent publications on the diffuse bands, and the reference lists of the cited papers, and so on; (2) solicitation of input from attendees at the Diffuse Interstellar Bands conference; (3) the extensive list of references provided to us by George Herbig, taken from his review of the diffuse band problem, soon to be published in *Annual Reviews of Astronomy and Astrophysics*; and (4) the *Astronomy and Astrophysics Abstracts* series, which began in 1969. Nevertheless, notwithstanding our immense efforts to be complete, there is a possibility, if not a certainty, that we have missed some papers that should be included. We are planning to maintain an updated version of this bibliography, and therefore we ask that anyone who has information about references that we have omitted contact us and provide the missing data.

In general we are *not* including papers published by abstract alone, nor are we including doctoral dissertations, on the basis that in both cases the reference is not useful unless the completed study is published in the literature that is generally available. There are a few exceptions to this (i.e. a few cases where abstract citations are included), where the information seemed especially useful or was not available elsewhere. On the other hand, we are including, where available, citations from relatively obscure publications such as various observatory reports or conference proceedings.

In most cases we have included the full title of the paper as well as the literature citation. However, with some of the older papers we were unable to accomplish this before the publication deadline.

ACKNOWLEDGEMENTS.

Following the Boulder conference, in response to a draft version of the bibliography that we circulated there, several participants supplied us with references that we had inadvertently omitted. Among those who helped us in this way were A. N. Witt., P. Jenniskens, C. G. Seab, and W. Pfau. We are also grateful to George Herbig, who made available to us the reference list from his upcoming review of the diffuse interstellar bands (to appear in *Annual Reviews of Astronomy and Astrophysics*). We apologize to anyone whose names we may have inadvertently forgotten to acknowledge.

REFERENCES

1994

1. Adamson, A. J., Kerr, T. H., Whittet, D. C. B., and Duley, W. W., "A Search for the 13 175Å Infrared Diffuse Band in Dense Environments", *M.N.R.A.S.*, **268**, 705.
2. Foing, B. H. and Ehrenfreund, P., "Detection of Two Interstellar Absorption Bands Coincident with Spectral Features of C_{60}^{+} ", *Nature*, **369**, 296.
3. Jenniskens, P., "Very-Broadband-Structure and the Linear Rise in the Extinction Curve", *Astr. Ap.*, **284**, 227.
4. Jenniskens, P., Ehrenfreund, P., and Foing, B., "Diffuse Interstellar Bands in Orion. The Environment Dependence of DIB Strength", *Astr. Ap.*, **281**, 517.
5. Kroto, H., "Fullerene's Faint Fingerprint?", *Nature*, **369**, 274.
6. Tripp, T.M., Cardelli, J.A., and Savage, B.D., "A Weak Diffuse Interstellar Band in the Far-Ultraviolet Spectrum of ζ Ophiuchi?", *Astron. J.*, **107**, 645.

1993

1. Edwards, S.A. and Leach, S., "Simulated Rotational Band Contours of C_{60} and Their Comparison with Some of the Diffuse Interstellar Bands", *Astr. Ap.*, **272**, 533.
2. Fulara, J., Lessen, D., Freivogel, P., and Maier, J.P., "Laboratory Evidence for Highly Unsaturated Hydrocarbons as Carriers of Some of the Diffuse Interstellar Bands", *Nature*, **366**, 439.
3. Herbig, G.H., "The Diffuse Interstellar Bands. IX. Constraints on the Identification", *Ap. J.*, **407**, 142.

4. Jenniskens, P. and Desert, F.X., "Complex Structure in Two Diffuse Interstellar Bands", *Astr. Ap.*, **274**, 465-477.
5. Krelowski, J. and Sneden, C., "Detailed Structures of the Diffuse Interstellar Bands near 5800 and 6150 Å", *P.A.S.P.*, **105**, 1141-1149.
6. Krelowski, J., Snow, T.P., Papaj, J., Seab, C.G., and Wszolek, B., "On the System of Diffuse Interstellar Bands at 5844 and 5850 Å", *Ap. J.*, **419**, 692-697.
7. LeBertre, T. and Lequeux, J., "Diffuse Absorption Bands in the Spectra of Mass-Losing Objects", *Astr. Ap.*, **274**, 909.
8. McIntosh, A. and Webster, A., "The Diffuse Interstellar Bands and the Galactic Latitude", *M.N.R.A.S.*, **261**, L13.
9. Ping, Du., Salama, F., and Loew, G.H., "Theoretical Study of the Electronic Spectra of a Polycyclic Aromatic Hydrocarbon, Naphthalene and Its Derivatives", *Chem. Phys.*, **173**, 421.
10. Snow, T. P., "Interstellar Chemistry: Trail of the Mystery Bands", *Nature*, **366**, 407.
11. Wallerstein, G., Krishaswamy-Gilroy, K., Willson, L.A., and Garnavich, P., "The Spectrum of the Symbiotic Nova AS 296 (=FG Serpentis) from 1988 July to 1992 March", *P.A.S.P.*, **105**, 859.
12. Webster, A., "Large Molecules, Small Radicals and the Diffuse Interstellar Bands", *M.N.R.A.S.*, **265**, 421.
13. Webster, A., "On the Carriers of the Diffuse Interstellar Bands", *M.N.R.A.S.*, **263**, 385.
14. Webster, A., "A Theory of the Diffuse Interstellar Bands", *M.N.R.A.S.*, **262**, 831.

1992

1. Adamson, A.J. and Whittet, D.C.B., "The Interstellar Spectrum of HD 175156", *Observatory*, **112**, 161.
2. Adamson, A.J. and Whittet, D.C.B., "Spectropolarimetry of the 5797 Å Diffuse Interstellar Band", *Ap. J. Lett.*, **398**, L69.
3. Crawford, I.A., "The Interstellar Spectrum of HD 175156", *Observatory*, **112**, 161.
4. Ehrenfreund, P., d'Hendecourt, L., Joblin, C., Leger, A., "Visible Absorption Bands of Coal Pitch Extract-Implications for the Diffuse Interstellar Bands", *Astr. Ap.*, **266**, 429.
5. Ehrenfreund, P., d'Hendecourt, L., Verstraete, L., Leger, A., Schmidt, W., and Defourneau, D., "Search for the 4430 Å DIB in the Spectra of Coronene Cation and Neutral Ovalene", *Astr. Ap.*, **259**, 257.

6. Hare, J.P. and Kroto, H.W., "A Postbuckminsterfullerene View of Carbon in the Galaxy", *Acc. Chem. Res.*, **25**, 106.
7. Krelowski, J., Snow, T.P., Seab, C.G., and Papaj, J., "Spatial Correlation Between CH, CN and the Diffuse Interstellar Band Carriers", *M.N.R.A.S.*, **258**, 693.
8. Kroto, H.W. and Jura, M., "Circumstellar and Interstellar Fullerenes and Their Analogues", *Astr. Ap.*, **263**, 275.
9. Le Bertre, T. and Lequeux, J., "Diffuse Circumstellar Bands in NGC 7027 and IRAS 21282+5050", *Astr. Ap.*, **255**, 288.
10. McIntosh, A. and Webster, A., "A Difference in the Distribution of Two Carriers of Diffuse Interstellar Bands Within the Taurus Dark Clouds", *M.N.R.A.S.*, **255**, 37p.
11. Miles, J.R. and Sarre, P.J., "Chlorin and the Diffuse Interstellar Bands", *J. Chem. Soc. Faraday Trans.*, **88**, 1-75-1076.
12. Parisel, O., Berthier, G., and Ellinger, Y., "New Clues for Ionized Polycyclic Aromatic Hydrocarbons as Possible Carriers of Diffuse Interstellar Bands", *Astr. Ap.*, **266**, L1.
13. Porceddu, I., Benvenuti, P., and Krelowski, J., "Anomalous Extinction and Diffuse Interstellar Bands in the Direction of Two Be Stars", *Astr. Ap.*, **257**, 745.
14. Salama, F. and Allamandola, L.J., "The Ultraviolet and Visible Spectrum of the Polycyclic Aromatic Hydrocarbon $C_{10}H_8^+$: Possible Contributions to the Diffuse Interstellar Bands and to the Ultraviolet-Visible Extinction", *Ap. J.*, **395**, 301.
15. Salama, F. and Allamandola, L.J., "Is a Pyrene-like Molecular Ion the Cause of the 4430 AA Diffuse Interstellar Absorption Band?", *Nature*, **358**, 42.
16. Scarrott, S.M., Watkin, S., Miles, J.R., and Sarre, P.J., "Evidence for a Link Between the More Prominent Optical Emission Bands in the Red Rectangle and Some of the Diffuse Interstellar Absorption Bands", *M.N.R.A.S.*, **255**, 11p.
17. Snow, T. P., "The Transition from Diffuse to Dense Interstellar Clouds", *Australian J. Phys.*, **45**, 543.
18. Snow, T.P., "On Ionized Naphthalene ($C_{10}H_8^+$) as a Carrier of Diffuse Interstellar Bands", *Ap. J.*, **401**, 775.
19. Webster, A., "Fullerenes, Fulleranes, and the Diffuse Interstellar Bands", *M.N.R.A.S.*, **255**, 41p.

1991

1. Adamson, A.J., Whittet, D.C.B., and Duley, W.W., "Diffuse Interstellar Bands in the Taurus Dark Clouds", *M.N.R.A.S.*, **252**, 234.

2. Braga, M., Rosen, A., and Larsson, S., "Electronic Transitions in C₆₀ and Its Ions", *Z. Phys. D, At. Mol. Clusters*, **19**, 435.
3. Braga, M., Larsson, S., Rosen, A., and Volosov, A., "Electronic Transitions in C₆₀. On the Origin of the Strong Interstellar Absorption at 217 nm", *Astr. Ap.*, **245**, 232-238.
4. Ehrenfreund, P., d'Hendecourt, L., Verstraete, L., Leger, A., and Schmidt, W., "Search for the 4430 Å DIB in the Spectrum of Coronene", in *The Astrochemistry of Cosmic Phenomena*, IAU Symp. 150, Campos do Jordao, Brazil, Aug. 3-7, 1991.
5. Fossey, S. J., "Red Rectangle Emission", *Nature*, **353**, 393.
6. Herbig, G.H. and Leka, K.D., "The Diffuse Interstellar Bands. VIII. New Features Between 6000 and 8650 Å", *Ap. J.*, **382**, 193-203.
7. Johnson, F.M., "Lab Spectra of MgTBP and H₂TBP: Assignment of 79 Diffuse Interstellar Bands", *B.A.A.S.*, **23**, 933.
8. Morrell, N., Walborn, N.R., and Fitzpatrick, E.L., "Unidentified Stellar and Interstellar Features Near 4500 Å in O-type Spectra", *P.A.S.P.*, **103**, 341.
9. Porceddu, I., Benvenuti, P., and Krelowski, J., "On the Diffuse Interstellar Bands Around 6200 Å", *Astr. Ap.*, **248**, 188.
10. Sarre, P.J., "Diffuse Bands in Emission", *Nature*, **351**, 356.
11. Sneden, C., Wozczyk, A., and Krelowski, J., "Diffuse-Band Observations Related to the Interstellar Extinction Law", *P.A.S.P.*, **103**, 1005.
12. Snow, T.P. and Seab, C.G., "Diffuse Band Profiles in the Spectrum of HD 29647: Evidence for a Molecular Origin?", *Ap. J.*, **382**, 189-192.

1990

1. Ballester, J.L., Antoniewicz, P.R., and Smoluchowski, R., "Atoms in Carbon Cages as a Source of Interstellar Diffuse Lines", *Ap. J.*, **356**, 507-512.
2. Cossart-Magos, C. and Leach, S., "Polycyclic Aromatic Hydrocarbons as Carriers of the Diffuse Interstellar Bands: Rotational Band Contour Tests", *Astr. Ap.*, **233**, 559.
3. Herbig, G.H., "The Diffuse Interstellar Bands. VII. Search for Diffuse Features in the Absorption Spectrum of Comet P/Halley", *Ap. J.*, **358**, 293.
4. Joblin, C., Maillard, J.P., d'Hendecourt, L., and Leger, A., "Detection of Diffuse Interstellar Bands in the Infrared", *Nature*, **346**, 729.
5. Kizskurno-Koziej, E., "Relationship Between Simple Molecules and Diffuse Interstellar Bands", in *Physics and Composition of Interstellar Matter*, (Bachotek - Poland, June 6-9, 1990).

6. Krätschmer, W., Lamb, L. D., Fostiropoulos, K., and Huffman, D. R., "Solid C₆₀: A New Form of Carbon", *Nature*, **347**, 354.
7. Krelowski, J., "Absorption Spectra of Dark Interstellar Clouds", Nordic-Baltic Astronomy Meeting, Uppsala Univ. (Sweden), Astronomiska Observatoriet, p. 153.
8. Le Bertre, T., "First Evidence of DIB (Diffuse Interstellar Bands) Carriers in the Circumstellar Shell of a Carbon Star", *Messenger (Garch.)*, No. **59**, 46.
9. Le Bertre, T., "Observational Study of CS 776 and of Diffuse Band Carriers in its Circumstellar Environment", *Astr. Ap.*, **236**, 472.
10. Pfau, W., "Diffuse Interstellar Bands and Their Places of Origin", in *Physics and Composition of Interstellar Matter*, (Bachotek - Poland, June 6-9, 1990).
11. Steidel, C.C., Rich, R.M., and McCarthy, J.K., "High-Resolution Observations of SN 1989M: the Interstellar Medium in NGC 4579", *Astron. J.*, **99**, 1476.
12. Torres-Dodgen, A.V., "Red Spectra of the Brightest Stars in Cygnus OB2: Possible Detection of Two New Interstellar Bands", *P.A.S.P.*, **102**, 1406.

1989

1. Benvenuti, P. and Porceddu, I., "Diffuse Absorption Bands and the 2175 AA Feature: Results from a Sample of Galactic Stars", *Astr. Ap.*, **223**, 329.
2. Bolte, M., Saddlemyer, L., Mendes de Oliveira, C., and Hodder, P., "Optical Spectra Near Maximum Light of the Type Ia Supernova 1989B", *P.A.S.P.*, **101**, 921.
3. Cohen, M., Jones, B.F., and Walker, H.J., "Optical Spectroscopy of IRAS Sources with Infrared Emission Bands. II. IRAS 04324+5106, 06114+1745, 20319+3958, and 22539+5758", *Ap. J.*, **341**, 908.
4. Krelowski, J., "Diffuse Interstellar Bands-An Observational Review", *Astr. Nachr.*, **310**, 255-263.
5. Krelowski, J., "Elemental Depletions in Single Interstellar Clouds", *Ap. Space Sci.*, **214**, 304.
6. Krelowski, J., "Diffuse Interstellar Bands - The Unidentified Part of the Interstellar Absorption Spectrum, in *Interstellar Dust*, IAU Symp. 135, eds. L.J. Allamandola and A.G.G.M. Tielens (Dordrecht: Kluwer), p. 67.
7. Krelowski, J. and Wegner, W., "Interstellar Extinction Curves Originated in Single Clouds", *Astr. Nachr.*, **310**, 281.
8. Kroto, H.W., "The Role of Linear and Spheroidal Carbon Molecules in Interstellar Grain Formation", *Ann. Phys.*, **14**, 169.
9. Le Bertre, T., "First Evidence of DIB Carriers in the Circumstellar Shell of a Carbon St", *ESO Messenger*, 46.

10. Niedzielski, A. and Krelowski, J., "Elemental Depletions in Single Interstellar Clouds", *Astr. Ap.*, **214**, 304.
11. Somerville, W.B., "Correlation Properties of Interstellar Dust: Diffuse Interstellar Bands", in *Interstellar Dust*, IAU Symp. 135, L.J. Allamandola and A.G.G.M. Tielens, eds (Dordrecht: Kluwer), 77.
12. Waters, L.B.F.M., Mathlener, E., Trams, N.R., van Hoof, P.A.M., Lamers, H.J.G.L.M., Snow, T.P., Waelkens, C., Seab, C.G., and Stanga, R., "Circumstellar Dust Around HR 4049. A Critical Test for Theories of Interstellar Dust", *Astr. Ap.*, **211**, 208.
13. Westerlund, B.E., "The Diffuse Interstellar Bands", *Rev. Mex. Astr. Astrofis.*, **19**, 39.
14. Westerlund, B.E. and Krelowski, J., "The Division of Diffuse Interstellar Bands into Families", *Astr. Ap.*, **218**, 216.

1988

1. Guarinos, J., "Update of the Catalogue of Diffuse Interstellar Bands by Snow et al. (1977)", *Bull. Inf. Cent. Donnees Stellaires*, 141.
2. Guarinos, J., "Catalog of Diffuse Interstellar Bands of Snow, York, and Welty (Magnetic Tape Version)", *Bull. Inf. Cent. Donnees Stellaires*, No. 35, 161.
3. Herbig, G.H., "The Diffuse Interstellar Bands. VI. New Features Near 6800 Å", *Ap. J.*, **331**, 999.
4. Herzberg, G., "Historical Remarks on the Discovery of Interstellar Molecules", *J. Roy. Astr. S. Canada.*, **82**, 115.
5. Isobe, S., Sasaki, G., and Iwashita, Y., "Galactic Distribution of Interstellar Diffuse Absorption at 4430 Å", *Tokyo Astron. Obs. Repr.*, No. 882.
6. Krelowski, J., "Diffuse Interstellar Bands", *P.A.S.P.*, **100**, 896.
7. Krelowski, J. and Westerlund, B.E., "High-Resolution Profiles of Diffuse Interstellar Bands as Functions of the Structure of the Interstellar Medium", *Astr. Ap.*, **190**, 339.
8. Leger, A., d'Hendecourt, L., Verstraete, L., and Schmidt, W., "Remarkable Candidates for the Carrier of the Diffuse Interstellar Bands: C_{60}^+ and Other Polyhedral Carbon Ions", *Astr. Ap.*, **203**, 145.
9. McNally, D., "The Diffuse Interstellar Lines", *Vistas in Astronomy*, **31**, 515 (= *Proc. Fourth Asian-Pacific Regional Meeting of the IAU*, eds. J. B. Hearnshaw and Zhang Ehre [Oxford: Pergamon]).
10. Somerville, W.G., "Diffuse Interstellar Bands and Cloud Density", *M.N.R.A.S.*, **234**, 655.
11. Westerlund, B. E. and Krelowski, J., "A High Resolution Study of Diffuse Interstellar Bands", *Pub. Astron. Inst. Czech. Acad. Sci.*, No. 169, 231.

12. Westerlund, B.E. and Krelowski, J., "The Structure of the Diffuse Interstellar Bands", *Astr. Ap.*, **189**, 221.
13. Westerlund, B.E. and Krelowski, J., "The Intrinsic Profiles of Five Diffuse Interstellar Bands", *Astr. Ap.*, **203**, 134.

1987

1. Bromage, G.E., "The Continuing Story of the Diffuse Interstellar Bands", *Q.J.R.A.S.*, **28**, 294.
2. Chlewicki, G., de Groot, M.S., van der Zwet, G.P., Greenberg, J.M., Alvarez, P.P., and Mampaso, A., "Correlation of Broad and Narrow Diffuse Band Features: Evidence for Molecular Carriers", *Astr. Ap.*, **173**, 131.
3. Cohen, M. and Jones, B.F., "Optical Spectroscopy of IRAS Sources with Infrared Emission Bands: IRAS 21282+5050 and the Diffuse Interstellar Bands", *Ap. J. Lett.*, **321**, L151.
4. Crawford, I. A. and McNally, D., "A Search for the Diffuse Interstellar lines at 5780 and 5797Å in the Coma of Comet Halley and the Possible Detection of an Unidentified Cometary Absorption Line", *Observatory*, **107**, 20.
5. Josafatsson, K. and Snow, T.P., "CCD Observations of Diffuse Interstellar Bands in Reflection Nebulae", *Ap. J.*, **319**, 436.
6. Jura, M., "The Diffuse Interstellar Bands - Are They Carried by PAHs?", in *Polycyclic Aromatic Hydrocarbons and Astrophysics*, eds. A. Leger, L. d'Hendecourt, and N. Boccarda (*NATO Adv. Sci. Inst., Ser. C*, **191**) (Dordrecht:Reidel), 367.
7. Krelowski, J. and Walker, G.A.H., "Three Families of Diffuse Interstellar Bands?", *Ap. J.*, **312**, 860.
8. Krelowski, J., Walker, G.A.H., Grieve, G.R., and Hill, G.M., "Interdependence of the 4430 Å Diffuse Interstellar Band, Polarization, and Ultraviolet Extinction", *Ap. J.*, **316**, 449.
9. McNally, D., Ashfield, M., Baines, D. W. T., Fossey, S., Rees, P. C. T., Somerville, W. B., and Whittet, D. C. B., "A Survey of the Yellow-Red Interstellar Diffuse Spectrum Lines", in *Astrochemistry, IAU Symp. 120*, eds. M. S. Vardya and S. P. Tarafdar (Dordrecht:Reidel), 321.
10. Morgan, D.H., "Dust in External Galaxies: Diffuse Bands and the Albedo", *Q.J.R.A.S.*, **28**, 328.
11. Phillips, M.M., Phillips, A.C., Heathcote, S.R., Blanco, V.M., Geisler, D., Hamilton, D., Suntzeff, N.B., Jablonski, F.J., Steiner, J.E., Cowley, A.P., Schmidtke, P., Wyckoff, S., Hutchings, J.B., Tonry, J., Strauss, M.A., Thorstensen, J.R., Honey, W., Maza, J., Ruiz, M.T., Landolt, A.U., Uomoto, A., Rich, R.M., Grindlay, J.E., Cohn, H., Smith, H.A., Lutz, J.H., Lavery, R.J., and Saha, A., "The Type Ia Supernova 1986G in NGC 5128: Optical Photometry and Spectra", *P.A.S.P.*, **99**, 592.

12. Rich, R.M., "Echelle Spectroscopy of SN 1986G in NGC 5128: Complex Na Absorption and Interstellar Diffuse Bands", *Astron. J.*, **94**, 651.
13. Van der Zwet, G., "Possible Carriers of the Diffuse Interstellar Bands", in *Polycyclic Aromatic Hydrocarbons and Astrophysics* (A. Leger et al. eds), p. 351.
14. Vidal-Madjar, A., Andreani, P., Christiani, S., Ferlet, R., Lanz, T., and Vladilo, G., "The Interstellar Spectrum Toward SN 1987A", *Astr. Ap.*, **177**, L17.
15. Vladilo, G., Crivellari, L., Molaro, P., and Beckman, J.E., "Detections of Diffuse Interstellar Bands Toward the SN 1987A in the Large Magellanic Cloud", *Astr. Ap.*, **182**, L59.
16. Wallerstein, G. and Cardelli, J. A., "The Diffuse Interstellar Features at 5780 and 5797Å in Star-Formation Regions", *Astron. J.*, **93**, 1522.

1986

1. Chlewicki, G., van der Zwet, G.P., van Ijzendoorn, L.J., Greenberg, J.M., and Alvarez, P.P., "Shapes and Correlations as Observational Discriminants for the Origin of Diffuse Bands", *Ap. J.*, **305**, 455.
2. Isobe, S., Sasaki, G., Norimoto, Y., and Takahashi, J., "Observations of Interstellar Diffuse Absorption Band at 4430Å", *Pub. Astr. Soc. Japan*, **38**, 511.
3. Krätschmer, W., "Carbon Molecules as Possible Carrier of the Diffuse Interstellar Bands", *Ap. Space Sci.*, **128**, 93.
4. Krelowski, J., "Diffuse Interstellar Bands. Some Observational Aspects", in *Evolution of Interstellar Dust and Related Topics*, Conference on International School of Physics Enrico Fermi. Course 101, Varenna (Italy), July 22-Aug. 1, 1986.
5. Kumar, K. C., "Diffuse Interstellar Bands in Low Color Excess Stars. III", *Ap. J.*, **306**, 38.
6. Pfau, W., "Astrophysical Influences on the Diffuse Interstellar Lines", *Ap. Space Sci.*, **128**, 101.
7. Scarfe, C.D., "Unusual Relative Strengths of the Diffuse Interstellar Bands in Some Interstellar Dust Clouds", *J. Roy. Astr. Soc. Canada.*, **80**, 274.
8. Shapiro, P.R. and Holcomb, K.A., "New Results in the Optics of Grains with Resonant Impurities", *Ap. J.*, **305**, 433.
9. Shapiro, P.R. and Holcomb, K.A., "On the Dust Grain Hypothesis for the Diffuse Interstellar Bands", *Ap. J.*, **310**, 872.
10. van der Zwet, G.P., "Possible Carriers of the Diffuse Interstellar Bands", in *Polycyclic Aromatic Hydrocarbons and Astrophysics*, Seminaire sur Hydrocarbures Aromatiques, Polycycliques et Astrophysique, Les Houches (France), Feb. 17-22, 1986.

11. van der Zwet, G. P. and Allamandola, L. J., "Polycyclic Aromatic Hydrocarbons and the Diffuse Interstellar Bands", in *Light on Dark Matter: Proc. First IRAS Conf.*, ed. F. P. Israel (*Ap. Space Sci. Library*, 24), (Dordrecht:Reidel), 233.

1985

1. Crawford, M.K., Tielens, A.G.G.M., and Allamandola, L.J., "Ionized Polycyclic Aromatic Hydrocarbons and the Diffuse Interstellar Bands", *Ap. J. Lett.*, **293**, L45.
2. Hobbs, L. M., "On Interstellar [Fe X] Absorption: the $\lambda 6367$ Feature", *Ap. J.*, **298**, 357.
3. Houziaux, L. and Nandy, K., "The Interstellar 4430 Å Band in the Small Magellanic Cloud", *M.N.R.A.S.*, **215**, 5p.
4. Kroto, H.W., Heath, J.R., O'Brien, S.C., Curl, R.F., and Smalley, R.E., "C₆₀: Buckminsterfullerene", *Nature*, **318**, 162.
5. Leger, A. and d'Hendecourt, L., "Are Polycyclic Aromatic Hydrocarbons the Carriers of the Diffuse Interstellar Bands in the Visible?", *Astr. Ap.*, **146**, 81.
6. Seab, C.B. and Snow, T.P., "A Search for Diffuse Interstellar Bands in the Ultraviolet", *Ap. J.*, **295**, 485.
7. van der Zwet, G.P. and Allamandola, L.J., "Polycyclic Aromatic Hydrocarbons and the Diffuse Interstellar Bands", *Astr. Ap.*, **146**, 76.

1984

1. Federman, S.R., Kumar, K. C., and Vanden-Bout, P.A., "Observations of Narrow Diffuse Interstellar Bands Toward Stars with Low Reddening", *Ap. J.*, **282**, 485.
2. Gammelgaard, P., "Observations of a Predicted Diffuse Interstellar Line at 7581 Å", *Astr. Ap.*, **135**, 77.
3. Hobbs, L.M., "On Absorption by Hot Interstellar Gas. I. (Fe X) $\lambda 6375$ ", *Ap. J.*, **280**, 132.
4. Meyer, D.M. and Ulrich, R.K., "Observations of Diffuse Interstellar Bands Toward T Tauri Stars", *Ap. J.*, **283**, 98.
5. Nuth, J. A. and Donn, B., "Remarks on a Vibronic Origin for the Diffuse Band Spectrum", *Ap. Space Sci.*, **103**, 353.
6. Pritchett, C.J. and Grillmair, C.J., "Spectrophotometry of Emission Nebulae in the $\lambda\lambda 5000$ -6000 Spectral Region", *P.A.S.P.*, **96**, 349.
7. Seab, C.G. and Snow, T.P., "Ultraviolet Extinction and Diffuse Band Strength Correlations", *Ap. J.*, **277**, 200.

1983

1. Baines, D. W. T. and Whittet, D. C. B., "Anomalous Diffuse Features in Dust-Embedded Stars", *M.N.R.A.S.*, **203**, 419.
2. Duley, W. W., "Vibronic Origin for the Diffuse Band Spectrum", *Ap. Space Sci.*, **95**, 213.
3. Meyer, D.M., "Observations of Diffuse Interstellar Lines Toward Stars with Low Column Densities of H_2 ", *Ap. J. Lett.*, **266**, L51.
4. Nuth, J.A., Donn, B., and Duley, W.W., "On a Vibronic Origin for the Diffuse Band Spectrum", *Ap. Space Sci.*, **95**, 209.
5. Witt, A.N., Bohlin, R.C., and Stecher, T.P., "The Diffuse Interstellar Feature at 4430 Å and Interstellar Extinction in the Far-Ultraviolet", *Ap. J. Lett.*, **267**, L47.

1982

1. Andersen, J., Gahm, G.F., and Krełowski, J., "On the Properties of the Circumstellar Matter Around the Bright Young Variable Shell Star HR 5999", *Astr. Ap.*, **113**, 176.
2. Duley, W.W., "Identification of Some Diffuse Interstellar Features", *Ap. Space Sci.*, **88**, 501.
3. Greenberg, J. M., "What Are Comets Made of? A Model Based on Interstellar Dust", in *Comets*, ed. L. L. Wilkening (Tucson:University of Arizona Press), 131.
4. Herbig, G.H. and Soderblom, D.R., "The Diffuse Interstellar Bands. V. High-Resolution Observations", *Ap. J.*, **252**, 610.
5. Kumar, K. C., Federman, S.R., and Vanden-Bout, A., "Diffuse Interstellar Bands Toward Stars with Low Color Excess", *Ap. J. Lett.*, **261**, L51.
6. Snow, T.P., Timothy, J.G., and Saar, S., "A Search for Diffuse Band Profile Variations in the Rho Ophiuchi Cloud", *Ap. J.*, **262**, 611.
7. Zimmermann, H., "The Interstellar Band at $\lambda 4430$ and the Abundance of Interstellar Iron, Titanium, and Molecular Hydrogen", *Ap. Space Sci.*, **84**, 505.

1981

1. Allen, D. A. and Wickramasinghe, N. C., "Diffuse Interstellar Absorption Bands between 2.9 and 4.0 μm ", *Nature*, **294**, 239.
2. Andriesse, C. D. and de Vries, J., "Pairing of the Diffuse Interstellar Lines", *Astr. Ap.*, **93**, 403.

3. Blades, J.C. and Somerville, W.B., "Interstellar Diffuse Bands in the Spectra of Six Stars Previously Reported Anomalous", *M.N.R.A.S.*, **197**, 543.
4. Breuer, H. D. and Petry, H., "On the Origin of the Diffuse Interstellar Lines", *Naturwissenschaften*, **68 Jahrg.**, 520.
5. Donn, B. and Khanna, R. K., "A Laboratory Study of Magnesium Tetrabenz-Porphyrin: Lack of Agreement with Diffuse Interstellar Bands", *Ap. Space Sci.*, **68**, 19.
6. Duley, W. WE., "Absorption Bands and Extinction in Small Interstellar Particles", *Ap. Space Sci.*, **78**, 145.
7. Exarhos, G.H., Mayer, J., and Klemperer, W., "Chemical Processes in the Interstellar Medium: On the Nature of the Carrier of the Diffuse Interstellar Bands", *Philos. Trans. R. Soc. London A*, **303**, 503.
8. Krelski, J. and Strobel, A., "Luminosity Effects in Interstellar Spectral Features", *Stud. Soc. Sci. Torunensis, Sect. F.*, **6**, 3.
9. Smith, W.H., Snow, T.P., Jura, M., and Cochran, W.D., "High-Resolution Profiles for the Diffuse Interstellar Band at 6196Å", *Ap. J.*, **248**, 128.
10. Snell, R.L. and Vanden Bout, P.A., "High Resolution Profiles of the 5780 Å Interstellar Diffuse Band", *Ap. J.*, **244**, 844.
11. Tüg, H. and Schmidt-Kaler, Th., "The Diffuse Interstellar Line at 4430Å", *Astr. Ap.*, **94**, 16.
12. van Breda, I.G. and Whittet, D.C.B., "Very Broadband Structure in the Extinction Curves of Southern Milky Way Stars", *M.N.R.A.S.*, **195**, 79.
13. Wdowiak, T.J., "Laboratory Produced Visible Spectral Emission Features Correlate with Those of the Red Rectangle", *Nature*, **293**, 724.
14. Wu, C-C., York, D.G., and Snow, T.P., "Empirical Relationship of Ultraviolet Extinction and the Interstellar Diffuse Bands", *A.J.*, **86**, 755.

1980

1. Arellano Ferro, A. and Garrison, R. F., "On the $\lambda 4430$ Interstellar Band: A Visual Classification", *Rev. Mexicana Astr. Astrofis.*, **4**, 351.
2. Danks, A.C., "Correlations Between the $\lambda 2200$ Feature, the Diffuse $\lambda 4430$ Band, and E_{B-V} ", *P.A.S.P.*, **92**, 52 (also published in *Interstellar Molecules, IAU Symp. 87*, ed B. H. Andrew [Dordrecht:Reidel], p. 389).
3. Donn, B. and Khanna, R.K., "A Laboratory Study of Magnesium-Tetrabenz-Porphyrin; Lack of Agreement with Diffuse Interstellar Bands", *Ap. Space Sci.*, **68**, 19.
4. Gammelgaard, P. and Rudkjöbing, M., "The Predicted $1s^2 - 1s6p$ H^- Auto-Ionization Resonance Observed as a Diffuse Interstellar Line at 7581Å", *Ap. Space Sci.*, **72**, 319.

5. Schmidt-kaler, T., Tüg, H., Buchholz, M., and Schlosser, W., "The Diffuse Interstellar Line at 6284Å", *Astr. Ap. Suppl.*, **39**, 305.
6. Somerville, W. B., "Correlations for Interstellar Molecules and Diffuse bands", in *Interstellar Molecules, IAU Symp. 87*, ed. B. H. Andrew [Dordrecht:Reidel], p. 395.
7. Somerville, W.B. and Blades, J.C., "The Interstellar Spectrum of the Central Object of NGC 3603 (HD 97950)", *M.N.R.A.S.*, **192**, 719.
8. Walker, G.A.H., Yang, S., Fahlman, G.G., and Witt, A.N., "The Extinction of HD200775 by Dust in NGC 7023", *P.A.S.P.*, **92**, 417.
9. Wdowiak, T.J., "Laboratory Production of Candidates for the Diffuse Interstellar Bands", *Ap. J. Lett.*, **241**, L55.

1979

1. Blades J. C. and Madore, B. F., "The Interstellar $\lambda 4428$ Feature in the Large Magellanic Cloud", *Astr. Ap.*, **71**, 359.
2. Duley, W.W., "Origin of the Diffuse Interstellar Absorption Bands: Transition Metal Ions in Oxide Grains", *Ap. J.*, **227**, 824.
3. Duley, W.W., "Emission Lines Due to Interstellar Dust in the Visible Spectra of Nebulae", *Ap. Space Sci.*, **61**, 243.
4. Hoyle, F. and Wickramasinghe, N. C., "On the Nature of Interstellar Grains", *Ap. Space Sci.*, **66**, 77.
5. Millar, T. J. and Duley, W. W., "Origin of the Diffuse Interstellar Absorption Bands. IV. Relation to Interstellar Depletion", *M.N.R.A.S.*, **187**, 379.
6. Mitchell, G. F. and Huntress, W. T., "Long Chain Carbon Molecules and Diffuse Interstellar Lines", *Nature*, **278**, 722.
7. Walker, G. A. H. and Yang, S., "An 'Emission' Wing Associated with the $\lambda 6177$ Diffuse Interstellar Absorption Band", *J. Roy. Astr. Soc. Canada*, **73**, 304.

1978

1. Kumar, C. K., "A Note on the Diffuse Interstellar Lines", *P.A.S.P.*, **90**, 552.
2. Rudkjobing, M., "Interstellar Heating by Photoelectrons from Negative Oxygen", *Astr. Ap.*, **63**, 189.
3. Sanner, F., Snell, R., and Vanden-Bout, P., "New Diffuse Interstellar Bands in the Wavelength Region 6500-8900 Å", *Ap. J.*, **226**, 460.
4. Schmidt, E. C., "The Diffuse Interstellar Band at $\lambda 5780$ ", *Ap.J.*, **223**, 458.

5. Sneden, C., Gehrz, R.D., Hackwell, J.A., York, D.G., and Snow, T.P., "Infrared Colors and the Diffuse Interstellar Bands", *Ap. J.*, **223**, 168.

1977

1. Blades, J. C. and Somerville, W. B., "Non-Anomalous Diffuse Interstellar Absorption Features in Rho Leonis", *M.N.R.A.S.*, **181**, 769.
2. Dorschner, J., Friedemann, C., and Gürtler, J., "The Ultraviolet Absorption Band at 2175Å: Correlations with Other Interstellar Features", *Ap. Space Sci.*, **46**, 357.
3. Dorschner, J., Friedemann, C., and Gürtler, J., "Correlations of the Band at 2175Å with Other Interstellar Features", *Astr. Ap.*, **58**, 201.
4. Douglas, A.E., "Origin of Diffuse Interstellar Lines", *Nature*, **269**, 130-132.
5. Duley, W.W., "Origin of the Diffuse Interstellar Absorption Bands. III. Zero Phonon Lines in MgO and CaO", *Ap. Space Sci.*, **47**, 185-193.
6. Duley, W.W. and McCullough, J.D., "Surface Activity of Interstellar Grains: Adsorbed Molecular Ions and the Diffuse Interstellar Bands", *Ap. J. Lett.*, **211**, L145-148.
7. Huffman, D. R., "Interstellar Grains. The Interaction of Light with a Small-Particle Scattering System", *Adv. Phys.*, **26**, 129.
8. Purcell, E.M. and Shapiro, P.R., "A Model for the Optical Behavior of Grains with Resonant Impurities", *Ap. J.*, **214**, 92.
9. Smith, W.H., Snow, T.P., and York, D.G., "Comments on the Origins of the Diffuse Interstellar Bands", *Ap. J.*, **218**, 124-132.
10. Snow, T. P., York, D. G., and Resnick, M., "A Search for Diffuse Interstellar Bands in Far-Ultraviolet Wavelengths", *P.A.S.P.*, **89**, 758.
11. Snow, T.P., York, D.G., and Welty, D.E., "Catalogue of Diffuse Interstellar Band Measurements", *Astron. J.*, **82**, 113.
12. Walborn, N. R., "Interstellar $\lambda 4430$ in the Carina Nebula, NGC 3603, and VI Cygni", *P.A.S.P.*, **89**, 765.
13. Welter, G.L. and Savage, B.D., "High-Resolution Profiles of the Diffuse Interstellar Features at 6379 and 6614 Å", *Ap. J.*, **215**, 788.

1976

1. Danks, A.C. and Lambert, D.L., "Line Profiles of the Diffuse Interstellar Lines", *M.N.R.A.S.*, **174**, 571-586.
2. Duley, W.W., "Origin of the Diffuse Interstellar Absorption Bands. II. Evidence for MgO and CaO Solids in the Interstellar Medium", *Astr. Space Sci.*, **45**, 253.

3. Greenberg, J.M. and Seung-Soo, H., "Diffuse Band Extinction and Polarization in Core-Mantle Grains", *Astr. Space Sci.*, **39**, 31.
4. Herbig, G. H., "The Diffuse Interstellar Lines", in *Molecular Spectroscopy: Modern Research*, Vol. II, ed. K. N. Rao (New York:Academic Press), 255.
5. Savage, B.C., "High-Resolution Profiles of the Diffuse Interstellar Feature at 5780Å", *Ap. J.*, **205**, 122.
6. Svatos, J., Solc, M., and Vanysek, V., "Radiative Effects and Interstellar Diffuse Features", *Ap. Space Sci.*, **45**, 163.

1975

1. Danks, A.C. and Lambert, C.L., "Absence of the 4400Å Diffuse Emission Feature", *Astr. Ap.*, **41**, 455.
2. Dorschner, J., "Interstellar Extinction and Diffuse Absorption Features", *Ap. Space Sci.*, **34**, 39.
3. Duley, W.W., "Origin of the Diffuse Interstellar Absorption Bands. I: The Structure of Interstellar Grains", *Ap. Space Sci.*, **36**, 345.
4. Fahlman, G.G. and Walker, G.A.H., "Differential Interstellar Polarization in the Region of 6284 Å for HD 183143", *Ap. J.*, **200**, 22.
5. Gammelgaard, P., "Observations of the Diffuse λ 4430 Absorption Band in Southern O, B, and A Stars", *Astr. Ap.*, **43**, 85.
6. Herbig, G.H., "The Diffuse Interstellar Bands. IV. The Region 4400-6850 Å", *Ap. J.*, **196**, 129.
7. Johnson, F. M., Bailey, D. T., and Wegner, P. A., "Spectroscopic Simulation of Diffuse Interstellar Lines and a laboratory Model for Interstellar Chemical Synthesis", in *Interstellar Dust and Related Topics, IAU Symp. 52*, eds. J. M. Greenberg and H. C. van de Hulst (Dordrecht:Reidel), 317.
8. Martin, P. G. and Angel, J. R.P., "The Diffuse Interstellar Features Studied in HD21389 by Polarimetry and Spectrophotometry", *Ap. J.*, **195**, 379.
9. Nandy, K. and Thompson, G. I., "The Correlation Between the Ultraviolet λ 2200 Feature and the Diffuse λ 4430 Band", *M.N.R.A.S.*, **173**, 237.
10. Nandy, K., Thompson, G. I., Jamar, C., Monfils, A., and Wilson, R., "Studies of Ultraviolet Interstellar Extinction with the Sky-survey Telescope of the TD-1 Satellite. I. Results for Three Galactic Regions", *Astr. Ap.*, **44**, 195.
11. Shapiro, P.R., "Interstellar Polarization: Magnetite Dust", *Ap. J.*, **201**, 151.
12. Snow, T.P. and Cohen, J.G., "Diffuse Interstellar Band Formation in Dense Clouds", *Ap. Space Sci.*, **34**, 33.

13. Strom, K.M., Strom, S.E., Carrasco, L., and Vrba, F.J., "M78: An Active Region of Star Formation in the Dark Cloud Lynds 1630", *Ap. J.*, **196**, 489.

1974

1. Dorshner, J., "The Extinction Feature at 2200Å and the Diffuse Interstellar Lines", *Astr. Nach.*, **295**, 147.
2. Herbst, E., Patterson, T.A., Norcross, D.W. and Lineberger, W.C., "Is H⁻ A Source of Diffuse Interstellar Lines?", *Ap. J.*, **191**, L43.
3. Martin, P. G. and Angel, J. R. P., "A Study of Interstellar Polarization at the $\lambda\lambda 4430$ and 5780 Features in HD 183143", *Ap. J.*, **188**, 517.
4. Romashin, G. S., "The $\lambda 4430$ Interstellar Band and Its Connection with Interstellar Reddening and Galactic Structure", *Astr. Tsirk.*, No. 689, 4.
5. Snow, T.P. and Cohen, J.G., "Diffuse Interstellar Band Formation in Dense Clouds", *Ap. J.*, **194**, 313.

1973

1. Bromage, G.E. and Nandy, K. 1973, "Observations of Diffuse Interstellar Features in the Spectra of Dust-embedded and Field Stars", *Astr. Ap.*, **26**, 17.
2. Chaldou, R., Honeycutt, R.K., and Penston, M.V., "The Extinction Curve for Cygnus OB2 No. 12", *P.A.S.P.*, **85**, 87.
3. Dorschner, J., "Properties of the $\lambda 2200$ Å Interstellar Absorber", *Ap. Space Sci.*, **25**, 405.
4. Gammelgaard, P. and Rudkjøbing, M., "Observations in Linearly Polarized Light of the Intensity of the $\lambda 6180$ Absorption Band in 49 O, B, and A Stars", *Astr. Ap.*, **27**, 261.
5. Rudkjøbing, M., "The Shape of the $1^1S_0 - 2^1P_1$ Fano Resonance in the H⁻ Photo-Ionization Continuum", *J. Quant. Spectr. & Radiat. Transfer*, **13**, 1479.
6. Snow, T.P., "On H⁻ as a Source of Diffuse Interstellar Bands", *Ap. J.*, **184**, 135.
7. Snow, T.P., "The Diffuse Interstellar Bands: A Correlation Analysis", *Astron. J.*, **78**, 913.
8. Snow, T.P., "A Search for Diffuse Bands in Circumstellar Shells. II", *P.A.S.P.*, **85**, 590.

1972

1. A'Hearn, M. F., "Polarization Observations of the $\lambda 4430$ Diffuse Interstellar Absorption Feature", *Astr. J.*, **77**, 302.

2. Bromage, G. E., "Profiles of the Diffuse Interstellar Bands", *Ap. Space Sci.*, **15**, 426.
3. Bromage, G.E., "Predictions of Exceptionally Strong '4430' in the Backscattered Light from Reflection Nebula", *Ap. Space Sci.*, **18**, 449.
4. Bromage, G.E., "Profiles of the Diffuse Interstellar Lines", *Ap. Space Sci.*, **15**, 426.
5. Honeycutt, R. K., "Structure in the Interstellar Reddening Law: 3450 - 5800Å", *Astron. J.*, **77**, 24.
6. Johnson, F. M., *Ann. Bull. N. Y. Acad. Sci.*, **187**, 186.
7. Johnson, F. M., "Spectroscopy of Tetrabenzporphin Molecules and Possible Astrophysical Implications", *Mem. Soc. Roy. Sci. Liège*, **3**, 391.
8. Manning, P. G., "Anionic Species of Fe in Interstellar Dust", *Nature*, **240**, 547.
9. Murdin, P., "Photoelectric Measurements of the 6284 Å Diffuse Interstellar Line", *M.N.R.A.S.*, **157**, 461.
10. Snow, T.P. and Wallerstein, G., "A Search for Diffuse Interstellar Features in Stars with Circumstellar Dust Shells", *P.A.S.P.*, **84**, 492.
11. Wu, C.-C., "A Study of the Unidentified Interstellar Diffuse Features", *Ap. J.*, **178**, 681.

1971

1. A'Hearn, M. F., "Observations of $\lambda 4430$ in Reflection Nebula", *A.J.*, **76**, 264-268.
2. Bromage, G. E., Bruck, M. T., and Nandy, K., "Interstellar Bands", *Astr. Nach.*, **293**, 39.
3. Dorschner, J., "Diffuse Interstellar Bands and Garnet Grains", *Nature*, **231**, 124.
4. Duley, W. W. and Graham, W. R. M., "The Diffuse Interstellar Band at 4430Å and the Spectrum of Atomic Calcium Trapped in Solid Hydrocarbons", *Astr. Nach.*, **293**, 33.
5. Graham, W. R. M. and Duley, W. W., "Identification of Type I Supernova Bands", *Nature. Phys. Sci.*, **232**, 43.
6. Greenburg, J.M. and Stoeckley, R., "Shape of the Diffuse Interstellar Bands", *Nature. Phys. Sci.*, **230**, 15-16.
7. Kelly, A., "Polarization at 4430Å", *Ap. Space Sci.*, **13**, 211.
8. Nandy, K. and Seddon, H., "A Diffuse Interstellar Band in the Far-Ultraviolet?", *Astr. Nach.*, **293**, 37.

9. Wickramasinghe, N. C. and Nandy, "Polarization within the 4430Å Absorption band", *Nature*, **229**, 234.
10. York, D.G., "Structure in the Interstellar-Extinction Curve", *Ap. J.*, **166**, 65.

1970

1. Dorschner, J., "Theoretische Untersuchungen über den Interstellaren Staub. IV. Silikatteilchen und Diffuse Interstellare Banden", *Astr. Ap.*, **292**, 107.
2. Huffman, D.R., "A Possible Cause of Some Unidentified Interstellar Absorption Bands: Crystal-Field Absorption Bands due to Fe^{3+} ", *Ap. J.*, **161**, 1157-1160.
3. Johnson, F.M., *Spectroscopic Studies of Interstellar Grains* (Electro Optical Syst. Rept. No. 4022).
4. Kellman, S. A., "Scanner Observations of the $\lambda 4430$ Diffuse Interstellar Feature", *P.A.S.P.*, **82**, 1368.
5. McIntyre, H. A. J. and Williams, D. A., "The Calcium-Graphite Grain 4430 Å Model", *M.N.R.A.S.*, **148**, 53.
6. Manning, P.G., "Is the Diffuse Interstellar Absorption Band at 4430Å Caused by Trivalent Iron?", *Nature*, **226**, 829.
7. Manning, P.G., "Compositions of Garnets in the Interstellar Medium" *Nature*, **227**, 1121.
8. Manning, P. G., "Origin of the Iron Bands in Supernovae Spectra", *Nature*, **228**, 844.
9. Nandy, K. and Seddon, H., "Polarization-Wavelength Profile of the Interstellar 4430Å Band", *Nature*, **227**, 264.
10. Rudkjöbing, M., "Galactic Longitude Dependence of the Intensity Ratio of the Diffuse Interstellar Absorption Bands at $\lambda\lambda 6180$ and 4430", *Ap. Space Sci.*, **6**, 157.
11. Runciman, W. A., "Origin of the Diffuse Interstellar Band at 4430 Å", *Nature*, **228**, 843.
12. Wickramasinghe, N. C. and Nandy, K., "The Shape of the Interstellar Absorption Band", *Ap. Space Sci.*, **6**, 154.

1969

1. Duley, W.W. and Graham, W.R.M., "Possible Identification of the Diffuse Interstellar Absorption Band at 4430Å", *Nature*, **224**, 785.
2. Harris, J. W., "Measurements of the 'Corner' of the Interstellar Extinction Law", *Nature*, **223**, 1046.

3. Rudkjobing, M., "Tentative Identification of the Diffuse Interstellar Absorption Bands and of a Diffuse Interstellar Doublet Line", *Ap. Space Sci.*, **3**, 102.
4. Rudkjobing, M., "Diffuse Interstellar Absorption Bands as Due to Quadrupole Transitions Enforced by a Magnetic Field", *Ap. Space Sci.*, **5**, 68.
5. Walker, G.A.H., Hutchings, J.B., and Younger, P.F., "Interstellar Extinction Anomalies and the Diffuse Interstellar Bands", *Astron. J.*, **74**, 1061.
6. Wolstencroft, R.D., Ireland, J.G., Nancy, K., and Seddon, H., "Defects in Interstellar Grains", *M.N.R.A.S.*, **144**, 245.

1968

1. Duley, W. W., "Origin of the Diffuse Interstellar Absorption Bands", *Nature*, **218**, 153.

1967

1. Deeming, T. J. and Walker, G. A. H., "Measures of Interstellar Å4430 Absorption", *Z. f. Ap.*, **66**, 175.
2. Herbig, G.H., "The Diffuse Interstellar Bands III: The Situation in 1966", *IAU Symposium 31*, 85-93.
3. Johnson, F.M., *Interstellar Grains*, ed. J.M. Greenberg and T.P. Roarke (NASA SP-140, Washington).

1966

1. Herbig, G.H., "The Diffuse Interstellar Bands. II. The Profile of $\lambda 4430$ in HD 183143", *Zs. f. Ap.*, **64**, 512.
2. Herbig, G. H., "On the Interpretation of FU Orionis", *Vistas in Astronomy*, **8**, 109.
3. Hutchings, J.B., "4430 Å Band Absorption in the Magellanic Clouds", *M.N.R.A.S.*, **131**, 299.
4. Walker, G. A. H., "The Extended Wings of the $\lambda 4430$ Diffuse Interstellar Absorption Band", *Observatory*, **86**, 117.
5. Walker, G.A.H. and Hodge, S.M., "Equivalent Widths and Half-Widths of the $\lambda 4388$ and $\lambda 4471$ He I Lines, Rotational Velocities, and $\lambda 4430$ Central Depths for 450 O and B Stars", *Pub. Dom. Ap. Obs.*, **12**, 401.
6. Wampler, E.J., "Scanner Observations of $\lambda 4430$ ", *Ap. J.*, **144**, 921.

1964

1. Herbig, G. H., "The Diffuse Interstellar Bands. II. The Profile of $\lambda 4430$ in HD 183143", *Z. f. Ap.*, **64**, 512.
2. Malville, J.M., "Abundance of Metastable Hydrogen Molecular in the Interstellar Medium", *Ap. J.*, **139**, 198.
3. Stoeckley, R. and Dressler, K., "On the Interstellar $\lambda 4430$ Line", *Ap. J.*, **139**, 240.
4. Wilson, R., "Some Remarks on Interstellar Absorption Bands", *Pub. Roy. Obs. Edinburgh*, **4**, 67.

1963

1. Herbig, G.H., "The Diffuse Interstellar Bands. I. A Possible Identification of $\lambda 4430$ ", *Ap. J.*, **137**, 200.
2. Unsöld, A., "Zur Deutung der Interstellaren Absorptionbänder", *Z. f. Ap.*, **56**, 221.
3. Walker, G. A. H., "Photoelectric Measures of the 4430 Å Diffuse Interstellar Band", *M.N.R.A.S.*, **125**, 141.
4. Walker, G. A. H., "The Apparent $\lambda 4430$ Band Deficiency for Stars Interacting with Nearby Interstellar Clouds", *P.A.S.P.*, **75**, 418.
5. Wampler, E.J., "Systematic Variations in the Slope of the Correlation Between the Intensity of $\lambda 4430$ and Color Excess", *Ap. J.*, **137**, 1071.

1960

1. McKellar, A., "Some Topics in Molecular Astronomy", *J. Roy. Astr. Soc. Canada*, **54**, 97.

1958

1. Wilson, R., "Observations of Broad Interstellar Features at $\lambda\lambda 4430, 4760, 4890, 6180$ ", *Ap.J.*, **128**, 57.

1955

1. Herzberg, G., *Mem. Roy. Soc. Sci. Liege, Serie 4*, **15**, 326.
2. McKellar, A., Welsh, H. L., and Stephenson, F. C., "The Spectrum of Solid Oxygen a few Degrees above Absolute Zero", *Astron. J.*, **60**, 170.

1951

1. Duke, D., "Intensities of the Interstellar Band at $\lambda 4430$ ", *Ap. J.*, **113**, 100.

1950

1. Greenstein, J. L. and Aller, L. H., "The Interstellar $\lambda 4430$ Band", *Ap. J.*, **111**, 328.

1949

1. Adams, W.S., "Observations of Interstellar H and K, Molecular Lines, and Radial Velocities in the Spectra of 300 O and B Stars", *Ap. J.*, **109**, 354.
2. Baker, E. A., "Spectrophotometric Measurements of Early Type Stars. 1. Methods of Observation and Results for Oe5 Stars", *Publ. Roy. Obs. Edinburgh*, **1**, 15.

1944

1. Morgan, W. W., "Note on the Interstellar Reddening in the Region of the Orion Nebula", *Astron. J.*, **51**, 21.

1941

1. Ledoux, P., "A Summary of the Symposium on Interstellar Lines at the Yerkes Observatory, on June 30, 1941", *Pop. Astr.*, **49**, 513.
2. Struve, O., "The Constituion of Diffuse Matter in Space", *J. Washington Acad. Sci.*, **31**, 217 (reprinted in 1970, in *Spectroscopic Astrophysics*, ed. G. H. Herbig [Berkeley:U. of California Press], p. 251).

1939

1. Sherman, F., "Note on the Interstellar Band at $\lambda 4430$ ", *Ap. J.*, **90**, 630.

1938

1. Beals, C. S. and Blanchet, G. H., "An Absorption Line at $\lambda 4430.6$ of Possible Interstellar Origin", *M.N.R.A.S.*, **98**, 398.
2. Merrill, P. W. and Humason, M., "The Diffuse Stationary Line $\lambda 4430$ in the Spectrum of a Binary Star", *P.A.S.P.*, **50**, 212.
3. Merrill, P.W. and Wilson, O.C., "Unidentified Interstellar Lines in the Yellow and Red", *Ap. J.*, **87**, 9.

1937

1. Beals, C. S. and Blanchet, G. H., "A Line at $\lambda 4430.5$ of Possibly Interstellar Origin", *P.A.S.P.*, **49**, 224.
2. Eyster, E. H., "Note on the Interpretation of Unidentified Interstellar Lines", *Ap. J.*, **86**, 486.
3. Merrill, P.W., Sandford, R.F., Wilson, O.C., and Burwell, C.G., "Intensities and Displacements of Interstellar Lines", *Ap. J.*, **86**, 274.
4. Saha, M. N., *Nature*, **139**, 840.
5. Swings, P., "A Note on Molecular Absorption in Interstellar Space", *M.N.R.A.S.*, **97**, 212.

1936

1. Merrill, P. W., "Tests of the Lines at $\lambda 5780$ and $\lambda 6284$ in Stellar Spectra", *P.A.S.P.*, **48**, 179.
2. Merrill, P.W., "Stationary Lines in the Spectrum of the Binary Star Boss 6142", *Ap. J.*, **83**, 126.

1935

1. Russell, H. N., "The Analysis of Spectra and Its Applications in Astronomy", *M.N.R.A.S.*, **95**, 610 (see p. 635).

1934

1. Merrill, P.W., "Unidentified Interstellar Absorption Lines", *P.A.S.P.*, **46**, 206.

1922

1. Heger, M. L., "The Spectra of Certain Class B Stars in the Regions $5630\text{\AA}$ - $6680\text{\AA}$ and $3280\text{\AA}$ - $3380\text{\AA}$ ", *Lick Obs. Bull.*, Vol. **10**, No. **337**, 146.