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# Space Science Division Cumulative Bibliography 1989-1994

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D. Morrison

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May 1995



National Aeronautics and  
Space Administration

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# Space Science Division Cumulative Bibliography 1989–1994

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National Aeronautics and  
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**Ames Research Center**  
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# Space Science Division Cumulative Bibliography 1989–1994

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*Ames Research Center*

## Summary

The Space Science Division at NASA's Ames Research Center is dedicated to research in astrophysics, exobiology, and planetary science. These research programs are structured around the study of origins and evolution of stars, planets, planetary atmospheres, and life, and address some of the most fundamental questions pursued by science, questions that examine the origin of life and of our place in the universe.

This bibliography is the accumulation of peer-reviewed publications authored by Division scientists for the years 1989 through 1994. The list includes 777 papers published in over 5 dozen scientific journals representing the high productivity and interdisciplinary nature of the Space Science Division.

Major elements of the Space Science Division's programs include the study of the interstellar gas and dust that form the raw material for stars, planets, and life; the processes of star and planet formation; the search for planetary systems around other stars; the evolution of planets and their atmospheres; the structure, dynamics, and chemistry of planetary atmospheres; the origin of the biogenic elements and molecules and their distribution in space; the origin of life and its early evolution on the Earth; and the search for past or present life throughout the solar system.

Space Science Division personnel participate in a variety of major NASA missions, including research flights of the Kuiper Airborne Observatory (KAO) and operations of the Pioneer and Galileo Probe planetary missions; both of these projects are operated and managed by Ames Research Center. Division scientists are also investigators, team members, or interdisciplinary scientists on the Galileo Jupiter Orbiter, Cassini mission to Saturn, Mars Surveyor, and Ulysses space missions; Division scientists are also involved in the development of the Stratospheric Observatory for Infrared Astronomy (SOFIA). Finally, we participate actively in a variety of working groups and advisory committees for NASA and the National Research Council as well as numerous professional organizations.

For further information on the Division and its research activities we can be reached by telephone

at 415-604-5029; there is also a Space Science Division home page which can be accessed through the world wide web at <http://www-space.arc.nasa.gov/division/>

## 1989 Publications

Allamandola, L.J. and A.G.G.M. Tielens, eds., *Interstellar Dust: Contributed Papers*, NASA Ames Research Center, NASA CP-3036 (1989).

Allamandola, L.J. and A.G.G.M. Tielens, eds., **Interstellar Dust**, Kluwer Publishers, Dordrecht, The Netherlands, 656 pp (1989).

Allamandola, L.J., J.D. Bregman, S.A. Sandford, A.G.G.M. Tielens, F.C. Witteborn, D.H. Wooden, and D. Rank, "The Discovery of a New IR Emission Feature at  $1905\text{ cm}^{-1}$  ( $5.25\text{ }\mu\text{m}$ ) in the Spectrum of BD+30°3639 and Its Relation to the Polycyclic Aromatic Hydrocarbon Mode," **Astrophysical Journal** **345**:L59-L62 (1989).

Allamandola, L.J., "The Infrared Emission Features and Polycyclic Aromatic Hydrocarbons," pp. 129-139, IN: **Interstellar Dust**, L.J. Allamandola and A.G.G.M. Tielens, eds., Kluwer Publishers, Dordrecht, The Netherlands (1989).

Allamandola, L.J., A.G.G.M. Tielens, and J.R. Barker, "Interstellar Polycyclic Aromatic Hydrocarbons: The Infrared Emission Bands, the Excitation/Emission Mechanism and the Astrophysical Implications," **Astrophysical Journal Supplement** **71**:733-775 (1989).

Atreya, S.K., J.B. Pollack, and M.S. Matthews, eds., **Origins and Evolution of Planetary and Satellite Atmospheres**, University of Arizona Press, Tucson, 881 pp (1989).

Berner, R.A. and D.E. Canfield, "A Model for Atmospheric Oxygen over Phanerozoic Time," **American Journal Science** **289**:333-361 (1989).

Blake, D.F., R.H. Fleming, and T.E. Bunch, "Identification and Characterization of a Carbonaceous, Titanium Containing Interplanetary Dust Particle," pp. 84-85, IN: **Lunar and Planetary Science Conference XX** (1989).

- Borucki, W.J., "Predictions of Lightning Activity at Neptune," **Geophysical Research Letters** **16**:937-939 (1989).
- Bregman, J.D., L.J. Allamandola, A.G.G.M. Tielens, Geballe, T., and F.C. Witteborn, "The Infrared Emission Bands, II: A Spatial and Spectral Study of the Orion Bar," **Astrophysical Journal** **344**: 791-798 (1989).
- Bregman, J.D., "Observations of HII Regions and Planetary Nebulae: The Infrared Emissions Bands," pp. 109-117, IN: **Interstellar Dust**, L.J. Allamandola and A.G.G.M. Tielens, eds., Kluwer Publishers, Dordrecht, The Netherlands (1989).
- Burton, M., D.J. Hollenbach, and A.G.G.M. Tielens, "IR Line Emission from Dense Photodissociation Regions," pp. 141-148, IN: **Proceedings of the 22nd ESLAB Symposium on Infrared Spectroscopy in Astronomy**, European Space Agency, ESA SP-290, M. Kessler, ed. (1989).
- Buss, Jr., R.H., H.J.G.L.M. Lamers, and T.P., Snow, Jr., "Grain Ultraviolet Extinction Properties of Recently Discovered Post Asymptotic Giant Branch Stars," **Astrophysical Journal** **347**:977-988 (1989).
- Canfield, D.E., "Reactive Iron in Marine Sediments," **Geochimica Cosmochimica Acta** **53**:619-632 (1989).
- Canfield, D.E., "Sulfate Reduction and Oxidic Respiration in Marine Sediments: Implications for Organic Carbon Preservation in Euxinic Environments," **Deep-Sea Research** **36**: 121-138 (1989).
- Chapman, C.R. and D. Morrison, "Cosmic Impacts, Cosmic Catastrophes (Part 1)," **Mercury** **28**:185-192 (1989).
- Clayton, D.D., P. Scowen, and K. Liffman, "Average Age of Refractory Interstellar Dust," **Astrophysical Journal** **346**:531 (1989).
- Cohen, M., A.G.G.M. Tielens, and J. Bregman, "Mid-Infrared Spectra of WC9 Stars: The Composition of Circumstellar and Interstellar Dust," **Astrophysical Journal** **344**:L13-L16 (1989).
- Cohen, M., A.G.G.M. Tielens, J.D. Bregman, F.C. Witteborn, D.M. Rank, L.J. Allamandola, D.H. Wooden, and M. de Muizon, "The Infrared Emission Bands, III: Southern IRAS Sources," **Astrophysical Journal** **341**:246-269 (1989).
- Colburn, D.S., J.B. Pollack, and R.M. Haberle, "Diurnal Variation in Optical Depth on Mars," **Icarus** **79**:159-189 (1989).
- Colgan, S.W.J., E.E. Salpeter, and Y. Terzian, "Arecibo Emission-Absorption Observations of Galactic OH," **Astrophysical Journal** **336**: 231-242 (1989).
- Conrath, B., et al., "Infrared Observations of the Neptunian System," **Science** **246**: 1454-1459 (1989).
- Coyne, L., J. Bishop, A. Banin, G. Carle, J. Orenberg, and Scattergood, T., "Use of Near Infrared Correlation Spectroscopy to Quantify Surface Iron and Surface Water in a Series of Variably Cation-exchanged Montmorillonite Clays," pp. 407-429, IN: **Spectroscopic Characterization of Minerals and their Surfaces (ACS Symposium Series 415)**, L.M. Coyne, D.F. Blake, and S. McKeever, eds., American Chemical Society Press, Washington, DC (1989).
- Coyne, L., P. Costanzo, P., and B.K.G. Theng, "Luminescence and Electron Spin Resonance Studies of Relationships Between O<sup>-</sup> Centers and Structural Iron in Natural and Synthetically Hydrated Kaolinites," **Clay Minerals** **24**:671-693 (1989).
- Coyne, L., "Spectroscopic Characterization of Minerals and Their Surfaces - Preface," pp. IX-X, IN: **Spectroscopic Characterization of Minerals and their Surfaces (ACS Symposium Series 415)**, L.M. Coyne, D.F. Blake, and S. McKeever, eds., American Chemical Society Press, Washington, DC (1989).
- Coyne, L. and S. McKeever, "Spectroscopic Characterization of Minerals and Their Surfaces - Overview," pp. 1-7, IN: **Spectroscopic Characterization of Minerals and their Surfaces (ACS Symposium Series 415)**, L.M. Coyne, D.F. Blake, and S. McKeever, eds., American Chemical Society Press, Washington, DC (1989).
- Coyne, L. and S. McKeever, "Spectroscopic Characterization of Minerals and Their Surfaces - Chapter 1," pp. 8-29, IN: **Spectroscopic Characterization of Minerals and their Surfaces (ACS Symposium Series 415)**, L.M. Coyne, D.F. Blake, and S. McKeever, eds., American Chemical Society Press, Washington, DC (1989).
- Coyne, L.M., S. McKeever, and D.F. Blake, eds., **Spectroscopic Characterization of Minerals and their Surfaces (ACS Symposium Series 415)**, American Chemical Society Press, Washington, DC, 526 pp (1989).
- Crisp, D., et al., "Venus After Dark - Views of the Night-side," **Planetary Report IX**:22-23 (1989).

- Crisp, D., W. Sinton, K.W. Hodapp, B. Ragent, F. Gerbault, J.H. Goebel, R.G. Probst, D.A. Allen, K. Pierce, and K.R. Stapelfeldt, "The Nature of the Near-infrared Features on the Venus Night Side," **Science** **246**:506 (1989).
- Cruikshank, D.P., R.H. Brown, L.P. Giver, and A.T. Tokunaga, "Triton: Do We See to the Surface?," **Science** **245**:283-286 (1989).
- Cruikshank, D.P., "Dark Surfaces of Asteroids and Comets: Evidence for Macromolecular Carbon Compounds," **Advances in Space Research** **9**(2):65-71 (1989).
- Cruikshank, D.P., "The Space Infrared Telescope Facility (SIRTF) and the Solar System," IN: **The Formation and Evolution of Planetary Systems**, H.A. Weaver and L. Danly, eds., Cambridge University Press, New York, pp. 329-330 (1989).
- Cuzzi, J.N., J.M. Champney, T.A. Coakley, and A. Dobrovolskis, "Particle-Gas Dynamics in the Protoplanetary Nebula," pp. 216-217, IN: **Lunar and Planetary Science Conference XX** (1989).
- Cuzzi, J.N., J.A. Cooper, L.L. Hood, and M.R. Showalter, "Abundance and Size Distribution of Ring Material Outside of the Main Rings of Saturn," pp. 5A1-5F7, IN: **Cassini Mission: Saturn Orbiter Proposal Information Package, Volume XIII: Physical Models**, Jet Propulsion Laboratory, JPL PD-669-11 (1989).
- Cuzzi, J.N., "Saturn: Jewel of the Solar System," **Planetary Report IX**:12-15 (1989).
- D'Amelio, E.D., Y. Cohen, and D.J. Des Marais, "Comparative Functional Ultra-structure of Two Hypersaline Submerged Cyanobacterial Mats: Guerrero Negro, Baja California Sur, Mexico," pp. 97-113, IN: **Microbial Mats: Physiological Ecology of Benthic Microbial Communities**, Y. Cohen and E. Rosenberg, eds. American Society for Microbiology, Washington, DC (1989).
- Des Marais, D.J., Y. Cohen, H. Nguyen, M. Cheatham, T. Cheatham and E. Munoz, "Carbon Isotopic Trends in the Hypersaline Ponds and Microbial Mats at Guerrero Negro, Baja California Sur, Mexico: Implications for Precambrian Stromatolites," pp. 193-205, IN: **Microbial Mats: Physiological Ecology of Benthic Microbial Communities**, Y. Cohen and E. Rosenberg, eds. American Society for Microbiology, Washington, DC (1989).
- DeVincenzi, D.L., and H.P. Klein, "Planetary Protection Issues for Sample Return Missions," **Advances in Space Research** **9**:203-206 (1989).
- Dobrovolskis, A.R., N.J. Borderies, and T.Y. Steiman-Cameron, "Stability of Polar Rings Around Neptune," **Icarus** **81**:132-144 (1989).
- Dobrovolskis, A.R., "Dynamics of Pluto and Charon," **Geophysical Research Letters** **16**:1217-1220 (1989).
- Dobrovolskis, A.R., T.Y. Steiman-Cameron, and N.J. Borderies, "Neptune May Have Polar Rings," **Geophysical Research Letters** **16**:949-952 (1989).
- Dones, L., M.R. Showalter, and J.N. Cuzzi, "Simulations of Light Scattering in Planetary Rings," pp. 43-44, IN: **Dynamics of Astrophysical Disks**, ed. J. Sellwood: Cambridge University Press, New York (1989).
- Doyle, L.R., and W.J. Borucki, "Jovian Lightning Locations," pp. 384-389, IN: **Time-Variable Phenomena in the Jovian System**, NASA Ames Research Center, NASA SP-494, M.J.S. Belton, R.A. West, and J. Rahe, eds. (1989).
- Doyle, L.R., L.C. Dones, and J.N. Cuzzi, "Radiative Transfer Modeling of Saturn's Outer B-Ring," **Icarus** **80**:104-135 (1989).
- Durisen, R.H., N.L. Cramer, B.W. Murphy, J.N. Cuzzi, T.L. Mullikin, and S.E. Cederbloom, "Ballistic Transport in Planetary Ring Systems Due to Particle Erosion Mechanisms. I: Theory, Numerical Methods, and Illustrative Examples," **Icarus** **80**:136-166 (1989).
- Durisen, R.H., S. Yang, P. Cassen, and S.W. Stahler, "Numerical Models of Rotating Protostars," **Astrophysical Journal** **345**:959-971 (1989).
- Elitzur, M., D.J. Hollenbach, and L.F. McKee, "H<sub>2</sub>O Masers in Star-Forming Regions," **Astrophysical Journal** **346**:983-990 (1989).
- Flynn, B.C. and J.N. Cuzzi, "Structure in the Cassini Division of Saturn," **Icarus** **82**:180-199 (1989).
- Fogelman, G., J. Huntington, D.E. Schwartz, and M. Fonda, eds., **The Gas-Grain Simulation Facility: Fundamental Studies of Particle Formation and Interaction Vol. I**, NASA Ames Research Center, NASA CP-10026, 34 pp (1989).

- Fogelman, G., J. Huntington, D.E. Schwartz, and M. Fonda, eds., **The Gas-Grain Simulation Facility: Fundamental Studies of Particle Formation and Interaction Vol. II**, NASA Ames Research Center, NASA CP-10026, 199 pp (1989).
- Fogelman, G., J.L. Huntington, and G.C. Carle, "Collection of Cosmic Dust in Earth Orbit for Exobiological Analysis," **Origins of Life** **19**:465-466 (1989).
- Fogelman, G., J.L. Huntington, G.C. Carle, and J.A. Nuth, "Microgravity Particle Research on the Space Station: The Gas-Grain Simulation Facility," **Advances in Space Research** **9**(2):91-94 (1989).
- Freund, F., F. Batllo, and M.M. Freund, "Dissociation and Recombination of Positive Holes in Minerals," pp. 310-329, IN: **Spectroscopic Characterization of Minerals and their Surfaces (ACS Symposium Series 415)**, L.C. Coyne, S.W.S. McKeever, and D.F. Blake, eds., American Chemical Society Press, Washington, DC (1989).
- Freund, M.M., F. Freund, and F. Batllo, "Highly Mobile Oxygen Holes in Magnesium Oxide," **Physics in Review Letters** **63**:2096-2099 (1989).
- Gaffey, M.J., J.F. Bell, and D.P. Cruikshank, "Reflectance Spectroscopy and Asteroid Surface Mineralogy," pp. 98-127, IN: **Asteroids II**, R.P. Binzel, T. Gehrels, and M.S. Matthews, eds., University of Arizona Press, Tucson, AZ (1989).
- Gazis, P.R., J.D. Mihalov, A. Barnes, A.J. Lazarus, and E.J. Smith, "Pioneer and Voyager Observations of the Solar Wind at Large Heliocentric Distances and Latitudes," **Geophysical Research Letters** **16**:223-226 (1989).
- Geballe, T.R., A.G.G.M. Tielens, L.J. Allamandola, A. Moorhouse, and P.W.J.L. Brand, "Spatial Variations of the 3 Micron Emission Features Within UV-Excited Nebulae: Photochemical Evolution of Interstellar PAHs," **Astrophysical Journal** **341**:278-287 (1989).
- Goldsmith, D. and D.J. Hollenbach, **LDR: To Lift the Far-Infrared Veil of the Cosmos**, NASA Brochure, Ames Research Center (1989).
- Gooding, J.L., M.H. Carr, and McKay, C.P., "The Case for Planetary Sample Return Missions, 2: History of Mars," **EOS** **70**:745-755 (1989).
- Green, W.J., D.E. Canfield, and T.G. Ferdelman, "Metal Dynamics in Lake Vanda (Wright Valley, Antarctica)," **Chemical Geology** **76**:85-94 (1989).
- Grim, R., W. Schutte, B. Schmitt, and J.M. Greenberg, "New Insights in the Photochemistry of Grain Mantles: The Identification of the 4.62 and 6.87 mm Bands," pp. 245-246, IN: **Interstellar Dust: Contributed Papers**, NASA Ames Research Center, NASA CP-3036, L.J. Allamandola and A.G.G.M. Tielens, eds. (1989).
- Grim, R.J.A., M.S. de Groot, J.M. Greenberg, F. Baas, W.A. Schutte, and B. Schmitt, "Infrared Spectroscopy of Astrophysical Ices: New Insights in the Photochemistry," **Astronomy and Astrophysics Supplement** **78**:161 (1989).
- Grim, R.J.A., J.M. Greenberg, W. Schutte, and B. Schmitt, "Ions in Grain Mantles, II: A New Explanation for the 6.86 mm Absorption in W33 A," **Astrophysical Journal** **341**:L87-L90 (1989).
- Harrison, A.A., Y.A. Clearwater, and C.P. McKay, "The Human Experience in Antarctica: Applications to Life in Space," **Behavioral Science** **34**:253-271 (1989).
- Hartmann, L. and J. Stauffer, "Additional Measurements of Pre-Main Sequence Stellar Rotation," **Astronomical Journal** **97**:873-880 (1989).
- Hodapp, K.W., W. Sinton, B. Ragent, and D. Allen, "High Resolution Imaging of the Venus Night-side using a Rockwell 128X128 HgCdTe Array, IN: **Proceedings of the Third International Infrared Workshop**, NASA Ames Research Center, NASA TM-102209 C.R. McCreight, ed. (1989).
- Hollenbach, D.J., and C.F. McKee, "Molecule Formation and Infrared Emission in Fast Interstellar Shocks, III: Results for J Shocks in Molecular Clouds," **Astrophysical Journal** **342**:306-336 (1989).
- Hollenbach, D.J., D.F. Chernoff, and C.F. McKee, "Infrared Diagnostics of Interstellar Shocks," pp. 245-258, IN: **Proceedings of the 22nd ESLAB Symposium on Infrared Spectroscopy in Astronomy**, European Space Agency, ESA SP-290, M. Kessler, ed. (1989).
- Hollenbach, D.J., "The Heating of Interstellar Gas by Dust," pp. 227-238, IN: **Interstellar Dust**, L. Allamandola and A.G.G.M. Tielens, eds., Kluwer Publishers, Dordrecht, The Netherlands (1989).
- Howell, R.R., D.B. Nash, T.R. Geballe, and D.P. Cruikshank, "High Resolution Infrared Spectroscopy of Io and Possible Surface Material," **Icarus** **78**:27-37 (1989).



- Huntington, J.L. and G. Fogelman, "On Performing Exobiology Experiments on an Earth-Orbital Platform with the Gas-Grain Simulation Facility," **Origins of Life** **19**:493-494 (1989).
- Jahnke, L.L., B. Lee, B., M.J. Sweeney, and H.P. Klein, "Anaerobic Biosynthesis of Unsaturated Fatty Acids in the Cyanobacterium, *Oscillatoria limnetica*," **Archives of Microbiology** **152**:215-217 (1989).
- Jahnke, L.L., "Evidence for the Synthesis of the Multi-Positional Isomers of Monounsaturated Fatty Acid in *Methylococcus capsulatus* by the Anaerobic Pathway," **FEMS Microbiology Letters** **58**:183-188 (1989).
- Kanavarioti, A., C.F. Bernasconi, D.L. Doodokyan, and D.J. Alberas, "Magnesium Ion Catalyzed P-N Bond Hydrolysis in Imidazolide-Activated Nucleotides: Relevance to Template-Directed Synthesis of Polynucleotides," **Journal of the American Chemical Society** **111**:7247-7257 (1989).
- Kasting, J.F., K.J. Zahnle, J.P. Pinto, and A.T. Young, "Sulfur, Ultraviolet Radiation, and the Early Evolution of Life," **Origins of Life** **19**:95-108 (1989).
- Kerridge, J.F., R. Mariner, J. Flores and S. Chang, "Isotopic Characteristics of Simulated Meteoritic Organic Matter: I. Kerogen-like Material," **Origins of Life** **19**: 561-572 (1989).
- Klingler, J.M., R.L. Mancinelli, and M.R. White, "Biological Nitrogen Fixation Under Primordial Martian Partial Pressures of Dinitrogen," **Advances in Space Research** **9**: 173-176 (1989).
- Krishna Swamy, K.S., S.A. Sandford, L.J. Allamandola, F.C. Witteborn, and J.D. Bregman, "Infrared Emission from Comets," **Astrophysical Journal** **340**:537-549 (1989).
- Kristian, J., C. Pennypacker, J. Middleditch, M. Hamuy, J. Imamura, W. Kunkel, D. Morris, R. Muller, S. Perlmutter, S. Rawlings, T. Sasseen, I. Shelton, T. Steiman-Cameron, and I. Toyhy, "Sub-Millisecond Optical Pulsar in Supernova 1987A," **Nature** **338**: 234 (1989).
- Lane, A.P., D.J. Hollenbach, M.R. Haas, and E.F. Erickson, "Far-Infrared Spectroscopy of Bipolar Flows," pp. 239, IN: **The Physics and Chemistry of Interstellar Molecular Clouds**, G. Winnewisser and J.T. Armstrong, eds., Springer-Verlag Publ. Co., Berlin, Germany (1989).
- Lark, N.L., H.B. Hammel, D.P. Cruikshank, D.J. Tholen, and M.A. Rigler, "The Brightness and Light Curve of Triton in 1987," **Icarus** **79**:15-22 (1989).
- Lesyna, L., T. Roellig, M. Savage, and M. Werner, "A Progress Report on Using Bolometers Cooled by Adiabatic Demagnetization Refrigeration," pp. 45-57, IN: **Proceedings of the Third Infrared Detector Technology Workshop**, NASA Ames Research Center, NASA TM-102209, C.R. McCreight, ed. (1989).
- Liffman, K. and D.D. Clayton, "Stochastic Evolution of Refractory Interstellar Dust During the Chemical Evolution of a Two-Phase Interstellar Medium," **Astrophysical Journal** **340**:853 (1989).
- Lunine, J.I., S.K. Atreya, and J.B. Pollack, "Present State and Chemical Evolution of the Atmospheres of Titan, Triton, and Pluto," pp. 605-665, IN: **Origin and Evolution of Planetary and Satellite Atmospheres**, S.K. Atreya, J.B. Pollack, M.S. Matthews: University of Arizona Press, Tucson, eds. (1989).
- Lynch, D.K., R.W. Russell, H. Campins, F.C. Witteborn, J.D. Bregman, D.M. Rank and M. Cohen, "5-13 Micron Airborne Observations of Comet Wilson 1986," **Icarus** **82**:379-388 (1989).
- Mancinelli, R.L., "Nitrogen Cycling in Microbial Mats Beneath an Antarctic Perennially Ice-covered Lake," **International Symposium on Microbial Ecology** **5**:86 (1989).
- Mancinelli, R.L., "Peroxides and the Survivability of Micro-organisms on Mars," **Advances in Space Research** **9**:191-195 (1989).
- Matese, J.J., D.P. Whitmire, and R.T. Reynolds, "Dust Shells Around Red Giant Stars: Evidence of Sublimating Comet Clouds?," **Icarus** **81**:24-30 (1989).
- Matese, J.J., D.P. Whitmire, and R.T. Reynolds, "Sublimating Planetesimals as the Source of Nucleating Seeds for Grain Condensation in Classical Novae," pp. 485-488, IN: **Interstellar Dust: Contributed Papers**, NASA Ames Research Center, NASA CP-3036, L.J. Allamandola and A.G.G.M. Tielens, eds. (1989).
- McKay, C.P. and W.L. Davis, eds., **Exobiology and Future Mars Missions**, NASA Ames Research Center, NASA CP-10027, 72 pp (1989).
- McKay, C.P. and W.L. Davis, "Planetary Protection Issues in Advance of Human Exploration of Mars," **Advances in Space Research** **9**(6): 197-202 (1989).

- McKay, C.P. and C.R. Stoker, "The Early Environment and its Evolution on Mars: Implications for Life," **Reviews in Geophysics** **27**:189-214 (1989).
- McKay, C.P., J.B. Pollack, and R. Courtin, "The Thermal Structure of Titan's Atmosphere," **Icarus** **80**:23-53 (1989).
- McKay, C.P., J.B. Pollack, A.P. Zent, D.P. Cruikshank, and R. Courtin, "The Thermal Structure of Triton's Atmosphere: Pre-Voyager Models," **Geophysical Research Letters** **16**:973-976 (1989).
- Mendoza-Gomez, C.X., J.M. Greenberg, P. McCain, J.P. Ferris, R. Briggs, M.S. de Groot, and W.A. Schutte, "Molecular and Mass Spectroscopic Analysis of Isotopically Labelled Organic Residues," pp. 257-259, IN: **Interstellar Dust: Contributed Papers**, NASA Ames Research Center, NASA CP-3036, L.J. Allamandola and A.G.G.M. Tielens, eds. (1989).
- Meyer, T.R., and C.P. McKay, "The Resources of Mars for Human Settlement," **Journal of the British Interplanetary Society** **42**: 147-160 (1989).
- Michelangeli, D.V., M. Allen, and Y.L. Yung, "El Chichon Volcanic Aerosols: Impact of Radiative, Thermal and Chemical Perturbations," **Journal of Geophysical Research** **94**: 18429-18443 (1989).
- Mihalov, J.D., "Pioneer Missions 6-E (The Delta Launches Solar Flares)," pp. 1123-1129, IN: **Magill's Survey of Science: Space Exploration Series**, F.N. Magill, ed., Salem Press Inc., Pasadena, CA (1989).
- Miller, R.H., P.O. Vanderort, D.E. Welty, and B.F. Smith, "Numerical Experiments on the Oscillation of a Rotating Axisymmetric Galaxy," **Astrophysical Journal** **342**:105-121 (1989).
- Moore, K.R., D.J. McComas, C.T. Russell, and J.D. Mihalov, "Suprathermal Ions Observed Upstream of the Venus Bow Shock," **Journal of Geophysical Research** **94**:3743-3748 (1989).
- Morrison, D. and C.R. Chapman, "The New Catastrophism," **Skeptical Inquirer** **14**: 141-152 (1989).
- Oberbeck, V.R. and G. Fogelman, "Estimate of the Maximum Time Required to Originate Life," **Origins of Life** **19**: 549-560 (1989).
- Oberbeck, V.R. and G. Fogelman, "Impacts and the Origin of Life," **Nature** **339**:577 (1989).
- Oberbeck, V.R. and G. Fogelman, "On the Possibility of Life on Early Mars," pp. 800-801, IN: **Lunar and Planetary Science Conference XX** (1989).
- Oberbeck, V.R., J.M. Livingston, P.B. Russell, R.F. Pueschel, J.N. Rosen, M.T. Osborn, M.A. Kritz, K.E. Snetsinger, and G.V. Ferry, "Sage II Aerosol Validation: Selected Altitude Measurements, Including Particle Micrometeorology," **Journal of Geophysical Research** **94**: 8367-8380 (1989).
- Oberbeck, V.R., C.P. McKay, T.W. Scattergood, G.C. Carle, and J.R. Valentin, "The Role of Cometary Particle Coalescence in Chemical Evolution," **Origins of Life** **19**: 39-55 (1989).
- Oberbeck, V.R., B. O'Hara, and G.C. Carle, "Concepts for Collection of Aerosols in Titan's Atmosphere," **Journal of Geophysical Research** **92**: E717-E722 (1989).
- Oberbeck, V.R., "Sampling Stratospheric Aerosols with Impactors," **Aerosol Science and Technology** **11**:65-79 (1989).
- Palmisano, A.C., R.E. Summons, S.E. Cronin, and D.J. Des Marais, "Lipophilic Pigments from Cyanobacterial (Blue-Green Algal) and Diatom Mats in Hamelin Pool, Shark Bay, Western Australia," **Journal of Phycology** **25**:655-662 (1989).
- Palmisano, A.C., S.E. Cronin, E.D. D'Amelio, E. Munoz, and D.J. Des Marais, "Distribution and Survival of Lipophilic Pigments in a Laminated Microbial Mat Community near Guerrero Negro, Mexico," pp. 138-152, IN: **Microbial Mats: Physiological Ecology of Benthic Microbial Communities**, Y. Cohen and E. Rosenberg, eds. American Society for Microbiology, Washington, DC (1989).
- Palmisano, A.C., R.A. Wharton, Jr., S.E. Cronin, and D.J. Des Marais, "Lipophilic Pigments from the Benthos of a Perennially Ice-covered Antarctic Lake," **Hydrobiologia** **178**:73-80 (1989).
- Pohorille, A. and R.D. MacElroy, "Ions in Aqueous Solutions and at Water Interfaces -Supercomputer Simulation Tests of Basic Theories," pp. 610-620, IN: **Proceedings of the Fourth International Conference on Supercomputing**, L. Kartashev and S. Kartashev, eds., International Supercomputing Institute, Moscow, Russia (1989).

- Pollack, J.B. and P. Bodenheimer, "Theories of the Origin and Evolution of the Giant Planets," pp. 564-604, IN: **Origin and Evolution of Planetary and Satellite Atmospheres**, S.K. Atreya, J.B. Pollack, M.S. Matthews, eds., University of Arizona Press, Tucson, AZ (1989).
- Pueschel, R.F., K.G. Snetsinger, J.K. Goddman, O.B. Toon, G.V. Ferry, V.R. Oberbeck, J.M. Livingston, S. Verma, W. Fong, W.L. Starr, and K.R. Chan, "Condensed Nitrate, Sulfate and Chloride in Antarctic Stratospheric Aerosols," **Journal of Geophysical Research, AAOE Special Edition 94(D9)**:11271-11284 (1989).
- Rau, G.H., M. Heyraud, and R. Cherry, "N-15/N-14 and C-13/C-12 in Mesopelagic Shrimp from the N.E. Atlantic: Evidence for Differences in Diet," **Deep-Sea Research 36**: 1103-1110 (1989).
- Rau, G.H., T. Takahashi, and D.J. Des Marais, "Latitudinal Variations in Plankton  $\delta^{13}\text{C}$ : Implications for  $\text{CO}_2$  and Productivity in Past Oceans," **Nature 341**: 516-518 (1989).
- Rothschild, L.J. and D.J. Des Marais, "Stable Carbon Isotope Fractionation in the Search for Life on Early Mars," **Advances in Space Research 9**:159-165. (1989).
- Rothschild, L.J. and R.L. Mancinelli, "Microbial Mats as a Model System for the Early Evolution of Carbon Metabolism," **Origins of Life 19**:413-414 (1989).
- Rothschild, L.J., "Protozoa, Protoctista, Protista: What's in a Name?," **Journal of Histology and Biology 22**:277-305 (1989).
- Roush, T.L., "Infrared Transmission Measurements of Martian Soil Analogs," pp. 52-54, IN: **MECA Workshop on Dust on Mars III**, Lunar and Planetary Institute, LPI TR-89-01, S. Lee, ed. (1989).
- Roush, T.L., J.B. Pollack, C. Stoker, F.C. Witteborn, J.D. Bregman, D.H. Wooden, and D. Rank, " $\text{CO}_3^{2-}$  and  $\text{SO}_4^{2-}$  Bearing Anionic Complexes Detected in Martian Atmospheric Dust," pp. 928-929, IN: **Lunar and Planetary Science Conference XX** (1989).
- Salama, F., L.J. Allamandola, F.C. Witteborn, D.P. Cruikshank, S.A. Sandford, and J.D. Bregman, "The 2.5 - 5.0  $\mu\text{m}$  Spectra of Io: Evidence for  $\text{H}_2\text{S}$  and  $\text{H}_2\text{O}$  Frozen in  $\text{SO}_2$ ," **Icarus 83**:66-82 (1989).
- Sandford, S.A. and J.P. Bradley, "Interplanetary Dust Particles Collected in the Stratosphere: Observations of Atmospheric Heating and Constraints on their Inter-relationships and Sources," **Icarus 82**:146-166 (1989).
- Sandford, S.A., "Interstellar Dust in Collected Interplanetary Dust Particles," pp. 403-413, IN: **Interstellar Dust**, L.J. Allamandola and A.G.G.M. Tielens, eds., Kluwer Publishers, Dordrecht, The Netherlands (1989).
- Scargle, J.D., "An Introduction to Chaotic and Random Time Series Analysis," **International Journal of Imaging Systems and Technology 1**:243-253 (1989).
- Scargle, J.D., "Studies in Astronomical Time Series Analysis, III: Fourier Transforms, Autocorrelation and Cross-Correlation Functions of Unevenly Spaced Data," **Astrophysical Journal 343**: 874-887 (1989).
- Scattergood, T.W., C.P. McKay, W.J. Borucki, L.P. Giver, H. Van Ghysseghem, J.E. Parris, and S.L. Miller, "Production of Organic Compounds in Plasmas: A Comparison Between Electric Sparks, Laser-Induced Plasmas and UV Light," **Icarus 81**:413-428 (1989).
- Schutte, W. and A.G.G.M. Tielens, "Theoretical Studies of the Infrared Emission for Circumstellar Dust Shells: The Infrared Characteristics of Circumstellar Silicates and the Mass-Loss Rate of Oxygen-Rich Late-Type Giants," **Astrophysical Journal 343**:369-392 (1989).
- Schutte, W.A. and J.M. Greenberg, "The Evolution of Organic Mantles on Interstellar Grains," pp. 267-268, IN: **Interstellar Dust: Contributed Papers**, NASA Ames Research Center, NASA CP-3036, L.J. Allamandola and A.G.G.M. Tielens, eds.(1989).
- Schwartz, A.W., K. Dose, D.M. Raup, H.P. Klein, and D.L. DeVincenzi, eds., "Life Sciences and Space Research XXIII(2), Planetary Biology and Origins of Life," **Advances in Space Research 9**:170-179 (1989).
- Schwartz, D.E. and R.L. Mancinelli, "Bio-markers and the Search for Extinct Life on Mars," **Advances in Space Research 9(3-5)**: 155-158 (1989).
- Schwartz, D.E., R.L. Mancinelli, and J. Marshall, "Crystals as Biomarkers: A Potential MRSR Experiment," **Origins of Life 19**:530-541 (1989).
- Showalter, M.R., "Anticipated Time-Variations in (our understanding of) Jupiter's Ring System," pp. 116-125, IN: **Time-Variable Phenomena in the Jovian System**, NASA Ames Research Center, NASA SP-494, M.J.S. Belton, R.A. West, and J. Rahe, eds. (1989).

- Simonelli, D.P. and R.T. Reynolds, "The Interiors of Pluto and Charon: Structure, Composition and Implications," **Geophysical Research Letters** **16**:1209-1212 (1989).
- Simonelli, D.P., J.B. Pollack, C.P. McKay, R.T. Reynolds, and A.L. Summers, "The Carbon Budget in the Outer Solar Nebula," **Icarus** **82**:1-35 (1989).
- Simpson, J.P. and R.H. Rubin, "Interstellar Extinction at 10 - 20  $\mu\text{m}$ ," pp. 523-526, IN: **Interstellar Dust: Contributed Papers**, NASA Ames Research Center, NASA CP-3036, L.J. Allamandola and A.G.G.M. Tielens, eds.(1989).
- Sleep, N.H., K.J. Zahnle, J.F. Kasting, and H.J. Morowitz, "Annihilation of Ecosystems by Large Asteroid Impacts on the Early Earth," **Nature** **342**:139-142 (1989).
- Smith, B.A., et al., "Voyager 2 at Neptune: Imaging Science Results," **Science** **246**: 1422-1449 (1989).
- Smith, B.F. and R.H. Miller, "Galactic Formation and Evolution," pp. 1-6, IN: **Proceedings of the Fourth International Conference on Supercomputing**, L. Kartashev and S. Kartashev, eds., International Supercomputing Institute, Moscow, Russia (1989).
- Stan-Lotter, H. and L.I. Hochstein, "A Comparison of an ATPase from the Archaeobacterium Halobacterium saccharovororum with the F<sub>1</sub> Moiety from the Escherichia coli ATP Synthase," **European Journal of Biochemistry** **179**:155 (1989).
- Stan-Lotter, H., F. Lang, and L.I. Hochstein, "Electrophoresis and Isoelectricfocusing of Whole Cell and Membrane Proteins from the Extremely Halophilic Archaeobacteria," **Applications of Theoretical Electrophoresis** **1**:147-153 (1989).
- Stauffer, J., D. Hamilton, R. Probst, G. Rieke, and M. Mateo, "Possible Pleiades Member with M=0.07 M (sun): Identification of Brown Dwarf Candidates of Known Age, Distance and Metallicity," **Astrophysical Journal** **344**:L21-L24 (1989).
- Stauffer, J., L. Hartmann, and B. Jones, "Rotational Velocities of Newly Discovered, Low Mass Members of the Alpha Persei Cluster," **Astrophysical Journal** **346**: 160-167 (1989).
- Stauffer, J., L. Hartmann, B. Jones, and B. McNamara, "Pre-Main Sequence Stars in the Young Cluster IC2391," **Astrophysical Journal** **342**: 285-294 (1989).
- Steiman-Cameron, T.Y., J.N. Imamura, and D.V. Steiman-Cameron, "High-speed Optical Photometry of the DQ Herculis Object H2215-086," **Astrophysical Journal** **339**: 434-442 (1989).
- Steiman-Cameron, T.Y., "Structure and Evolution of Dissipative Nonplanar Galactic Disks," pp. 149-150, IN: **Dynamics of Astrophysical Disks**, J. Sellwood, ed., Cambridge University Press, New York, NY (1989).
- Stoker, C.R., and O.B. Toon, "Moist Convection on Neptune," **Geophysical Research Letters** **16**:929-932 (1989).
- Stoker, C.R., ed., **The Case for Mars III**, American Astronautical Society Science and Technology Series, Vol. 74, 727 pp (1989).
- Tielens, A.G.G.M., "Dust in Dense Clouds," pp. 239-262, IN: **Interstellar Dust**, L.J. Allamandola and A.G.G.M. Tielens, eds., Kluwer Publishers, Dordrecht, The Netherlands (1989).
- Tindall, B.J., G. A. Tomlinson, and L.I. Hochstein, "Transfer of Halobacterium denitrificans (Tomlinson, Jahnke, & Hochstein) to the genus Haloferax, as Haloferax denitrificans comb. nov.," **International Journal of Systemic Bacteriology** **39**:359-360 (1989).
- Toon, O.B., C.P. McKay, T.P. Ackerman, and K. Santhanam, "Rapid Calculation of Radiative Heating Rates and Photodissociation Rates in Inhomogeneous Multiple Scattering Atmospheres," **Journal of Geophysical Research** **94**: 16,287-16,301 (1989).
- Valentin, J.R. and K.W. Hall, "Mechanical Modulation for Multiplex Gas Chromatographic Analyses at Sub-atmospheric Pressures," **Journal of High Resolution Chromatography** **12**:53-55 (1989).
- van der Zwet, G.P., L.J. Allamandola, F. Baas, and J.M. Greenberg, "Infrared Spectrum of the Complex of Formaldehyde with Carbon Dioxide in Argon and Nitrogen Matrices," **Journal of Molecular Structure** **195**:213-255 (1989).
- Vanajakshi, T.C., K.W. Thompson, and D.C. Black, "Boundary Value Problems in Magneto-hydrodynamics (and Fluid Dynamics), I: Radiation Boundary Condition," **Journal of Computational Physics** **84**:343-359 (1989).

- Walker, H.J., M. Cohen, K. Volk, R.J. Wainscoat, and D.E. Schwartz, "A Practical Approach to the Classification of IRAS Sources Using Infrared Colors Alone," **Astronomical Journal** **98**:2163-2181 (1989).
- Wang, P., M.P. McCormic, L.R. McMaster, W.P. Chu, T.J. Swissler, M.T. Osborn, P.B. Russell, V.R. Oberbeck, J. Livingston, J.M. Rosen, D.J. Hofmann, G.W. Grams, W.H. Fuller, and G.K. Yue, "Sage II Aerosol Date Validation Based on Retrieved Aerosol Model Size Distribution from Sage II Aerosol Measurements," **Journal of Geophysical Research** **94**:8381-8393 (1989).
- Weissman, P.R., A.R. Dobrovolskis, and S.A. Stern, "Constraints on Impact Rates in the Pluto-Charon System and the Population of the Kuiper Comet Belt," **Geophysical Research Letters** **16**: 1241-1244 (1989).
- Welty, A., K. Strom, L. Hartmann, S. Kenyon, and J. Stauffer, "Further Evidence for Differential Rotation in V1057 Cygni," **Astrophysical Journal** **349**:328-324 (1989).
- Werner, M.W., W.F. Brooks, L.A. Manning, and P. Eisenhardt, "SIRTF in High Earth Orbit," pp. 387-400, IN: **Proceedings of the Third Infrared Detector Technology Workshop**, NASA Ames Research Center, NASA TM-102209, C.R. McCreight, ed. (1989).
- Wharton Jr., R.A., G.M. Simmons, Jr., and C.P. McKay, "Perennially Ice-Covered Lake Hoare, Antarctica: Physical Environment, Biology and Sedimentation," **Hydrobiologia** **172**:305-320 (1989).
- Wharton, R.A., C.P. McKay, R.L. Mancinelli, and G.M. Simmons, "Early Martian Environments: The Antarctic and Other Terrestrial Analogs," **Advances in Space Research** **9**: 147-153 (1989).
- Whitmire, D.P., J.J. Matese, and R.T. Reynolds, "Sublimating Comets as the Source of Nucleation Seeds for Grain Condensation Around M Super-giants," pp. 495-501, IN: **Interstellar Dust: Contributed Papers**, NASA Ames Research Center, NASA CP-3036, L.J. Allamandola and A.G.G.M. Tielens, eds. (1989).
- Wilson, M.A., A. Pohorille, and L.R. Pratt, "Comment on Study of the Liquid-Vapor Interface of Water, I: Simulation Results of Thermodynamic Properties and Orientational Structure," **Journal of Chemical Physics** **90**:5211-5213 (1989).
- Wilson, M.A., A. Pohorille, and L.R. Pratt, "Interaction of a Sodium Ion with the Water Liquid-Vapor Interface," **Chemical Physics** **129**:209-212 (1989).
- Witteborn, F.C., J.D. Bregman, D.H. Wooden, P.A. Pinto, D.M. Rank, S.E. Woosely, M. and Cohen, "Spectral Line Profiles of Nickel and Argon in Supernova 1987A: Expansion Velocity and Electron Scattering Effects," **Astrophysical Journal** **338**: L9-L12 (1989).
- Witteborn, F.C., S.A. Sandford, J.D. Bregman, L.J. Allamandola, M. Cohen, and D. Wooden, "New Emission Features in the 11 - 13  $\mu$ m Region and their Relationship to Polycyclic Aromatic Hydrocarbons," **Astrophysical Journal** **341**: 270-277 (1989).
- Wolfire, M.G., D.J. Hollenbach, and A.G.G.M. Tielens, "The Correlation of CII 158 Micron and CO (J=1-0) Line Emission," **Astrophysical Journal** **344**:770-778 (1989).
- Young, A., A. Skumanich, J. Stauffer, L. Hartmann, B. Bopp, and E. Harlan, "A Study of Excess H-Alpha Emission in Chromospherically Active M Dwarfs," **Astrophysical Journal** **344**:427-436 (1989).
- Young, R.E. and H. Houben, "Dynamics of Planetary-Scale Baroclinic Waves During Southern Hemisphere Winter," **Journal of Atmospheric Sciences** **46**:1365-1383 (1989).
- Zellner, B., E.N. Wells, C.R. Chapman, and D.P. Cruikshank, "Asteroid Observation with Space Telescope and SIRTF," pp. 949-969, IN: **Asteroids II**, R.P. Binzel, T. Gehrels, and M.S. Matthews, eds., University of Arizona Press, Tucson, AZ (1989).
- Zent, A.P., S.E. Fanale, S.E. Postawko, and J.R. Savail, "Distribution of Shallow Permafrost on Mars," pp. 284-289, IN: **Proceedings of the V International Conference on Permafrost**, Tapir Publishers, Trondheim, Norway (1989).
- Zent, A.P., C.P. McKay, J.B. Pollack, and D.P. Cruikshank, "Grain Metamorphism in Polar Nitrogen on Triton," **Geophysical Research Letters** **16**:965-968 (1989).

## 1990 Publications

- Allamandola, L., "The Nature of Interstellar/ Pre-Cometary Dust," pp.9-37, IN: **Physics and Composition of Interstellar Matter**, J. Krelowski and J. Papaj, eds., Institute of Astronomy of the Nicolaus Copernicus University, Torun, Poland, 238 pp (1990).
- Allamandola, L.J. and S.A. Sandford, "Interstellar Grain Chemistry and Organic Molecules," pp. 113-146, IN: **Carbon in the Galaxy: Studies from Earth and Space**, J.C. Tarter, S. Chang, and D.J. DeFrees, eds., NASA Ames Research Center, NASA CP-3061 (1990).
- Allamandola, L.J., "Benzenoid Hydrocarbons in Space: The Evidence and Implications," **Topics in Current Chemistry** **153**: 3-24 (1990).
- Andersen, D.T., C.P. McKay, R.A. Wharton, and J.D. Rummel, "An Antarctic Research Outpost as a Model for Planetary Exploration," **Journal of the British Interplanetary Society** **43**: 499-504 (1990).
- Barnes, A., "Distant Solar Wind Plasma - View From the Pioneers," pp. 235-240, IN: **Physics of the Outer Heliosphere**, S. Grzedzielski and D.E. Page, eds., Pergamon Press, Oxford, England (1990).
- Batlo, F., R.C. LeRoy, K. Parvin, and F. Freund, "Dissociation of  $O_2^{2-}$  Defects into Paramagnetic  $O^-$  in Wide Band Gap Insulators: A Magnetic Susceptibility Study of Magnesium Oxide," **Journal of Applied Physics** **67**: 588-596 (1990).
- Bibring, J.P., Y. Langevin, S. Erard, O. Forni, P. Masson, C. Sotin, M. Combes, V. Moroz, A. Coradini, V. Formisano, J. Head, L. Soderblom, F. Fanale, T. McCord, and D. Cruikshank, "The Observation of the Surface of Mars by the ISM Instrument on Board the Phobos 2 Spacecraft," pp. 79-80, IN: **Lunar and Planetary Science Conference XXI**, March 1990, Houston, TX (1990).
- Blake, D.F., L.J. Allamandola, and G. Palmer, "Direct Determination of the Morphology, Structure, and Composition of Cometary and Interstellar Ice Analogs in the Laboratory," pp. 95-96, IN: **Lunar and Planetary Science Conference XXI**, March 1990, Houston, TX (1990).
- Blake, D.F., "Scanning Electron Microscopy," pp. 11-44, IN: **Instrumental Surface Analysis of Geological Materials**, Dale Perry, ed., VCH Publishers, Inc., New York, NY (1990).
- Blake, D.F., L.J. Allamandola, G. Palmer, and A. Pohorille, "Analytical Electron Microscopy of Extraterrestrial Ice Analogs," pp. 594-595, IN: **XII International Congress for Electron Microscopy**, August 1990, Seattle, WA (1990).
- Brace, L.H., R.F. Theis, and J.D. Mihalov, "Response of Nightside Ionosphere and Ionotail of Venus to Variations in Solar EUV and Solar Wind Dynamic Pressure," **Journal of Geophysical Research** **95(A4)**: 4075-4084 (1990).
- Brown, P.D. and S.B. Charnley, "Chemical Models of Interstellar Gas-Grain Processes I. Modelling and the Effect of Accretion on Gas Abundances and Mantle Composition in Dense Clouds," **Mon. Not. R. Astronomical Society** **244**: 432-443 (1990).
- Brown, P.D., S.B. Charnley, and T.J. Miller, "Models of the Gas-Grain Interaction in Dense Interstellar Clouds," pp. 1-17, IN: **Chemistry and Spectroscopy of Interstellar Molecules, PACIFICHEM '89, Symposium No. 288**, December 1989, Honolulu, HI (1990).
- Bunch, T.E., P. Schultz, D. Brownlee, M. Podolak, R. Reynolds, P. Cassen, and S. Chang, "Hyper-velocity Impact Penetration Experiments - A Guide to the Origin of Rims on Chondrules," pp. 143-144, IN: **Lunar and Planetary Science Conference XXI**, March 1990, Houston, TX (1990).
- Burton, M., J. Bland, D. Axon, P. Brand, R. Garden, T. Geballe, D. Hollenbach, J. Hough, L. McLean, and A. Moorhouse, "High Spectral and Spatial Resolution Imaging of the Shock Waves in Orion," pp. 327-328, IN: **The Evolution of the Interstellar Medium, ASP Conference Series Vol. 12**, L. Blitz, ed., Astronomical Society of the Pacific, San Francisco, CA (1990).
- Burton, M.G., D.J. Hollenbach, and A.G.G.M. Tielens, "Line Emissions From Clumpy Photodissociation Regions," **The Astrophysical Journal** **365**: 620-639 (1990).
- Burton, M.G., D.J. Hollenbach, M.R. Haas, and E.F. Erickson, "Shocked [O I] 63 Micron Line Emission From the Supernova Remnant IC 443," **The Astrophysical Journal** **355**: 197-209 (1990).
- Buss, R.H., M. Cohen, A.G.G.M. Tielens, M.W. Werner, J.D. Bregman, F.C. Witteborn, D. Rank, and S.A. Sandford, "Hydrocarbon Emission Features in the Infrared Spectra of Warm Supergiants," **Astrophysical Journal Letters** **365**: L23-L26 (1990).

- Cabot, W., O. Hubickyj, J.B. Pollack, P. Cassen, and V.M. Canuto, "Direct Numerical Simulations of Turbulent Convection: I. Variable Gravity and Uniform Rotation," **Journal of Geophysics and Astrophysics Fluid Dynamics** **53**: 1-42 (1990).
- Carral, P., J.L. Turner, and P.T.P. Ho, "15 GHz Compact Structure in Galactic Nuclei," **The Astrophysical Journal** **362**:434-442 (1990).
- Chackerian, C., Jr., D. Goorvitch, and L.P. Giver, "N<sub>2</sub>-Broadening in the HCl Vibrational Fundamental: Temperature Dependence Between 160 and 296K," **Journal of Quantitative Spectroscopy and Radiative Transfer** **43(2)**: 127-132 (1990).
- Champney, J.M. and J.N. Cuzzi, "A Turbulent Two-Phase Flow Model for Nebula Flow," **AIAA Papers**, American Institute of Aeronautics and Astronautics, Washington, DC, AIAA Paper #90-0211 (1990).
- Chapman, C.R. and D. Morrison, "Cosmic Impacts, Cosmic Catastrophes, Part 2," **MERCURY The Journal of the Astronomical Society of the Pacific** **19(1)**: 21-25 (1990).
- Charnley, S.B., "Chemical Diagnostics of Turbulent Magnetic Boundary Layers," pp. 349-350, IN: **Galactic and Intergalactic Magnetic Fields**, R. Beck, P. Kronberg, and R. Wielebinski, eds., Kluwer Academic Publishers, Norwell, MA (1990).
- Charnley, S.B., and D.A. Williams, "Chemistry in the Molecular Cloud Barnard 5," pp. 313-327, IN: **Molecular Astrophysics - A Volume Honoring Alexander Dalgarno**, T.W. Hartquist, ed., Cambridge University Press, Cambridge, England (1990).
- Charnley, S.B., D.C.B. Whittet, and D.A. Williams, "Ice Mantles in Barnard 5 IRS1," **Mon. Not. R. Astronomical Society** **245**: 161-163 (1990).
- Charnley, S.B., J.E. Dyson, T.W. Hartquist, and D.A. Williams, "Chemical Evolution in Molecular Clump - Stellar Wind Interfaces," **Mon. Not. R. Astronomical Society** **243**: 405-412 (1990).
- Chu, Y.H. and M.M. MacLow, "X-Rays From Superbubbles in the Large Magellanic Cloud," **The Astrophysical Journal** **365**: 510-521 (1990).
- Clark, R.N., G.A. Swayze, R.B. Singer, and J.B. Pollack, "High Resolution Reflectance Spectra of Mars in the 2.3 Micron Region: Evidence for the Mineral Scapolite," **Journal of Geophysical Research** **95**:14481-14496 (1990).
- Cohen, M., "IRAS Observations of the Exciting Stars of Herbig-Haro Objects. II. The Reipurth and Graham Sample and Low-Resolution Spectra," **The Astrophysical Journal** **354**: 701-707 (1990).
- Cohen, M., H. Walker, R. Wainscoat, K. Volk, and D. Schwartz, eds., **An Infrared Model Based on the IRAS Point Source Data**, NASA Ames Research Center, NASA CR-177526, 588 pp (1990).
- Colgan, S.W.J., E.E. Salpeter, and Y. Terzian, "H I Absorption Limits and Emission Mapping for High-Velocity Clouds," **The Astrophysical Journal** **351**:503-514 (1990).
- Coyne, L., J.L. Bishop, T. Scattergood, A. Banin, G. Carle, and J. Orenberg, "Near-Infrared Correlation Spectroscopy: Quantifying Iron and Surface Water in a Series of Variably Cation-Exchanged Montmorillonite Clays," pp. 407-429, IN: **Spectroscopy Characterization of Minerals and Their Surfaces**, L.M. Coyne, S.W.S. McKeever, and D.F. Blake, eds., American Chemical Society Press, Washington, DC (1990).
- Cruikshank, D.P., "Solar System Astronomy from the Moon: Studies of Solid Bodies and Other Condensed Phase Matter," pp. 35-40, IN: **Astrophysics from the Moon**, AIP CR-207, M.J. Mumma and H.J. Smith, eds., American Institute of Physics, New York, NY (1990).
- Cruikshank, D.P., "Summary of Panel Discussion," pp. 33-34, IN: **Astrophysics from the Moon**, AIP CR-207, M.J. Mumma and H.J. Smith, eds., American Institute of Physics, New York, NY (1990).
- Cuzzi, J.N. and R.H. Durisen, "Meteoroid Bombardment of Planetary Rings: General Formulation and Effects of Oort Cloud Projectiles," **Icarus** **84**:467-501 (1990).
- Des Marais, D.J., "Microbial Mats and the Early Evolution of Life," **Trends in Ecology and Evolution** **5(5)**: 140-144 (1990).
- DeVincenzi, D.L., J.R. Marshall, and D. Andersen, eds., **Exobiology on Mars**, NASA Ames Research Center, NASA CP-10055, 32 pp (1990).
- Dobrovolskis, A.R., "Tidal Disruption of Solid Bodies," **Icarus** **88**:24-38 (1990).
- Dobrovolskis, A.R., and D.J. Diner, "Barotropic Instability with Divergence: Theory and Applications to Venus," **Journal of the Atmospheric Sciences** **47**:1578-1588 (1990).

- Embley, R.W., S.L. Eittrien, C. McHugh, W.R. Normak, G.H. Rau, B. Hecker, A. E. DeBevoise, H.G. Greene, W.B.F. Ryan, C. Harrold and C. Baxter, "Geological Setting of Chemosynthetic Communities the Monterey Fan-Valley System," **Deep-Sea Research** 37:1651-1667 (1990).
- Fleming, R.H., G.P. Meeker, F. Radicati di Brozolo, D.F. Blake, and L.D. White, "Isotope Ratio Imaging of Interplanetary Dust Particles," pp. 369-370, IN: **Lunar and Planetary Science Conference XXI**, March 1990, Houston, TX (1990).
- Freund, F., F. Batllo, and M.M. Freund, "Dissociation and Recombination of Positive Holes in Minerals," pp. 310-329, IN: **Spectroscopic Characterization of Minerals and Their Surfaces**, L.M. Coyne, S.W.S. McKeever, and D.F. Blake, eds., American Chemical Society Press, Washington, DC (1990).
- Freund, F., G.C. Maiti, F. Batllo, and M. Baerns, "O<sup>-</sup> Identified at High Temperatures in CaO-Based Catalysts for Oxidative Methane Dimerization," **Journal of Chemical Physics** 87:1467-1477 (1990).
- Friedman, E.I. and D. Schwartz-Kolyer, "Biological Pattern Recognition in Mars Imaging," pp. 23-25, IN: **Exobiology on Mars**, D.L. DeVincenzi, et al., eds., NASA Ames Research Center, NASA CP-10055 (1990).
- Gerber, R.A., S.A. Lamb, R.H. Miller, and B.F. Smith, "Models of Colliding Galaxies: Kinetic Energy and Density Enhancements," pp. 223-230, IN: **Heidelberg Conference on Dynamics and Interactions of Galaxies**, R. Wielen, ed., Springer-Verlag Publ. Co., Berlin, Germany (1990).
- Goorvitch, D., "The C2 Ballik-Ramsay Transitions in Carbon Stars," **The Astrophysical Journal Supplement Series** 74:769-783 (1990).
- Haas, M.R., S.W.J. Colgan, E.F. Erickson, S.D. Lord, M.G. Burton, and D.J. Hollenbach, "Velocity-resolved Far-infrared Spectra of [Fe II]: Evidence for Mixing and Clumping in SN 1987A," **The Astrophysical Journal** 360:257-266 (1990).
- Haberle, R.M. and B.M. Jakosky, "Sublimation and Transport of Water From the North Residual Polar Cap on Mars," **Journal of Geophysical Research** 95(B2):1423-1437 (1990).
- Hall, K.W., J.R. Valentin, and J.B. Phillips, "Development of a Modulator to Selectively Measure Water Vapor from a Gaseous Mixture," **Journal of High Resolution Chromatography** 12:835-837 (1990).
- Hollenbach, D.J. and H.A. Thronson, eds., **The Interstellar Medium in External Galaxies: Summaries of Contributed Papers**, NASA Ames Research Center, NASA CP-3084, 399 pp (1990).
- Hollenbach, D.J., "Photodissociation Regions," pp. 167-183, IN: **The Evolution of the Interstellar Medium**, ASP Conference Series Vol. 12, L. Blitz, ed., Astronomical Society of the Pacific, San Francisco, CA (1990).
- Hora, J.L., L.K. Deutsch, W.F. Hoffman, and G.G. Fazio, "High-Resolution 8-13 Micron Imaging of the Planetary Nebulae BD +30 3639 and NGC 6572," **The Astrophysical Journal** 353:549-563 (1990).
- Huebner, W.F., and C.P. McKay, "Implications of Comet Research," pp. 305-331, IN: **Physics and Chemistry of Comets**, W.F. Huebner, ed., Springer-Verlag Publ. Co., Berlin, Germany (1990).
- Imamura, J.N., J. Kristian, J.H. Middleditch, and T.Y. Steiman-Cameron, "The 8-Second Optical Quasi-Periodic Oscillations in GX339-4," **The Astrophysical Journal** 365:312-316 (1990).
- Imamura, J.N., T.Y. Steiman-Cameron, J. Kristian, and J.H. Middleditch, "The 8-Second Optical Quasi-Periodic Oscillations in GX399-4," pp. 63-66, IN: **Accretion Powered Compact Binaries**, C. Mauche, ed., Cambridge University Press, Cambridge, England (1990).
- Jahnke, L.L., "Lipid Characterization of Outer and Inner Membranes from *Methylococcus capsulatus*," IN: **90th Annual Meeting of the American Society of Microbiology**, May 1990, Anaheim, CA (1990).
- Jakosky, B.M. and R.M. Haberle, "Year-to-Year Instability of the Mars South Polar Cap," **Journal of Geophysical Research** 95(B2):1359-1365 (1990).
- Jones, T.D., L.A. Lebofsky, J.S. Lewis, and M.S. Marley, "The Composition and Origin of C, P, and D Asteroids: Water as a Tracer of Thermal Evolution in the Outer Belt," **Icarus** 88(1):172-192 (1990).
- Jorgensen, B.B. and D.J. Des Marais, "The Diffusive Boundary Layer of Sediments: Oxygen Microgradients Over a Microbial Mat," **Limnology and Oceanography** 35(6):1343-1355 (1990).
- Kanavarioti, A. and C.F. Bernasconi, "Computer Simulation in Template-Directed Oligonucleotide Synthesis," **Journal of Molecular Evolution** 31:470-477 (1990).



- Kanavarioti, A. and R.L. Mancinelli, "Could Organic Matter Have Been Preserved on Mars for 3.5 Billion Years?," **Icarus** **84**:196-202 (1990).
- Kanavarioti, A., S. Chang, and D.J. Alberas, "Limiting Concentrations of Activated Mononucleotides Necessary for Template-Directed Oligonucleotide Elongation," **Journal of Molecular Evolution** **31**:462-469 (1990).
- Koch, D.G., E.B. Hughes, and P.L. Nolan, "Lunar Occultations for Gamma-Ray Source Measurements," pp. 366-375, IN: **Astrophysics from the Moon**, M.J. Mumma and H.J. Smith, eds., American Institute of Physics, AIP CP-207 (1990).
- Kolvoord, R.A., J.A. Burns, and M.R. Showalter, "Periodic Features in Saturn's F Ring," **Nature** **345**:695-697 (1990).
- Korykansky, D.G., P. Bodenheimer, P. Cassen, and J.B. Pollack, "One-Dimensional Calculations of a Large Impact on Uranus," **Icarus** **84**:528-541 (1990).
- Lane, A.P., M.R. Haas, D.J. Hollenbach, and E.F. Erickson, "Far-Infrared Spectroscopy of the DR 21 Star Formation Region," **The Astrophysical Journal** **361**:132-144 (1990).
- Levison, H.F., M.J. Duncan, and B.F. Smith, "Dynamical Instabilities in Axisymmetric Stellar Systems I: Oblate E6 Models," **The Astrophysical Journal** **363**:66-78 (1990).
- Lindsey, C., G. Kopp, E.E. Becklin, T. Roellig, M.W. Werner, J.T. Jeffries, F.Q. Orrall, D. Braun, and D.L. Mickey, "Far Infrared Intensity Variations Caused by Five-Minute Oscillations," **The Astrophysical Journal** **350**:475-479 (1990).
- Lindsey, C.A., and T.L. Roellig, "Solar Astronomy on the New Large Submillimeter Facilities on Mauna Kea," pp. 297-307, IN: **Submillimeter Astronomy**, G.D. Watt and A.S. Webster, eds., Kluwer Academic, Norwell, MA (1990).
- Lindsey, C.A., S. Yee, T.L. Roellig, D. Brock, W.M. Duncan, G. Watt, A. Webster, R.E. Hills, and J.T. Jeffries, "Submillimeter Observations of the Sun from the James Clerk Maxwell Telescope," **Astrophysical Journal Letters** **353**:L53-L55 (1990).
- Lord, S.D. and J.S. Young, "Efficient Star Formation in the Spiral Arms of M51," **The Astrophysical Journal** **356**:135-148 (1990).
- Lord, S.D., D.J. Hollenbach, S.W.J. Colgan, M.R. Haas, E.F. Erickson, R.H. Rubin, P. Carral, and S. Lamb, "Far-Infrared Spectroscopy of Starburst Galaxies," IN: **Massive Stars in Starbursts**, Collected Papers from a Meeting Sponsored by the Space Telescope Research Institute, May 1990, Baltimore, MD (1990).
- Luhmann, J.G., A. Kliore, A. Barnes, and L. Brace, "Remote Sensing of Mars' Ionosphere and Solar Wind Interaction: Lessons from Venus," **Advances in Space Research** **10**(3):43-48 (1990).
- Luo, D., R. McCray, and M.M. MacLow, "X-Rays From Colliding Stellar Winds," **The Astrophysical Journal** **362**:267-273 (1990).
- Magalhaes, J.A., A.L. Weir, B.J. Conrath, P.J. Gierasch, and S.S. Leroy, "Zonal Motion and Structure in Jupiter's Upper Troposphere from Voyager Infrared and Imaging Observations," **Icarus** **88**(1):39-72 (1990).
- Margulis, M., C.J. Lada, T. Hasegawa, S.S. Hayashi, M. Hayashi, N. Kaifu, I. Gatley, T.P. Greene, and E.T. Young, "A Spectacular Molecular Outflow in the Monoceros OBI Molecular Cloud," **The Astrophysical Journal** **352**:615-624 (1990).
- McCormick, P.T. and R.C. Whitten, "Dynamics of the Ionosphere of Mars," **Journal of Geophysical Research** **95**:6263-6269 (1990).
- McGreevy, M. and C.R. Stoker, "Telepresence for Planetary Exploration," pp. 110-123, IN: **Society of Photo-optical Engineering Conference: Space in the 21st Century**, November 1990, Boston, MA (1990).
- McKay, C.P. and R.H. Haynes, "Should We Implant Life on Mars?," pp. 144-152, **Scientific American** Vol. 263, April (1990).
- McKay, C.P., "Does Mars Have Rights? An Approach to the Environmental Ethics of Planetary Engineering," pp. 184-197, IN: **Moral Expertise**, D. MacNiven, ed., Routledge Publ. House, London, England (1990).
- McKay, C.P., "La Vie Sur Mars," pp. 1216-1224, **La Recherche**, Vol. 21 (1990).
- Melosh, H.J., N.M. Schneider, K.J. Zahnle, and D. Latham, "Ignition of Global Wildfires at the Cretaceous/Tertiary Boundary," **Nature** **343**(6255):251-254 (1990).

- Mihalov, J.D., A. Barnes, A.J. Hundhausen, and E.J. Smith, "Coronal Changes Near Solar Minimum and Their Relation to the Distant Solar Wind," **Journal of Geophysical Research** **95(A6)**:8231-8242 (1990).
- Miller, R.H., G.R. Roelofs, and B.F. Smith, "An Experimental Study of Counter Rotating Cores in Elliptical Galaxies," pp. 549-552, IN: **Paired and Interacting Galaxies**, W. Keel and J. Sulentic, eds., NASA Ames Research Center, NASA CP-2098 (1990).
- Moore, J.M and J.R. Spencer, "Koyaanismuuyaw: The Hypothesis of a Perennially Dichotomous Triton," **Geophysical Research Letters** **17**:1757-1760 (1990).
- Moore, K.R., D.J. McComas, C.T. Russell, and J.D. Mihalov, "A Statistical Study of Ions and Magnetic Fields in the Venus Magnetotail," **Journal of Geophysical Research** **95(A8)**:12005-12018 (1990).
- Murphy, J.R., O.B. Toon, R.M. Haberle, and J.B. Pollack, "Numerical Simulations of the Decay of Martian Global Dust Storms," **Journal of Geophysical Research** **95(B9)**:14629-14647 (1990).
- Nejad, L.A.M., D.A. Williams, and S.B. Charnley, "Dynamical Models of Molecular Clouds: Nitrogen Chemistry," **Mon. Not. R. Astronomical Society** **246**:183-190 (1990).
- Oberbeck, V., J. Marshall, D. Schwartz, and R. Mancinelli, "A Model for the Chemical Evolution of Life on Mars," pp. 905-906, IN: **Lunar and Planetary Science Conference XXI**, March 1990, Houston, TX (1990).
- Oberbeck, V.R. and G. Fogleman, "Impact Constraints on the Environment for Chemical Evolution and the Continuity of Life," **Origins of Life and Evolution of the Biosphere** **20**:181-195 (1990).
- Oberbeck, V.R., J. Marshall, D. Schwartz, and R. Mancinelli, "Search for Life: A Science Rationale for a Permanent Base on Mars," pp. 907-908, IN: **Lunar and Planetary Science Conference XXI**, March 1990, Houston, TX (1990).
- Oren, A., M. Ginzburg, B. Ginzburg, B. Volcanii, and L.I. Hochstein, "*Halorcula marismortui* comb. nov. ATCC 43049, a Proposal for a Neotype of *Halobacterium marismortui*," **International Journal of International Systematic Bacteriology** **40**:209-210 (1990).
- Pendleton, Y.J., A.G.G.M. Tielens, and M.W. Werner, "Studies of Dust Grain Properties in Infrared Reflectance Nebulae," **The Astrophysical Journal** **349**:107-119 (1990).
- Podolak, M., R.T. Reynolds, and R. Young, "Post Voyager Comparisons of the Interiors of Uranus and Neptune," **Geophysical Research Letters** **17**:1737-1740 (1990).
- Podolak, M., T.E. Bunch, P. Cassen, R.T. Reynolds, and S. Chang, "Processing of Refractory Meteorite Inclusions (CAIs) in Parent Body Atmospheres," **Icarus** **84**:254-260 (1990).
- Pohorille, A. and L.R. Pratt, "Cavities in Molecular Liquids and the Theory of Hydrophobic Solubilities," **Journal of the American Chemical Society** **112**:5066-5074 (1990).
- Pohorille, A., W.S. Ross, and I. Tinoco, Jr., "DNA Dynamics in Aqueous Solution: Opening the Double Helix," **The International Journal of Supercomputer Applications** **4(3)**:81-96 (1990).
- Pollack, J.B., et al., "Thermal Emission Spectra of Mars (5.4-10.5 Microns): Evidence for Sulfates, Carbonates, and Hydrates," **Journal of Geophysical Research** **95**:14595-14628 (1990).
- Pollack, J.B., J.M. Schwartz, and K. Rages, "Scatterers in Triton's Atmosphere: Implications for the Seasonal Volatile Cycle," **Science** **250**:440-443 (1990).
- Pollack, J.B., R.M. Haberle, J. Schaeffer, and H. Lee, "Simulations of the General Circulations of the Martian Atmosphere I: Polar Processes," **Journal of Geophysical Research** **95**:1447-1473 (1990).
- Rau, G.H., "AMERIEZ 1986: C-13 and N-15 Natural Abundances in Southern Ocean Biota Collected During AMERIEZ 1986," **Antarctic Journal of the United States** **24**:168-169 (1990).
- Rau, G.H., C.M. McHugh, C. Harrold, C. Baxter, B. Hecker, and R.W. Embley, " $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$ , and  $\delta^{18}\text{O}$  of *Calypptogena phaseoliformis* (Bivalve Mollusc) from the Ascension Fan-Valley Near Monterey, California," **Deep-Sea Research** **37**:1669-1676 (1990).
- Rau, G.H., J.L. Teyssie, F. Rassoulzadegan, and S. Fowler, " $^{13}\text{C}/^{12}\text{C}$  and  $^{15}\text{N}/^{14}\text{N}$  Variations Among Size-Fractionated Marine Particles: Implications for their Origin and Trophic Relationships," **Marine Ecology - Progress Series** **59**:33-38 (1990).

- Roellig, T.L. and C.A. Lindsey, "Prospects for Submillimeter Observations of the Total Solar Eclipse of 1991," pp. 295-296, IN: **Submillimeter Astronomy**, G.D. Watt and A.S. Webster, eds., Kluwer Academic, Norwell, MA (1990).
- Rothschild, L.J. and R.L. Mancinelli, "Model of Carbon Fixation in Microbial Mats from 350 Million Years Ago to the Present," **Nature** **345**:710-712 (1990).
- Rothschild, L.J., "Earth Analogs for Martian Life: Microbes in Evaporites, A New Model System for Life on Mars," **Icarus** **88**:246-260 (1990).
- Roush, T. and R.B. Singer, "Estimates of Absolute Flux and Radiance Factor of Localized Regions on Mars in the 2-4 Micron Wavelength Region," pp. 1041-1042, IN: **Lunar and Planetary Science Conference XXI**, March 1990, Houston, TX (1990).
- Roush, T., J.B. Pollack, and J. Orenberg, "Derivation of Mid-Infrared (5-25 Micron) Optical Constants of Some Silicates and Palagonites," pp. 1043-1044, IN: **Lunar and Planetary Science Conference XXI**, March 1990, Houston, TX (1990).
- Roush, T.L., J.B. Pollack, F.C. Witteborn, J.D. Bregman, and J.P. Simpson, "Ice and Minerals on Callisto and Ganymede: A Reassessment of the Reflectance Spectra," **Icarus** **86**:355-382 (1990).
- Salama, F., L.J. Allamandola, F.C. Witteborn, D.P. Cruikshank, S.A. Sandford, and J.D. Bregman, "The 2.5-5.0 Micron Spectra of Io: Evidence for H<sub>2</sub>S and H<sub>2</sub>O Frozen in SO<sub>2</sub>," **Icarus** **83**:66-82 (1990).
- Salama, F., L.J. Allamandola, F.C. Witteborn, D.P. Cruikshank, S.A. Sandford, and J.D. Bregman, "The 2.5-5.0 Micron Spectra of Io: Evidence for H<sub>2</sub>S and H<sub>2</sub>O Frozen in SO<sub>2</sub>," pp. 203-208, IN: **Proceedings of the 24th ESLAB Symposium on the Formation of Stars and Planets, and the Evolution of the Solar System**, B. Battrick, ed., European Space Agency, ESA SP-315 (1990).
- Sandford, S.A. and L.J. Allamandola, "The Physical and Infrared Spectral Properties of CO<sub>2</sub> in Astrophysical Ice Analogs," **The Astrophysical Journal** **255**:357-372 (1990).
- Sandford, S.A. and L.J. Allamandola, "The Volume- and Surface-Binding Energies of Ice Systems Containing CO, CO<sub>2</sub>, and H<sub>2</sub>O," **Icarus** **87**:188-192 (1990).
- Saunders, R.S., A.R. Dobrovolskis, R. Greeley, and S.D. Wall, "Large-Scale Patterns of Eolian Sediment Transport on Venus: Predictions of Magellan," **Geophysical Research Letters** **17**:1365-1368 (1990).
- Scargle, J.D., "Astronomical Time Series Analysis: Modeling of Chaotic and Random Process," pp. 1-25, IN: **Errors, Bias and Uncertainties in Astronomy**, C. Jaschek and F. Murtagh, eds., Cambridge University Press, Cambridge, England (1990).
- Scargle, J.D., "Random and Chaotic Time Series Analysis: Minimum Phase-Volume Deconvolution," pp. 131-134, IN: **Nonlinear Structure in Physical Systems, Pattern Formation, Chaos, and Waves**, L. Lam and H. Morris, eds., Springer-Verlag Publ. Co., New York, NY (1990).
- Scargle, J.D., "Studies in Astronomical Time Series Analysis. IV. Modeling Chaotic and Random Processes with Linear Filters," **The Astrophysical Journal** **359**:469-482 (1990).
- Schutte, W., A.G.G.M. Tielens, L.J. Allamandola, M. Cohen, and D.H. Wooden, "The Anomalous 3.43 and 3.53 Micron Emission Features Towards Hd9-7048 and Elias 1: C-C Vibrational Modes of PAHs?," **The Astrophysical Journal** **360**:577-589 (1990).
- Showalter, M.R. and P.D. Nicholson, "Saturn's Rings Through a Microscope: Particle Size Constraints from the Voyager PPS Scan," **Icarus** **87**:285-306 (1990).
- Simpson, J.P. and R.H. Rubin, "IRAS Low-Resolution Spectral Observations of H II Regions," **The Astrophysical Journal** **354**:165-183 (1990).
- Singhal, R.P. and R.C. Whitten, "Comparative Dynamics of the Ionospheres of Mars and Venus," **Indian Journal of Radio and Space Physics** **19**:88-102 (1990).
- Smith, B., et al., "Voyager 2 at Neptune: Imaging Science Results," **Science** **246**:1422-1449 (1990).
- Steiman-Cameron, T.Y. and R.H. Durisen, "A Simple Analytic Model for the Evolution of Captured Galactic Gas Disks," **The Astrophysical Journal** **357**:62-70 (1990).
- Steiman-Cameron, T.Y., and R.H. Durisen, "Structure and Evolution of Dissipative Nonplanar Galactic Disks," pp. 149-150, IN: **Dynamics of Astrophysical Disks**, J. Sellwood, ed., Cambridge University Press, Cambridge, England (1990).
- Steiman-Cameron, T.Y., J.N. Imamura, and J. Middleditch, "A 190 s Periodicity of the Optical Emission of the Enigmatic X-Ray Source GX339-4," **The Astrophysical Journal** **359**:197-203 (1990).

- Steinberg, N., C. Culbertson, P. Blunden, S. Pasilis, R.S. Oremland, and L. Hochstein, "Bacterial Dissimilatory Selenate and Selenite by Denitrifying Isolates," IN: **90th Annual Meeting of the American Society of Microbiology**, May 1990, Anaheim, CA (1990).
- Stemwedel, S.W., C. Yuan, and P. Cassen, "Equilibrium Models for Self-Gravitating Inviscid Disks Resulting from the Collapse of Rotating Clouds," **The Astrophysical Journal** **351**:206-221 (1990).
- Stoker, C.R., P.J. Boston, R. Mancinelli, W. Segal, B. Khare, and C. Sagan, "Microbial Metabolism of Spark Tholin," **Icarus** **85**:241-256 (1990).
- Summons, R.E., and L.L. Jahnke, "Identification of the Methylhopanes in Sediments and Petroleum," **Geochimica et Cosmochimica Acta** **54**:247-251 (1990).
- Swenson, B.L., A.C. Masay, R.T. Reynolds, and P.F. Wercinski, "The Extension of the Cassini Spacecraft/Titan Probe to the Exploration of Neptune/Triton," **Advances in the Astronautical Sciences** **71 (Part II)**:1113-1131 (1990).
- Tarter, J.C., S. Chang, and D.J. DeFrees, eds., **Carbon in the Galaxy: Studies from Earth and Space**, NASA Ames Research Center, NASA CP-3061, 343 pp (1990).
- Thompson, K.W., "Time-Dependent Boundary Conditions for Hyperbolic Systems, II," **Journal of Computational Physics** **89(2)**:439-461 (1990).
- Tielens, A.G.G.M., "Towards a Circumstellar Silicate Mineralogy: Which Path for Stellar Evolution," pp. 186-200, IN: **From Miras to Planetary Nebulae**, M.O. Mennessier, ed., Edition Frontieres, Paris, France (1990).
- Valentin, J.R., K.W. Hall, and J.F. Becker, "Continuous Monitoring of a Changing Sample by Multiplex Gas Chromatography," **Journal of Chromatography** **518(1)**:199-206 (1990).
- Van Allen, J.A. and J.D. Mihalov, "Forbush Decreases and Particle Acceleration in the Outer Heliosphere," **Geophysical Research Letters** **17(6)**:761-764 (1990).
- Van Buren, D., M.M. MacLow, D.O.S. Wood, and E. Churchwell, "Cometary Compact H II Regions are Stellar-Wind Bow Shocks," **The Astrophysical Journal** **353**:570-578 (1990).
- Volk, K. and M. Cohen, "The IRAS Low-Resolution Spectra of Planetary Nebulae," **The Astronomical Journal** **100(2)**:485-510 (1990).
- Whitmire, D.P. and R.T. Reynolds, "The Fiery Fate of the Solar System," **Astronomy** **18**:20-29 (1990).
- Whitmore, B.C., R. Lucas, D.B. McElroy, T.Y. Steiman-Cameron, P.D. Sackett, and R. Olling, "New Observations and a Photographic Atlas of Polar Ring Galaxies," **The Astronomical Journal** **100**:1489-1522 (1990).
- Wilson, M.A. and D. Chandler, "Molecular Dynamics Study of Cyclohexane Interconversion," **Chemical Physics** **149**:11-20 (1990).
- Wolfire, M.G., A.G.G.M. Tielens, and D. Hollenbach, "Physical Conditions in Photodissociation Regions: Application to Galactic Nuclei," **The Astrophysical Journal** **358**:116-131 (1990).
- Yuen, G.U., J.A. Pecore, J.F. Kerridge, T.J. Pinnavaia, E.G. Rightor, J. Flores, K. Wedeking, R. Mariner, D.J. Des Marais, and S. Chang, "Carbon Isotopic Fractionation in Fischer-Tropsch Type Reactions," pp. 1367-1368, IN: **Lunar and Planetary Science Conference XXI**, March 1990, Houston, TX (1990).
- Zahnle, K.J., "Atmospheric Chemistry by Large Impacts," pp. 271-288, IN: **Global Catastrophies in Earth History**, V.L. Sharpton and P.D. Ward, eds., Geological Society of America, GSA Special Paper #247 (1990).
- Zahnle, K. and D. Grinspoon, "Comet Dust as a Source of Amino Acids at the Cretaceous/Tertiary Boundary," **Nature** **348(6297)**:157-160 (1990).
- Zahnle, K.J., J.B. Pollack, and J.F. Kasting, "Xenon Fractionation in Porous Planetesimals," **Geochimica et Cosmochimica Acta** **54(9)**:2577-2586 (1990).
- Zahnle, K.J., J.F. Kasting, and J.B. Pollack, "Mass Fractionation of Noble Gases in Diffusion-Limited Hydrodynamic Hydrogen Escape," **Icarus** **84(2)**:502-527 (1990).
- Zent, A.D., F.P. Fanale, and L.E. Roth, "Possible Martian Brines: Radar Observations and Models," **Journal of Geophysical Research** **95(B9)**:14531-14542 (1990).

## 1991 Publications

- Abell, G.O., D. Morrison, and S.C. Wolff, eds.,  
**Exploration of the Universe (6th Ed.)**, Saunders  
College Publishing, Philadelphia, PA, 682pp (1991).
- Allamandola, L.J., "Analysis of Frozen Volatiles,"  
pp. 46-52, IN: **Section 2.3.3 of ROSETTA/CNRS a  
Comet-Nucleus Sample-Return Mission, ESA's  
ROSETTA Mission and System Definition  
Document**, G.H. Schwemm and Y. Langevin, eds.,  
European Space Agency, ESA SP-1125 (1991).
- Allamandola, L.J., "PAHs in Space: Evidence and  
Implications," pp. 1-28, IN: **Solid State  
Astrophysics**, E. Bussoletti and G. Strazzulla, eds.,  
North Holland Press, Amsterdam, The Netherlands  
(1991).
- Banin, A., D.F. Blake, and T. Ben-Shlomo, "Detection  
of Nanophase Lepidocrocite ( $\alpha$ -FeOOH) in Iron-  
Smectite Mars Soil Analog Materials (MarSAM),"  
pp. 49-50, IN: **Lunar and Planetary Science  
Conference XXII**, March 1991, Houston, TX  
(1991).
- Batllo, F., R.C. LeRoy, K. Parvin, and F. Freund,  
"Positive Holes in Magnesium Oxide. Correlation  
Between Magnetic, Electric and Dielectric  
Anomalies," **Journal of Applied Physics**  
**69(8)**:6031-6033 (1991).
- Bauer, J.E., R.I. Haddad, and D.J. Des Marais, "Method  
for Determining Stable Isotope Ratios of Dissolved  
Organic Carbon in Interstitial and Other Natural  
Marine Waters," **Marine Chemistry** **33**:335-351  
(1991).
- Bauld, J., E. D'Amelio, and J.D. Farmer, "Modern  
Microbial Mats," pp. 261-269, IN: **The Proterozoic  
Biosphere: A Multidisciplinary Study**, J.W. Schopf  
and C. Klein, eds., Cambridge University Press,  
Cambridge, England (1992).
- Belton, M.J.S., "Images from Galileo of the Venus Cloud  
Deck," **Science** **253**:1531-1535 (1991).
- Bishop, J.L., C.M. Pieters, J.O. Edwards, L.M. Coyne,  
and S. Chang, "Spectroscopic Analyses of the Fe and  
Water in Clays," pp. 107-108, IN: **Lunar and  
Planetary Science Conference XXII**, March 1991,  
Houston, TX (1991).
- Blake, D., L. Allamandola, S. Sandford, D. Hudgins,  
and F. Freund, "Clathrate Hydrate Formation in  
Amorphous Cometary Ice Analogs *in Vacuo*,"  
**Science** **254**:548-551 (1991).
- Blake, D.F., and G. Palmer, "Analysis of Cometary and  
Interstellar Ice Analogs in the Electron Microscope,"  
pp. 293-298, IN: **Microbeam Analysis-1991**, August  
1991, San Jose, CA (1991)..
- Blake, D.F., L.J. Allamandola, and G. Palmer,  
"Eutectoid-like Phase Separation in H<sub>2</sub>O:CH<sub>3</sub>OH  
Ices: Microstructural Observations and Implications  
for the Physical Properties of Comets," pp. 109-110,  
IN: **Lunar and Planetary Science Conference  
XXII**, March 1991, Houston, TX (1991).
- Borucki, W.J., J.W. Dyer, J.R. Phillips, and P. Pham,  
"PVO Search for Venusian Lightning," **Journal of  
Geophysical Research** **96**:11033-11043 (1991).
- Bunch, T.E. and P.H. Schultz, "A Study of the Rio  
Cuarto Loess Impactites and Chondritic Impactor,"  
pp. 179-180, IN: **Lunar and Planetary Science  
XXII**, March 1991, Houston, TX (1991).
- Bunch, T.E., F. Radicati di Brozolo, and P. Schultz,  
"LDEF Crater and Impactor Simulations by Light  
Gas Gun Hypervelocity Impact Experiments,"  
pp. 3-6, IN: **Hypervelocity Impacts in Space**,  
J.A.M. McDonnell, ed. Univ. of Kent at Canterbury,  
United Kingdom (1992).
- Bunch, T.E., F. Radicati di Brozolo, R.H. Fleming, D.W.  
Harris, D. Brownlee, and T.W. Reilly, "LDEF  
Impact Craters Formed by Carbon-Rich Impactors:  
A Preliminary Report," pp. 549-564, IN: **LDEF -  
60 Months in Space: First Post-Retrieval  
Symposium**, June 1991, Kissimmee, FL (1992).
- Bunch, T.E., P. Schultz, P. Cassen, D. Brownlee,  
M. Podolak, J. Lissauer, R. Reynolds, and S. Chang,  
"Are Some Chondrule Rims Formed by Impact  
Processes? Observations and Experiments," **Icarus**  
**91**:76-92 (1991).
- Buss, R.H., A.G.G.M. Tielens, and T.P. Snow, "The  
Mid-Infrared Spectrum of the Carbon Star HD 38218  
and its Possible Relation to Polycyclic Aromatic  
Hydrocarbons," **Astrophysical Journal** **372**:281-290  
(1991).
- Butner, H.M., "Abundance of DCO<sup>+</sup> in Nearby  
Molecular Clouds," IN: **IAU Symposium No. 150,  
The Astrochemistry of Cosmic Phenomena**, P.D.  
Singh, ed., Kluwer Scientific Publishers, Dordrecht,  
The Netherlands (1991).
- Butner, H.M., N.J. Evans II, D.F. Lester, R.M. Levreault  
and S.E. Strom, "Testing Models of Low-Mass  
Star Formation: High-Resolution Far-Infrared  
Observations of L1551 IRS 5," **Astrophysical  
Journal** **376**:636-653 (1991).

- Campbell, M.F., H.M. Butner, A. Dayal, D.F. Lester, and P.M. Harvey, "Radiative Transfer Models for the W3(OH) Dust Cocoon," IN: **Proceedings of the 1991 North American Workshop on Infrared Spectroscopy**, June 1991, Laramie, WO (1991).
- Canfield, D.E. and D.J. Des Marais, "Aerobic Sulfate Reduction in Microbial Mats," **Science** **251**:1471-1473 (1991).
- Canfield, D.E. and R. Raiswell, "Carbonate Precipitation and Dissolution," pp. 411-453, IN: **Taphonomy: Releasing the Data Locked in the Fossil Record, Volume 9 of Topics in Geobiology**, P.A. Allison and D.E.G. Briggs, eds., Plenum Press, New York, NY (1991).
- Canfield, D.E. and R. Raiswell, "Pyrite Formation and Fossil Preservation," pp. 337-387, IN: **Taphonomy: Releasing the Data Locked in the Fossil Record, Volume 9 of Topics in Geobiology**, P.A. Allison and D.E.G. Briggs, eds., Plenum Press, New York, NY (1991).
- Canfield, D.E., "Sulfate Reduction in Deep-Sea Sediments," **American Journal of Science** **291**:177-188 (1991).
- Carlson, R.W., et al., "Galileo Infrared Imaging Spectroscopic Measurements at Venus," **Science** **253**:1541-1547 (1991).
- Cherchneff, I., J.R. Barker, and A.G.G.M. Tielens, "Polycyclic Aromatic Hydrocarbon Optical Properties and Contribution to the Acceleration of Stellar Outflows," **Astrophysical Journal** **377**:541-552 (1991).
- Cohen, M., "Enrichment by Wolf-Rayet Stars and Other Massive Stars in Gas, Dust, and Energy," pp. 323-334, IN: **IAU Symposium No. 143, Wolf-Rayet Stars and Interrelations with Other Massive Stars in Galaxies**, K.A. Van Derhucht and B. Hidayat, eds., Kluwer Academic Press, Amsterdam, The Netherlands (1991).
- Cohen, M., "The Relationship Between Accretion Disks and Stellar Winds in T Tau Stars," pp. 353-356, IN: **Structure and Emission Properties of Accretion Disks**, C. Bertout, S. Collin, J.-P. Lasota, and J. Tran Thanh Van, eds., Frontiers 6th IAP Meeting- IAU Colloquium No. 129 Proceedings (1991).
- Cohen, M., B.F. Jones, and M. Hereld, "HH 5, HH 6, and Their Exciting Stars," **Astrophysical Journal** **371**:237-247 (1991).
- Cohen, M., ed., **New Version of the NASA Ames/JS & E Point Source Infrared Sky Model**, NASA Ames Research Center GL-TR-90-0307 (1991).
- Cohen, M., K.A. Van Der Hucht, P.M. Williams, The "IRAS 17380-3031: A New Dusty Late WC-Type Wolf-Rayet Star," **Astrophysical Journal** **378**:302-306 (1991).
- Colgan, S.W.J., J.P. Simpson, R.H. Rubin, E.F. Erickson, M.R. Haas, and J. Wolf, "Far Infrared Lines from G45.13+0.14A and K3-50 A: Density Fluctuations in Compact H II Regions," **Astrophysical Journal** **366**:172-180 (1991).
- Courtin, R., R. Wagener, C.P. McKay, J. Caldwell, K.-H. Fricke, F. Raulin, and P. Brunston, "UV Spectroscopy of Titan's Atmosphere, Planetary Organic Chemistry and Prebiotic Synthesis II: Interpretation of New IUE Observations in the 235 to 335 $\mu$ m Region," **Icarus** **90**:43-56 (1991).
- Coyne, L.M. and D.P. Summers, "Surface Activation of Air Oxidation of Hydrazine on Kaolinite 2. Consideration of Oxidizing/Reducing Entities in Relationship to Other Compositional, Structural, and Energetic Factors," **Langmuir** **7**(8):1675-1688 (1991).
- Coyne, L.M., R. Mariner, and A. Rice, "Air Oxidation of Hydrazine 1. Reaction Kinetics on Natural Kaolinites, Halloysites, and Model Substituent Layers with Varying Iron and Titanium Oxide and O<sup>-</sup> Center Contents," **Langmuir** **7**(8):1660-1674 (1991).
- Crisp, D., D.A. Allen, D.H. Grinspoon, and J.B. Pollack, "The Dark Side of Venus: Near-Infrared Images and Spectra from the Anglo-Australian Observatory," **Science** **253**:1263-1266 (1991).
- Cruikshank, D.P., D.J. Tholen, W.K. Hartmann, J.F. Bell and R.H. Brown, "Three Basaltic Earth-Crossing Asteroids and the Source of the Basaltic Meteorites," **Icarus** **89**:1-13 (1991).
- Cruikshank, D.P., L.J. Allamandola, W.K. Hartmann, D.J. Tholen, R.H. Brown, C.N. Matthews, and J.F. Bell, "Solid C-N Bearing Material on Outer Solar System Bodies," **Icarus** **94**:345-353 (1991).
- Cruikshank, D.P., M.J. Bartholomew, and T.L. Roush, "Composition of the Surface of Phobos: Results from the Phobos Mission," pp. 263-264, IN: **Lunar and Planetary Science Conference XXII**, March 1991, Houston, TX (1991).

- Cruikshank, D.P., W.K. Hartmann, D.J. Tholen, and L.J. Allamandola, "Identification of Solid C-N Bearing Organics on Outer Solar System Bodies," pp. 265-266, IN: **Lunar and Planetary Science Conference XXII**, March 1991, Houston, TX (1991).
- Davis, W.L., D. Bachman, L. Doyle, and C.P. McKay, "The Habitability of Mars-Like Planets Around Main Sequence Stars," pp. 55-61, IN: **Bioastronomy the Search for Extraterrestrial Life - the Search Broadens**, J. Heidmann and M.J. Klein, eds., Springer-Verlag Publ. Co., Berlin, Germany (1991).
- de Vries, M.S., H.R. Wendt, H. Hunziker, E. Peterson, and S. Chang, "Search for High Molecular Weight Polycyclic Aromatic Hydrocarbons and Fullerenes in Carbonaceous Meteorites," pp. 315-316, IN: **Lunar and Planetary Science Conference XXII**, March 1991, Houston, TX (1991).
- Des Marais, D.J., "Microbial Mats, Stromatolites and the Rise of Oxygen in the Precambrian Atmosphere," **Global and Planetary Change** **97**:93-96 (1991).
- DeVincenzi, D.L., H.P. Klein, and J.R. Bagby, eds., **Planetary Protection Issues and Future Mars Missions**, NASA Ames Research Center CP-10086, 55 pp (1991).
- Doyle, L.R. and C.P. McKay, "Exobiological Habitats: An Overview," pp. 163-172, IN: **Bioastronomy the Search for Extraterrestrial Life - the Search Broadens**, J. Heidmann and M.J. Klein, eds., Springer-Verlag Publ. Co., Berlin, Germany (1991).
- Dunham, E.W., S.W. McDonald, and J.L. Elliot, "Pluto-Charon Stellar Occultation Candidates: 1990-1995," **Astronomical Journal** **102**(4): 1464-1484 (1991).
- Elitzur, M., C.F. McKee, and D.J. Hollenbach, "Radiative Transfer in Astronomical Masers. III. Filamentary Masers," **Astrophysical Journal** **367**:333-349 (1991).
- Erickson, E.F., S.W.J. Colgan, J.P. Simpson, R.H. Rubin, M. Morris, and M.R. Haas, "Far-Infrared Line and Continuum Observations of G0.095+0.012 and the E2 Thermal Radio Filament Near the Galactic Center," **Astrophysical Journal** **370**: 69-72 (1991).
- Ferriere, K.M., M.-M. MacLow, and E.G. Zweibel, "Expansion of a Superbubble in a Uniform Magnetic Field," **Astrophysical Journal** **375**: 239-253 (1991).
- Freund, F., M. Masuda, M. Freund, "Highly Mobile Oxygen Hole-Type Charge Carriers in Fused Silica," **Journal of Materials Research** **6**(8): 1619-1622 (1991).
- Gerber, R.A., S.A. Lamb, R.H. Miller, and B.F. Smith, "Models of Colliding Galaxies: Kinetic Energy and Density Enhancements" pp. 223-230, IN: **Proceedings of the Heidelberg Conference on Dynamics and Interactions of Galaxies**, Heidelberg, Germany (1991).
- Gerber, R.A., S.A. Lamb, R.H. Miller, and B.F. Smith, "Potential Sites for Star Formation in Interacting Galaxies," IN: **Windows on Galaxies**, A. Renzini, G. Fabbiano, and J. Gallagher, eds., Kluwer Academic Publishers, Norwell, MA (1991).
- Gerber, R.A., S.A. Lamb, R.H. Miller, and B.F. Smith, "Potential Sites for Star Formation in Interacting Galaxies," pp. 366, IN: **Proceedings of Windows on Galaxies** (1991).
- Goldader, J.D., D.J. Tholen, D.P. Cruikshank and W.K. Hartmann, "Galileo Support Observations of Asteroid 951 Gaspra," **Astronomical Journal** **102**:1503-1509 (1991).
- Goorvitch, D., "The C2 Ballik-Ramsay Transitions in Carbon Stars," **Astrophysical Journal** **74**:769-783 (1991).
- Goorvitch, D., A. Goldman, H. Dothe, R.H. Tipping, and C. Chackerian Jr., "Hydroxyl C2P Pure Rotational Transitions," **Journal of Geophysical Research** **97**(D18):20,771-20,786 (1992).
- Greeley, R., J.R. Marshall, D. Clemens, A.R. Dobrovolskis, and J.B. Pollack, "Venus: Concentration of Radar Reflective Materials by Wind," **Icarus** **90**:123-128 (1991).
- Gwynne, O., C.P. McKay, and R. Zurbin, "Human Exploration of Mars," **Spaceflight** **33**(6): 208-212 (1991).
- Haas, M.R., D. Hollenbach, and E.F. Erickson, "Observations of [Si II] (35  $\mu$ m) and [S I] (25  $\mu$ m) in Orion: Evidence for a Wind Shock Near IRC2," **Astrophysical Journal** **374**:555-563 (1991).
- Haas, M.R., D.J. Hollenbach, and E.F. Erickson, "Far-Infrared Observations of [S I], [Fe II] and [Fe I] in the Orion Wind Shock," pp. 82-82, IN: **Proceedings of the 1991 North American Workshop on Infrared Spectroscopy**, June 1991, Laramie, WO (1991).
- Haberle, R.M. and B.M. Jakosky, "Atmospheric Effects on the Remote Determination of Thermal Inertia on Mars," **Icarus** **90**:187-204 (1991).

- Harrison, A. A., Y.A. Clearwater, and C.P. McKay, eds., **From Antarctica to Outer Space: Life in Isolation and Confinement**, Springer-Verlag Publ. Co., Berlin, Germany (1991).
- Hinson, D.P and J.A. Magalhaes, "Equatorial Waves in the Stratosphere of Uranus," *Icarus* **94**:64-91 (1991).
- Hochstein, L.I. and F. Lang, "Purification and Properties of a Dissimilatory Nitrate Reductase from *Haloferax dentrificans*," *Archives of Biochemistry and Biophysics* **288**(2):380-385 (1991).
- Hochstein, L.I., "Nitrate Reduction in the Extremely Halophilic Bacteria," pp. 129-137, IN: **General and Applied Aspects of Halophilic Microorganisms**, F. Rodriguez-Valera, ed., Plenum Press, New York, NY (1991).
- Hollenbach, D.J. and C.F. McKee, "Shock Waves, Astrophysical," pp. 623-627, IN: **The Reference Encyclopedia of Astronomy and Astrophysics**, S.P. Maran, ed., Van Nostrand Reinhold, New York, NY (1991).
- Hollenbach, D.J., T. Takahashi, and A.G.G.M. Tielens, "Low-Density Photodissociation Regions," *Astrophysical Journal* **377**:192-209 (1991).
- Johnson, T.V., C.M. Yeates, R.E. Young, and J. Dunne, "The Galileo Venus Encounter," *Science* **253**:1516-1518 (1991).
- Jorgensen, B.B. and D.J. Des Marais, "The Diffusive Boundary Layer Sediments: Oxygen Microgradients over a Microbial Mat," *Limnology and Oceanography* **35**(6):1343-1355 (1991).
- Kanavarioti, A. and M.T. Rosenbach, "Catalysis of Hydrolysis and Nucleophilic Substitution at the P-N Bond of Phosphoimidazolidine-Activated Nucleotides in Phosphate Buffers," *The Journal of Organic Chemistry* **56**:1513-1521 (1991).
- Kanavarioti, A., J. Lu, M.T. Rosenbach, and T.B. Hurley, "Unexpectedly Facile Synthesis of Symmetrical P1,P2-Dinucleoside-5'-pyrophosphates," *Tetrahedron Letters* **32**(43):6065-6068 (1991).
- Kim, S.J., P. Drossart, J. Caldwell, J.P. Maillard, D. Goorvitch, A. Morrwood, A. Moneti, and J. Lecacheux, "The 2  $\mu$ m Polar Haze of Jupiter," *Icarus* **91**:145-153 (1991).
- Kojiro, D.R., M.J. Cohen, R.M. Stimac, R.F. Wernlund, D.E. Humphry, and N. Takeuchi, "Determination of C1-C14 Alkanes by Ion Mobility Spectrometry," *Analytical Chemistry* **63**:2295-2300 (1991).
- Korycansky, D.G., "Two-Dimensional Hydrodynamic Calculations of the Nonlinear Development of the Goldreich-Schubert-Fricke Instability in a Rotating Annulus," *Astrophysical Journal* **381**:515-525 (1991).
- Korycansky, D.G., P. Bodenheimer, and J.B. Pollack, "Numerical Models of Giant Planet Formation with Rotation," *Icarus* **92**:234-251 (1991).
- Ladd, E.F., F.C. Adams, S. Casey, J.A. Davidson, G.A. Fuller, D.A. Harper, P.C. Myer, and R. Padman, "Far-IR and SMM Wavelength Observations of Star Forming Dense Cores. I. Spectra," *Astrophysical Journal* **366**:203 (1991).
- Ladd, E.F., F.C. Adams, S. Casey, J.A. Davidson, G.A. Fuller, D.A. Harper, P.C. Myer, and R. Padman, "Far-IR and SMM Wavelength Observations of Star Forming Dense Cores. II. Images," *Astrophysical Journal* **382**:555 (1991).
- Langevin, Y., J.-P. Bibring, B. Gondet, and D.P. Cruikshank, "ISM Observations of the Spectral Characteristics of Phobos in the Near Infrared," pp. 781-782, IN: **Lunar and Planetary Science Conference XXII**, March 1991, Houston, TX (1991).
- Lerner, N.R., E. Peterson, and S. Chang, "Evaluation of the Strecker Synthesis as a Source of Amino Acids on Carbonaceous Chondrites," *Meteoritics* **26**:363-363 (1991).
- Lindsey, C.A. and T.L. Roellig, "Telescope Beam-Profile Diagnostics and the Solar Limb," *Astrophysical Journal* **375**:414-422 (1991).
- MacLow, M.-M., D. Van Buren, D.O.S. Wood, and E. Churchwell, "Bow Shock Models of Ultracompact H II Regions," *Astrophysical Journal* **369**:395-409 (1991).
- Magalhaes, J.A. and W.J. Borucki, "Spatial Distribution of Visible Lightning on Jupiter," *Nature* **349**:311-313 (1991).
- Mancinelli, R.L. and M.R. White, "Methylotroph Activity in Soil Permeated with Methane (Abt.)," *American Society of Microbiology I-45*:198 (1991).
- Mancinelli, R.L. and M.R. White, "Nitrogen Fixation and Denitrification in Microbial Mats Inhabiting Acid and Thermal Alkaline Springs (Abt.)," *American Society of Microbiology I-46*:198 (1991).
- Marley, M.S., "Nonradial Oscillations of Saturn," *Icarus* **94**:420-435 (1991).



- McGreevy, M. and C.R. Stoker, "Telepresence for Planetary Exploration," pp. 110-123, IN: **Society of Photo-Optical Engineering Conference: Space in the 21st Century**, November 1990, Boston, MA (1991).
- McKay, C.P. and C.R. Stoker, "Gaia and Life on Mars," pp. 375-381, IN: **Scientists on Gaia**, S. Schneider and P.J. Boston, eds., MIT Press, Cambridge, MA (1991).
- McKay, C.P. and H. Hartman, "Hydrogen Peroxide and the Origin of Oxygenic Photosynthesis," **Origins of Life and Evolution of the Biosphere** **21**:157-163 (1991).
- McKay, C.P. and W.L. Davis, "Duration of Liquid Water Habitats on Early Mars," **Icarus** **90**(2):214-221 (1991).
- McKay, C.P., "Urey Prize Lecture: Planetary Evolution and the Origin of Life," **Icarus** **91**:93-100 (1991).
- McKay, C.P., J.B. Pollack, and R. Courtin, "The Greenhouse and Anti-Greenhouse Effects of Titan," **Science** **253**:1118-1121 (1991).
- McKay, C.P., O.B. Toon, and J.F. Kasting, "Making Mars Habitable," **Nature** **352**:489-496 (1991).
- Melnick, G. A. Dalgarno, G. Fazio, J. Stauffer, N. Erickson, P. Goldsmith, R. Snell, M. Harwit, D. Hollenbach, D. Koch, D. Neufeld, R. Scheider, and G. Winnewisser, "The Submillimeter Wave Astronomy Satellite," IN: **Atoms, Ions, and Molecules: New Results in Spectral Line Astrophysics**, J. Swings, ed. (1991).
- Melnick, G., A. Dalgarno, N. Erickson, G. Fazio, P. Goldsmith, M. Harwit, D. Hollenbach, D. Koch, D. Neufeld, R. Scheider, R. Snell, P. Thaddeus, and G. Winnewisser, "The Submillimeter Wave Astronomy Satellite," IN: **From Ground-Based to Space-Borne Submillimeter Astronomy**, J. Swings, ed. (1991).
- Oberbeck, V.R., J. Marshall, and T. Shen, "Prebiotic Chemistry in Clouds," **Journal of Molecular Evolution** **32**:296-303 (1991).
- Peterson, E., F. Horz, G. Haynes, and T. See, "Modification of Amino Acids at Shock Pressures of 3 to 30 GPA: Initial Results," **Meteoritics** **26**:384-385 (1991).
- Platt, S.R., R.H. Hildebrand, R. J. Pernic, J.A. Davidson, and G. Novak, "100  $\mu\text{m}$  Array Polarimetry from KAO: Instrumentation, Techniques, and First Results," **Publications of the Astronomical Society of the Pacific** **103**:1193-1210 (1991).
- Pohorille, A. and I. Benjamin, "Molecular Dynamics of Phenol at the Liquid-Vapor Interface of Water," **Journal of Chemical Physics** **94**(8):5599-5605 (1991).
- Pollack, J.B., "Kuiper Prize Lecture: Present and Past Climates of the Terrestrial Planets," **Icarus** **91**:173-198 (1991).
- Pollack, J.B., F.C. Witteborn, K. O'Brien, and B. Flynn, "A Determination of the Infrared Optical Depth of the El Chicon Volcanic Cloud," **Journal of Geophysical Research** **96**(D2):3115-3122 (1991).
- Rages, K., J.B. Pollack, M.G. Tomasko, and L.R. Dose, "Properties of Scatterers in the Troposphere and Lower Stratosphere of Uranus Based on Voyager Imaging Data," **Icarus** **89**(2):359-376 (1991).
- Rau, G.H., P.N. Froelich, T. Takahashi, and D.J. Des Marais, "Does Sedimentary Organic  $^{13}\text{C}$  Record Variations in Quaternary Ocean  $[\text{CO}_2(\text{aq})]$ ?", **Paleoceanography** **6**(3):335-347 (1991).
- Rau, G.H., T. Takahashi, D.J. Des Marais, and C.W. Sullivan, "Particulate Organic Matter  $\delta^{13}\text{C}$  Variations Across the Drake Passage," **Journal of Geophysical Research** **96**(C8):15131-15135 (1991).
- Rau, G.H., T.L. Hopkins, and J.J. Torres, " $^{15}\text{N}/^{14}\text{N}$  and  $^{13}\text{C}/^{12}\text{C}$  in Weddell Sea Invertebrates: Implications for Feeding Diversity," **Marine Ecology Progress Series** **77**:1-6 (1991).
- Rizk, B., W.K. Wells, D.M. Hunten, C.R. Stoker, R.S. Freedman, T. Roush, J.B. Pollack, and R.M. Haberle, "Meridional Martian Water Abundance Profiles During the 1988-1989 Season," **Icarus** **90**:205-213 (1991).
- Roellig, T.L. and T. Onaka, "The Mid-Infrared Spectrometer for the Infrared Telescope in Space," pp. 67, IN: **Proceedings of the 1991 North American Workshop on Infrared Spectroscopy**, June 1991, Laramie, WY (1991).
- Roellig, T.L., E.E. Becklin, J.T. Jefferies, G.A. Kopp, C.A. Lindsey, F.Q. Orrall, and M.W. Werner, "Submillimeter Solar Limb Profiles Determined From Observations of the Total Solar Eclipse of 1988 March 18," **Astrophysical Journal** **381**:288-294 (1991).

- Roush, T., F. Witteborn, P. Lucey, A. Graps, and J. Pollack, "Thermal Infrared Observations of Mars (7.5-12.8 Micron) During the 1990 Opposition," pp. 1137-1138, IN: **Lunar and Planetary Science Conference XXII**, March 1991, Houston, TX (1991).
- Roush, T., J. Pollack, and J. Orenberg, "Derivation of Midinfrared (5-25 Micron) Optical Constants of Some Silicates and Palagonite," **Icarus** **94**:191-208 (1991).
- Roush, T.L. and D. Blake, "Characterization of a Mauna Kea Palagonite Using Transmission Electron Microscopy," pp. 1139-1140, IN: **Lunar and Planetary Science Conference XXII**, March 1991, Houston, TX (1991).
- Rubin, R.H., E.F. Erickson, S.W.J. Colgan, J.P. Simpson, M. Morris, and M.R. Haas, "Far-Infrared Line and Continuum Observations of G0.095+0.012 and the E2 Thermal Radio Filament Near the Galactic Center," **Astrophysical Journal** **370**: 281-283 (1991).
- Rubin, R.H., J.P. Simpson, M.R. Haas, and E.F. Erickson, "Axisymmetric Model of the Ionized Gas in the Orion Nebula," **Astrophysical Journal** **374**: 564-579 (1991).
- Rubin, R.H., J.P. Simpson, M.R. Haas, and E.F. Erickson, "Modeling the Orion Nebula as an Axisymmetric Blister," **Publications of the Astronomical Society of the Pacific** **103**:834-837 (1991).
- Salama, F. and L.J. Allamandola, "The Role of Matrix Material and CCl<sub>4</sub> (electron acceptor) on the Ionization Mechanisms of Matrix-Isolated Naphthalene," **Journal of Chemical Physics** **95**(8):6190-6191 (1991).
- Salama, F., and L.J. Allamandola, "Electronic Absorption Spectroscopy of Matrix-Isolated Polycyclic Aromatic Hydrocarbon Cations. I. The Naphthalene Cation (C<sub>10</sub>H<sub>8</sub><sup>+</sup>)," **Journal of Chemical Physics** **94**(11):6964-6977 (1991).
- Sandford, S.A., "Constraints on the Parent Bodies of Collected Interplanetary Dust Particles," pp. 397-404, IN: **Origin and Evolution of Dust in the Solar System, Proceedings of the IAU Colloquium No. 126**, A.C. Levasseur-Regourd and H. Hasegawa, eds., Kluwer Scientific Publishers, Dordrecht, The Netherlands (1991).
- Sandford, S.A., "The Spectrum of NGC 7027 from 3080 to 2630 cm<sup>-1</sup> (3.25-3.80 μm): Detection of New Atomic and Molecular Hydrogen Lines and New Constraints on the Chemical Sidegroups on PAHs," **Astrophysical Journal** **376**: 599-607 (1991).
- Sandford, S.A., F. Salama, L.J. Allamandola, L.M. Trafton, D.F. Lester, and T.F. Ramseyer, "Laboratory Studies of the Newly Discovered Infrared Band at 4705.2 cm<sup>-1</sup> (2.1253 μm) in the Spectrum of Io: The Tentative Identification of CO<sub>2</sub>," **Icarus** **91**:125-144 (1991).
- Sandford, S.A., L.J. Allamandola, A.G.G.M. Tielens, K. Sellgren, M. Tapia and Y. Pendleton, "The Interstellar C-H Stretching Band Near 3.4 μm: Constraints on the Composition of Organic Material in the Diffuse Interstellar Medium," **Astrophysical Journal** **371**:607-620 (1991).
- Scargle, J., "Predictive Deconvolution of Chaotic and Random Processes," IN: **New Directions in Time Series Analysis**, Institute for Mathematics and Its Applications, University of Minnesota, Minneapolis, MN (1991).
- Scargle, J.D., "Deconvolution of Chaotic and Random Time Series," IN: **Statistics in the Environmental and Earth Sciences**, Edward Arnold, London, England (1991).
- Schutte, W.A., A.G.G.M. Tielens, and S.A. Sandford, "10 μm Spectra of Protostars and the Solid Methanol Abundance," **Astrophysical Journal** **382**: 523-529 (1991).
- Schwartz, D.E., R.L. Mancinelli, and E.S. Kaneshiro, "The Use of Mineral Crystals as Bio-Markers in the Search for Life on Mars," **Advances in Space Research** **10**:245-249 (1991).
- Schwartzkoff, S.H. and R.L. Mancinelli, "Germination and Growth of Wheat in Simulated Martian Atmospheres," **Acta. Ast.** **25**:245-247 (1991).
- Showalter, M.R., "Visual Detection of 1981S13, Saturn's Eighteenth Satellite, and its Role in the Encke Gap," **Nature** **351**:709-713 (1991).
- Showalter, M.R., J.N. Cuzzi, and S.M. Larson, "Structure and Particle Properties of Saturn's E Ring," **Icarus** **94**:451-473 (1991).
- Simpson, J.P., "IRAS Low-Resolution Spectral Observations of the 10 and 18 Micron Silicate Emission Features," **Astrophysical Journal** **368**:570-579 (1991).

Stan-Lotter, H., E.J. Bowman, and L.I. Hochstein, "Relationship of the Membrane ATPase from *Halobacterium sacchorovorum* to Vacuolar ATPases," **Archives of Biochemistry and Biophysics** **284**(1): 116-119 (1991).

Sun, Z.-P., C.R. Stoker, and G. Schubert, "Thermal and Humidity Winds in Outer Planet Atmospheres," **Icarus** **91**:154-160 (1991).

Tielens, A.G.G.M., A.T. Tokunaga, T.R. Geballe, and F. Baas, "Interstellar Solid CO: Polar and Nonpolar Interstellar Ices," **Astrophysical Journal** **381**:181-199 (1991).

Tielens, A.G.G.M., L.J. Allamandola, and S.A. Sandford, "Laboratory, Observational, and Theoretical Studies of Interstellar Ices," pp. 29-58, IN: **Solid State Astrophysics**, E. Bussoletti and G. Strazzulla, eds., North Holland Press, Amsterdam, The Netherlands (1991).

Tomely, L., P. Cassen, and T. Steiman-Cameron, "On the Evolution of Gravitationally Unstable Protostellar Disks," **Astrophysical Journal** **382**: 530-543 (1991).

Trafton, L.M., D.F. Lester, T.F. Ramseyer, F. Salama, S.A. Sandford, and L.J. Allamandola, "A New Class of Absorption Feature in Io's Near-Infrared Spectrum," **Icarus** **89**: 264-276 (1991).

Whitten, R.C., A. Barnes, and P.T. McCormick, "Plasma Motion in the Venus Ionosphere: Transition to Supersonic Flow," **Journal of Geophysical Research** **96**(A7):11057-11064 (1991).

Wilson, M.A. and A. Pohorille, "Interaction of Monovalent Ions with the Water Liquid-Vapor Interface: A Molecular Dynamics Study," **Journal of Chemical Physics** **95**(8):6005-6013 (1991).

Witteborn, F.C. and Bregman, J.D., "Upgrading the Faint Object Grating Spectrometer and Its Calibration Standards," pp. 29-34, IN: **Proceedings of the 1991 North American Workshop on Infrared Spectroscopy**, June 1991, Laramie, WO (1991).

Young, A.T., R.M. Genet, L.J. Boyd, W.J. Borucki, G.W. Lockwood, G.W. Henry, D.S. Hall, D. Pyper Smith, S.L. Baliunas, R. Donahue, and D.H. Epan, "Precise Automatic Stellar Photometry," **Publications of the Astronomical Society of the Pacific** **103**:221-242 (1991).

## 1992 Publications

Allamandola, L.J., "Grain Spectroscopy," pp. 65-72, IN: **Astrochemistry of Cosmic Phenomena**, P.D. Singh, ed., Kluwer Scientific Publishers, Dordrecht, The Netherlands (1992).

Allamandola, L.J., "Interstellar Polycyclic Aromatic Hydrocarbons," pp. 133-140, IN: **Chemistry and Spectroscopy of Interstellar Molecules**, N. Kaifu, ed., Tokyo University Press, Tokyo, Japan (1992).

Allamandola, L.J., S.A. Sandford, A.G.G.M. Tielens, and T. Herbst, "Spectroscopy of Dense Clouds in the C-H Stretch Region: Methanol and 'Diamonds'," **Astrophysical Journal** **399**: 134-146 (1992).

Andersen, D.T., C.P. McKay, R.A. Wharton, and J.D. Rummel, "Testing a Mars Science Outpost in the Antarctic Dry Valleys," **Advances in Space Research** **12**(5): 205-209 (1992).

Backman, D.E., F.C. Gillet, and F.C. Witteborn, "Infrared Observations and Thermal Models of the  $\beta$  Pictoris Disk," **Astrophysical Journal** **385**:670-679 (1992).

Baines, K.H., R.H. Brown, D.L. Matson, R.M. Nelson, B.J. Buratti, J.P. Bibring, Y. Langevin, C. Sotin, A. Carusi, A. Coradini, R.N. Clark, M. Combes, P. Drossart, B. Sicardy, D.P. Cruikshank, V. Formisano, and R. Jaumann, "VIMS/Cassini at Titan: Scientific Objectives and Observational Scenarios," pp. 215-219, IN: **Proceedings of the Symposium on Titan**, European Space Agency, ESA SP-338 (1992).

Barnes, A., "Acceleration of the Solar Wind," **Reviews in Geophysics** **30**:43-55 (1992).

Barnes, A., "Theory of Magnetohydrodynamic Waves: the WKB Approximation Revisited," **Journal of Geophysical Research** **97**:12105-12112 (1992).

Barnes, A., J.D. Mihalov, P.R. Gazis, A.J. Lazarus, J.W. Belcher, G.S. Gordon, Jr., and R.L. McNutt Jr., "Global Properties of the Plasma in the Outer Heliosphere I. Large-Scale Structure and Evolution," pp. 143-146, IN: **Solar Wind Seven, Proceedings of the 3rd COSPAR Colloquium**, E. Marsch and R. Schwemm, eds., Pergamon Press, Oxford, England (1992).

Barnes, J. and R.E. Young, "Nonlinear Baroclinic Instability of the Sphere: Multiple Life Cycles with Surface Drag and Thermal Damping," **Journal of the Atmospheric Sciences** **49**:861-878 (1992).

- Belton, M.J.S., et al. (including D. Morrison), "Imaging of Venus from Galileo: Early Results and Camera Performance," **Advances in Space Research** **12(9)**:91-103 (1992).
- Blake, D.F., L. Allamandola, S. Sandford, D. Hudgins, and F. Freund, "Type II Clathrate Hydrate Formation in Cometary Ice Analogs in Vacuo," pp. 437-438, IN: **Astrochemistry of Cosmic Phenomena**, P.D. Singh, ed., International Astronomical Union Symposium #150 (1992).
- Borucki, W.J. and J.A. Magalhaes, "Analysis of Voyager 2 Images of Jovian Lightning," **Icarus** **96**:1-14 (1992).
- Borucki, W.J. and M. Fulchignoni, "The Atmospheric Temperature Structure of Titan," pp. 77-80, IN: **Proceedings of the Symposium on Titan**, European Space Agency, ESA SP-338 (1992).
- Borucki, W.J. and R.M. Genet, "The Use of Robotic Telescopes for Detecting Planetary Systems," IN: **Robotic Telescopes of the 1990s**, A.V. Filippenko, ed., ASP Conference Series Vol. 34 (1992).
- Boston, P.J., M.V. Ivanov, and C.P. McKay, "On the Possibility of Chemosynthetic Ecosystems in Subsurface Habitats on Mars," **Icarus** **95**:300-308 (1992).
- Bregman, J., J. Booth, D.K. Gilmore, L. Kay, and D. Rank, "Extended Infrared Emission Around IRAS 21282+5050," **Astrophysical Journal** **396**:120-123 (1992).
- Brownlee, D.E. and S.A. Sandford, "Cosmic Dust," pp. 145-157, IN: **Exobiology in Solar System Exploration**, G.C. Carle, D.E. Schwartz, and J.L. Huntington, eds., NASA Ames Research Center, NASA SP-512, 297pp (1992).
- Burton, M.G., D.J. Hollenbach, and A.G.G.M. Tielens, "Mid-Infrared Rotational Line Emission from Interstellar Molecular Hydrogen," **Astrophysical Journal** **399**:563-572 (1992).
- Butner, H.M., "'Complete' Models of Young Stellar Objects: The Spectral Energy Distributions of Embedded YSO's with and without Disks," pp. 105-117, IN: **Proceedings of the Workshop on Astronomy and Astrophysics 'Dusty Discs'**, May (1992).
- Campbell, M.F., M.B. Campbell, C.N. Sabbey, P.M. Harvey, D.F. Lester, N.J. Evans II, H.M. Butner, P.G. Oldham, K.J. Richardson, M.J. Griffin, and G.H.L. Sandell, "Far-Infrared Observations and Models of the W3-IRS5 Protostellar Cloud," IN: **ASP Symposium: Massive Stars, Their Lives in the Interstellar Medium**, June 1992, Madison, WI (1992).
- Carle, G.C. and D.E. Schwartz, "Overview: Exobiology in Solar System Exploration," pp. 3-17, IN: **Exobiology in Solar System Exploration**, G.C. Carle, D.E. Schwartz, and J.L. Huntington, eds., NASA Ames Research Center, NASA SP-512, 297pp (1992).
- Carle, G.C. and D.E. Schwartz, "The Moon: Biogenic Elements," pp. 29-43, IN: **Exobiology in Solar System Exploration**, Carle, G.C., D.E. Schwartz, and J.L. Huntington, eds., NASA Ames Research Center, NASA SP-512, 297pp (1992).
- Carle, G.C., D.E. Schwartz, and J.L. Huntington, eds., IN: **Exobiology in Solar System Exploration**, NASA Ames Research Center, NASA SP-512, 297pp (1992).
- Cassen, P., "Thermal Models of the Primitive Solar Nebula," pp. 207-208, IN: **Lunar and Planetary Science Conference XXIII**, March 1992, Houston, TX (1992).
- Chackerian, C., Jr., D. Goorvitch, A. Benidar, R. Farrenq, G. Guelachvili, P.M. Martin, M.C. Abrams, and S.P. Davis, "Rovibrational Intensities and Electric Dipole Moment Function of the C2P Hydroxyl Radical," **Journal of Quantitative Spectroscopy and Radiative Transfer** **48(5/6)**:667-673 (1992).
- Charnley, S.B., A.G.G.M. Tielens, and T. Millar, "On the Molecular Complexity of the Hot Cores in Orion A: Grain Surface Chemistry as 'The Last Refuge of the Scoundrel'," **Astrophysical Journal Letters** **399**:L71-L74 (1992).
- Cherchneff, I., Barker, J.R. and A.G.G.M. Tielens, "Polycyclic Aromatic Hydrocarbon Formation in Carbon Rich Stellar Envelopes," **Astrophysical Journal** **401**:269-287 (1992).
- Cohen, M., F.C. Witteborn, D.F. Carbon, G. Augason, D. Wooden, J. Bregman, and D. Goorvitch, "Spectral Irradiance Calibration in the Infrared. III. The Influence of CO and SiO," **Astronomical Journal** **104(5)**:2045-2052 (1992).

- Cohen, M., R.G. Walker, and F.C. Witteborn, "Spectral Irradiance Calibration in the Infrared. II. A Tau and the Recalibration of the IRAS Low Resolution Spectrometer," **Astronomical Journal** **104(5)**: 2030-2044 (1992).
- Courtin, R., C.P. McKay, and J.B. Pollack, "L'effet de Serre dans le Syst em Soltaire," pp. 542-549, IN: **La Recherche** (1992).
- Craig, H., R.A. Wharton, Jr., and C.P. McKay, "Oxygen Supersaturation in Ice-Covered Antarctic Lakes: Biological Versus Physical Contributions," **Science** **255**:318-321 (1992).
- Cruikshank, D.P. and J.F. Kerridge, "Organic Material in Asteroids, Meteorites, and Planetary Satellites," pp. 159-175, IN: **Exobiology in Solar System Exploration**, Carle, G.C., D.E. Schwartz, and J.L. Huntington, eds., NASA Ames Research Center, NASA SP-512, 297pp (1992).
- Cruikshank, D.P., M. Werner, D.E. Backman, "SIRTF: Capabilities for Planetary Science," **Advances in Space Research** **12(11)**: 187-193 (1992).
- Davidson, J.A., M.W. Werner, X. Wu, P.M. Harvey, D.F. Lester, M. Joy, and M. Morris, "The Luminosity of the Galactic Center," **Astrophysical Journal** **387**:189-211 (1992).
- Des Marais, D.J., H. Strauss, R. Summons, and J.M. Hayes, "Carbon Isotopic Evidence for the Stepwise Oxidation of the Proterozoic Environment," **Nature** **359**:605-609 (1992).
- Des Marais, D.J., J. Bauld, A.C. Palmisano, B.K. Pierson, and D.M. Ward, "The Biogeochemistry of Carbon in Modern Microbial Mats," pp. 299-308, IN: **The Proterozoic Biosphere: A Multidisciplinary Study**, J.W. Schopf and C. Klein, eds., Cambridge University Press, New York, NY (1992).
- Des Marais, D.J., Y. Cohen, E. D'Amelio, J.D. Farmer, B.B. Jorgensen, A. Palmisano, and B.K. Pierson, "Case Study of a Modern Microbial Mat-Building Community: the Submerged Cyanobacterial Mats of Guerrero Negro, Baja California Sur, Mexico," pp. 325-334, IN: **The Proterozoic Biosphere: A Multidisciplinary Study**, J.W. Schopf and C. Klein, eds., Cambridge University Press, New York, NY (1992).
- DeVincenzi, D.L., "Planetary Protection Issues and the Future Exploration of Mars," **Advances in Space Research** **12(4)**: 121-128 (1992).
- Durisen, R.H., P.W. Bode, J.N. Cuzzi, S.E. Cederbloom, and B.W. Murphy, "Ballistic Transport in Planetary Ring Systems Due to Particle Erosion Mechanisms II. Theoretical Models for Saturn's A- and B-Ring Inner Edges," **Icarus** **100**: 364-393 (1992).
- Elitzur, M., D.J. Hollenbach, and C.F. McKee, "Planar H<sub>2</sub>O Masers in Star-Forming Regions," **Astrophysical Journal** **394**: 221-227 (1992).
- Emery, C.A., R.M. Haberle, and T.P. Ackerman, "A One-Dimensional Modeling Study of Carbonaceous Haze Effects on the Springtime Arctic Environment," **Journal of Geophysical Research** **97**: 20,599-20,613 (1992).
- Fanale, F.P., S.E. Postawko, J.B. Pollack, M.H. Carr, and R.O. Pepin, "Mars: Epochal Climate Change and Volatile History," pp. 1135-1179, IN: **Mars**, H.H. Kieffer, B.M. Jakosky, C.W. Snyder, and M.S. Matthews, eds., University of Arizona Press, Tucson, AZ (1992).
- Farmer, J., G. Vidal, M. Moczydlowska, H. Strauss, P. Ahlberg, P. Siedlecka, "Ediacaran Fossils from the Innerelv Member (late Proterozoic) of the Tanafjorden Area, Northeastern Finnmark," **Geology Magazine** **129(2)**: 181-195 (1992).
- Farmer, J.D., "Grazing and Bioturbation in Modern Microbial Mats," pp. 295-297, IN: **The Proterozoic Biosphere: A Multidisciplinary Study**, J.W. Schopf and C. Klein, eds., Cambridge University Press, Cambridge, England (1992).
- Farmer, J.D., "Meiofauna: Strategies for Field Studies," pp. 839-839, IN: **The Proterozoic Biosphere: A Multidisciplinary Study**, J.W. Schopf and C. Klein, eds., Cambridge University Press, Cambridge, England (1992).
- Farmer, J.D., "Methods of Light Microscopy," pp. 823-823, IN: **The Proterozoic Biosphere: A Multidisciplinary Study**, J.W. Schopf and C. Klein, eds., Cambridge University Press, Cambridge, England (1992).
- Farmer, J.D., "Origins of Multicellular Individuality," pp. 429-446, IN: **The Proterozoic Biosphere: A Multidisciplinary Study**, J.W. Schopf and C. Klein, eds., Cambridge University Press, Cambridge, England (1992).
- Fischer, H.M., J.D. Mihalov, L.J. Lanzerotti, G. Wibberenz, K. Rinnert, F.O. Gleim, and J. Bach, "Energetic Particles Investigation (EPI)," **Space Science Reviews** **60**:79-90 (1992).

- Fomenkova, M., S. Chang, and L. Muhkin, "Classification of Carbonaceous Components in Comet Halley 'CHON' Particles," pp. 379-380, IN: **Lunar and Planetary Science Conference XXIII**, March 1992, Houston, TX (1992).
- Gat, N., J.L. Kropp, J.L. Huntington, and M.L. Fonda, "The Gas-Grain Simulation Facility (GGSF) for Space Station Freedom: Design Concept," Paper #IAF-92-0950, pp. 1-10, IN: **Proceedings of the 43rd Congress of the International Astronautical Federation**, August/September 1992, Washington, D.C. (1992).
- Geballe, T.R., A.G.G.M. Tielens, S. Kwok, and B.J. Hrivnak, "Unusual 3 Micron Emission Features in Three Proto-Planetary Nebulae," **Astrophysical Journal Letters** **387**:L89-L92 (1992).
- Goorvitch, D. and D.C. Galant, "Schrödinger's Radial Equation: Solution by Extrapolation," **Journal of Quantitative Spectroscopy and Radiative Transfer** **47(5)**:391-399 (1992).
- Goorvitch, D. and D.C. Galant, "Solution of the Schrödinger Equation for a Double Minimum Potential," **Journal of Quantitative Spectroscopy and Radiative Transfer** **48(4)**:467-468 (1992).
- Goorvitch, D. and D.C. Galant, "The Solution of Coupled Schrödinger Equations Using an Extrapolation Method," **Journal of Quantitative Spectroscopy and Radiative Transfer** **47(6)**:505-513 (1992).
- Hayes, J.M., R.E. Summons, I.B. Lambert, H. Strauss, and D.J. Des Marais, "Unsolved Problems and Conclusions," pp. 133-134, IN: **The Proterozoic Biosphere: A Multidisciplinary Study**, J.W. Schopf and C. Klein, eds., Cambridge University Press, New York, NY (1992).
- Haynes, R.H. and C.P. McKay, "The Implantation of Life on Mars: Feasibility and Motivation," **Advances in Space Research** **12(4)**:133-140 (1992).
- Hochstein, L.I. and H. Stan-Lotter, "Purification and Properties of an ATPase from *Sulfolobus solfataricus*," **Archives of Biochemistry and Biophysics** **295**:153-160 (1992).
- Hochstein, L.I., "ATP Synthesis in *Halobacterium saccharovororum*: Evidence that ATP Synthesis May be Catalyzed by an FOF1-ATP Synthases," **FEMS Letters** **97**:155-160 (1992).
- Hourdin, F., P. Le Van, O. Talagrand, R. Courtin, D. Gautier, and C.P. McKay, "Numerical Simulation of the Circulation of the Atmosphere of Titan," pp. 101-106, IN: **Proceedings of the Symposium on Titan**, European Space Agency, ESA SP-338 (1992).
- Hudgins, D.M., S.A. Sandford, A.G.G.M. Tielens, and L.J. Allamandola, "Infrared Spectroscopy of Interstellar and Solar System Ice Analogs: Measurement of Optical Constants," pp. 27-28, IN: **Astrochemistry of Cosmic Phenomena**, P.D. Singh, ed., International Astronomical Union Symposium #150 (1992).
- Hudgins, D.M., S.A. Sandford, L.J. Allamandola, and A.G.G.M. Tielens, "The Measurement of Optical Constants from Interstellar and Solar System Ice Analogs Using Transmission Infrared Spectroscopy," pp. 561-562, IN: **Lunar and Planetary Science Conference XXIII**, March 1992, Houston, TX (1992).
- Jahnke, L.L., "The Effects of Growth Temperature on the Methyl Sterol and Phospholipid Fatty Acid Composition of *Methylococcus capsulatus* (Bath)," **FEMS Microbiology Letters** **93**:209-212 (1992).
- Jahnke, L.L., H. Stan-Lotter, K. Kato, and L.I. Hochstein, "Presence of Methyl Sterol and Bacteriohopanepolyol in an Outer Membrane Preparation from *Methylococcus capsulatus* (Bath)," **Journal of General Microbiology** **138**:1759-1766 (1992).
- Jakosky, B.M. and R.M. Haberle, "The Seasonal Behavior of Water on Mars," pp. 969-1016, IN: **Mars**, H.H. Kieffer, B.M. Jakosky, C.W. Snyder, and M.S. Matthews, eds., University of Arizona Press, Tucson, AZ (1992).
- Jebens, D.S., H.S. Lakkaraju, C.P. McKay, and W.J. Borucki, "Time Resolved Simulation of Lightning by LIP," **Geophysical Research Letters** **19**:273-276 (1992).
- Justtanout, K. and A.G.G.M. Tielens, "Mass Loss from OH/IR Stars: Models for the Infrared Emission of Circumstellar Dust Shells," **Astrophysical Journal** **389**:400-412 (1992).
- Justtanout, K. M.J. Barlow, C.J. Skinner, and A.G.G.M. Tielens, "The Nature of Dust Around the Post-Asymptotic Giant Branch Objects HD 161796 and HD 179821," **Astrophysical Journal Letters** **392**:L75-L79 (1992).

- Kasting, J.F. and S. Chang, "Formation of the Earth and the Origin of Life," pp. 9-12, IN: **The Proterozoic Biosphere: A Multidisciplinary Study**, J.W. Schopf and C. Klein, eds., Cambridge University Press, New York, NY (1992).
- Linder B.L., C.P. McKay, G.D. Clow, and R.A. Wharton, "Computational Modeling of Antarctic Lake Ice," pp. 105-116, IN: **Advances in Ice Technology**, T.K.S. Murthy, W.M. Sackinger, and P. Wadhams, eds., Computational Mechanics Publications (1992).
- Lindsey, C., J.T. Jefferies, T.A. Clark, R.A. Harrison, M.K. Carter, G. Watt, E.E. Becklin, T.L. Roellig, D.C. Braun, D.A. Naylor, and G.J. Tompkins, "Extreme-Infrared Brightness Profile of the Solar Chromosphere Obtained During the Total Eclipse of 1991," **Letters to Nature** **358**:308-310 (1992).
- Lipps, J.H., S. Bengtson, J.D. Farmer, "The Precambrian-Cambrian Evolutionary Transition," pp. 453-457, IN: **The Proterozoic Biosphere: A Multidisciplinary Study**, J.W. Schopf and C. Klein, eds., Cambridge University Press, Cambridge, England (1992).
- Maloney, P., D.J. Hollenbach, and C.H. Townes, "Heating of H II Regions Near the Galactic Center," **Astrophysical Journal** **401**:559-573 (1992).
- Maloney, P.R., D.J. Hollenbach, and C.H. Townes, "Heating of H II Regions with Application to the Galactic Center," **Astrophysical Journal** **401**:559-573 (1992).
- Mancinelli, R.L., J.R. Marshall, and M.R. White, "Analyses of Exobiological and Potential Resource Materials in the Martian Soil," **Advances in Space Research** **12**:111-116 (1992).
- McKay, C.P. and O.B. Toon, "Titan's Organic Haze," pp. 185-190, IN: **Proceedings of the Symposium on Titan**, European Space Agency, ESA SP-338 (1992).
- McKay, C.P., "Mars: A Reassessment of its Interest to Biology," pp. 67-81, IN: **Exobiology in Solar System Exploration**, Carle, G.C., D.E. Schwartz, and J.L. Huntington, eds., NASA Ames Research Center, NASA SP-512, 297pp (1992).
- McKay, C.P., E.I. Friedmann, R.A. Wharton, Jr., and W.L. Davis, "History of Water on Mars: A Biological Perspective," **Advances in Space Research** **12**(4): 231-238 (1992).
- McKay, C.P., J.B. Pollack, R. Courtin, and J.I. Lunine, "The Atmospheric Temperature Structure of Titan," pp. 77-80, IN: **Proceedings of the Symposium on Titan**, European Space Agency, ESA SP-338 (1992).
- McKay, C.P., R.L. Mancinelli, C.R. Stoker, and R.A. Wharton, Jr., "The Possibility of Life on Mars During a Water-Rich Past," pp. 1234-1245, IN: **Mars**, H.H. Kieffer, B.M. Jakosky, C.W. Snyder, and M.S. Matthews, eds., University of Arizona Press, Tucson, AZ (1992).
- Meixner, M., M.R. Haas, A.G.G.M. Tielens, E.F. Erickson, and M. Werner, "Far-Infrared Observations of M17SW: The Clumpy Structure of the Photo-dissociation Region," **Astrophysical Journal** **390**:499-513 (1992).
- Mihalov, J.D., A. Barnes, F.B. McDonald, J.T. Burkepile, and A.J. Hundhausen, "Concerning Solar Sources for Cycle 22 Solar Wind Activity in the Heliosphere," pp. 229-232, IN: **Solar Wind Seven, Proceedings of the 3rd COSPAR Colloquium**, E. Marsch and R. Schwenn, eds., Pergamon Press, Oxford, England (1992).
- Miller, R.H. and B.F. Smith, "Longevity of Disks in Galaxies," pp. 227-244, IN: **Astrophysical Disks**, S.F. Dermott, J.H. Hunter and R.E. Wilson, eds., Annals of the New York Academy of Sciences, New York, NY, 675pp (1992).
- Miller, R.H. and B.F. Smith, "Off-Center Nuclei in Galaxies," **Astrophysical Journal** **393**:508-515 (1992).
- Miller, R.H., "Experimenting with Galaxies," **American Scientist** **80**:143-162 (1992).
- Miller, R.H., and B.F. Smith, "Longevity of Disks in Galaxies," pp. 227, IN: **Proceedings of the Seventh Florida Workshop in Nonlinear Astronomy on 'Astrophysical Disks'**, Gainesville, FL (1992).
- Muller, B.E.A., D.J. Tholen, W.K. Hartman, and D.P. Cruikshank, "Extraordinary Colors of Asteroidal Object 1992AD," **Icarus** **97**:150-154 (1992).
- Natta, A., F. Palla, H.M. Butner, N.J. Evans II, and P.M. Harvey, "Infrared Studies of Pre-Main-Sequence Intermediate-Mass Stars: LkHa 198," **Astrophysical Journal** **391**:805-816 (1992).

- O'Sullivan, D. and R.E. Young, "Modeling the Quasi-Biennial Oscillation's Effect on the Winter Stratospheric Circulation," **Journal of the Atmospheric Sciences** **49**:2437-2448 (1992).
- Orenberg, J. and J. Handy, "Reflectance Spectroscopy of Palagonite and Iron-Rich Montmorillonite Clay Mixtures: Implications for the Surface Composition of Mars," **Icarus** **96**:219-225 (1992).
- Orenberg, J., J. Handy, and R. Quinn, "Reflectance Spectroscopy and GEX Simulation of Palagonite and Iron-Rich Montmorillonite Clay Mixtures: Implications for the Surface Composition of Mars," pp. 29-30, IN: **Workshop on Chemical Weathering on Mars (MSATT)**, Lunar and Planetary Institute 92-04 (1992).
- Owen, T., D. Gautier, F. Raulin, and T. Scattergood, "Titan," pp. 29-43, IN: **Exobiology in Solar System Exploration**, Carle, G.C., D.E. Schwartz, and J.L. Huntington, eds., NASA Ames Research Center, NASA SP-512, 297pp (1992).
- Owen, T.C., T. Geballe, C. DeBergh, L. Young, J. Elliot, and D.P. Cruikshank, IN: **Pluto**, International Astronomical Union IAU Circular No. 5532 (1992).
- Pendleton, Y., R. Gehrz, C. Kaminski, N. Jennerjohn, S. Sandford, and L. Allamandola, IN: **Nova Cygni 1992**, Harvard Smithsonian Astrophysical Observatory, eds., International Astronomical Union IAU Circular No. 5544 (1992).
- Pollack, J.B., D.H. Atkinson, A. Seiff, and J.D. Andersen, "Retrieval of a Wind Profile from the Galileo Probe Telemetry Signal," **Space Science Reviews** **60**:143-178 (1992).
- Porco, C.C., J.N. Cuzzi, et al., "Neptune's Rings," IN: **Neptune and Triton**, D. Cruikshank and M. Matthews, eds., University of Arizona Press, Tucson, AZ (1992).
- Pratt, L.R. and A. Pohorille, "Theory of Hydrophobicity: Transient Cavities in Molecular Liquids," pp. 2995-2999, IN: **Proceedings of the National Academy of Science**, April 1992 (1992).
- Rages, K. and J.B. Pollack, "Voyager Imaging of Triton's Clouds and Hazes," **Icarus** **99**:289-301 (1992).
- Rau, G.H., D.G. Ainley, J.L. Bengston, J.J. Torres, and T.L. Hopkins, "<sup>15</sup>N/<sup>14</sup>N and <sup>13</sup>C/<sup>12</sup>C in Weddell Sea Birds, Seals, and Fish: Implications for Diet and Trophic Structure," **Marine Ecology Progress Series** **84**:1-8 (1992).
- Rau, G.H., T. Takahashi, D.J. Des Marais, D.J. Repeta, and J.H. Martin, "The Relationship Between Organic Matter  $\delta^{13}\text{C}$  and  $[\text{CO}_2(\text{aq})]$  in Ocean Surface Water: Data from a JGOFS Site in the Northeast Atlantic Ocean and a Model," **Geochimica et Cosmochimica Acta** **56**:1413-1419 (1992).
- Roellig, T.L., L.K. Deutsch, C. McCreight, M. McKelevey, T. McMahon, Y. Pendleton, F. Witteborn, L. Yuen, and M. Werner, "The NASA-ARC 10/20 Micron Camera," **Bulletin American Astronomical Society** **24**:743-744 (1992).
- Roush, T.L. and R.B. Singer, "Analysis of Mars 1986 Seasonal South Polar Cap Spectrum," pp. 1177-1178, IN: **Lunar and Planetary Science Conference XXIII**, March 1992, Houston, TX (1992).
- Roush, T.L., "Hot Shots of Mars - Thermal Infrared (5.5-10.5  $\mu\text{m}$ ) Spectra of Mars Obtained During the Past Two Oppositions," pp. 62-63, IN: **Capistrano Conference No. 2: Infrared Spectroscopy of Surfaces**, August 1992, San Juan Capistrano, CA (1992).
- Roush, T.L., "Infrared Optical Properties of Mars Soil Analog Materials: Palagonites," pp. 62-63, IN: **Workshop on Chemical Weathering on Mars**, R. Burns and A. Banin, eds., Lunar and Planetary Institute LPI/TR - 92-04, Part 1 (1992).
- Roush, T.L., E.A. Roush, R.B. Singer, and P.G. Lucey, "Estimates of Absolute Flux and Radiance Factor of Localization Regions on Mars in the 2 - 4  $\mu\text{m}$  Wavelength Region," **Icarus** **99**:42-50 (1992).
- Roush, T.L., F.C. Witteborn, J. Bregman, D. Rank, A. Graps, and J.B. Pollack, "Thermal Infrared Spectrum of Mars Obtained from the Kuiper Airborne Observatory," pp. 1181-1182, IN: **Lunar and Planetary Science Conference XXIII**, March 1992, Houston, TX (1992).



- Roush, T.L., T.Z. Martin, and J.B. Pollack, "Analysis of Mariner 7 Thermal Infrared Spectrum of Mars and Comparison to Recent Airborne Observations," pp. 1179-1180, IN: **Lunar and Planetary Science Conference XXIII**, March 1992, Houston, TX (1992).
- Rubin, R.H., E.F. Erickson, M.R. Haas, S.W.J. Colgan, J.P. Simpson, and R.J. Dufour, "Abundances of Refractory Elements in the Orion Nebula," IN: **IAU Symposium No. 150, The Astrochemistry of Cosmic Phenomena**, P.D. Singh, ed., Kluwer Scientific Publishers, Dordrecht, The Netherlands (1992).
- Salama, F. and L.J. Allamandola, "Is a Pyrene-Like Molecular Ion Responsible for the 4430 Å Diffuse Interstellar Absorption Band?," **Nature** **358**:42-43 (1992).
- Salama, F. L.J. and Allamandola, "The Ultraviolet and Visible Spectrum of the PAH (Polycyclic Aromatic Hydrocarbon) C<sub>10</sub>H<sub>8</sub><sup>+</sup>: Possible Contributions to the Diffuse Interstellar Bands and to the UV-Visible Extinction," **Astrophysical Journal** **395**:301-306 (1992).
- Sandford, S.A., "A Report on the 1984-1985 ANSMET Field Season," pp. 5-9, IN: **Field and Laboratory Investigations of Antarctic Meteorites Collected by United States Expeditions, 1985-1987**, U.B. Marvin and G.J. MacPherson, eds., Smithsonian Contributions #30 (1992).
- Sandford, S.A., L.J. Allamandola, A.G.G.M. Tielens, and T. Herbst, "The Detection of Methanol and Diamonds in Dense Molecular Clouds," pp. 1207-1208, IN: **Lunar and Planetary Science Conference XXIII**, March 1992, Houston, TX (1992).
- Sandford, S.A., L.J. Allamandola, A.G.G.M. Tielens, K. Sellgren, M. Tapia, and Y. Pendleton, "The Interstellar C-H Stretching Band Near 3.4 μm: Constraints on the Composition of Organic Material in the Diffuse ISM," pp. 133-134, IN: **Astrochemistry of Cosmic Phenomena**, P.D. Singh, ed., International Astronomical Union Symposium #150 (1992).
- Scargle, J., "Chaotic Processes in Astronomical Data," pp. 411-428, IN: **Statistical Challenges in Modern Astronomy**, E. Feigelson and G. Babu, eds., Springer-Verlag Publ. Co., Berlin, Germany (1992).
- Scargle, J., "Is Hyperion's Rotation Only Mildly Chaotic?: Evidence for a Dense Spherical Core," **Bulletin American Astronomical Society** **23**:1171-1172 (1992).
- Scargle, J., "Predictive Deconvolution of Chaotic and Random Processes," IN: **New Directions in Time Series Analysis Part I**, D. Brillinger, P. Caines, J. Geweke, E. Parzen, M. Rosenblatt, and M. Taquq, eds., Springer-Verlag Publ. Co., Berlin, Germany (1992).
- Scattergood, T.W., E.Y. Lau, and B.M. Stone, "Laboratory Investigations of the Aerosol's in the Stratosphere of Titan," pp. 377-381, IN: **Proceedings of the Symposium on Titan**, European Space Agency, ESA SP-338 (1992).
- Scattergood, T.W., E.Y. Lau, and B.M. Stone, "Titan's Aerosol's: I. Laboratory Investigations of Shapes, Size Distributions, and Aggregation of Particles Produced by UV Photolysis of Model Titan Atmospheres," **Icarus** **99**:98-105 (1992).
- Schutte, W.A., A.G.G.M. Tielens, and L.J. Allamandola, "Theoretical Modelling of the Infrared Fluorescence by Interstellar Polycyclic Aromatic Hydrocarbons," pp. 137-138, IN: **Astrochemistry of Cosmic Phenomena**, P.D. Singh, ed., International Astronomical Union Symposium #150 (1992).
- Schutte, W.A., L.J. Allamandola, and S.A. Sandford, "Formation of Organic Molecules by Formaldehyde Reactions in Astrophysical Ices at Very Low Temperatures," pp. 29-30, IN: **Astrochemistry of Cosmic Phenomena**, P. Singh, ed., International Astronomical Union Symposium #150 (1992).
- Schutte, W.A., L.J. Allamandola, and S.A. Sandford, "Laboratory Simulation of the Photoprocessing and Warm-up of Cometary and Pre-Cometary Ices: Production and Analysis of Complex Organic Molecules," **Advances in Space Research** **12**(4):47-51 (1992).
- Seiff, A., R.E. Young, R. Haberle, and H. Houben, "The Evidence of Waves in the Atmospheres of Venus and Mars," IN: **Venus and Mars: Atmospheres, Ionospheres**, American Geophysical Union AGU Monograph 66 (1992).

- Shen, T.C., "In Situ Polymerization PLOT Columns I: Divinylbenzene," **Journal of Chromatographic Science** 30:239-240 (1992).
- Showalter, M., J.B. Pollack, M.E. Ockert, L.R. Doyle, and J.B. Dalton, "A Photometric Study of Saturn's F Ring," **Icarus** 100:394-411 (1992).
- Simpson, J.P., S.W.J. Colgan, E.F. Erickson, M.R. Haas, and R.H. Rubin, "Far-Infrared Observations of the N/O Ratio in Interstellar Gas," pp. 311-312, IN: **The Evolution of the Interstellar Medium, ASP Conference Series Vol. 12**, L. Blitz, ed., Astronomical Society of the Pacific, San Francisco, CA (1992).
- Skinner, C.J., Tielens, A.G.G.M., M.J. Barlow, and K. Justtanout, "Methanol Ice in the Protostar GL 2136," **Astrophysical Journal Letters** 399:L79-L82 (1992).
- Sprague, A.L., F.C. Witteborn, R.W.H. Kozlowski, D.P. Cruikshank, M.J. Bartholomew, and A.L. Graps, "The Moon: Mid-Infrared (7.5 - 11.4  $\mu\text{m}$ ) Spectroscopy of Five Selected Regions," pp. 1343-1344, IN: **Lunar and Planetary Science Conference XXIII**, March 1992, Houston, TX (1992).
- Sprague, A.L., W.C. Witteborn, R.W. Kozlowski, and D.P. Cruikshank, "The Moon: Mid-Infrared (7.5 - 11.4  $\mu\text{m}$ ) Spectroscopy of Selected Regions," **Icarus** 100:73-84 (1992).
- Stan-Lotter, H., M. Sulzner, E. Egelseer, C.F. Norton, and L.I. Hochstein, "Comparison of Membrane ATPases from Extreme Halophiles Isolated from Ancient Salt Deposits," **Origins of Life** 23:53-64 (1992).
- Steinberg, N., J.S. Blum, L.I. Hochstein, and R.S. Oremland, "Nitrate is a Preferred Electron Acceptor for Growth of Fresh Water Selenate-Respiring Bacteria," **Applied Environmental Microbiology** 58:426-428 (1992).
- Stoker, C.R., C.P. McKay, R.M. Haberle, and D.T. Andersen, "Science Strategy for Human Exploration of Mars," **Advances in Space Research** 12(4): 70-90 (1992).
- Strauss, H., D.J. Des Marais, J.M. Hayes, and R.E. Summons, "Proterozoic Organic Carbon - its Preservation and Isotopic Record," pp. 203-211, IN: **Proceedings of the Final Meeting of IGCP Project 157**, M. Schidlowski, et al., eds., Springer-Verlag Publ. Co., Berlin, Germany (1992).
- Strauss, H., D.J. Des Marais, R.E. Summons, and J.M. Hayes, "Concentrations of Organic Carbon and Maturities and Elemental Compositions of Kerogens," pp. 95-100, IN: **The Proterozoic Biosphere: A Multidisciplinary Study**, J.W. Schopf and C. Klein, eds., Cambridge University Press, New York, NY (1992).
- Strauss, H., D.J. Des Marais, R.E. Summons, and J.M. Hayes, "The Carbon Isotopic Record," pp. 117-128, IN: **The Proterozoic Biosphere: A Multidisciplinary Study**, J.W. Schopf and C. Klein, eds., Cambridge University Press, New York, NY (1992).
- Sulzner, M., H. Stan-Lotter, and L.I. Hochstein, "Nucleotide Protectable Labeling of Sulfhydryl Groups in Subunit I of the ATPase from *Halobacterium saccharovororum*," **Archives of Biochemistry and Biophysics** 296:347-349 (1992).
- Summons, R.E. and L.L. Jahnke, "Hopanes and Popanes Methylated in Ring-A: Correlation of the Hopanoids from Extant Methylotrophic Bacteria with their Fossil Analogues," pp. 182-200, IN: **Biological Markers in Sediments and Petroleum**, M. Moldowan, ed., Prentice Hall, Englewood Cliffs, NJ (1992).
- Thomas, P.N., J. Veverka, J. Bell, J. Lunine, and D. Cruikshank, "Satellites of Mars: Geologic History," pp. 1257-1282, IN: **Mars**, H.H. Kieffer, B.M. Jakosky, C.W. Snyder, and M.S. Matthews, eds., University of Arizona Press, Tucson, AZ (1992).
- Tielens, A.G.G.M., "Characteristics of Interstellar and Interplanetary Dust," IN: **Origin and Evolution of Dust in the Solar System, Proceedings of the IAU Colloquium No. 126**, A.C. Levasseur-Regourd and H. Hasegawa, eds., Kluwer Scientific Publishers, Dordrecht, The Netherlands (1992).
- Tielens, A.G.G.M., "Grain Surface Chemistry," IN: **Chemistry and Spectroscopy of Interstellar Molecules**, D.K. Bohme, et al., eds., University of Tokyo Press, Tokyo, Japan (1992).
- Tielens, A.G.G.M., "The D/H Ratio in Molecular Clouds," IN: **IAU Symposium No. 150, The Astrochemistry of Cosmic Phenomena**, P.D. Singh, ed., Kluwer Scientific Publishers, Dordrecht, The Netherlands (1992).

- Toon, O.B., C.P. McKay, C.A. Griffith, and R.P. Turco, "A Physical Model of Titan's Aerosols," **Icarus** **95**:24-53 (1992).
- Vreeland, R.H. and L.I. Hochstein, eds., **The Biology of Halophilic Bacteria**, CRC Press, Boca Raton, FL (1992).
- Walker, R.G. and M. Cohen, "An Atlas of Selected Calibrated Stellar Spectra," NASA Ames Research Center, NASA CR-177604, 251pp (1992).
- Walter, M.R., J. Bauld, D.J. Des Marais, and J.W. Schopf, "A General Comparison of Microbial Mats and Microbial Stromatolites: Bridging the Gap Between the Modern and the Fossil," pp. 335-338, IN: **The Proterozoic Biosphere: A Multi-disciplinary Study**, J.W. Schopf and C. Klein, eds., Cambridge University Press, New York, NY (1992).
- Weber, A.L., "Prebiotic Sugar Synthesis: Hexose and Hydroxy Acid Synthesis from Glyceraldehyde Catalyzed by Iron (III) Hydroxide Oxide," **Journal of Molecular Evolution** **35**: 1-6 (1992).
- Wharton, R.A., C.P. McKay, G.D. Clow, D.T. Andersen, G.M. Simmons, and F.G. Love, "Changes in Ice Cover Thickness and Lake Level of Lake Hoare, Antarctica," **Journal of Geophysical Research** **97**:3503-3513 (1992).
- Zahnle, K. and L. Dones, "Impact Origin of Titan's Atmosphere," pp. 19-25, IN: **Proceedings of the Symposium on Titan**, European Space Agency, ESA SP-338 (1992).
- Zahnle, K., "Airburst Origin of Dark Shadows on Venus," **Journal of Geophysical Research** **97**(E6): 10243-10255 (1992).
- Zahnle, K., J.B. Pollack, D. Grinspoon, and L. Dones, "Impact-Generated Atmospheres over Titan, Ganymede, and Calisto," **Icarus** **95**:1-23 (1992).
- Zent, A.P. and T.L. Roush, "The Spectra of Chemisorbed CO<sub>2</sub> on Mars Analog Materials," pp. 1575-1576, IN: **Lunar and Planetary Science Conference XXIII**, March 1992, Houston, TX (1992).
- Zurek, R.W., J.R. Barnes, R.M. Haberle, J.B. Pollack, J.E. Tillman, and C.B. Leovy, "Mars Atmospheric Dynamics," pp. 835-933, IN: **Mars**, H.H. Kieffer, B.M. Jakosky, C.W. Snyder, and M.S. Matthews, eds., University of Arizona Press, Tucson, AZ (1992).
- 1993 Publications**
- Allamandola, L.J., "ISO, Dust and PAHs," pp. 197-206, IN: **Astronomical Infrared Spectroscopy: Future Observational Directions**, Astronomical Society of the Pacific, San Francisco, CA (1993).
- Allamandola, L.J., S.A. Sandford, A.G.G.M. Tielens, and T. Herbst, "'Diamonds' in Dense Molecular Clouds: A Challenge to the Standard Interstellar Medium Paradigm," **Science** **260**:64-66 (1993).
- Baker, V.R., V.C. Gulick, and J.S. Kargel, "Water Resources and Hydrogeology of Mars," pp. 765-798, IN: **Resources of Near-Earth Space**, J. Lewis, M.S. Matthews and M.L. Guerrieri, eds., University of Arizona Press, Tucson, AZ (1993).
- Banin, A., T. Ben-Shlomo, L. Margulis, D.R. Blake, R.L. Mancinelli, and A.U. Gehring, "The Nanophase Iron Mineral(s) in Mars Soil," **Journal of Geophysical Research** **98**:20,831-20,853 (1993).
- Barnes, A., "Motion of Heliospheric Termination Shock: A Gas Dynamic Model," **Journal of Geophysical Research** **98**(A9):15137-15146 (1993).
- Barnes, J.R., J.B. Pollack, R.M. Haberle, R.W. Zurek, C.B. Leovy, H. Lee, and J. Schaeffer, "Mars Atmospheric Dynamics as Simulated by the NASA/Ames General Circulation Model 2. Transient Baroclinic Eddies," **Journal of Geophysical Research** **98**:3125-3148 (1993).
- Bell, J.F., F. Fanale, and D.P. Cruikshank, "Chemical and Physical Properties of the Martian Satellites," pp. 887-901, IN: **Resources of Near-Earth Space**, J.S. Lewis, M.S. Matthews and M.L. Guerrieri, eds., The University of Arizona Press, Tucson, AZ (1993).
- Bell, J.F. and T.L. Roush, "Thermal Emission Measurements (5-25 $\mu$ m) of Hawaiian Palagonitic Soils with Implications for Mars," MSATT Study Group and Lunar Planetary Institute, LPI TR-93-06, Part 1 (1993).
- Benjamin, I. and A. Pohorille, "Isomerization Reaction Dynamics and Equilibrium at the Liquid-Vapor Interface of Water. A Molecular-Dynamics Study," **Journal of Chemical Physics** **98**:236 (1993).
- Blank, J.G., J.R. Delaney, and D.J. Des Marais, "The Concentration and Isotopic Composition of Carbon in Basaltic Glasses from the Juan de Fuca Ridge," **Geochimica et Cosmochimica Acta** **57**:875-887 (1993).

- Borg, J., T.E. Bunch, F. Radicati di Brozolo, and J.-C. Mandeville, "Further Analysis of LDEF Frecoipa Micrometeoroid Remnants," pp. 347-356, IN: **Second Post-Retrieval Symposium**, NASA CP-3194, San Diego, CA (1993).
- Bregman, J., D. Rank, S.A. Sandford, and P. Temi, "Spectral Imaging of the 3.3 and 11.3 Micron Emission Bands in NGC 1333: Discovery of Spatially Separate Band Emissions," **Astronomical Journal** **410**:668-672 (1993).
- Bregman, J.D., "Infrared Observations of Cometary Dust and Ice," pp. 11, IN: **Astronomical Infrared Spectroscopy: Future Observational Directions**, Astronomical Society of the Pacific, San Francisco, CA (1993).
- Bregman, J.D., D. Rank, P. Temi, D. Hudgins, and L. Kay, "3.3  $\mu\text{m}$  and 11.3  $\mu\text{m}$  Images of HD44179: Evidence for an Optically Thick Disk," **Astrophysical Journal** **411**:794 (1993).
- Bunch, T.E., F. Radicati di Brozolo, and P. Schultz, "A Study of Carbon-Rich Impactor Residues from Two Craters Compared with Hypervelocity Experimental Results," pp. 277, IN: **Hypervelocity Impacts in Space**, J.A.M. McDonnell, ed., University of Kent at Canterbury, Canterbury (1993).
- Buss, R.H., A.G.G.M. Tielens, M. Cohen, M.W. Werner, J.D. Bregman, and F.C. Witteborn, "Infrared Spectra of Transition Objects and the Composition and Evolution of Carbon Dust," **Astrophysical Journal** **415**:250-257 (1993).
- Camp, J.B. and F.C. Witteborn, "Effect of Coulomb Interaction on Time of Flight of Cold Antiprotons Launched from an Ion Trap," **Review of Scientific Instrumentation** **64**(4):854 (1993).
- Canfield, D.E. and D.J. Des Marais, "Biogeochemical Cycles of Carbon, Sulfur, and Free Oxygen in a Microbial Mat," **Geochimica et Cosmochimica Acta** **57**:3971-3984 (1993).
- Cassen, P., "Why Convective Heat Transport in the Solar Nebula was Inefficient," pp. 261-262, IN: **Lunar and Planetary Science Conference XXIV**, Lunar and Planetary Institute, Houston, TX (1993).
- Chang, S., "Prebiotic Synthesis in Planetary Environments," pp. 259-299, IN: **The Chemistry of Life's Origins**, J.M. Greenberg, C.X. Mendoza-Gomez and V. Pirronello, eds., Kluwer Academic Publishers, Dordrecht, The Netherlands (1993).
- Chapman, C.R., J. Veverka, M.J.S. Belton, G. Neukum, and D. Morrison, "Cratering on Gaspra," IN: **Lunar and Planetary Science Conference XXIV**, Lunar and Planetary Institute, Houston, TX (1993).
- Chokshi, A., A.G.G.M. Tielens, and D. Hollenbach, "Dust Coagulation," **Astrophysical Journal** **407**:806-819 (1993).
- Colgan, S.W.J., M.R. Haas, E.F. Erickson, R.H. Rubin, J.P. Simpson, and R.W. Russell, "Detection of the [N II] 122 and 205 Micron Lines: Densities in G333.6-0.2," **Astrophysical Journal** **413**:237-241 (1993).
- Cronin, J.R. and S. Chang, "Organic Matter in Meteorites: Molecular and Isotopic Analyses of the Murchison Meteorite," pp. 209-258, IN: **The Chemistry of Life's Origins**, J.M. Greenberg, C.X. Mendoza-Gomez and V. Pirronello, eds., Kluwer Academic Publishers, The Netherlands (1993).
- Cruikshank, D.P., "Icy Bodies in the Solar System: Present and Future of Infrared Studies," pp. 21, IN: **Astronomical Infrared Spectroscopy: Future Observational Directions**, Astronomical Society of the Pacific, San Francisco, CA (1993).
- Cruikshank, D.P., "Gerard Peter Kuiper," pp. 259-295, IN: **Biographical Memoir**, eds., National Academy of Sciences, Washington, DC (1993).
- Cruikshank, D.P. and R.H. Brown, "Remote Sensing of Ices and Ice-Mineral Mixtures in the Outer Solar System," pp. 455-468, IN: **Remote Geochemical Analysis: Elemental and Mineralogical Composition**, C.M. Pieters and P.A.J. Englert, eds., Cambridge University Press (1993).
- Cruikshank, D.P., T.L. Roush, T.C. Owen, T.R. Geballe, C. deBergh, B. Schmitt, R.H. Brown, and M.J. Bartholomew, "Ices on the Surface of Triton," **Science** **261**:742-745 (1993).
- Cuzzi, J.N., A.R. Dobrovolskis, and J.M. Champney, "Particle-Gas Dynamics in the Midplane of a Protoplanetary Nebula," **Icarus** **106**:102-134 (1993).
- Davies, J.K., M.V. Sykes, and D.P. Cruikshank, "Near-Infrared Photometry and Spectroscopy of the Unusual Minor Planet 5145 Pholus (1992AD)," **Icarus** **102**:166-169 (1993).
- Des Marais, D.J., J.D. Farmer, and D. Canfield, "Biogeochemistry of Microbial Mats at Guerrero Negro, Baja California, Mexico: Implications for Stromatolites," pp. A-294, IN: **Geological Society of America 1993 Annual Meeting**, Boston, MA (1993).

- Des Marais, D.J., H. Strauss, R. Summons, and J.M. Hayes, "Proterozoic Carbon Cycle - Reply," **Nature** **362**:118 (1993).
- DeVries, M.S., K. Reihs, H.R. Wendt, W.G. Golden, H.E. Hunziker, R. Fleming, E. Peterson, and S. Chang, "A Search for C<sub>60</sub> in Carbonaceous Chondrites," **Geochimica et Cosmochimica Acta** **57**:933-938 (1993).
- Du, P., F. Salama, and G.H. Loew, "Theoretical Study of the Electronic Spectra of a Polycyclic Aromatic Hydrocarbon, Naphthalene, and its Derivatives," **Chemical Physics** **173**:421-437 (1993).
- Farmer, J.D. and D.J. Des Marais, "Distributional Controls and Origin of Microstructure of Laminated Microbial Mats at Guerrero Negro, Baja, Mexico," pp. A-294, IN: **Geological Society of America 1993 Annual Meeting**, Boston, MA (1993).
- Farmer, J.D., M.C. Farmer, and R. Berger, "Radiocarbon Ages of Lacustrine Deposits in Volcanic Sequences of the Lomas Coloradas Area, Socorro Island, Mexico," **Radiocarbon** **35**(2):253-262 (1993).
- Fomenkova, M. and S. Chang, "Mass and Spatial Distribution of Carbonaceous Component in Comet Halley," pp. 501-502, IN: **Lunar and Planetary Science Conference XXIV**, Lunar and Planetary Institute, Houston, TX (1993).
- Fomenkova, M. and S. Chang, "Carbon in Comet Halley Dust Particles," pp. 193-202, IN: **AIP Conference on Analysis of Interplanetary Dust**, AIP Press, Houston, TX (1993).
- French, R.G., P.D. Nicholson, M.L. Cooke, J.L. Elliot, K. Matthews, O. Perkovic, E. Tollestrup, P. Harvey, N.J. Chanover, M.A. Clark, E.W. Dunham, and W. Forrest, "Geometry of the Saturn System from the 3 July 1989 Occultation of 28 Sgr and Voyager Observations," **Icarus** **103**:163-214 (1993).
- Goebel, J.H., D. Goorvitch, H.P. Larson, and D.R. Alexander, "A Deep Envelope Composition For TX Piscium?," **Astrophysical Journal** **402**:680-693 (1993).
- Goldman, T., R.E. Brown, J.B. Camp, S. Cornford, T. Darling, P. Dyer, S. Hoibraten, F.C. Witteborn, and K. Hosea, "Beyond Metric Gravity: Progress on PS-200," pp. 87-96, IN: **Beyond Metric Gravity: Progress on PS-200 Hyperfine Interactions**, J.C. Baltzer, ed., Science Publishers, Basel, Switzerland (1993).
- Gulick, V.C. and V.R. Baker, "Fluvial Erosion on Mars: Implications for Paleoclimatic Change," pp. 587, IN: **Lunar and Planetary Science Conference XXIV**, Lunar and Planetary Institute, Houston, TX (1993).
- Gulick, V.C. and V.R. Baker, "Fluvial Valleys in the Heavily Cratered Terrains of Mars: Evidence for Paleoclimatic Change?," LPI TR-93-03, Part 1 (1993).
- Haas, M.R. and A.E. Glassgold, "Detection of O I and Si II Far-Infrared Fine-Structure Emission from  $\alpha$  Orionis," **Astrophysical Journal** **410**:L111-L114 (1993).
- Haberle, R.M., H.C. Houben, R. Hertenstein, and T. Herdtle, "A Boundary Layer Model for Mars: Comparison with Viking Lander and Entry Data," **Journal of the Atmospheric Sciences** **50**(11):1544 (1993).
- Haberle, R.M., C.P. McKay, J.B. Pollack, O.E. Gwynne, D.H. Atkinson, J. Appelbaum, G.A. Landis, R.W. Zurek, and D.J. Flood, "Atmospheric Effects on the Utility of Solar Power on Mars," pp. 845-885, IN: **Resources of Near-Earth Space**, J. Lewis, M.S. Matthews and M.L. Guerrieri, eds., University of Arizona Press, Tucson, AZ (1993).
- Haberle, R.M., J.B. Pollack, J.R. Barnes, R.W. Zurek, C.B. Leovy, J.R. Murphy, J. Schaeffer, and H. Lee, "Mars Atmospheric Dynamics as Simulated by the NASA/Ames General Circulation Model 1. The Zonal Mean Circulation," **Journal of Geophysical Research** **98**:3093-3124 (1993).
- Haberle, R.M., D. Tyler, C.P. McKay, and W.L. Davis, "A Model for the Evolution of CO<sub>2</sub> on Mars," **Icarus** **109**:102-120 (1993).
- Harrington, J., M.L. Cooke, W.J. Forrest, J.L. Pipher, E.W. Dunham, and J.L. Elliot, "IRTF Observations of the Occultation of 28 Sgr by Saturn," **Icarus** **103**:235-252 (1993).
- Harrison, R.A., M.K. Carter, T.A. Clark, C. Lindsey, J.T. Jefferies, D.G. Sime, G. Watt, T.L. Roellig, E.E. Becklin, D.A. Naylor, G.J. Tompkins, and D. Braun, "An Active Solar Prominence in 1.3  $\mu$ m Radiation," **Astronomy and Astrophysics** **274**:L9-L12 (1993).
- Hildebrand, R.H., J.A. Davidson, J. Dotson, D.F. Figer, G. Novak, S.R. Platt, and L. Tao, "Polarization of the Thermal Emission from the Dust Ring at the Center of the Galaxy," **Astrophysical Journal** **417**:565 (1993).

- Hinson, D.P. and J.A. Magalhaes, "Inertio-Gravity Waves in the Atmosphere of Neptune," **Icarus** **105**:142-161 (1993).
- Hollenbach, D., D. Johnstone and F. Shu, "Photoevaporation of Disks Around Massive Stars and Ultracompact H II Regions," pp. 26, IN: **Massive Stars: Their Lives in the Interstellar Medium**, Madison, WI (1993).
- Holzcheiter, M.H., R.E. Brown, J.B. Camp, S. Cornford, T. Darling, P. Dyer, T. Goldman, and F.C. Witteborn, "Trapping of Antiprotons in a Large Penning Trap - Progress Towards a Measurement of the Gravitational Acceleration of the Antiproton," **Nuclear Physics A558**: 709c-718c (1993).
- Hudgins, D., S.A. Sandford, L.J. Allamandola and A.G.G.M. Tielens, "Mid- and Far-Infrared Spectroscopy of Ices: Optical Constants and Integrated Absorbances," **The American Astronomical Society CD-ROM Series 1**:713-870 (1993).
- Hutzell, W.T., C.P. McKay, and O.B. Toon, "Effects of Time-Varying Haze Production on Titan's Geometric Albedo," **Icarus** **105**:162-174 (1993).
- Imamura, J.N., J. Middleditch, J.D. Scargle, T.Y. Steiman-Cameron, L.A. Whitlock, M.T. Wolff, and K.S. Wood, "The Quasi-Periodic Oscillations of VV Puppis," **Astrophysical Journal** **419**:793-802 (1993).
- Jakosky, B.M. and A.P. Zent, "Water on Mars: Its History and Availability as a Resource," pp. 737-763, IN: **Resources of Near-Earth Space**, J.S. Lewis, M.S. Matthews, and M.L. Guerrieri, eds., The University of Arizona Press, Tucson, AZ (1993).
- Jenniskens, P., "Optical Constants of Organic Refractory Residue," **Astronomy and Astrophysics** **274**:653-661 (1993).
- Jenniskens, P., "On the Nature of Organic Matter in the Diffuse Medium," pp. 275-278, IN: **First Symposium on the Infrared Cirrus and Diffuse Interstellar Clouds**, Tucson, AZ (1993).
- Jenniskens, P., G.A. Baratta, A. Kouchi, M.S. deGroot, J.M. Greenberg, and G. Strazzulla, "Carbon Dust Formation on Interstellar Grains," **Astronomy and Astrophysics** **273**:583-600 (1993).
- Jenniskens, P. and F.X. Desert, "Complex Structure in Two Diffuse Interstellar Bands," **Astronomy and Astrophysics** **274**:465-477 (1993).
- Jenniskens, P. and F.X. Desert, "Tracing the Roots of Interstellar Mid-Infrared Emission," **Astronomy and Astrophysics** **275**:549-557 (1993).
- Jenniskens, P. and J.M. Greenberg, "Environment Dependence of Interstellar Extinction Curves," **Astronomy and Astrophysics** **274**:439-450 (1993).
- Klein, H.P. and D.L. DeVincenzi, "An Exobiology Science Strategy for Mars Exploration," pp. 114, IN: **7th ISSOL Meeting and 10th International Conference on the Origin of Life**, Barcelona, Spain (1993).
- Landheim, R., R. Greeley, D.J. Des Marais, J.D. Farmer, and H.P. Klein, "Mars Exobiology Landing Sites for Future Exploration," pp. 845-846, IN: **Lunar and Planetary Conference XXIV**, Houston, TX (1993).
- Luhmann, J.G., T.-L. Zhang, S.M. Petrinec, and C.T. Russell, "Solar Cycle 21 Effects on the Interplanetary Magnetic Field and Related Parameters at 0.7 and 1.0 AU," **Journal of Geophysical Research** **98(A4)**:5559-5572 (1993).
- Mamet, B., J.D. Farmer, and R. Fisher, "Stratigraphy of the Ebbadalen Formation (Bashkirian, Carboniferous) at Odellfjellet, Central Spitsbergen," pp. 279-290, IN: **12th International Symposium on the Carboniferous System**, Buenos Aires, Argentina (1993).
- Mancinelli, R.L. and D.T. Smernoff, "The Effect of Elevated CO<sub>2</sub> on Growth, Photosynthesis and Nitrogen Fixation in an Induced Association between *Aphanizomenon flos-aquae* and Duckweed Species," pp. 305, IN: **American Society for Microbiology**, Atlanta, GA (1993).
- Mancinelli, R.L. and M.R. White, "The *in situ* Exobiological Investigation of the Martian Surface Mineralogy during Unmanned Missions," pp. 45, IN: **7th ISSOL Meeting and 10th International Conference on the Origin of Life**, Barcelona, Spain (1993).
- Mancinelli, R.L. and M.R. White, "Characterization and Identification of New Species of Halophiles," pp. 340, IN: **American Society for Microbiology**, Atlanta, GA (1993).
- McFadden, L.A., A.L. Cochran, E.S. Barker, D.P. Cruikshank, and W.K. Hartmann, "The Enigmatic Object 2201 Oljato: Is it an Asteroid or an Evolved Comet?," **Journal of Geophysical Research** **98(E2)**:3031-3041 (1993).

- McKay, C.P., "Life in the Solar System," pp. 317-325, IN: **Frontiers of Life**, J.T. ThanhVan, K.T. ThanhVan, J.C. Mounolou, J. Schneider and C. McKay, eds., Editions Frontiers, Gif-Sur-Yvette, France (1993).
- McKay, C.P., "Did Mars Once Have Martians?," **Astronomy** **21**:26-33 (1993).
- McKay, C.P., "Relevance of Antarctic Microbial Ecosystems to Exobiology," pp. 593-601, IN: **Antarctic Microbiology**, E.I. Friedmann, ed., Wiley-Liss, New York, NY (1993).
- McKay, C.P., "Life on Mars," **Giornale Botanico Italiano** **127**:359-368 (1993).
- McKay, C.P., "Restoring Mars to Habitable Conditions: Can We? Should We? Will We?," **Journal of Irish Colleges of Physicians and Surgeons** **22**:17-19 (1993).
- McKay, C.P., T.R. Meyer, P.J. Boston, M. Nelson, T. Maccallum, and O. Gwynne, "Utilizing Martian Resources for Life Support," pp. 819-843, IN: **Resources of Near-Earth Space**, J. Lewis, M.S. Matthews and M.L. Guerrieri, eds., University of Arizona Press, Tuscon, AZ (1993).
- McKay, C.P., J.A. Nienow, M.A. Meyer, and E.I. Friedmann, "Continuous Nanoclimate Data (1985-1988) from the Ross Desert (McMurdo Dry Valleys) Cryptoendolithic Microbial Ecosystem," pp. 201-207, IN: **Antarctic Meteorology and Climatology: Studies Based on Automatic Weather Stations**, D.H. Bromwich and C.R. Stearns, eds., Antarctic Research Series, American Geophysical Union, Washington, DC (1993).
- McKay, C.P., J.B. Pollack, J.I. Lunine, and R. Courtin, "Coupled Atmosphere-Ocean Models of Titan's Past," **Icarus** **102**:88-98 (1993).
- McKelvey, M.E., R.E. McMurray, C.R. McCreight, T.L. Roellig, R. Cooper, L. Yuen and L.K. Deutsch, "58x62 Si:As IBC Detector Arrays on PMOS Multiplexers for Astronomy," **Society for Photo-Optical Engineering Journal** **1946**:88 (1993).
- Meixner, M., C.J. Skinner, P.Temi, D. Rank, J. Bregman, J.R. Ball, E. Keto, J.K. Arens, and J.G. Jernigan, "2-12.5  $\mu\text{m}$  Imaging of IRAS 21282+5050: The Structure of a Young Planetary Nebula," **Astrophysical Journal** **411**:266 (1993).
- Miller, R.H. and B.F. Smith, "Galactic Oscillations," pp. 130, IN: **Back to the Galaxy, American Institute of Physics Conference Proceedings**, American Institute of Physics, College Park, MD (1993).
- Millis, R.L., L.H. Wasserman, O.G. Franz, R.A. Nye, J.L. Elliot, E.W. Dunham, A.S. Bosh, L.A. Young, S.M. Slivan, A.C. Gilmore, P.M. Kilmartin, W.H. Allen, and R.D. Watson, "Pluto's Radius and Atmosphere: Results from the Entire 9 June 1988 Occultation Date Set," **Icarus** **105**:282-297 (1993).
- Morrison, D., "The Impact Hazard," pp. 49-61, IN: **Proceedings of the Near Earth Object Interception Workshop**, Los Alamos National Laboratory, Los Alamos, CA (1993).
- Morrison, D., "Exploring Planetary Worlds," W.M. Freeman Publishers, Scientific American Books, New York, NY, 238pp (1993).
- Morrison, D., "An International Program to Protect the Earth from Impact Catastrophe," **Acta Astronautica** **30**:11-16 (1993).
- Murphy, J.R., R.M. Haberle, O.B. Toon, and J.B. Pollack, "Martian Global Dust Storms: Zonally Symmetric Numerical Simulations Including Size-Dependent Particle Transport," **Journal of Geophysical Research** **98**:3197-3220 (1993).
- Nishioka, K., G.C. Carle, T.E. Bunch, D.J. Mendez and J.T. Ryder, "Status Report-Small Particles Intact Capture Experiment (SPICE)," pp. 43-44, IN: **Workshop on the Analysis of Interplanetary Dust Particles** (1993).
- Nishioka, K. and et al., "SPICE: An Innovative, Flexible Instrument Concept," pp. 61-64, IN: **Workshop on Particle Capture, Recovery and Velocity/Trajectory Measurement Technologies**, Lunar and Planetary Institute, Houston, TX (1993).
- Owen, T.C., T.L. Roush, D.P. Cruikshank, J.L. Elliot, L.A. Young, C. deBergh, B. Schmitt, T.R. Geballe, R.H. Brown, and M.J. Bartholomew, "Surface Ices and the Atmospheric Composition of Pluto," **Science** **261**:745-748 (1993).
- Paerl, H.W., B.M. Bebout, S.B. Joye, and D.J. Des Marais, "Microscale Characterization of Dissolved Organic Matter Production and Uptake in Marine Microbial Mat Communities," **Limnology and Oceanography** **38**:1150-1161 (1993).

- Pendleton, Y.J., "Organics in the Diffuse Interstellar Medium," pp. 171-181, IN: **Astronomical Infrared Spectroscopy: Future Observational Directions**, Astronomical Society of the Pacific, San Francisco, CA (1993).
- Podolak, M., W.B. Hubbard and J.B. Pollack, "Gaseous Accretion and the Formation of Giant Planets," pp. 1109, IN: **Protostars and Planets 3**, E.H. Levy and J.I. Lunine, eds., The University of Arizona Press, Tucson, AZ (1993).
- Podolak, M., D. Prialnik, T. Bunch, P. Cassen, and R. Reynolds, "Secondary Processing of Chondrules and Refractory Inclusions (CAIs) by Gasdynamic Heating," **Icarus** **104**:97-109 (1993).
- Podolak, M., D. Prialnik, T.E. Bunch, P. Cassen, and R. Reynolds, "Processing of Refractory Inclusions (CAIs) in Parent Body Atmospheres - II," **Icarus** **104**:97-109 (1993).
- Pohorille, A. and I. Benjamin, "Structure and Energetics of Model Amphiphilic Molecules at the Water Liquid-Vapor Interface. A Molecular Dynamics Study," **Journal of Physical Chemistry** **97**:2664-2670 (1993).
- Pohorille, A. and M.A. Wilson, "Viewpoint 9-Molecular Structure of Aqueous Interfaces," **Journal of Molecular Structure** **284**:271-298 (1993).
- Pollack, J.B., R.M. Haberle, J.R. Murphy, J. Schaeffer, and H. Lee, "Simulations of the General Circulation of the Martian Atmosphere 2. Seasonal Pressure Variations," **Journal of Geophysical Research** **98**:3149-3182 (1993).
- Pollack, J.B. and C. Sagan, "Planetary Engineering," pp. 921-950, IN: **Resources of Near-Earth Space**, J.S. Lewis, M.S. Matthews and M.L. Guerrieri, eds., The University of Arizona Press, Tucson, AZ (1993).
- Pratt, L.R. and A. Pohorille, "Hydrophobic Effects from Cavity Statistics," pp. 261-268, IN: **Water Biomolecule Interactions**, Bologna, Italy (1993).
- Rank, D.M., P. Temi, and J.D. Bregman, "3-12  $\mu$ m Images of HD44179 and M42: Spectral Differencing as a Mid-Infrared Astronomical Image Enhancement Technique," pp. 420, IN: **Infrared Detectors and Instrumentation**, International Society for Optical Engineering, Orlando, FL (1993).
- Roellig, T.L., "Surveys from the Infrared Telescope in Space," pp. 227-232, IN: **Sky Surveys: Protostars to Protogalaxies**, Pasadena, CA (1993).
- Roellig, T.L., R. Cooper, L.K. Deutsch, C. McCreight, M. McKelvey, Y.J. Pendleton, F.C. Witteborn, and L. Yuen, "The NASA-ARC 10/20 Micron Camera," pp. 333-334, IN: **Infrared Astronomy with Arrays**, Kluwer Academic Publishers, Los Angeles, CA (1993).
- Roellig, T.L., T. Onaka, T.J. McMahon and T. Tanabe, "The Mid-Infrared Spectrometer on the Infrared Telescope in Space," **Society for Photo-Optical Engineering Journal** **1946**:249-260 (1993).
- Roush, T.L., D.L. Blaney, and R.B. Singer, "The Surface Composition of Mars as Inferred from Spectroscopic Observations," pp. 367-393, IN: **Remote Geochemical Analysis: Elemental and Mineralogical Composition**, C.M. Pieters and P.A.J. Englert, eds., Cambridge University Press, Cambridge, England (1993).
- Roush, T.L. and J.B. Orenberg, "Derivation of the Midinfrared (5.0-25.0  $\mu$ m) Optical Constants of Hydrated Carbonate and Sulfate," pp. 1215-1216, IN: **Lunar and Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1993).
- Rubin, R.H., R.J. Dufour, and D.K. Walter, "Silicon and Carbon Abundances in the Orion Nebula," **Astrophysical Journal** **413**:242-250 (1993).
- Salama, F. and L.J. Allamandola, "Neutral and Ionized Polycyclic Aromatic Hydrocarbons, Diffuse Interstellar Bands, and the Ultraviolet Extinction Curve," **Journal of American Chemical Society Faraday Transactions** **89**(13):2277-2284 (1993).
- Sandford, S.A., "The Mid-Infrared Transmission Spectra of Antarctic Ureilites," **Meteoritics** **28**:579-585 (1993).
- Sandford, S.A., "Interstellar Ices, their Processing, and their Relationship to Refractory Dust," pp. 181-188, IN: **Astronomical Infrared Spectroscopy Conference**, Astronomical Society of the Pacific, Calgary, Canada (1993).
- Sandford, S.A. and L.J. Allamandola, "Condensation and Vaporization Studies of CH<sub>3</sub>OH and NH<sub>3</sub> Ices: Major Implications for Astrochemistry," **Astrophysical Journal** **417**:815-825 (1993).
- Sandford, S.A. and L.J. Allamandola, "The Condensation and Vaporization Behavior of Ices Containing SO<sub>2</sub>, H<sub>2</sub>S and CO<sub>2</sub>: Implications for Io," **Icarus** **106**:478-488 (1993).



- Sandford, S.A. and L.J. Allamandola, "H<sub>2</sub> in Interstellar and Extragalactic Ices: Infrared Characteristics, Ultraviolet Production, and Implications," **Astrophysical Journal Letters** **409**:L65-L68 (1993).
- Sandford, S.A., L.J. Allamandola, and T.R. Geballe, "Spectroscopic Detection of Molecular Hydrogen Frozen in Interstellar Ices," **Science** **262**:400-402 (1993).
- Sauke, T.B., J.F. Becker, T.D. Gutierrez, and C.G. Bratton, "Improved Stable Isotope Laser Spectrometer and Its Application to Soil Analysis," pp. 170, IN: **Novel Laser Sources and Applications**, SPIE Optical Engineering Press, San Jose, CA (1993).
- Scargle, J.D., T. Steiman-Cameron, K. Young, D.L. Donoho, J.P. Crutchfield, and J. Imamura, "The Quasi-Periodic Oscillations and Very Low Frequency Noise of Scorpius X-1 as Transient Chaos: A Dripping Handrail?," **Astrophysical Journal Letters** **411**:L91-L94 (1993).
- Schultz, P.H., T.E. Bunch, C. Koeberl, and W. Collins, "Further Analysis of Rio Cuarto Impact Glass," pp. 1259-1260, IN: **Lunar and Planetary Science Conference XXIV**, Lunar and Planetary Institute, Houston, TX (1993).
- Schutte, W.A., L.J. Allamandola, and S.A. Sandford, "Formaldehyde and Organic Molecule Production in Astrophysical Ices at Cryogenic Temperatures," **Science** **259**:1143-1145 (1993).
- Schutte, W.A., L.J. Allamandola, and S.A. Sandford, "An Experimental Study of the Organic Molecules Produced in Cometary and Interstellar Ice Analogs by Thermal Formaldehyde Reactions," **Icarus** **104**:118-137 (1993).
- Schutte, W.A., A.G.G.M. Tielens, and L.J. Allamandola, "Theoretical Modelling of the Infrared Fluorescence from Interstellar Polycyclic Aromatic Hydrocarbons," **Astrophysical Journal** **415**:397-414 (1993).
- Showalter, M.R. and J.N. Cuzzi, "Seeing Ghosts: Photometry of Saturn's G Ring," **Icarus** **103**:124-143 (1993).
- Shu, F.H., D. Johnstone, and D. Hollenbach, "Photoevaporation of the Solar Nebula and the Formation of the Giant Planets," **Icarus** **106**:92-101 (1993).
- Simpson, J.P., F.C. Witteborn, A. Graps, G.G. Fazio and D.G. Koch, "Particle Sightings by the Infrared Telescope on Spacelab 2," **Journal of Spacecraft and Rockets** **30**(2):216-221 (1993).
- Smith, B.F. and R.H. Miller, "Galactic Oscillations," pp. 195, IN: **Evolution of Galaxies and Their Environments**, Universities of Colorado and Wyoming, Grand Teton National Park, WO (1993).
- Stoker, C., "Telepresence in Human Exploration of Mars: Field Studies in Analog Environments," IN: **Proceedings of Vision 21: Interdisciplinary Science and Engineering in the Era of Cyberspace**, Cleveland, OH (1993).
- Stoker, C.R., J.L. Gooding, T. Roush, A. Banin, D. Burt, B.C. Clark, G. Flynn, and O. Gwynne, "The Physical and Chemical Properties and Resource Potential of Martian Surface Soils," pp. 659-708, IN: **Resources of Near-Earth Space**, J.S. Lewis, M.S. Matthews and M.L. Guerrieri, eds., University of Arizona Press, Tucson, AZ (1993).
- Summers, D.P. and S. Chang, "Prebiotic Ammonia from Reduction of Nitrite by Iron (II) on the Early Earth," **Nature** **365**:630-633 (1993).
- Tegler, S.C., D.A. Weintraub, L.J. Allamandola, S.A. Sandford, T.W. Rettig, and H. Campins, "The Detection of the 2165 cm<sup>-1</sup> (4.619 μm) XCN Band in the Spectrum of L 1551 IRS 5," **Astrophysical Journal** **411**:260-265 (1993).
- Tielens, A.G.G.M., M.M. Meixner, P.P. Van Der Werf, J.D. Bregman, J.A. Tauber, J. Stutzki, and D. Rank, "Anatomy of the Photodissociation Region in the Orion Bar," **Science** **262**:86-89 (1993).
- Tryka, K.A., R.H. Brown, V. Anicich, D.P. Cruikshank, and T.C. Owen, "Spectroscopic Determination of the Phase Composition and Temperature of Nitrogen Ice on Triton," **Science** **261**:751-754 (1993).
- Walter, M.R. and D.J. Des Marais, "Preservation of Biological Information in Thermal Spring Deposits: Developing a Strategy for the Search for Fossil Life on Mars," **Icarus** **101**:129-143 (1993).
- Weidenschilling, S.J. and J.N. Cuzzi, "Formation of Planetesimals in the Solar Nebula," pp. 1031-1060, IN: **Protostars and Planets III**, E.H. Levy and J.I. Lunine, eds., University of Arizona Press, Tucson, AZ (1993).

- Wharton, R.A., W.B. Lyons, and D.J. Des Marais, "Stable Isotope Biogeochemistry of Carbon and Nitrogen in a Perennially Ice-Covered Antarctic Lake," **Chemical Geology (Isotope Geoscience Section)** **107**:159-172 (1993).
- Wharton, R.A., C.P. McKay, G.D. Clow, and D.T. Andersen, "Perennial Ice Covers and their Influence on Antarctic Lake Ecosystems," pp. 53-70, IN: **Physical and Biogeochemical Processes in Antarctic Lakes**, W. Green and E.I. Friedmann, eds., Antarctic Research Series, American Geophysical Union, Washington, DC (1993).
- Wilson, M.A. and A. Pohorille, "Structure of Bilayer-Water and Monolayer-Water Interfaces: A Molecular Dynamics Study," pp. 227-230, IN: **Water-Biomolecule Interactions**, Bologna, Italy (1993).
- Witteborn, F.C., T. Greene, D.H. Wooden, and M. Cohen, "Future Airborne IR Spectrometers: Improved Efficiency and Calibration," pp. 365, IN: **Astronomical Infrared Spectroscopy: Future Observational Directions**, Astronomical Society of the Pacific, San Francisco, CA (1993).
- Wooden, D.H., D.M. Rank, J.D. Bregman, F.C. Witteborn, A.G.G.M. Tielens, M. Cohen, P.A. Pinto, and T.S. Axelrod, "Airborne Spectrophotometry of SN 1987A from 1.7 to 12.6 Microns: Time History of the Dust Continuum and Line Emission," **Astrophysical Journal Supplement Series** **88**: 477-507 (1993).
- Young, E.F. and R.P. Binzel, "Comparative Mapping of Pluto's Sub-Charon Hemisphere: Three Least Squares Models Based on Mutual Event Lightcurves," **Icarus** **134**:134-149 (1993).
- Zent, A.P., R.M. Haberle, H.C. Houben, and B.M. Jakosky, "A Coupled Subsurface-Boundary Layer Model of Water on Mars," **Journal of Geophysical Research** **98(E2)**: 3319-3337 (1993).
- Zent, A.P. and T.L. Roush, "Spectral Analysis of Chemisorbed CO<sub>2</sub> on Mars Analog Materials," pp. 1569-1570, IN: **Lunar and Planetary Science Conference XXIV**, Lunar and Planetary Institute, Houston, TX (1993).
- 1994 Publications**
- Barnes, A., "Motion of the Heliospheric Termination Shock: 2. Energy Loss Due to Energetic Particle Acceleration," **Journal of Geophysical Research** **99(A4)**:6553-6560 (1994).
- Bebout, B.M., H.W. Paerl, J.E. Bauer, D.E. Canfield, and D.J. Des Marais, "Nitrogen Cycling in Microbial Mat Communities: The Quantitative Importance of N-Fixation and Other Sources for N for Primary Productivity," pp. 265-271, IN: **Microbial Mats: Structure, Development and Environmental Significance**, L. Stal and P. Caumette, eds., Springer-Verlag, Berlin, Germany (1994).
- Becker, L., J.L. Bada, R.E. Winans, J.E. Hunt, and T.E. Bunch, "Fullerenes in the 1.85 Billion Year Old Sudbury Impact Structure," **Science** **265**:642-645 (1994).
- Bell, J.F., J.B. Pollack, T.R. Geballe, D.P. Cruikshank, and R. Freedman, "Absolute Calibration and Atmospheric vs. Mineralogic Origin of Absorption Features in 2.0 to 2.5  $\mu$ m Mars Spectra Obtained During 1993," pp. 85-86, IN: **Lunar Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).
- Bell, J.F., J.B. Pollack, T.R. Geballe, D.P. Cruikshank, and R. Freedman, "Spectroscopy of Mars from 2.04 to 2.44  $\mu$ m during the 1993 Opposition: Absolute Calibration and Atmospheric vs. Mineralogic Origin of Narrow Absorption Features," **Icarus** **111**:106-123 (1994).
- Bell, J.F. and T.L. Roush, "Wavelength Calibration Techniques and Subtle Surface and Atmospheric Absorption Features in the Mariner 6, 7 IRS Reflectance Data," pp. 87-88, IN: **Lunar and Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).
- Bell, K.R., "Reconciling Accretion Scenarios with Inner Holes: The Thermal Instability and the 2  $\mu$ m Gap," pp. 215, IN: **Proceedings from The Nature and Evolutionary Status of Herbig Ae/Be Stars Conference**, Astronomical Society of the Pacific, Amsterdam, The Netherlands (1994).
- Bell, K.R. and D.N.C. Lin, "Using FU Orionis Outbursts to Constrain Self-Regulated Protostellar Disk Models," **Astrophysical Journal** **427**:987-1004 (1994).

- Belton, M.J.S., J. Veverka, P. Thomas, P. Helfenstein, D. Simonelli, C. Chapman, M.E. Davies, R. Greeley, R. Greenberg, J. Head, S. Murchie, K. Klaasen, T.V. Johnson, A. McEwen, D. Morrison, G. Neukum, F. Fanale, C. Anger, M. Carr and C. Pilcher, "First Images of Asteroid 243 Ida," **Science** **265**:1543-1547 (1994).
- Benjamin, I., M. Wilson, and A. Pohorille, "Scattering of Ne from the Liquid-Vapor Interface of Glycerol: A Molecular Dynamics Study," **Journal of Chemical Physics** **100**:6500-6508 (1994).
- Bernstein, M., S.A. Sandford, L.J. Allamandola, and S. Chang, "The Infrared Spectrum of Matrix-Isolated Hexamethylenetetramine in Argon and H<sub>2</sub>O at Cryogenic Temperatures," **Journal of Chemical Physics** **98**:12206-12210 (1994).
- Blake, D.F., D.T. Vaniman, and D.L. Bish, "A Mineralogical Instrument for Planetary Applications," pp. 121-122, IN: **Lunar and Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).
- Bohn, R.B., S.A. Sandford, L.J. Allamandola, and D.P. Cruikshank, "Infrared Spectroscopy of Triton and Pluto Ice Analogs: The Case for Saturated Hydrocarbons," **Icarus** **111**:151-173 (1994).
- Bougher, S.W. and W.J. Borucki, "Venus O<sub>2</sub> Visible and IR Nightglow: Implications for Lower Thermosphere Dynamics and Chemistry," **Journal of Geophysical Research** **99(E2)**:3759-3776 (1994).
- Bregman, J.D., K. Larson, D. Rank and P. Temi, "Spectral Imaging of the Orion Bar at 3.3, 8.4 and 11.3  $\mu$ m: Comparison with a Fluorescent PAH Model," **Astrophysical Journal** **423**:326-333 (1994).
- Bullock, M.A., C.R. Stoker, C.P. McKay, and A.P. Zent, "A Coupled Soil-Atmosphere Model of H<sub>2</sub>O<sub>2</sub> on Mars," **Icarus** **107**:142-154 (1994).
- Bunch, T.E., J.M. Paque, L. Becker, J. Vedder and J. Erlichman, "Hypervelocity Impact Survivability Experiments for Carbonaceous Impactors: Part 2," pp. 453-477, IN: **Third LDEF Symposium**, NASA CP-3275 (1994).
- Cabrol, N., R. Landheim, R. Greeley, and J. Farmer, "Fluvial Processes in Ma'Adim Vallis and the Potential of Gusev Crater as a High Priority Site," pp. 213-214, IN: **Lunar and Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).
- Canfield, D.E. and D.J. DesMarais, "Cycling of Carbon, Sulfur, Oxygen and Nutrients in a Microbial Mat," pp. 255-263, IN: **Microbial Mats: Structure, Development and Environmental Significance**, L.J. Stal and P. Caumette, eds., Springer-Verlag, Heidelberg, Germany (1994).
- Carle, G.C., D.R. Kojiro, T.B. Sauke, J.R. Valentin, T.C. Shen and J.R. Marshall, "Advanced Instrumentation for Exobiology," pp. 2-8, IN: **39th Society for Photo-Optical Engineering's International Symposium on Optics, Imaging and Instrumentation**, San Diego, CA (1994).
- Carral, P., D.J. Hollenbach, S.D. Lord, S.W.J. Colgan, M.R. Haas, R.H. Rubin, and E.F. Erickson, "The Interstellar Medium in the Starburst Regions of NGC 253 and NGC 3256," **Astrophysical Journal** **423**:223-236 (1994).
- Chapman, C.R. and D. Morrison, "Impacts on the Earth by Asteroids and Comets: Assessing the Hazard," **Nature** **367**:33-40 (1994).
- Colgan, S.W.J., M.R. Haas, E.R. Erickson, S.D. Lord, and D.J. Hollenbach, "Day 640 Infrared Line and Continuum Measurements: Dust Formation in SN 1987A," **Astrophysical Journal** **427**:874-888 (1994).
- Cruikshank, D.P., M.W. Werner, and D.E. Backman, "SIRTF: Capabilities for the Study of Planetary Systems," **Astrophysics and Space Science** **212**:407-415 (1994).
- Cuzzi, J.N., A.R. Dobrovolskis, and R.C. Hogan, "What Initiated Planetsimal Formation?," pp. 307-308, IN: **Lunar and Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).
- Davidson, J.A. and T.L. Roellig, "Background-Limited Performance in the Submillimeter," pp. 382, IN: **Proceedings of Astronomy with Millimeter and Submillimeter Wave Interferometry Conference**, Astronomical Society of the Pacific Conference Series, Hakone, Japan (1994).
- DePree, C.G., W.M. Goss, P. Palmer, and R.H. Rubin, "A Bipolar Outflow of Ionized Gas in K3-50A: H76 $\alpha$  Radio Recombination Line and Continuum Observations of K3-50," **Astrophysical Journal** **428**:670-679 (1994).
- Des Marais, D.J., "Tectonic Control of the Crustal Organic Carbon Reservoir During the Precambrian," **Chemical Geology** **114**:303-314 (1994).

- Des Marais, D.J., "Multiple Lines of Isotopic Evidence for Episodic Changes in the Proterozoic Environment," pp. A-35, IN: **Geological Society of America 1994 Annual Meeting**, Seattle, WA (1994).
- Des Marais, D.J., "Exobiology," Mars Surveyor Science Objectives and Measurements Requirements Workshop, Jet Propulsion Laboratory, JPL TR-D12017 (1994).
- Des Marais, D.J. and D.E. Canfield, "The Carbon Isotope Biogeochemistry of Microbial Mats," pp. 289-298, IN: **Microbial Mats: Structure, Development and Environmental Significance**, L.J. Stal and P. Caumette, eds., Springer-Verlag, Heidelberg, Germany (1994).
- DeVincenzi, D.L., P.D. Stabekis and J. Barendgoltz, "Revision to Planetary Protection Policy for Mars Missions," IN: **30th COSPAR Scientific Assembly**, Hamburg, Germany (1994).
- Farmer, J. and R. Landheim, "Exobiology Landing Site Descriptions (Sites 1, 2, 4, 5, 7, 8, 10, 22, 79, 137, 138, 140, 141, 142, 143, 144, 145, 146, 147, 148)," pp. 392, IN: **Mars Landing Site Catalog**, NASA Ames Research Center, NASA RP-1238, R. Greeley and P. Thomas, eds. (1994).
- Farmer, J.D. and D.J. DesMarais, "An Exploration Strategy for Mars Exopaleontology," IN: **Mars Surveyor Science Objectives and Measurements Requirements Workshop**, Jet Propulsion Laboratory, Pasadena, CA, JPL TR-D12012 (1994).
- Farmer, J.D. and D.J. Des Marais, "Biological Versus Inorganic Processes in Stromatolite Morphogenesis: Observations from Mineralizing Sedimentary Systems," IN: **NATO Advanced Research Workshop on Structure, Development and Environmental Significance of Microbial Mats**, Arcachon, France (1994).
- Farmer, J.D. and D.J. Des Marais, "Exopaleontology and the Search for a Fossil Record on Mars," **Lunar Planetary Science** 25:367-368 (1994).
- Farmer, J.D. and D.J. Des Marais, "The Search for Carbonates on Mars," pp. 16-17, IN: **Breakthroughs in Karst Geomicrobiology and Redox Geochemistry Conference**, Karst Waters Institute, Inc., Colorado Springs, CO (1994).
- Farmer, J.D. and D.J. Des Marais, "Exobiology Site Priorities for Mars Pathfinder," Lunar and Planetary Institute, LPI TR-94-04 (1994).
- Farmer, J.D. and D.J. Des Marais, "Biological Versus Inorganic Processes in Stromatolite Morphogenesis: Observations from Mineralizing Sedimentary Systems," pp. 61-68, IN: **Microbial Mats: Structure, Development and Environmental Significance**, L.J. Stal and P. Caumette, eds., Springer-Verlag, Berlin, Germany (1994).
- Farmer, J.D., D.J. Des Marais and H.P. Klein, "Mars Site Selection for Exobiology: Criteria and Methodology," pp. 11-16, IN: **Mars Landing Site Catalog (Second Edition)**, NASA Ames Research Center, NASA RP-1238 (1994).
- Fomenkova, M.N., S. Chang, and L.M. Mukhin, "Carbonaceous Components in Comet Halley Dust," **Geochimica et Cosmochimica Acta** 58:4503-4512 (1994).
- Gazis, P.R., A. Barnes, J.D. Mihalov, and A.J. Lazarus, "Solar Wind Velocity and Temperature in the Outer Heliosphere," **Journal of Geophysical Research** 99(A4):6561-6573 (1994).
- Gehrz, R.D., C.E. Woodward, M.A. Greenhouse, S. Starrfield, D.H. Wooden, F.C. Witteborn, S.A. Sandford, L.J. Allamandola, J.D. Bregman, and M. Klapisch, "The Temporal Evolution of the 4-14 Micron Spectrum of V1974 CYGNI (NOVA CYGNI 1992)," **Astrophysical Journal** 421:762-770 (1994).
- Genzel, R., D. Hollenbach, and C.H. Townes, "The Nucleus of Our Galaxy," **Progress in Physics** 57:417-479 (1994).
- Gerber, R.A. and S.A. Lamb, "A Model for Collisionally Induced Disturbed Structure in Disk Galaxies," **Astrophysical Journal** 431:604-616 (1994).
- Ghandour, L., P. Jenniskens and P. Hartigan, "Dibs Independent of Accretion in T Tauri Stars," pp. 7-10, IN: **The Diffuse Interstellar Bands: Contributed Papers**, NASA Ames Research Center, NASA CP-10144 (1994).
- Goebel, J.H., J.D. Bregman, and F.C. Witteborn, "A 7 Micron Dust Emission Feature in Oxygen-Rich Circumstellar Shells," **Astrophysical Journal** 430:317-322 (1994).
- Goorvitch, D. and J. C. Chackerian, "Calculation of  $^{12}\text{C}^{16}\text{O}$  and  $^{13}\text{C}^{16}\text{O}$   $^1\Sigma^+$  Rovibrational Intensities for  $v \leq 20$  and  $J \leq 150$ ," **Astrophysical Journal Supplement Series** 91:483-489 (1994).

- Goorvitch, D., J. C. Chackerian, J.M. Hure, and E. Roueff, "Rovibrational Intensities of High  $v$ -J States of  $^1\Sigma^+$  CO," **Journal of Molecular Spectroscopy** **165**:583-585 (1994).
- Goorvitch, D. and C. Chackerian, "Rovibrational Intensities of the Minor Isotopes of CO Calculated for  $v \leq 20$  and  $J \leq 150$ ," **Astrophysical Journal Supplement Series** **92**: 311-321 (1994).
- Gulick, V.C. and C.P. McKay, "A Possible Atmospheric Water Source for the Fluvial Valleys on Alba Patera," pp. 491-492, IN: **Lunar and Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).
- Hine, B.P., C. Stoker, M. Sims, D. Rasmussen, P. Hontalas, T.W. Fong, J. Steele, and D. Barch, "The Application of Telepresence and Virtual Reality to Subsea Exploration," IN: **Proceedings of ROV '94, The 2nd Workshop on Mobile Robots for Subsea Environments**, Monterey, CA (1994).
- Hollenbach, D., D. Johnstone, S. Lizano, and F. Shu, "Photoevaporation of Disks Around Massive Stars and Application to Ultracompact H II Regions," **Astrophysical Journal** **428**: 654-669 (1994).
- Hörz, F., T.E. Bunch, and V. Oberbeck, "Shocked Materials from the Dutch Peak Diamictite, Utah," pp. 565-566, IN: **Lunar and Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).
- Jenniskens, P., "Very-Broadband-Structure and the Linear Rise in the Extinction Curve," **Astronomy and Astrophysics** **284**: 227-232 (1994).
- Jenniskens, P., "Meteor Stream Activity I.," **Astronomy and Astrophysics** **287**:990-1013 (1994).
- Jenniskens, P., H. Betlem, J. Betlem, E. Barifajjo, T. Schluter, C. Hampton, M. Laubenstein, J. Kunz, and G. Heusser, "The Mbale Meteorite Shower," **Meteoritics** **29(2)**: 246-254 (1994).
- Jenniskens, P. and D.F. Blake, "Structural Transitions in Amorphous Water Ice and Astrophysical Implications," **Science** **265**: 753-756 (1994).
- Jenniskens, P. and D.L. Blake, "The Structural Changes of Water Ice I During Warmup," pp. 621, IN: **Lunar and Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).
- Jenniskens, P. and F.X. Desert, "A Survey of Diffuse Interstellar Bands (3800-8680 Å)," **Astronomy and Astrophysics Supplement Series** **106**:39-78 (1994).
- Jenniskens, P., P. Ehrenfreund, and B. Foing, "Diffuse Interstellar Bands in Orion," **Astronomy and Astrophysics** **281**: 517-525 (1994).
- Keenan, F.P., E.S. Conlon, and R.H. Rubin, "Relative Emission-Line Strengths for the 146 and 63 Micron Transitions in O I and a Comparison with Far-Infrared Observations of Photodissociation Regions," **Astrophysical Journal** **434**: 811-815 (1994).
- Kozlowski, R.W.H., A.L. Sprague, F.C. Witteborn, D.P. Cruikshank, D. Wooden, and K.D. Snyder, "Mercury: Mid-Infrared (7.3 - 13.5  $\mu$ m) Spectroscopic Observations Showing Features Characteristic of Plagioclase," pp. 739-740, IN: **Lunar and Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).
- Krasnopolsky, V.A. and J.B. Pollack, "H<sub>2</sub>O-H<sub>2</sub>SO<sub>4</sub> System in Venus' Clouds and OCS, CO, and H<sub>2</sub>SO<sub>4</sub> Profiles in Venus' Troposphere," **Icarus** **109**:58-78 (1994).
- Landheim, R., N.A. Cabrol, R. Greeley, and J.D. Farmer, "Stratigraphic Assessment of Gusev Crater as an Exobiology Landing Site," **Lunar and Planetary Science** **25**:769-770 (1994).
- Mancinelli, R.L., J. Scarbeck, and M.R. White, "Soil Methane Oxidation and Predation in Sanitary Landfill Soils," pp. 256, IN: **American Society for Microbiology**, Las Vegas, NV (1994).
- Mancinelli, R.L., M.R. White, and L.J. Rothschild, "Nitrogen, Carbon, and Phosphate Metabolism in a Microbial Community Inhabiting a Thermal Alkaline Spring," pp. 328, IN: **American Society for Microbiology**, Las Vegas, NV (1994).
- McDonald, F.B., A. Barnes, L.F. Burlaga, P. Gazis, J. Mihalov, and R.S. Selesnick, "Effects of the Intense Solar Activity of March/June 1991 Observed in the Outer Heliosphere," **Journal of Geophysical Research** **99(A8)**:14705-14715 (1994).
- Meyerott, R.E., G.R. Swenson, E.L. Schweitzer, and D.G. Koch, "Excitation of the Low Lying Vibrational Levels of H<sub>2</sub>O by O (3P) as Measured on Spacelab 2," **Journal of Geophysical Research** **99(A9)**:17559-17575 (1994).
- Miller, R.H. and B.F. Smith, "Galactic Oscillations," **Celestial Mechanics and Dynamical Astronomy** **59**:161-199 (1994).

- Morrison, D., "Asteroids, Comets and Other Small Bodies," pp. 177-194, IN: **Space Biology and Medicine**, A.E. Nicogossian, ed., American Institute of Aeronautics and Astronautics and Nauka Press, Washington, DC (1994).
- Morrison, D., "Physical Study of Planets and Satellites," pp. 157-168, IN: **Reports on Astronomy (IAU Transactions)**, D. Reidel Publishing Company, Dordrecht, The Netherlands (1994).
- Morrison, D., C.R. Chapman, and P. Slovic, "The Impact Hazard," pp. 59-92, IN: **Hazards Due to Comets and Asteroids**, T. Gehrels, ed., University of Arizona Press, Tucson, AZ (1994).
- Morrison, D. and E. Teller, "Issues for the Future," pp. 1135-1144, IN: **Hazards Due to Comets and Asteroids**, T. Gehrels, ed., University of Arizona Press, Tucson, AZ (1994).
- Murakami, H., J. Bock, M.M. Freund, H. Guo, T. Hirao, A.E. Lange, H. Matsuhura, T. Matsumoto, S. Matsuura, T.J. McMahon, and T.L. Roellig, "The Infrared Telescope in Space," **Astrophysical Journal** **428**:354-362 (1994).
- Naidu, K. and A. Barnes, "Motion of the Heliospheric Termination Shock 3. Incident Interplanetary Shocks," **Journal of Geophysical Research** **99(A6)**:11553-11560 (1994).
- Naidu, K. and A. Barnes, "Motion of the Heliospheric Termination Shock 4. MHD Effects," **Journal of Geophysical Research** **99(A9)**: 17673-17679 (1994).
- Neufeld, D.A. and D.J. Hollenbach, "Dense Molecular Shocks and Accretion onto Protostellar Disks," **Astrophysical Journal** **428**: 170-185 (1994).
- Nishioka, K., D.J. Mendez, and J.T. Ryder, "Cosmic Dust Collection for Exobiology: Media and Sensors," IN: **Fifth Exobiology Symposium and Mars Workshop**, NASA Ames Research Center, Moffett Field, CA (1994).
- Nishioka, K., D.J. Mendez, and J.T. Ryder, "SPICE Mission and Flight Instrument Concept," IN: **Fifth Exobiology Symposium and Mars Workshop**, NASA Ames Research Center, Moffett Field, CA (1994).
- Norris, J.P., R.J. Nemiroff, J.D. Scargle, C. Kouveliotou, G.J. Fishman, C.A. Meegan, W.S. Paciesas, and J.T. Bonnell, "Detection of Signature Consistent with Cosmological Time Dilation in Gamma-Ray Bursts," **Astrophysical Journal** **424**: 540-545 (1994).
- Oberbeck, V.R., F. Hörz, and T.E. Bunch, "Impacts, Tillites and the Breakup of Gondwanaland: Reply," **Journal of Geology** **102**:485-489 (1994).
- Oberbeck, V.R. and R.L. Mancinelli, "Asteroid Impacts, Microbes and Cooling of the Atmosphere after 4.4 Ga.," **Bioscience** **44**:173-177 (1994).
- Pendleton, Y. and T. Roellig, "Development of a Polarimeter for Astrophysical Applications in the Mid-Infrared," NASA Ames Research Center, pp. 66-70, NASA TM-108813 (1994).
- Pendleton, Y., S. Sandford, L. Allamandola, A. Tielens and K. Sellgren, "Near Infrared Spectroscopy of Hydrocarbon Absorption in the Interstellar Medium," **Astrophysical Journal** **437**: 683-696 (1994).
- Pendleton, Y.J., "Infrared Spectroscopy of Organic Material in Diffuse Interstellar Clouds," pp. 255-265, IN: **The First Symposium on the Infrared Cirrus and Diffuse Interstellar Clouds**, Tucson, AZ (1994).
- Petuchowski, S.J., C.L. Bennett, M.R. Haas, E.F. Erickson, S.D. Lord, R.H. Rubin, S.W.J. Colgan, and D.J. Hollenbach, "The [N II] 205 Micron Line in M82: The Warm Ionized Medium," **Astrophysical Journal Letters** **427**:L17-L20 (1994).
- Podoseki, F.A. and P. Cassen, "Theoretical, Observational and Isotopic Estimates of the Lifetime of the Solar Nebula," **Meteoritics** **29**: 6-25 (1994).
- Pohorille, A. and M. Wilson, "Isomerization Reactions at Aqueous Interfaces," pp. 207-226, IN: **Reaction Dynamics in Clusters and Condensed Phases**, J. Jortner, et al., eds., Kluwer Academic Publishers, The Netherlands (1994).
- Pollack, J.B., D. Hollenbach, S. Beckwith, D.P. Simonelli, T. Roush, and W. Fong, "Composition and Radiative Properties of Grains in Molecular Clouds and Accretion Disks," **Astrophysical Journal** **421**:615-639 (1994).
- Radicati di Brozolo, F., T.E. Bunch, R.H. Fleming, and J. Macklin, "Fullerenes in an Impact Crater on the LDEF Spacecraft," **Nature** **369**: 37-40 (1994).
- Roellig, T.L. and et al., "The Infrared Telescope in Space (IRTS)," **Astrophysical Journal** **428**:354-362 (1994).
- Roellig, T.L., T. Onaka, T.J. McMahon, and T. Tanabe, "The Mid-Infrared Spectrometer on the Infrared Telescope in Space (IRTS) Mission," **Astrophysical Journal** **428**:370-376 (1994).

- Rothschild, L.J., L.J. Giver, M.R. White, and R.L. Mancinelli, "Metabolic Activity of Microorganisms in Gypsum-halite Crusts," **Journal of Phycology** **30**:431-438 (1994).
- Roush, T.L., "Charon: More than Water Ice?," **Icarus** **108**:243-254 (1994).
- Roush, T.L. and J.F. Bell, "Transmission Measurements ( $4000\text{-}400\text{ cm}^{-1}$ ,  $2.5\text{-}25\text{ }\mu\text{m}$ ) of Crystalline Ferric Oxides and Ferric Oxyhydroxides: Implications for Mars," pp. 1165-1166, IN: **Lunar and Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).
- Roush, T.L. and J.F. Bell, "Thermal Emission Measurements ( $5\text{-}25\text{ }\mu\text{m}$ ) of Hawaiian Palagonitic Soils with Implications for Mars," pp. 1161-1162, IN: **Lunar and Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).
- Roush, T.L. and J.B. Orenberg, "Thermal Emission Measurements ( $5\text{-}25\text{ }\mu\text{m}$ ) of Palagonite/ Fe-substituted Montmorillonite Intimate Mixtures: Applications to Mars," pp. 1163-1164, IN: **Lunar and Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).
- Rubin, R.H., J.P. Simpson, S.D. Lord, S.W.J. Colgan, E.F. Erickson, and M.R. Haas, "Nebular Properties from Far-Infrared Spectroscopy," **Astrophysical Journal** **420**:772-782 (1994).
- Salama, F. and L.J. Allamandola, "PAHs, DIBs and Interstellar Extinction," pp. 279-282, IN: **The First Symposium on the Infrared Cirrus and Diffuse Interstellar Clouds**, Tucson, AZ (1994).
- Salama, F., L.J. Allamandola, S.A. Sandford, J.D. Bregman, F.C. Witteborn, and D.P. Cruikshank, "Is  $\text{H}_2\text{O}$  Present on Io? The Detection of a New Strong Band Near  $3590\text{ cm}^{-1}$  ( $2.79\text{ }\mu\text{m}$ )," **Icarus** **107**:413-417 (1994).
- Salama, F., C. Joblin, and L.J. Allamandola, "Electronic Absorption Spectroscopy of Matrix-Isolated Polycyclic Aromatic Hydrocarbon Cations. II. The Phenanthrene Cation ( $\text{C}_{14}\text{H}_{10}^+$ ) and its 1-Methyl Derivative," **Journal of Chemical Physics** **101**:10,252-10,262 (1994).
- Sandford, S.A., T.R. Geballe, F. Salama and D. Goorvitch, "New Narrow Infrared Absorption Features in the Spectrum of Io Between  $3600$  and  $3100\text{ cm}^{-1}$  ( $2.8\text{-}3.2\text{ }\mu\text{m}$ )," **Icarus** **110**:292-302 (1994).
- Sauke, T.B., J.F. Becker, M. Lowenstein, T.D. Gutierrez, and C.G. Bratton, "An Overview of Isotopic Analysis Using Tunable Diode Laser Spectrometry," **Spectroscopy** **9**(5):34-40 (1994).
- Schultz, P.M., C. Koeberl, T.E. Bunch, R. Grant, and W. Collins, "Ground Truth for the Oblique Impact Process: New Insight from the Rio Cuarto Crater Field," **Geology** **22**: 865-870 (1994).
- Shen, T.C. and M.F. Fong, "*In-Situ* Polymerized PLOT Columns III: Divinylbenzene Copolymers and Dimethacrylate Homopolymers," **Journal of Chromatographic Science** **32**: 36-40 (1994).
- Spencer, M.N., C. Chackerian, L.P. Giver, and L.R. Brown, "The Nitric Oxide Fundamental Band: Rovibrational Line Frequency and Shape Parameters," **Journal of Molecular Spectroscopy** **165**:506-524 (1994).
- Sprague, A.L., R.W.H. Kozlowski, F.C. Witteborn, D.P. Cruikshank, and D.H. Wooden, "Mercury: Evidence for Anorthosite and Basalt from Mid-Infrared ( $7.3\text{-}13.5\text{ }\mu\text{m}$ ) Spectroscopy," **Icarus** **109**:156-167 (1994).
- Stoker, C., "From Antarctica to Space: Use of Telepresence and Virtual Reality in Control of a Remote Water Vehicle," NASA Ames Research Center, NASA CP (1994).
- Stoker, C., J. Barry, D.R. Barch, and B.P. Hine, "Use of Telepresence and Virtual Reality in Undersea Exploration: 1993 Antarctic Telepresence Experiment," IN: **Proceedings of AAI Workshop AI Technologies in Environmental Applications**, Seattle, WA (1994).
- Stolz, J.F. and D.J. Des Marais, "New Concepts in Biogeochemical Cycling and Ecology," pp. 437-440, IN: **Microbial Mats: Structure, Development and Environmental Significance**, L.J. Stal and P. Caumette, eds., Springer Publishing, Heidelberg, Germany (1994).
- Stratton, D.M., "Coagulation Algorithms with Size Binning," **Journal of Computational Physics** **112**(2): 364-369 (1994).
- Summons, R.E., L.L. Jahnke, and Z. Rokсандik, "Carbon Isotopic Fractionation in Lipids from Methanotropic Bacteria: Relevance for Interpretation of the Geochemical Record of Biomarkers," **Geochimica et Cosmochimica Acta** **58**(13):2853-2863 (1994).

- Tielens, A.G.G.M., C.F. McKee, C.G. Seab, and D.J. Hollenbach, "The Physics of Grain-Grain Collisions and Gas-Grain Sputtering in Interstellar Shocks," **Astrophysical Journal** **431**:321-340 (1994).
- Tomley, L., T.Y. Steiman-Cameron and P. Cassen, "Further Studies of Gravitationally Unstable Protostellar Disks," **Astrophysical Journal** **422**:850-861 (1994).
- Tsou, P., R.H. Fleming, P.M. Lindley, A.Y. Craig, and D. Blake, "Purity and Cleanness of Aerogel as a Cosmic Dust Capture Medium," pp. 1421-1422, IN: **Lunar and Planetary Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).
- Vaniman, D.T. and D.L. Bish, "A Mineralogical Instrument for Planetary Applications," pp. 121, IN: **Lunar and Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).
- Veverka, J., P. Thomas, D. Simonelli, M.J.S. Belton, M. Carr, C. Chapman, M.E. Davies, R. Greeley, R. Greenberg, J. Head, K. Klaasen, T.V. Johnson, D. Morrison and G. Neukum, "Discovery of Grooves on Gaspra," **Icarus** **107**:72-83 (1994).
- Wharton, R.A., M.A. Meyer, C.P. McKay, R.L. Mancinelli, and G.M. Simmons, "Sediment Oxygen Profiles in a Super-Oxygenated Antarctic Lake," **Limnology and Oceanography** **39**: 839-853 (1994).
- Wilson, M.A. and A. Pohorille, "Molecular Dynamics of a Water-Lipid Bilayer Interface," **Journal of the American Chemical Society** **116**:1490-1516 (1994).
- Wooden, D.H., "8  $\mu\text{m}$  - 13  $\mu\text{m}$  Spectrophotometry of Herbig Ae/Be Stars," pp. 138-139, IN: **The Nature and Evolutionary Status of Herbig Ae/Be Stars**, Astronomical Society of the Pacific, Amsterdam, The Netherlands (1994).
- Young, E.F. and R.P. Binzel, "A New Determination of Radii and Limb Parameters for Pluto and Charon from Mutual Event Lightcurves," **Icarus** **108**:219-224 (1994).
- Young, R.E., H. Houben, and O.B. Toon, "Radiatively Forced Dispersion of the Mt. Pinatubo Volcanic Cloud and Induced Temperature Perturbations in the Stratosphere during the First Few Months Following the Eruption," **Geophysical Research Letters** **21**(5):369-372 (1994).
- Young, R.E., R.L. Walterscheid, G. Schubert, L. Pfister, H. Houben, and D.L. Bindschadler, "Characteristics of Finite Amplitude Stationary Gravity Waves in the Atmosphere of Venus," **Journal of Atmospheric Sciences** **51**(13):1857-1875 (1994).
- Zent, A.P. and C.P. McKay, "The Chemical Reactivity of the Martial Soil and Implications for Future Missions," **Icarus** **108**:146-157 (1994).
- Zent, A.P. and R.C. Quinn, "Simultaneous Adsorption of CO<sub>2</sub> and H<sub>2</sub>O under Mars-like Conditions and Application to the Evolution of the Martian Climate," pp. 1543-1544, IN: **Lunar and Planetary Science Conference XXV**, Lunar and Planetary Institute, Houston, TX (1994).



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