

RICHARD L. SHOEMAKER--Professor

Date and place of birth: 12/31/44 Grand Rapids, Michigan

Citizenship: USA

Educational background:

University of Illinois	PhD Physical Chemistry	1971
Calvin College	BS Chemistry	1966

Employment history:

University of Arizona		
Optical Sciences Center	Associate Director	1993–date
Professor		1981–date
Associate Professor		1976–1981
Assistant Professor		1972–1976
Dept. of Chemistry	Professor	1981–date
Dept. of Radiology	Professor	1989–date
IBM Research Laboratories	Visiting Scientist	Summer 1979
		Summer 1973
		1971–1972
University of Illinois	Teaching Assistant	1966–1967
Calvin College	Laboratory Assistant	1965–1966

Fields of major current interest:

Multiprocessor computer systems and software, computer interfaces to laboratory experiments, biomedical image analysis, high speed optical detection systems, and coherent optical transient effects.

Honors and fellowships:

Fellow of the Optical Society of America
Alfred P. Sloan Research Fellow, 1976–1980
National Science Foundation Predoctoral Fellow, 1968–1970, University of Illinois
Dow Chemical Company Fellow, 1967–1968, University of Illinois
National Science Foundation Summer Trainee, 1967, University of Illinois
Upjohn Company National Merit Scholar, 1962–1966, Calvin College

Professional society affiliations and activities:

Associate Editor, Computers in Physics, 1997–1998

IEEE

Regular member, Computer Section

SPIE

Member, Education Committee, 1998–1999

Optical Society of America

Board of Directors, elected Director–at–Large, 1999–date

Chair, Publications Council, 1997–1998

Member, Publications Council, 1994–1998

Chair, Publishing Technology Committee, 1994–1995

Member, Publishing Technology Committee, 1993–1995

Chairman, Tucson Section, 1977–1978

Publications:

1. T. P. Dirkse, David DeWit, and R. L. Shoemaker, "Silver oxide electrode process," *J. Electrochem. Soc.* **114**, 1196–1200 (1967).
2. T. P. Dirkse and R. L. Shoemaker, "Double layer capacitance of zinc electrodes in KOH solutions," *J. Electrochem. Soc.* **115**, 784–786 (1968).
3. R. L. Shoemaker and W. H. Flygare, "Sulfur-33 nuclear quadrupole coupling and the sulfur localized electron distribution in ethylene sulfide," *J. Am. Chem. Soc.* **90**, 6263–6266 (1968).
4. R. L. Shoemaker and W. H. Flygare, "Magnetic susceptibility anisotropy and molecular quadrupole moment of fluoracetylene," *Chem. Phys. Letters* **2**, 610–612 (1968).
5. W. H. Flygare, W. Huttner, R. L. Shoemaker, and P. D. Foster, "Magnetic susceptibility anisotropy, molecular quadrupole moment, and the sign of the electric dipole moment in OCS," *J. Chem. Phys.* **50**, 1714–1719 (1969).
6. W. H. Flygare, R. L. Shoemaker, and W. Huttner, "Magnetic susceptibility anisotropy, molecular g value, and molecular quadrupole moment of $^{15}\text{N}^{15}\text{N}^{16}\text{O}$," *J. Chem. Phys.* **50**, 2414–2416 (1969).
7. R. L. Shoemaker and W. H. Flygare, "Magnetic susceptibility anisotropy, molecular quadrupole moment, molecular g values, and the sign of the electric dipole moment in methylacetylene," *J. Am. Chem. Soc.* **91**, 5417–5421 (1969).
8. R. L. Shoemaker and W. H. Flygare, "Molecular quadrupole moment, molecular magnetic susceptibilities, and molecular g values in benzene," *J. Chem. Phys.* **51**, 2988–2991 (1969).
9. W. H. Flygare and R. L. Shoemaker, "Measurement of molecular magnetic susceptibility anisotropies," *Symposium of the Faraday Society* **3** 119–130, 1970.
10. R. L. Shoemaker and W. H. Flygare, "Molecular g -value, magnetic susceptibility anisotropy, and molecular quadrupole moment in OCSe," *Chem. Phys. Letters* **6**, 576–578 (1970).
11. J. M. Pochan, R. L. Shoemaker, R. G. Stone, and W. H. Flygare, "Molecular g values, magnetic susceptibility anisotropies, diamagnetic and paramagnetic susceptibilities, second moment of the charge distribution, and molecular quadrupole moments of H_3CCN and H_3CNC ," *J. Chem. Phys.* **52**, 2478–2484 (1970).
12. R. G. Brewer and R. L. Shoemaker, "Photon echo and optical nutation in molecules," *Phys. Rev. Letters* **27**, 631–634 (1971).
13. R. L. Shoemaker and W. H. Flygare, "Molecular magnetic moments, magnetic susceptibility

- anisotropy, molecular quadrupole moment, and sign of the electric dipole moment in methylsilane," *J. Am. Chem. Soc.* **94**, 684–686 (1972).
14. R. L. Shoemaker and R. G. Brewer, "Two-photon superradiance," *Phys. Rev. Letters* **28**, 1430–1433 (1972).
 15. R. G. Brewer and R. L. Shoemaker, "Optical free induction decay," *Phys. Rev. A* **6**, 2001–2007 (1972).
 16. R. G. Brewer, R. L. Shoemaker, and S. Stenholm, "Collision-induced optical double resonance," *Phys. Rev. Letters* **33**, 63–66 (1974).
 17. R. L. Shoemaker and F. A. Hopf, "Observation of quantum beats in photon echoes and optical nutation," *Phys. Rev. Letters* **33**, 1527–1530 (1974).
 18. R. L. Shoemaker, S. Stenholm, and R. G. Brewer, "Collision-induced optical double resonance," *Phys. Rev. A* **10**, 2037–2050 (1974).
 19. R. L. Shoemaker, E. W. Van Stryland, "Direct measurements of transition dipole matrix elements using optical nutation," *J. Chem. Phys.* **64**, 1733–1740 (1976).
 20. E. W. Van Stryland and R. L. Shoemaker, "Lamb dip studies of the nuclear quadrupole coupling and dipole moment in an excited vibrational state of NH_2D ," *J. Chem. Phys.* **64**, 4968–4972 (1976).
 21. A. L. Smirl, R. L. Shoemaker, J. B. Hambenne, and J. C. Matter, "Simple laser pulse energy monitor," *Rev. Sci. Instr.* **49**, 672–673 (1978).
 22. R. Shack, R. Baker, R. Buchroeder, D. Hillman, R. L. Shoemaker, and P. H. Bartels, "Ultrafast laser scanner microscope," *J. Histochem. Cytochem.* **27**, 153–159 (1979).
 23. R. L. Shoemaker and E. W. Van Styland, "Modulated coherent Raman beats," *Phys. Rev. A* **20**, 1376–1384 (1979).
 24. R. M. Macfarlane, R. M. Shelby, and R. L. Shoemaker, "Ultrahigh-resolution spectroscopy: photon echoes in YAIO:Pr^{3+} ," *Phys. Rev. Letters* **43**, 1726–1730 (1979).
 25. B. Comaskey, R. E. Scotti, and R. L. Shoemaker, "Optical coherent transient measurements of velocity-changing collisions in SF_6 ," *Optics Letters* **6**, 45–57 (1981).
 26. H. M. Gibbs, F. A. Hopf, D. L. Kaplan, and R. L. Shoemaker, "Observation of chaos in optical bistability," *Phys. Rev. Letters* **46**, 474–477 (1981).
 27. P. H. Bartels, R. Buchroeder, D. Hillman, J. Jonas, D. Kessler, R. L. Shoemaker, R. Shack, D. Towner, and D. Vukobratovich, "Ultrafast laser scanner microscope: design and construction," *Analyt. Quant. Cytol.* **3**, 55–66 (1981).

28. H. M. Gibbs, M. W. Derstine, F. A. Hopf, J. L. Jewell, D. L. Kaplan, J. V. Moloney, R. L. Shoemaker, K. Tai, S. S. Tarnag, E. A. Watson, A. C. Gossard, S. L. McCall, A. Passner, T. N. C. Venkatesan, and W. Wiegmann, "Transient phenomena in optical bistability," Proc. Int. Conf. Lasers '81, pp. 265–273, December 1981.
29. H. M. Gibbs, F. A. Hopf, D. L. Kaplan, M. W. Derstine, and R. L. Shoemaker, "Periodic oscillations and chaos in optical bistability; possible guided-wave all-optical square-wave oscillators," in *Integrated Optics and Millimeter and Microwave Integrated Circuits*, W. C. Pittman and B. D. Guenther, Eds., Proc. SPIE **317**, 297–304, November 1981.
30. R. L. Shoemaker, P. H. Bartels, D. Hillman, J. Jonas, D. Kessler, R. Shack, and D. Vukobratovich, "An ultrafast laser scanner microscope for digital image analysis," IEEE Trans. Biomed. Eng. **BME-29**, 82–91 (1982).
31. F. A. Hopf, D. L. Kaplan, H. M. Gibbs, and R. L. Shoemaker, "Bifurcations to chaos in optical bistability," Phys. Rev. A **25**, 2172–2182 (1982).
32. B. Comaskey and R. L. Shoemaker, "Adiabatic rapid passage within a Doppler broadened line: a technique for level lifetime measurements," J. Chem. Phys. **76**, 3981–3986 (1982).
33. R. L. Shoemaker, R. E. Scotti, B. Comaskey, and J. Soto-Manriques, "Frequency-switchable CO₂ laser: design and performance," Applied Optics **21**, 961–966 (1982).
34. R. M. Shelby, R. M. Macfarlane, and R. L. Shoemaker, "Two-pulse photon echo electron-nuclear double resonance of YAlO₃:Pr³⁺," Phys. Rev. A **25**, 6578–6583 (1982).
35. R. Shack, B. Bell, D. Hillman, R. Kingston, A. Landesman, R. L. Shoemaker, D. Vukobratovich, and P. H. Bartels, "Ultrafast laser scanner microscopy—first performance tests," Proceedings of the Conference on Physics & Engineering in Medical Imaging, IEEE Computer Soc. 82CH1751-7 pp. 49–57, March 1982.
36. R. Maenner, B. Ueberreiter, J. Bille, P. H. Bartels, and R. L. Shoemaker, "Multiprocessor system in medical imaging," in *Architecture and Algorithms for Digital Image Processing*, A. Oosterlinck and P. Danielsson, Eds., Proc. SPIE **435**, 28–36 (1983).
37. D. L. Kaplan, F. A. Hopf, M. W. Derstine, H. M. Gibbs, and R. L. Shoemaker, "Periodic oscillations and chaos in optical bistability—possible guided-wave all-optical square-wave oscillators," Opt. Eng. **22**, 161–165 (1983).
38. C. E. Gaebe, J. D. Macomber, R. L. Shoemaker, J. W. Farley, and W. H. Wing, "Kinetic evidence for Rydberg–Rydberg collisions in the laser ionization of sodium atoms at intermediate vapor densities," Arab. J. Sci. Eng. **9**, 362–369 (1984).
39. C. T. Seaton, J. D. Valera, R. L. Shoemaker, G. I. Stegeman, J. Chilwell, and S. D. Smith, "Anomalous nonlinear guided-wave cut-off phenomena," Appl. Phys. Lett. **45**, 1162–1163 (1984).

40. J. D. Valera, C. T. Seaton, G. I. Stegeman, R. L. Shoemaker, Xu Mai, and C. Liao, "Demonstration of nonlinear prism coupling," *Appl. Phys. Lett.* **45**, 1013–1015 (1984).
41. C. T. Seaton, J. D. Valera, R. L. Shoemaker, G. I. Stegeman, J. Chilwell, and S. D. Smith, "Calculations of nonlinear TE waves guided by thin dielectric films bounded by nonlinear media," *IEEE J. Quant. Elec.* **QE-21**, 774–783 (1985).
42. C. Liao, G. I. Stegeman, C. T. Seaton, R. L. Shoemaker, J. D. Valera, and H. D. Winful, "Nonlinear distributed waveguide couplers," *J. Opt. Soc. Am.* **A2**, 590–594 (1985).
43. F. J. Van Milligen, B. Bovard, M. R. Jacobson, J. Mueller, R. Potoff, R. L. Shoemaker, and H. A. Macleod, "Development of an automated scanning monochromator for monitoring thin films," *Appl. Opt.* **24**, 1799–1802 (1985).
44. R. L. Shoemaker, P. H. Bartels, H. Bartels, W. G. Griswold, D. Hillman, and R. Maenner, "Image–data–driven dynamically reconfigurable multiprocessor system in automated histopathology," in *Architecture and Algorithms for Digital Image Processing*, M. J. B. Duff et. al., Eds., Proc. SPIE **596**, 190–198 (1986).
45. R. Maenner, R. L. Shoemaker, and P. H. Bartels, "The Heidelberg POLYP system", *IEEE Micro* **7**(1), 5–13 (1987).
46. R. V. Shack, P. H. Bartels, R. A. Buchroeder, R. L. Shoemaker, D. W. Hillman, and D. Vukobratovich, "Design for a Fast Fluorescence Laser Scanning Microscope", *Analyt. Quant. Cytol. Histol.* **9**(6), 509–520 (1987).
47. W. P. Kuhn, P. H. Bartels, W. G. Griswold, and R. L. Shoemaker, "A Hierarchical Expert System for Automated Assessment of Histopathologic Images", in *Applications of Digital Image Processing X*, A. G. Tescher, Ed., Proc. SPIE **829**, 275–282, August 1987.
48. D. Vukobratovich, P. H. Bartels, D. Hillman, R. Kingston, A. Landesman, M. Sabb, R. L. Shoemaker, and R. V. Shack, "Ultrafast laser scanner microscope:review of design and performance testing", in *Simulation and Modeling of Optical Systems*, R. E. Fischer and D. C. O’Shea, Eds., Proc. SPIE **892**, 115–124, January, 1988.
49. W. P. Kuhn, H. G. Bartels, P. H. Bartels, D. L. Richards, J. S. Saffer, and R. L. Shoemaker, "A composite approach to the identification of high–level topological features in a histopathologic image", in *Medical Imaging II:Image Formation, Detection, Processing, and Interpretation*, R. H. Schneider and S. J. Dwyer III, Eds., Proc. SPIE **914**, 484–487, January, 1988.
50. R. L. Shoemaker, O. Stucky, R. Maenner, D. B. Thompson, W. G. Griswold, and P. H. Bartels, "Dynamically Reconfigurable Multiprocessor System for Scene Segmentation in Histopathology", in *New Technologies in Cytometry*, G. C. Salzman, Ed., Proc. SPIE **1063**, 10–17, Jan. 1989.
51. D. Thompson, W. Griswold, W. Kuhn, H. G. Bartels, R. L. Shoemaker, and P. H. Bartels,

- "Organization and Knowledge Representation in an Expert System for Scene Segmentation in Histologic Sections", in *New Technologies in Cytometry*, G. C. Salzman, Ed., Proc. SPIE **1063**, 18–28, Jan. 1989.
52. P. H. Bartels, M. Bibbo, A. Graham, S. Paplanus, R. L. Shoemaker, and D. Thompson, "Image Understanding System for Histopathology", *Analytical Cellular Pathology*, **1**, 195–214 (1989).
 53. O. Stucky, R. L. Shoemaker, R. Maenner, and P. H. Bartels, "An Optical Interconnection for Multiprocessor Computer Bus Systems", *Opt. Eng.* **28**, 1185–1192, Nov. 1989.
 54. R. L. Shoemaker, R. H. Seacat III, A. Landesman, B. B. Taylor, and H. H. Barrett, "TRIMM: A High Speed Parallel Processor for Optimization and Estimation Problems", in *Medical Imaging III: Image Processing*, R. H. Schneider, et. al. Eds., Proc. SPIE **1092**, 619–624, Jan. 1989
 55. P. H. Bartels, D. Thompson, H. G. Bartels, and R. L. Shoemaker, "Machine Vison System for Diagnostic Histopathology", *Pathology Research and Practice*, **185**: 635–646 (1989).
 56. R. Shack, P. H. Bartels, D. Hillman, M. Sabb, and R. L. Shoemaker, "Confocal Microscope with Enhanced Depth Discrimination", in *New Technologies in Cytometry and Molecular Biology*, G. C. Salzman, Ed., Proc. SPIE **1206**, 12–18, Jan. 1990.
 57. R. L. Shoemaker, D. Thompson, W. G. Griswold, and P. H. Bartels, "Performance and Task Scheduling Studies of a Multiprocessor in Histopathologic Image Analysis", in *New Technologies in Cytometry and Molecular Biology*, G. C. Salzman, Ed., Proc. SPIE **1206**, 31–39, Jan. 1990.
 58. R. L. Shoemaker, H. H. Barrett, and R. H. Seacat III, "TRIMM: A Parallel Processor for Image Reconstruction by Simulated Annealing", in *Parallel Problem Solving from Nature*, H. Schwefel and R. Maenner, eds., 242–252, Springer, Berlin, 1991.
 59. K. A. Girodias, H. H. Barrett, and R. L. Shoemaker, "Parallel Simulated Annealing for Emission Tomography", *Phys. Med. Biol.* **36**, 921–938 (1991).
 60. R. L. Shoemaker, H. H. Barrett, A. Landesman, R. H. Seacat III, and B. B. Taylor, "The TRIMM Parallel Processor", *Comp. in Phys.* **5**, 418–425 (1991).
 61. R. L. Shoemaker, D. Thompson, and P. H. Bartels, "Efficient Task Scheduling in the multiprocessing of Histopathologic Imagery", *Analyt. Quant. Cytol. Histol.* **14**, 282–293 (1992).
 62. M. M. Rogulski, H. B. Barber, H. H. Barrett, R. L. Shoemaker, and J. M. Wolfenden, "Ultra-high-resolution Brain SPECT Imaging: Simulation Results", *IEEE Trans. Nuclear Science* **40**, 1123–1129 (1993).
 63. J. A. Eberly, J. A. Giordmaine, P. L. Kelley, and R. L. Shoemaker, "The OpTiX E-print

- Server and the Future of On-line Journals at OSA", *Optics and Photonics News*, **6**(2), February 1995, pp. 66–67.
64. R. L. Shoemaker and J. A. Eberly, "Using The OpTiX E-print Server", *Optics and Photonics News*, **6**(3), March 1995, pp. 42–43.
 65. R. L. Shoemaker, "Get Stuck on the Web", *Optics and Photonics News*, **6**(7), July 1995, pp. 47–48.
 66. R. L. Shoemaker, "Where Have All the (U.S.) Optics Students Gone?", *OE Reports*, Number 179, November 1998, p. 15.

Books and book chapters

1. R. L. Shoemaker, "Nonlinear spectroscopy," in *Laser Applications to Optics and Spectroscopy*, Vol. 2 in *Physics of Quantum Electronics Series*, S. F. Jacobs, M. Sargent III, M. O. Scully, and J. F. Scott, eds. (Addison–Wesley, Reading, Massachusetts 1975), pp. 453–504.
2. R. L. Shoemaker, "Coherent transient infrared spectroscopy," in *Laser and Coherence Spectroscopy*, J. I. Steinfeld, ed. (Plenum Press, New York 1978), pp. 197–371.
3. R. L. Shoemaker, "Coherent transient effects in optical spectroscopy," in Volume 39 of *Annual Review of Physical Chemistry* (Annual Reviews, Inc., Palo Alto, Calif., 1979), pp. 239–270.
4. M. Sargent III and R. L. Shoemaker, *Interfacing Microcomputers to the Real World* (Addison–Wesley, Reading, Massachusetts, 1981), 304 pp., ISBN 0–201–07773–6.
5. M. Sargent III and R. L. Shoemaker, *The IBM Personal Computer from the Inside Out* (Addison–Wesley, Reading, Massachusetts, 1984) 483 pp., ISBN 0–201–06896–6.
6. P. H. Bartels, J. Layton, and R. L. Shoemaker, "Digital Microscopy" in *Computer–Assisted Image Analysis Cytology*, S. D. Greenberg, ed. (S. Karger Publishers Inc., New York, 1984), pp. 28–61.
7. W. G. Griswold, P. H. Bartels, R. L. Shoemaker, H. G. Bartels, R. Maenner, and D. Hillman, "Multiprocessor computer system for medical image processing" in *Intermediate–Level Image Processing*, M. J. B. Duff, ed. (Academic Press, London, 1986) pp. 267–286.
8. P. H. Bartels, R. Maenner, R. L. Shoemaker, S. Paplanus, and A. Graham, "Computer configurations for the processing of diagnostic imagery in histopathology" in *Evaluation of Multicomputers for Image Processing*, L. Uhr et al., eds. (Academic Press, Orlando, 1986) pp. 239–278.
9. M. Sargent III and R. L. Shoemaker, *The IBM Personal Computer from the Inside Out*, Revised Edition (Addison–Wesley, Reading, Massachusetts, 1986) 483 pp., ISBN 0–201–06918–0.
10. M. Sargent III, R. L. Shoemaker, and E. Stelzer, *Assemblersprache und Hardware des IBM PC*, (Addison–Wesley, Bonn, West Germany, 1987) 471 pp., ISBN 3–925118–28–4.
11. R. L. Shoemaker, "Lasers", in *Photonics Devices and Systems*, R. G. Hunsperger, ed. (Marcel Dekker Inc., New York, 1994), pp. 9–60.
12. R. L. Shoemaker and P. H. Bartels, "Image Analysis in Quantitative Histopathology and Cytopathology: Computer Resources", in *The Automation of Cervical Cancer Screening*, H. K. Grohs, ed. (Igaku–Shoin Medical Publishers, New York, 1994), pp. 147–161.

13. M. Sargent III and R. L. Shoemaker, *The Personal Computer from the Inside Out*, Third Edition (Addison–Wesley, Reading, Massachusetts, 1995) 800 pp., **ISBN** 0–201–62646–2.

Invited and Contributed Papers

R. L. Shoemaker and W. H. Flygare, "The molecular Zeeman effect and magnetic susceptibility anisotropies in acetylenic molecules," presented at the Twenty-Fourth Symposium on Molecular Structure and Spectroscopy, Columbus, Ohio, Ohio State University, Sept. 5, 1969.

R. L. Shoemaker and R. G. Brewer, "Coherent spontaneous emission in NH_2D ," presented at the 1972 Annual Meeting of the American Physical Society, San Francisco, Feb. 1, 1972; abstract in *Bull. Am. Phys. Soc.*, Series II **17**, 66 (1972).

R. L. Shoemaker, "Nonlinear spectroscopy," presented at the Physics of Quantum Electronics Summer School, Crystal Mountain, Washington, July 9, 1973.

R. G. Brewer, R. L. Shoemaker, and S. Stenholm, "Collision-induced optical double resonance," presented at the VIII International Quantum Electronics Conference, San Francisco, June 10, 1974; abstract in *IEEE J. Quantum Electronics* **EQ-10**, 787 (1974).

R. L. Shoemaker, "A new pulse code modulator for CO_2 lasers," NSF Grantee-User Group Meeting on Optical Communications Systems, Urbana, Illinois, Nov. 14-15, 1974.

E. W. Van Stryland and R. L. Shoemaker, "Direct measurements of transition dipole matrix elements using optical nutation," presented at the 1975 Annual Meeting of the APS Division of Electron and Atomic Physics, Tucson, Arizona, Dec. 2-5, 1975.

E. W. Van Stryland and R. L. Shoemaker, "Lamb dip study of IR hyperfine structure of NH_2D ," presented at the 1975 Annual Meeting of the APS Division of Electron and Atomic Physics, Tucson, Arizona, Dec. 2-5, 1975.

R. L. Shoemaker and E. W. Van Stryland, "Coherent Raman beat spectroscopy," presented at the Annual Meeting of the Optical Society of America, Tucson, Arizona, Oct. 18-33, 1976; abstract in *J. Opt. Soc. Am.* **66**, 1109 (1976).

R. L. Shoemaker, "Optical transient spectroscopy," presented at the 1977 Annual Meeting of the Optical Society of America, Toronto, Ontario, Canada, Oct. 10, 1977.

R. L. Shoemaker, R. E. Scotti, and B. Comaskey, "Coherent transient effects using a frequency switched CO_2 laser," presented at the Annual Meeting of the Optical Society of America, San Francisco, California, Oct. 31-Nov. 3, 1978; abstract in *J. Opt. Soc. Am.* **68**, 1388 (1978).

R. L. Shoemaker, "Coherent transient spectroscopy," presented at the Ninth Winter Colloquium on Quantum Electronics, Snowbird, Utah, Jan. 10, 1979.

R. Shack, R. Baker, R. Buchroeder, D. Hillman, R. Shoemaker, and P. H. Bartels, "Ultrafast laser scanner microscope," presented at the Third International Conference on Automation of Diagnostic Cytology and Cell Image Analysis, Munich, West Germany, May 23-24, 1980.

B. Comaskey, R. E. Scotti, and R. L. Shoemaker, "Optical coherent transient measurements of velocity-changing collisions in SF_6 ," presented at the Eleventh International Quantum

Electronics Conference, Boston, Massachusetts, June 23–26, 1980.

H. M. Gibbs, F. A. Hopf, D. L. Kaplan, and R. L. Shoemaker, "Observation of chaos in optical bistability," presented at the 1980 Annual Meeting of the Optical Society of America, Chicago, Illinois, Oct. 14–17, 1980; abstract in *J. Opt. Soc. Am.* **71** 367 (1981).

F. A. Hopf, D. L. Kaplan, R. L. Shoemaker, and H. M. Gibbs, "Path to turbulence of an optical bistable system," presented at the 1981 Annual Meeting of the Optical Society of America, Kissimmee, Florida, Oct. 26–30, 1981; abstract in *J. Opt. Soc. Am.* **71**, 1634 (1981).

J. B. Newman, H. M. Gibbs, R. E. Scott, R. L. Shoemaker, and W. H. Wing, "CW two-photon phase conjugation," *Bull. Am. Phys. Soc.* **26**, 1328 (1981).

F. A. Hopf, H. M. Gibbs, D. L. Kaplan, and R. L. Shoemaker, "Chaos in optical bistability," ARO Workshop in Coupled Nonlinear Oscillators, Los Alamos, New Mexico, July 21–23, 1981.

F. A. Hopf, H. M. Gibbs, D. L. Kaplan, and R. L. Shoemaker, "Chaos in optical bistability," Nonlinear Optics and Lasers Gordon Research Conference, Brewster Academy, New Hampshire, Aug. 3–7, 1981.

H. M. Gibbs, M. W. Derstine, F. A. Hopf, D. L. Kaplan, M. C. Rushford, R. L. Shoemaker, D. A. Weinberger, and W. H. Wing, "Optical bistability instabilities: regenerative pulsations, periodic oscillations, and optical chaos," invited talk, CLEO 1982.

R. L. Shoemaker and P. H. Bartels, "The Heidelberg POLYP in medical image processing," Tanque Verde Workshop on Multicomputer Languages, Architectures, and Algorithms, Tucson, AZ, May 22–25, 1984.

G. I. Stegeman, C. T. Seaton, R. L. Shoemaker, and J. D. Valera, "Nonlinear guided waves," Annual Meeting of the Optical Society of America, San Diego, CA, Oct. 29 – Nov. 2, 1984.

J. D. Valera, C. T. Seaton, G. I. Stegeman, R. L. Shoemaker, Xu Mai, and C. Liao, "Demonstration of nonlinear prism coupling," Annual Meeting of the Optical Society of America, San Diego, CA, Oct. 29 – Nov. 2, 1984.

F. J. Van Milligen, B. Bovard, M. R. Jacobson, J. Mueller, R. Potoff, H. A. Macleod, and R. L. Shoemaker, "Development of an automated scanning monochromator for a Balzers 760 evaporation system," Annual Meeting of the Optical Society of America, San Diego, CA, Oct. 29 – Nov. 2, 1984.

P. H. Bartels, R. L. Shoemaker, and H. G. Bartels, "Processing Needs for Diagnostic Histopathology," IEEE/EMBS Frontiers of Engineering and Computing in Health Care Conference, Chicago, IL, Sept. 27–30, 1985

R. L. Shoemaker and P. H. Bartels, "Multiprocessor Computing Systems for Rapid Biomedical Image Analysis," IEEE/EMBS Frontiers of Engineering and Computing in Health Care Conference, Chicago, IL, Sept. 27–30, 1985 (invited paper)

R. L. Shoemaker, "Multimicroprocessor Computer Systems in Optics", Annual Meeting of the Optical Society of America, Seattle, WA, Oct. 19–24, 1986.

R. L. Shoemaker, P. H. Bartels, W. G. Griswold, and W. P. Kuhn, "An Expert System approach to the Processing of Histopathologic Imagery", First International Conference on Artificial Intelligence Systems as Diagnostic Consultants for the Cytologic and Histologic Diagnosis of Cancer, Universal City, CA, Feb. 1 – 3, 1987 (invited paper).

R. L. Shoemaker, P. H. Bartels, and L. J. Dalton, "The SANDAC V: A multiprocessor testbed for expert system software development", Second International Conference on Artificial Intelligence Systems as Diagnostic Consultants for the Cytologic and Histologic Diagnosis of Cancer, Chicago, Illinois, March 13–15, 1988.

R. L. Shoemaker, A. Landesman, R. H. Seacat III, and H. H. Barrett, "A Parallel Processor for Optimization and Estimation Problems: Architecture," Annual Meeting of the Optical Society of America, Santa Clara, CA, Oct. 30 – Nov. 4, 1988.

R. H. Seacat III, H. H. Barrett, R. L. Shoemaker, T. J. Roney, and W. J. Smith, "A Parallel Processor for Optimization and Estimation Problems: Algorithms," Annual Meeting of the Optical Society of America, Santa Clara, CA, Oct. 30 – Nov. 4, 1988.

M. M. Rogulski, H. B. Barber, H. H. Barrett, R. L. Shoemaker, J. M. Wolfenden, "Improved Reconstructed Resolution for SPECT Imaging: Simulation Results", Society of Nuclear Medicine, 39th Annual Meeting, Los Angeles, CA, June 9 – 12, 1992.

Patents:

R. G. Brewer and R. L. Shoemaker, "Method and apparatus for producing electromagnetic transient coherent effects," U. S. Patent 3,766,498, Oct. 16, 1973.