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Optical sciences
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EDUCATION -

- Ph.D. and MSc, Optical Sciences, College of Optical Sciences, University of Arizona, Tucson
 - Ph.D. Dissertation: Coherence Interferometer and Astronomical Applications
 - MSc. Thesis: Polarization and Image-Forming Properties of a Large Grating Spectrograph
- B.Sc., Physics, Case Institute of Technology (now Case Western Reserve University), Cleveland, Ohio.
- Wharton School, Univ. of PA. - Executive Management training

CAREER -

2010 to current -

- NASA Principal Investigator for: \$569K peer-review selected research grant: *Threshold raw retrieved contrast in coronagraphs is limited by internal polarization* NASA # NNX17AB29G, 2017=>2019
- Member NASA WFIRST-CGI mission science definition team (2012-2015)
- Consultant in optical systems engineering, Northrop Grumman
- NSF, NASA and DoD science and technology review panel service
- Books written:
 - **Basic Optics for the Astronomical Sciences**, 2012, 420 page textbook published by SPIE, ISBN# 9780819483669
 - **With Stars in their Eyes, the Extraordinary lives and enduring genius of Aden and Marjorie Meinel**, 2021, 510 page biography published by Oxford University Press.
- Associate editor, Applied Optics (1988-1994 & 2011-2015)

- Associate editor, Journal of Ast. Telescopes & Instrument Systems (JATIS) [2013-current]
- Program chair for SPIE's Astronomical Telescopes and Instruments conferences 2021, 2018, 2016, 2014, 2012, 2010, 2008, 2006, 2004
- Faculty Visiting Associate & Lecturer, California Institute of Technology – teach Optical System Engineering and mentor students on the AAReST cube-sat space flight project.
- Adjunct Professor, College of Optical Sciences, University of Arizona, Tucson – annual short course on space optics

1976 to 2010: NASA Jet Propulsion Laboratory (JPL) of CALTECH

- 2008 - 2010: Optics Technologist
- 2004 – 2007: Chief Technologist, NASA Navigator Program
 - Responsible for advanced technology for the detection and characterization of exo-planetary systems using space telescopes: Large mirror space telescopes, interferometers, innovative optical systems, coronagraphs, and imaging spectrometers.
 - Member of the NASA technology strategic planning group
- 2002 – 2003 Technologist, Astronomy & Physics Division, NASA HQ – Washington DC.
 - Advanced technology planning & prioritization for the next generation NASA telescopes and instruments.
 - 1999 to 2003 National Science Foundation (NSF) Washington DC. Interagency Personnel Agreement (IPA) transfer from NASA to NSF. Director for Advanced Instruments & Technology (ATI), and Program Manager for National Radio Astronomy Observatory (NRAO).
 - Advanced Technology and Instruments:
 - Set research program agenda, goals and objectives and prepared call for proposals and managed the selection process.
 - Managed \$15M/year program in grants – assembled panels of experts, managed debate, selected winners and prepared justification papers.
 - Created a joint AFOSR and NSF research program (\$4M/yr) to use Air Force adaptive optics facilities for scientific research and managed the grants program.
 - National Radio Astronomy Observatory:
 - Managed the NSF NRAO technical, scientific and administrative contract with Associated Universities Inc. (\$40M/yr budget). Represented US government and the National Science Board in proposal negotiation for new research instruments and facilities.
 - 1995 to 1999: JPL - Technical Program Manager: Innovative Imaging Systems for defense department applications.
 - Business development lead for JPL's innovative optical and infrared sensor systems.
 - Led studies of large aperture segmented space telescopes and sparse aperture telescopes: their design, construction and applications.
 - Led interagency large optics working group (LOWG) for the Dod/NASA/DOE space technology alliance.
 - 1980 to 1994: Line technical manager, Optical sciences and applications

section.

- Recruited and hired > 40 optical scientists, proposed The JPL Optics Initiative (1981), received \$4,000K and successfully created a capability for optical system design, engineering, and supporting optical science research at JPL in support of flight hardware for remote sensing applications. Responsible for 70 to 90 engineers and delivering space flight hardware to support the NASA science and engineering communities. Imaging spectrometers, cameras and interferometers were the hardware products of the Section. Delivered the optical systems for Cassini, Galileo and the ATMOS missions.
- NASA HQ. Hubble failure board – Technical advisor to the chairman: Dr. Lew Allen.
- Managed the section responsible for the repair of the optical system on the Hubble Space Telescope.
- Led the NASA optics-working group to exchange optical sciences and technical information across NASA centers in support of NASA missions.
- Led the NASA team to investigate, summarize status and recommend action to the Agency on how to utilize Russian remote sensing optical science and technology. Led 5 NASA teams to institutes in St. Petersburg, Moscow, Podolsk, and Troitsk, Russia (1992-95)
- Instrument scientist responsible for the optical design and engineering of the ATMOS system for the Space Shuttle. ATMOS is a 1- meter path difference Fourier transform spectrometer space-flight hardware system that made 3 successful shuttle flights.
- 1976 to 1979: Senior Scientist, Space Science Division
- Responsible for personal research programs in the optical sciences and astrophysics. Published original papers in physical optics, interferometry, spectroscopy and instruments.
- 1977 to 1983: Instrument Scientist and science co-investigator for the ATMOS space flight instrument system on board Space Lab 1 and 3.

1979 – 86, 1988-92, 1995-1998, 2005-06, 2009-current:

California Institute of Technology academic faculty, Applied Physics department and Graduate Aeronautical Laboratories (GALCIT)

- Developed material and wrote textbook for a two-quarter class in optical system engineering, a graduate course in optical design, optical systems engineering and image formation. Class size range from 3 to 20 students.

1966 to 1976:

- Research Assistant, Kitt Peak National Observatory
- Spectroscopy, physical optics, atmospheric optics and astronomical research. Design, construction and applications of a coherence interferometer for spatial analysis of solar and features and optical computer processing.
- Graduate Student, College of Optical Sciences, University of Arizona, Tucson.

1964 to 1966: Electron-Tube engineer, Rauland Corporation of Zenith Radio, Chicago, IL.

- Electron optics design, photocathode preparation and characterization of electrostatically focused high quantum efficiency image intensifier tubes for biomedical and military applications. Optical thin film design and deposition engineering.

1961 to 1964:

Research Assistant. Lick Observatory, University of California. Six color photoelectric photometry and development of an electronographic image converter tube.

Professional Honors & Awards –

- 2005 – 2010: Elected chair and led the Large Optics Working Group (LOWG) of the Space Technology Alliance (STA) – {a subcommittee of the Federal agencies' Technology Alliance (NRO & NASA & DOE & DOD)}
- 2003 George W. Goddard Award and Prize. (Awarded by the International Society for Optical Engineering for outstanding innovative optical systems for space-based telescopes & instruments).
- 1999 Elected: United States Chair International Commission for Optics (ICO), an IUPAP organization of the National Academy of Science. Represent US optics research and technology interests to the international optics community and assessment of the international status of US optical sciences.
- 2001 Elected: Fellow, American Association for the Advancement of Science (AAAS)
- 1996 Elected: Executive Board, Council of Scientific Society Presidents (CSSP)
 - Participated in National Academy of Science meetings and legislative meetings to advocate National support for the priority of science and technical education and research in the US.
- 1994 Elected: President, International Society for Optical Engineering (SPIE).
- 1993 Hubble Space Telescope NASA failure review board –
 - Led the technical section responsible for the optical repair
- 1988 Elected to Board of Governors of the International Society for Optical Engineering.
- 1985 Elected: Fellow, Optical Society of America (OSA) and Royal Astronomical Society of London (RAS) and the International Society for Optical Engineering (SPIE).
- 1984 Elected to Board of Directors of the Optical Society of America.
- 1974 Elected member of the International Astronomical Union (IAU)
- Six patents for innovative optical systems for astrophysics and earth science
- Eight NASA achievement and leadership awards
- Huntington Foundation four-year undergraduate scholarship

NASA Space-Flight Science roles:

- WFIRST-AFTA science & technology definition team
- ATMOS - Instrument Scientist & Science Co-investigator
- Space Interferometer Mission (SIM) – Technology Advisory Committee
- NASA failure review board for Hubble Space Telescope
- Wide Field Planetary Camera for HST-Optics repair

Patents

- Disclosure to the NSF for *Coherence Interferometer* (1974)
- U.S. Patent No. 4,243,323, Jan. 6, 1981, for *Chevron Beamsplitter Interferometer*
- U.S. Patent No. 4,278,351, July 15, 1981, for a tilt-compensated, 1-meter OPD Fourier Transform Spectrometer – *The ATMOS space-flight Interferometer*
- U.S. Patent No. 4,497,540, Jan. 15, 1985, for *Shuttle Imaging Spectrometer*
- U.S. Patent No. 4,523,846, June 17, 1985, for an *Electronically Scanned Fourier*

James B. Breckinridge

Transform Spectrometer

- International Patent Application # WO 2020/146588, 16 July 2020 for *Aperture designs to minimize diffraction noise*

Book Chapter:

- First Order Optical Design for Fourier Spectrometers, pages 64 to 125, book chapter in *Spectrometric Techniques Volume 2*, Ed. By George Vanasse, Academic Press, 1981, ISBN number 0-12-710402-X.

MSc Thesis

J. B. Breckinridge, "*Polarization and Image-Forming Properties of a Large Grating Spectrograph.*" Thesis. Optical Sciences Center, University of Arizona. Technical Report No. 56, 66 pages, June 15, 1970.

PhD Dissertation

J. B. Breckinridge PhD. Dissertation: *Coherence Interferometer and Astronomical Applications.* PhD Dissertation, College of Optical Sciences, University of Arizona, Tucson, AZ., September, 1976

Personal

Married 55 years, with 2 children, 6 grandchildren and 1 great grand daughter

Scoutmaster JPL BSA troop 509 1976 to 1983.

All published papers: program committee peer-reviewed journals & proceedings papers plus blind peer-review papers.

Blind peer-review papers are shown below in italics.

1. James Breckinridge, Tony Hull and James E. Harvey (2021) "Innovative aperture segmentation controls image plane diffraction", paper presented at the 2020 International Congress on Space Optics (ICSO) held 26 Mar to 02 April 2021, Antibes France [Held virtually because of Covid-19]
2. James Heath, Meredith Kupinski, Ewan Douglas, Kira Hart and James Breckinridge (2020) Mueller matrix maps of dichroic filters reveal polarization aberrations, Proc. SPIE 11443-1 pp 1-11
3. Erin Maier, Ewan Douglas, Dae Wook Kim, Kate Su James Breckinridge . . . (2020) Coronagraphic Debris and Exoplanet Exploring Pioneer Proc. SPIE 11443-
4. Yi-Ting Feng, Jaren Nicholas Ashcraft, James B. Breckinridge, James E. Harvey, Ewan S. Douglas, Heejoo Choi, Charles Lillie, Tony Hull, Dae Wook Kim, "Topological pupil segmentation and point spread function analysis for large aperture imaging systems," Proc. SPIE 11568, AOPC 2020: doi: 10.1117/12.2575809
5. J. B. Breckinridge, J. E. Harvey, R. Irvin, R. Chipman, M. Kupinski, J. Davis, D-W Kim, E. Douglass, C. F. Lillie and T. Hull (2019) ExoPlanet Optics: conceptual design processes for Stealth telescopes, Proc. SPIE 11115-OH
6. James E. Harvey, James B. Breckinridge, R.G. Irvin, R. N. Pfisterer (2018) Novel Designs for Minimizing Diffraction effects from Large Segmented Telescopes, Proc. SPIE 10745-0L
7. J. B. Breckinridge, M. Kupinski, J. Davis, B. Daugherty, R. A. Chipman (2018) Terrestrial Exoplanet coronagraph image quality polarization aberrations in HabEx, Proc SPIE 10698-1D
8. J. B. Breckinridge, J. E. Harvey, K. Krabtree & T. Hull (2018) ExoPlanet Telescope diffracted light minimized: The pinwheel pupil solution. Proc. SPIE 10698-1P
9. J. Davis, M. Kupinski, R. A. Chipman and J. B. Breckinridge (2018) HabEx Polarization Ray Trace and aberration analysis, Proc. SPIE 10689-H3
10. J. E. Harvey, R. G. Irvin, K. Crabtree, R. N. Pfister and J. B. Breckinridge (2018) Diffraction analysis of Large Segmented Mirror concepts for exoplanet exploration. SPIE Proc 10698--1Q.
11. *R. Polidan, J. B. Breckinridge, C. F. Lillie, H. A. MacEwen, et. al. (2016) Innovative telescope architectures for future large space observatories , Journ. Ast. Tele. & Instruments, JATIS 2, #4 DOI 1-1117/1.JATIS.2.4041211*
12. J. B. Breckinridge and C. F. Lillie (2016) Prime focus architecture for large space telescopes and: reduce surfaces to save cost SPIE Proc 9904-4K
13. J. B. Breckinridge and R. A. Chipman (2016) Telescope polarization and image quality: Lyot coronagraph performance SPIE Proc 9904-1C
14. *W. A. Traub, J. B. Breckinridge, T. P. Greene, O. Guyon, N. J. Kasdin and B. Macintosh (2016), Science yield estimate with the WFIRST coronagraph, Journ. Ast. Tele. & Instruments (JATIS), Vol 2 # 1 Jan paper # 011020.*
15. R. Polidan, J. Breckinridge, C. Lillie, et. al. (2015) An evolvable space telescope for future astronomical missions Proc. SPIE 9602-6
16. David Spergel, Neil Gehrels ... J. Breckinridge.... Widefield Infrared Survey Telescope Astrophysics Focused Telescope Assets (WFIRST-AFTA) final report

- 10 March 2015 by the science definition team and the WFIRST study office.
140 pages.
17. Russell A. Chipman, Wai Sze T. Lam and James B. Breckinridge Polarization Aberration in Astronomical Telescopes, Proc. SPIE 9613-16, Polarization Science and Remote Sensing VII , San Diego, CA 2015
 18. *James B. Breckinridge, Wai Sze T. Lam and Russell A. Chipman, Polarization Aberrations in Astronomical Telescopes: The Point Spread Function, Publications of the Astronomical Society of the Pacific (PASP), 127:445–468 May 2015*
 19. Polidan, R., J. B. Breckinridge, C. F. Lillie, H. A. MacEwen, M. R. Flannery, D. R. Dailey, An Evolvable Space Telescope for Future Astronomical Missions. Proc. SPIE 9143 # 19 pp1 – 10.
 20. James B. Breckinridge, Self induced polarization anisoplanatism, SPIE 8860-39, 2013.
 21. H. MacEwen and J. Breckinridge, Large Diffractive/refractive apertures for space and airborne telescopes, SPIE 8739 # UNSP 873904, 2013
 22. C. Underwood, S. Pellegrino. J. Breckinridge...et.al Autonomous Assembly of a Reconfigurable Space Telescope (AAReST) – a cubesat based technology demonstrator, 27th annual AIAA/USU conference on small satellites, 2013
 23. J. Breckinridge, Fourier Transforms by White-Light Interferometry, Proc SPIE Vol. 8122 Article # 812206, 2011
 24. N. Clark & Breckinridge, J. Polarization compensation of Fresnel aberrations in telescopes. 2011 SPIE 8146 # 814600
 25. K. Patterson, S. Pellegrino and J Breckinridge, Shape correction of thin mirrors in a reconfigurable modular space telescope SPIE 7731-21, 2010
 26. J. Breckinridge, N. Bryant and J. Lorre, Innovative Pupil Topographies for Sparse Aperture Telescopes and SNR, SPIE, 7013-3E, 2008.
 27. Neal Turner, Keith Grogan & James Breckinridge, Probing Interstellar Dust With Space-Based Coronagraphs, *Astrophysical Journal* 2008.
 28. Joseph Carson, James Breckinridge, John Trauger... The effects of instrumental elliptical polarization stellar point spread function fine structure Proceeding of the SPIE 6265-3M, (2006)
 29. J. Breckinridge and C. Lindensmith, The Astronomical Search for Origins, Optical Society of America (OSA), Optics and Photonics News popular article. – February 2005 issue
 30. James B. Breckinridge, Challenges to optimizing a telescope system to detect and characterize exo-solar planetary systems. SPIE 5875-08 (2005)
 31. J. B. Breckinridge, Image Formation in High Contrast Optical Systems: The role of polarization. SPIE proceedings 5487 page 1337-1345. Proceedings of the 2004 Glasgow Scotland Telescopes and Instruments conference.
 32. *J. B. Breckinridge and B. Oppenheimer, Polarization Effects in Reflecting Coronagraphs for White Light Applications in Astronomy, *Astrophysical Journal*, 600, pp 1091 – 1098. January 10, 2004*
 33. J. B. Breckinridge, Astronomical Search for Origins: Are we Alone? International Society for Optical Engineering annual 2003 meeting proceedings # 5166-2; August 2003.
 34. J. B. Breckinridge, Future focal plane technology challenges for NASA's Origins missions International Society for Optical Engineering annual 2003 meeting

- proceedings # 5167-2; August 2003.
35. J. B. Breckinridge, Meinel, A., Meinel, M., Inflation-deployed Camera. International Society for Optical Engineering, Proceedings of Technical Conference, Kona, Hawaii '98. Volume 3356, Inflation-deployed camera and hyper-thin mirrors.
 36. J. B. Breckinridge, Advanced applications: an overview, International Society for Optical Engineering, Critical Reviews of Optical Science and Technology, Advanced Materials for Optics, & Precision Structures, SPIE Volume CR67. 1997
 37. J. B. Breckinridge, Evolution of Imaging Spectrometry: Past, Present and Future International Society for Optical Engineering, Proceedings of Technical Conference Denver Colorado, 1996.
 38. A. B. Meinel, M. P. Meinel, J. B. Breckinridge, A Folded Astronomical Space Telescope, International Society for Optical Engineering, Proceedings of Technical Conference Kona, Hawaii '94
 39. J. B. Breckinridge, R. Benedict and D. L. Fried Atmospheric Compensation Technology Journ. Opt. Soc. Amer. A Vol 11 pp 783 to 911, 1994
 40. A. B. Meinel, M. P. Meinel, J. B. Breckinridge, Deployable Space Telescopes for Planetary and Astronomical Missions, International Society for Optical Engineering, Proceedings of Technical Conference Orlando, Florida, April 1994.
 41. J. B. Breckinridge, Optics Technology for the Future, invited paper at Laser Optics '93, St. Petersburg Russia, June 1993.
 42. J. B. Breckinridge, Space Optics for Astrophysics, invited paper June '92, S.I. Vavilov Optics Institute, St. Petersburg, Russia.
 43. J. B. Breckinridge, A. B. Meinel, M. P. Meinel Preliminary Design for the Keck Interferometer Array, October 1991 European Southern Observatory High Resolution Imaging Interferometry, Garching, Germany.
 44. J. B. Breckinridge, Optics for Remote Sensing from Geosynchronous Platforms, IEEE Topical Meeting on Space-borne Photonics, Newport Beach, CA, September 1991.
 45. A. B. Meinel, M. P. Meinel, J. B. Breckinridge, Wavefront Control of Large Optical Systems, SPIE 1271, 180-190. The Hague.
 46. J. B. Breckinridge, Technologies for New Imaging Instruments, invited paper at International Society for Optical Engineering seminar on Man's Exploration of the Solar System Through the Imaging Sciences, August 1989.
 47. J. B. Breckinridge, Review of Image Correlation Systems: Hybrid and Optical, SPIE Conference 1082, January 1989.
 48. E. Ribak, C. Roddier, F. Roddier and J. B. Breckinridge, Beam Combination in a Multiple Telescope, Monolithic Interferometer, F. Merkle, ed. ESO Conference 1989.
 49. J. B. Breckinridge, FTS Technology Applied to Space Spatial Interferometry, American Astronomical Society Meeting, Austin, TX, 1988.
 50. A. B. Meinel, M. P. Meinel and J. B. Breckinridge, Wavefront Correction in Very Large Monolithic on Segmented Mirror Telescopes, ESO Conference on Very Large Telescopes, 1988.
 51. E. Ribak, R. Roddier, C. Roddier and J. B. Breckinridge, "SNR for White-Light Holography." *Applied Optics*, 27, 1183-1186, 1988.
 52. P. N. Swanson, J. B. Breckinridge, et al., "System Concept for a Moderate Cost

- Large Deployable Reflector." Optical Engineering 25, 1045-1054, 1986.*
53. M. P. Chrisp, J. B. Breckinridge, S. A. Macenka, and N. A. Page, "Imaging Spectrometers for Remote Sensing from Space." SPIE meeting, Cannes France and SPIE 580, 1985.
 54. J. B. Breckinridge, Space Optics, International Congress on Optics No. 13, Sapporo, Japan, August 1984.
 55. J. B. Breckinridge, T. G. Kuper, and R. V. Shack, "Space Telescope Low-Scattered-Light Camera: A Model." *Optical Engineering*, 23, 816-820, 1984.
 56. F. Roddier and J. B. Breckinridge, Interferometric Image Reconstruction Using the LDR in a Light Bucket Mode, Amer. Astron. Soc. Meeting, Baltimore, MD, June 13, 1984.
 57. F. Roddier and J. B. Breckinridge, "Interferometer Image Reconstruction Using the LDR in a Light Bucket Mode." Bulletin of the American Astronomical Society, 16, 832-837, 1984.
 58. N. J. Woolf, S. Synnott, and J. B. Breckinridge, "UV Spectro-Interferometer from the Shuttle Bay." Bulletin of the American Astronomical Society, 16, 747-750, 1984.
 59. D. J. Collins, J. B. Breckinridge, "Recent Progress in the Measurement of Temperature and Salinity by Optical Scattering." Ocean Optics VII, SPIE 489, 247-268, 1984.
 60. J. B. Breckinridge, Advanced Optical Instruments for Remote Sensing of the Atmosphere, invited paper at IEEE/OSA CLEO Meeting, Baltimore, MD, May 1983.
 61. J. B. Breckinridge, Spatial Interferometry for White Light Processing, Optical Information Processing for Space Applications II, Conference Proceedings, Langley Research Center, August 30, 1983.
 62. J. B. Breckinridge, N. A. Page, R. R. Shannon, and J. M. Rodgers, "Reflecting Schmidt Imaging Spectrometer." *Applied Optics*, 22, 1175-1180, 1983.
 63. J. B. Breckinridge, P. N. Swanson, A. B. Meinel and M. P. Meinel, Perception for a Large Deployable Reflector Telescope, Proceedings of the Society of Photo-Optical Instrumentation Engineers, 444, 1983
 64. D. J. Collins, J. B. Breckinridge, I. S. McDermott, and C. A. Sepulveda, On The Remote Measurement of the Distribution of Temperature in the Sea by Optical Scattering, AGU Meeting, December 1982, San Francisco, CA.
 65. J. B. Wellman, J. B. Breckinridge, P. N. Kupferman, and R. Salazar, "Imaging Spectrometer: An Advanced Multispectral Imaging Concept," 1982 International Geosciences and Remote Sensing Symposium, Munich, Federal Republic of Germany, June 1-4, 1982.
 66. J. B. Breckinridge and C. A. Sepulveda, "Optical Measurements of Brillion Scattering Spectra for Water Temperatures," Opt. Soc. Am., October 1982 Meeting.
 67. J. B. Breckinridge, "Infrared Imaging by Interferometry with LDR," Opt. Soc. Am. October 1982 Meeting.
 68. J. B. Breckinridge and N. A. Page, "Wide Angle Reflecting Schmidt Cameras for Remote Sensing," Opt. Soc. Am. October 1982 Meeting.
 69. C. W. Chen and J. B. Breckinridge, "Holographic Twyman-Green Interferometer." *Applied Optics*, 21, 2563-2568, 1982.
 70. J. B. Wellman, J. B. Breckinridge, P. N. Kupferman, R. P. Salazar, and J. B.

- Sigurdson, JPL, "Imaging Spectrometer Technologies for Advanced Earth Remote Sensing No. 345-04," in Proceedings of the Society of Photo-Optical Instrumentation Engineers, 345, May 4-7, 1982.
71. P. N. Swanson, J. B. Breckinridge, S. Gulkis, T. B. H. Kuiper, "Plans for a Large Deployable Reflector for Submillimeter and Infrared Astronomy from Space," Tucson, 1982, SPIE Volume 332.
 72. J. B. Breckinridge, T. G. Kuper, R. V. Shack, "Space Telescope Low Scattered Light Camera - A Model," Tucson, March 1982 SPIE Volume 331.
 73. J. B. Breckinridge, "Interfacing Fourier Spectrometers to Optical Systems," Invited Paper, Optical Society of America 1981 Annual Meeting, Florida.
 74. R. Beer, J. B. Breckinridge, C. B. Farmer and R. Zander, "Infrared (625 to 4700 cm-1 High Resolution) 01. cm-1 Solar Spectra from Earth Orbit," A.A.S. Solar Physics Division Meeting, Taos, New Mexico, January 1981.
 75. J. B. Breckinridge, "Shuttle F.T.S. with .01 cm-1 Resolution," Proceedings of Solar Instrumentation, Sacramento Peak Observatory, Oct. 14, 1981.
 76. J. B. Breckinridge and R. A. Schindler, "First Order Optical Design of FTS," 60 page chapter in book *Spectroscopy II*, ed. by G. A. Vanasse, Academic Press, 1981, ISBN: 0-13-710402-X.
 77. C. W. Chen, J. B. Breckinridge and J. C. Wyant, "Holographic Twyman Green Interferometer," presented at the October 1980 Annual Meeting of the Optical Society of America, Chicago, IL.
 78. J. B. Breckinridge, F. G. O'Callaghan and A. G. Cassie, "Optical Alignment of High Resolution Fourier Transform Spectrometers," SPIE San Diego Meeting, July 1980.
 79. C. W. Chen, J. C. Wyant and J. B. Breckinridge, "Designing the Multiple-Channel Ebert-Type Spectrometer with a Flat Image Plane," October 1979, Optical Soc. Amer. meeting, Rochester, N.Y.
 80. I. Abel, B. R. Reynolds (Honeywell), J. B. Breckinridge (JPL), "Optical Design of ATMOS Fourier Transform Spectrometer," SPIE meeting, August 27, 1979.
 81. J. B. Breckinridge, R. H. Norton, R. A. Schindler (JPL) and I. Abel (Honeywell), "Design Approach for a Tilt Compensated FTS," SPIE meeting, August 27, 1979.
 82. J. B. Breckinridge, H. A. McAlister and W. G. Robinson, "The Kitt Peak Speckle Camera," *Applied Optics*, 18, 1034-1041, 1979.
 83. J. B. Breckinridge, R. A. Schindler and C. B. Farmer, "High Resolution Interferometer for Atmospheric Trace-Molecule Spectroscopy," paper presented at the October 1978 Annual Meeting of the Optical Society of America, San Francisco, California.
 84. J. B. Breckinridge, "Two-Dimensional White-Light Amplitude Interferometer," paper presented at the August 1978, International Astronomical Union Colloquium No. 50: High Resolution Stellar Interferometry.
 85. J. B. Breckinridge, "A White-Light Amplitude Interferometer with 180-Degree Rotational Shear," *Opt. Engr.*, 17, 156-159, 1978.
 86. J. J. Burke and J. B. Breckinridge, "Passive Imaging Through the Turbulent Atmosphere: Fundamental Limits on the Spatial Frequency Resolution of a Rotational Shearing Interferometer," *J. Opt. Soc. Amer.*, 68, 67-77, 1978.
 87. J. B. Breckinridge, R. A. Schindler and C. B. Farmer, "The ATMOS Spacelab 1 Interferometer," paper presented at the August 1978, Optical Society of America topical meeting on Atmospheric Spectroscopy, Keystone, Colorado.

88. J. B. Breckinridge, "A Two Dimensional White-Light Interferometer." International Astronomical Union Colloquium No. 50, Proceedings: A High Resolution Stellar Interferometry. Univ. Md., pp. 31-1 through 31-13, Sept. 1978.
89. J. B. Breckinridge and H. McAlister, "Measurement of Atmospheric Speckle Isoplanacity." paper presented at the October 1976, Tucson, Arizona, Optical Society American Meeting.
90. J. B. Breckinridge, "Order of Interference in Speckle Patterns," paper presented at the 18 June 1975 Meeting of the Optical Society of America on Imaging in Astronomy.
91. J. B. Breckinridge, "Interference in Astronomical Speckle Patterns." *J. Opt. Soc. Amer.*, 66, 1240-1242, 1976.
92. J. B. Breckinridge, "Measurement of the Amplitude of Phase Excursions in the Earth's Atmosphere." *J. Opt. Soc. Amer.* 66, 143-144, 1976.
93. J. B. Breckinridge, "Obtaining Information Through the Atmosphere at the Diffraction Limit of a Large Aperture." *J. Opt. Soc. Amer.*, 65, 755-759, 1975.
94. J. B. Breckinridge, A. K. Pierce, and C P. Stoll, "Thorium Comparison Spectrum." *Astrophys. Journal. Supp.* 29, 97-112, 1975.
95. J. B. Breckinridge, "Two Dimensional White Light Coherence Interferometer." *Applied Optics*, 13, 2760-2762, 1974.
96. I. Furenlid and J. B. Breckinridge, "A Technique for Analysis of Photographic Emulsions," paper presented at Amer. Astron. Soc. Photographic Section, fall 1974 meeting.
97. J. W. Harvey and J. B. Breckinridge, "Solar Speckle Interferometry." January 1973, Solar Division Meeting of American Astronomical Society, Las Cruces, New Mexico.
98. J. B. Breckinridge, "A Spatial Structure Interferometer." Astronomical Society of the Pacific Meeting at University of Southern California, June 1973. *PASP*, 85, 524, 1973
99. A. K. Pierce and J. B. Breckinridge, "The Kitt Peak Table of Photographic Solar Spectrum Wavelengths." Kitt Peak National Observatory Publication, Contribution #559, June 1973, 150 pages.
100. J. B. Breckinridge, "Diffraction Grating Polarization." IAU Coll. Meeting No. 23, Tucson, Arizona, Proceedings published in *Planets, Stars, and Nebulae Studied with Photo-Polarimetry*, T. Geherls (ed.), 1973.
101. J. W. Harvey and J. B. Breckinridge, "Solar Speckle Interferometry." *The Ap J Letters*, 182, L137-L139
102. J. B. Breckinridge and D. N. B. Hall, "The Absorption Spectrum of Atmospheric Water Vapor in the Vicinity of the He 10830 A Triplet." *Solar Physics*, 28, 15-21, 1973.
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