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Michael F. Brown

Curriculum Vitae

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EDUCATION

1975 Ph.D., University of California at Santa Cruz
1970 A.B., University of California at Santa Cruz

ACADEMIC APPOINTMENTS

PRESENT POSITIONS:

1987– Professor of Chemistry (*primary appointment*), University of Arizona
1987– Professor of Biochemistry & Molecular Biophysics (*joint appointment*), University of Arizona
1993– Professor, Committee on Neuroscience (*joint appointment*), University of Arizona
2003– Professor of Physics (*joint appointment*), University of Arizona
2003– Professor of Applied Mathematics (*joint appointment*), University of Arizona

PREVIOUS POSITIONS:

2003–05 Visiting Professor, Institute for Protein Research, Osaka University, Japan
2001 Visiting Professor, University of Florence, Italy
2000– Visiting Professor of Physics, University of Würzburg, Germany
1987– Visiting Professor of Physical Chemistry, University of Lund, Sweden
1985–87 Associate Professor of Chemistry (with Tenure), University of Virginia
1980–85 Assistant Professor of Chemistry, University of Virginia
1979–80 Postdoctoral Fellow, Department of Chemistry, University of California at Berkeley
1976–78 Postdoctoral Fellow, Biocenter, University of Basel, Switzerland

HONORS AND PRIZES

2003–04 Japan Society for the Promotion of Science Research Fellowship (Japan)
2000–01 Senior Fullbright Fellow (Italy)
1999 Röntgen-Professorship of Physics (Germany)
1985–90 Research Career Development Award, U.S. National Institutes of Health
1983–85 Alfred P. Sloan Foundation Research Fellowship

NAMED LECTURESHIPS

The Wilhelm Conrad Röntgen Lecture (University of Würzburg, Germany, November, 1999)

NATIONAL SERVICE (RECENT)

2004– Permanent Member, Biochemistry and Biophysics of Membranes Study Section (U. S. Public Health Service)
2003–04 U. S. Public Health Service (Biophysical Chemistry Study Section)
2004 Biochemistry and Biophysics of Membranes Study Section (U. S. Public Health Service)

OTHER HONORS

1979–80 U.S. National Institutes of Health Postdoctoral Fellowship, University of California, Berkeley

1976–78 U.S. National Institutes of Health Postdoctoral Fellowship, University of Basel, Switzerland
1970–72 University of California Predoctoral Graduate Fellowship
1970 California State Graduate Fellowship
1969 President's Scholarship, University of California
1968–70 California State Scholarship
1968–69 University of California Scholarship

PROFESSIONAL SOCIETIES

Biophysical Society
International Society for Magnetic Resonance (ISMAR)

TEACHING ACTIVITIES

UNDERGRADUATE LEVEL:
Fundamentals of Chemistry, CHEM 103b (UA)
Biological Chemistry Seminar, CHEM 252 (UVa)
Biological Chemistry Seminar, CHEM 296a (UA)
Physical Chemistry, CHEM 341 (UVa)
Biological Chemistry, CHEM 442 (UVa)
Biological Chemistry Laboratory, CHEM 452 (UVa)
Physical Chemistry, CHEM 480a (UA)
Physical Chemistry, CHEM 480b (UA)
Biophysical Chemistry, CHEM 481 (UA)

GRADUATE LEVEL:
Intermediate Physical Chemistry, CHEM 503 (UA)
Practical NMR Spectroscopy, CHEM 584 (UA)
Magnetic Resonance Spectroscopy, CHEM 684 (UA)

CURRENT RESEARCH INTERESTS

Physical and Biophysical Chemistry ;Membrane Biophysics; Chemical Biology

Lipid Biophysics and Nanotechnology: Physical properties of membrane lipids and liquid crystals; nonlameller phases of membrane lipids; surface chemistry; differential geometry and flexible surface modeling of membrane interfaces; lipid-protein interactions and biomembrane function

Biomolecular NMR Spectroscopy: Solid-state and solution NMR applied to chemical biology; macromolecular structure; NMR relaxation theory; functional dynamics of biomolecules

Membrane Signaling: Rhodopsin structure and light-induced conformation changes; flash photolysis of visual pigments; molecular basis of visual excitation; structure and function of G protein-coupled receptors (GPCRs); membrane ion channels; role of membranes in neurodegeneration

Related Topics: Computational biology; plasmon waveguide resonance (PWR) spectroscopy

SCIENTIFIC PUBLICATIONS

Papers: total of ca. 110; Abstracts & Conference Presentations: total of ca. 190
Total citations: 3,546; h-index: 30

[Numbers in brackets indicate citations in the Web of Science as of February 2008]

1. Brown, M. F., and Schleich, T. (1975), Circular Dichroism and Gel Filtration Behavior of Subtilisin Enzymes in Concentrated Solutions of Guanidine Hydrochloride, *Biochemistry* **14**, 3069-3074. *[17]*

2. Brown, M. F., Miljanich G. P., Franklin, L. K., and Dratz, E. A. (1976), ^{1}H-NMR Studies of Protein-Lipid Interactions in Retinal Rod Outer Segment Disc Membranes, *FEBS Lett*. **70**, 56-60. *[21]*

3. Brown, M. F., Miljanich, G. P., and Dratz, E. A. (1977), Interpretation of 100- and 360-MHz Proton Magnetic Resonance Spectra of Retinal Rod Outer Segment Disk Membranes, *Biochemistry* **16**, 2640-2648. *[60]*

4. Brown, M. F. Miljanich, G. P., and Dratz, E. A. (1977), Proton Spin-Lattice Relaxation of Retinal Rod Outer Segment Membranes and Liposomes of Extracted Phospholipids, *Proc. Natl. Acad. Sci. USA* **74**, 1978-1982. *[27]*

5. Brown, M.F., Omar, S., Raubach, R. A., and Schleich, T. (1977), Quenching of The Tyrosyl and Tryptophyl Fluorescence of Subtilisins Carslberg and Novo by Iodide, *Biochemistry* **16**, 987-992. *[22]*

6. Brown, M. F., and Schleich, T. (1977), Resolution of Independently Titrating Spectral Components in the Ultraviolet Circular Dichroism of Subtilisin Enzymes by Matrix Rank Analysis, *Biochim. Biophys. Acta* **485**, 37-51. *[8]*

7. Brown, M. F., and Seelig, J. (1977), Ion-Induced Changes in Head Group Conformation of Lecithin Bilayers, *Nature (London)* **269**, 721-723. *[106]*

8. Brown, M. F., and Seelig, J. (1978), Influence of Cholesterol on the Polar Region of Phosphatidylcholine and Phosphatidylethanolamine Bilayers, *Biochemistry* **17**, 381-384. *[168]*

9. Omar, S., Brown, M. F., Silver, P., and Schleich, T. (1979), Histidyl and Tyrosyl Residue Ionization Studies of Subtilisin Novo, *Biochim. Biophys. Acta* **578**, 261-268. *[6]*

10. Brown, M. F., Seelig, J., and Häberlen, U. (1979), Structural Dynamics in Phospholipid Bilayers from Deuterium Spin-Lattice Relaxation Time Measurements, *J. Chem. Phys*. **70**, 5045-5053. *[183]*

11. Brown, M. F. (1979), Deuterium Relaxation and Molecular Dynamics in Lipid Bilayers, *J. Magn. Res*. **35**, 203-215. *[53]*

12. Fleischer, S., Wang, C.-T., Hymel, L., Seelig, J., Brown, M. F., Herbette, L., Scarpa, A., McLaughlin, A. C., and Blasie, J. K. (1979), Structural Studies of the Sarcoplasmic Reticulum Membrane Using the Reconstitution Approach, in *Function and Molecular Aspects of Biomembrane Transport* (Quagliariello, E., et al., Eds.) Elsevier/North-Holland, Amsterdam, pp. 465-485 (invited book chapter).

13. Deese, A. J., Dratz, E. ., and Brown, M. F. (1981), Retinal Rod Outer Segment Lipids Form Bilayers in the Presence and Absence of Rhodopsin: A ^{31}P NMR Study, *FEBS Lett*. **124**, 93-99. *[43]*

14. Brown, M. F., and Davis, J. H. (1981), Orientation and Frequency Dependence of the Deuterium Spin-Lattice Relaxation in Multilamellar Phospholipid Dispersions: Implications for Dynamic Models of Membrane Structure, *Chem. Phys. Lett*. **79**, 431-435. *[77]*

15. Brown, M. F., Deese, A. J., and Dratz, E. A. (1982), Proton, Carbon-13, and Phosphorus-31 NMR Methods for the Investigation of Rhodopsin-Lipid Interactions in Retinal Rod Outer Segment Membranes, *Methods Enzymol.* **81**, 709-728 (invited book chapter). *[28]*

16. Brown, M. F. (1982), Theory of Spin-Lattice Relaxation in Lipid Bilayers and Biological Membranes. ^{2}H and ^{14}N Quadrupolar Relaxation, *J. Chem. Phys.* **77**, 1576-1599. *[159]*

17. Brown, M. F., Ribeiro, A. A., and Williams, G. D. (1983), New View of Lipid Bilayer Dynamics From ^{2}H and ^{13}C NMR Relaxation Time Measurements, *Proc. Natl. Acad. Sci. USA* **80**, 4325-4329. *[103]*

18. Sefcik M. D., Schaefer, J., Stejskal, E. O., McKay, R. A., Ellena, J. F., Dodd, S. W., and Brown, M. F. (1983), Lipid Bilayer Dynamics and Rhodopsin-Lipid interactions: New Approach Using High-Resolution Solid-State ^{13}C NMR. *Biochem. Biophys. Res. Commun.* **114**, 1048-1055. *[38]*

19. Siminovitch, D. J., Brown, M. F., and Jeffrey, K. R. (1984), ^{14}N NMR of Lipid Bilayers: Effects of Ions and Anesthetics, *Biochemistry* **23**, 2412-2420. *[23]*

20. Siminovitch, D. J., Rance, M., Jeffrey, K. R., and Brown, M. F. (1984), The Quadrupolar Spectrum of a Spin I=1 in a Lipid Bilayer in the Presence of Paramagnetic Ions, *J. Magn. Res.* **58**, 62-75. *[39]*

21. Brown, M. F. (1984), Theory of Spin-Lattice Relaxation in Lipid Bilayers and Biological Membranes. Dipolar Relaxation, *J. Chem. Phys.* **80**, 2808-2831. [67]

22. Brown, M.F. (1984), Unified Picture for Spin-Lattice Relaxation of Lipid Bilayers and Biomembranes, *J. Chem. Phys.* **80**, 2832-2836. *[51]*

23. Trindle, C., Brown, M., and Newton, M. G. (1984), Use of Algebraic Symbol-Manipulation Programs in Chemical Research and Education, in *Computer Education of Chemists* (P. Lykos, Ed.), Wiley, New York, pp. 93-107.

24. Miljanich, G. P., Brown, M. F., Mabrey-Gaud, S., Dratz, E. A., and Sturtevant, J. M. (1985), Thermotropic Behavior of Retinal Rod Membranes and Dispersions of Extracted Phospholipids, *J. Membrane Biol.* **85**, 79-86. *[30]*

25. Brown, M. F., and Williams, G. D. (1985), Membrane NMR: A Dynamic Research Area, *J. Biochem. Biophys. Meth.* **11**, 71-81. *[22]*

26. Williams, G. D., Beach, J. M., Dodd, S. W., and Brown, M. F. (1985), Dependence of Deuterium Spin-Lattice Relaxation Rates of Multilamellar Phospholipid Dispersions on Orientational Order, *J. Am. Chem. Soc.* **107**, 6868-6873. *[29]*

27. Brown, M. F., Ellena, J. F., Trindle, C., and Williams, G. D. (1986), Frequency Dependence of Spin-Lattice Relaxation Times of Lipid Bilayers, *J. Chem. Phys.* **84**, 465-470. *[22]*

28. Ellena, J. F., Pates, R. D., and Brown, M. F. (1986), ^{31}P NMR Spectra of Rod Outer Segment and Sarcoplasmic Reticulum Membranes Show No Evidence of Immobilized Components Due to Lipid-Protein Interactions, *Biochemistry* **25**, 3742-3748. *[14]*

29. Salmon, A., Dodd, S. W., Williams, G. D., Beach, J. M., and Brown, M. F. (1987), Configurational Statistics of Acyl Chains in Polyunsaturated Lipid Bilayers From ^{2}H NMR, *J. Am. Chem. Soc.* **109**, 3600-2609. *[82]*

30. Zajicek, J., Pearlman, J. D., Merickel, M. B., Ayers, C. R., Brookeman, J. R., and Brown, M. F. (1987), High-Resolution Proton NMR Spectra of Human Arterial Plaque, *Biochem. Biophys. Res. Commun.* **149**, 437-442. *[8]*

31. Pearlman, J. D., Zajicek, J., Merickel, M. B., Carman, C. S., Ayers, C. R., Brookeman, J. R., and Brown, M. F. (1988), High-Resolution ^{1}H NMR Spectral Signature From Human Atheroma, *Magn. Reson. Med.* **7**, 262-279. *[41]*

32. Wiedmann, T. S., Pates, R. D., Beach, J. M., Salmon, A., and Brown, M. F. (1988), Lipid-Protein Interactions Mediate Photochemical Function of Rhodopsin, *Biochemistry* **27**, 6469-6474. *[108]*

33. Merickel, M. B., Carman, C. S., Brookeman, J. R., Mugler, J., Brown, M. F., and Ayers, C. (1988), Identification and 3-D Quantification of Atherosclerosis Using Magnetic Resonance Imaging, *Compt. Biol. Med.* **18**, 89-102. *[39]*

34. Brown, M. F., Dodd, S. W., and Salmon, A. (1989), Deuterium NMR Spectroscopy of Saturated and Polyunsaturated Lipid Bilayers, in *Highlights of Modern Biochemistry* (Kotyk, A., et al., Eds.) VSP International, Zeist, pp. 725-734.

35. Brown, M. F., Salmon, A., Henriksson, U., and Söderman, O. (1990), Frequency Dependent ^{2}H N.M.R. Relaxation Rates of Small Unilamellar Vesicles, *Mol. Phys.* **69**, 379-383. *[18]*

36. Brown, M. F., and Söderman, O. (1990), Orientational Anisotropy of Nuclear Spin Relaxation in Phospholipid Membranes, *Chem. Phys. Lett.* **167**, 158-164. *[20]*

37. Jansson, M., Thurmond, R. L., Trouard, T. P., and Brown, M. F. (1990), Magnetic Alignment and Orientational Order of Dipalmitoylphosphatidylcholine Bilayers Containing Palmitoyllyso-phosphatidylcholine, *Chem. Phys. Lipids* **54**, 157-170. *[20]*

38. Gibson, N. J., and Brown, M. F. (1990), Influence of pH on the MI-MII Equilibrium of Rhodopsin in Recombinant Membranes, *Biochem. Biophys. Res. Commun.* **169**, 1028-1034. ***[15]***

39. Brown, M. F. (1990), Anisotropic Nuclear Spin Relaxation of Cholesterol in Phospholipid Bilayers, *Mol. Phys.* **71**, 903-908. *[16]*

40. Thurmond, R. L., Lindblom, G., and Brown, M. F. (1990), Influences of Membrane Curvature in Lipid Hexagonal Phases Studied by Deuterium NMR Spectroscopy, *Biochem. Biophys. Res. Commun.* **173**, 1231-1238. *[15]*

41. Thurmond, R. L., Dodd, S. W., and Brown, M. F. (1991), Molecular Areas of Phospholipids as Determined By ^{2}H NMR Spectroscopy: Comparison of Phosphatidylethanolamines and Phosphatidylcholines, *Biophys. J.* **59**, 108-113. *[70]*

42. Barry, J. A., Trouard, T. P., Salmon, A., and Brown, M. F. (1991), Low Temperature ^{2}H NMR Spectroscopy of Phospholipid Bilayers Containing Docosahexaenoyl (22:6ω3) Chains, *Biochemistry* **30**, 8386-8394. *[28]*

43. Rajamoorthi, K., and Brown, M. F. (1991), Bilayers of Arachidonic Acid Containing Phospholipids Studied By ^{2}H and ^{31}P NMR Spectroscopy, *Biochemistry* **30**, 4204-4212. *[27]*

44. Altbach, M. I., Mattingly, M., Brown, M. F., and Gmitro, A. F. (1991), Magnetic Resonance Imaging of Lipid Deposits in Human Atheroma via a Stimulated-Echo Diffusion Technique, *Magn. Reson. Med.* **20**, 319-326. *[26]*

45. Gibson, N. J., and Brown, M. F. (1991), Membrane Lipid Influences on the Energetics of the MI and MII Conformational States of Rhodopsin Probed by Flash Photolysis, *Photochem. Photobiol.* **54**, 985-992. *[23]*

46. Thurmond, R. L., Lindblom, G., and Brown, M. F. (1991), Effect of Bile Salts on Monolayer Curvature of a Phosphatidylethanolamine/Water Model Membrane System, *Biophys. J.* **60**, 728-732. *[18]*

47. Gibson, N. J., and Brown, M. F. (1991), Role of Phosphatidylserine in the MI-MII Equilibrium of Rhodopsin, *Biochem. Biophys. Res. Commun.* **176**, 915-921. *[16]*

48. Lamparski, H., Liman, U., Barry, J. A., Frankel, D. A., Ramaswami, V., Brown, M. F., and O'Brien, D. F. (1992), The Photoinduced Destabilization of Liposomes, *Biochemistry* **31**, 685-694. *[52]*

49. Trouard, T. P., Alam, T. M., Zajicek, J., and Brown, M. F. (1992), Angular Anisotropy of ^{2}H NMR Spectral Densities in Phospholipid Bilayers Containing Cholesterol, *Chem. Phys. Lett.* **189**, 67-75. *[23]*

50. Barry, J. A., Lamparski, H., Shyamsunder, E., Osterberg, F., Cerne, J., Brown, M. F., and O'Brien, D. F. (1992), ^{31}P NMR and X-Ray Diffraction Study of the Effect of Photopolymerization on Lipid Polymorphism, *Biochemistry* **31**, 10114-10120. *[14]*

51. Jansson, M., Thurmond, R. L., Barry, J. A., and Brown, M. F. (1992), Deuterium NMR Study of Intermolecular Interactions in Lamellar Phases Containing Palmitoyllysophosphatidycholine, *J. Phys. Chem.* **96**, 9532-9544. *[21]*

52. Alexander, A. A., Pytlewski, V. T., Brown, M. F., and Gmitro, A. F. (1992), Detection of Atherosclerosis via Magnetic Resonance Imaging, *Proc. SPIE (Society of Photooptical Engineers)* **1642**, 26-33.

53. Brown, M. F., and Gibson, N. J. (1992), Biological Function of Docosahexaenoic Acid in the Retinal Rod Disk Membrane, in *Essential Fatty Acids and Eicosanoids* (Sinclair, A., and Gibson, R., Eds.), American Oil Chemist's Society Press, Champaign, Illinois, pp. 134-138 (invited review).

54. Gibson, N. J., and Brown, M. F. (1993), Lipid Headgroup and Acyl Chain Composition Modulate the MI-MII Equilibrium of Rhodopsin in Recombinant Membranes, *Biochemistry* **32**, 2438-2454. *[101]*

55. Thurmond, R. L., Lindblom, G., and Brown, M. F. (1993), Curvature, Order, and Dynamics of Lipid Hexagonal Phases Studied by Deuterium NMR Spectroscopy, *Biochemistry* **32**, 5394-5410. *[41]*

56. Thurmond, R. L., Otten, D., Brown, M. F., and Beyer, K. (1993), Structure and Packing of Phosphatidylcholines in Lamellar and Hexagonal Liquid Crystalline Mixtures with a Nonionic Detergent: A Wide Line NMR Study, *J. Phys. Chem* **98**, 972-983. *[27]*

57. Trouard, T. P., Alam, T. M., Job, C., and Brown, M. F. (1994), Angular Dependence of Deuterium Spin-Lattice Relaxation of Dilaurylphosphatidylcholine in the Liquid-Crystalline Phase, *J. Chem. Phys.* **101**, 5229-5261. *[25]*

58. Job. C., Pearson, R., and Brown, M. F. (1994), A Personal Computer-Based NMR Spectrometer, *Rev. Sci. Inst.* **65**, 3354-3362. *[8]*

59. Salamon, Z., Wang, Y., Brown, M. F., MacLeod, A., and Tollin, G. (1994), Conformational Changes in Rhodopsin Probed by Surface Plasmon Resonance Spectroscopy, *Biochemistry* **33**, 13706-13711. *[60]*

60. Brown, M. F. (1994), Modulation of Rhodopsin Function by Properties of the Membrane Bilayer, *Chem. Phys. Lipids* **73**, 159-180 (invited review). *[177]*

61. Schroeder, T. B., Job, C., Brown, M. F., and Glass, R. S. (1995), Indirect Detection of Selenium-77 in Nuclear Magnetic Resonance Spectra of Organoselenium Compounds, *Mag. Reson. Chem.* **33**, 191-195. *[7]*

62. Zajicek, J., Ellena, J. F., Williams, G. D., Khadim, M., and Brown, M. F. (1995), Molecular Dynamics of Vesicles of Unsaturated Phosphatidylcholines Studied by ^{13}C NMR Spin-Lattice Relaxation, *Collect. Czech. Chem. Commun.* **60**, 719-735. *[3]*

63. Brown, M. F., and Chan, S. I. (1996), Bilayer Membranes: Deuterium & Carbon-13 NMR, in *Encylcopedia of Nuclear Magnetic Resonance* (Grant, D. M., and Harris, R. K., Eds.), Wiley, New York, pp. 871-885 (invited book chapter).

64. Brown, M. F. (1996), Membrane Structure and Dynamics Investigated with NMR Spectroscopy, in *Membrane Structure and Dynamics* (Merz, K. M., and Roux, B., Eds.), Birkhäuser, Boston, pp. 175-252 (invited book chapter).

65. Salamon, Z., Wang, Y., Soulages, J. L., Brown, M. F., and Tollin, G. (1996), Surface Plasmon Resonance Spectroscopy Studies of Membrane Proteins: Transducin Binding and Activation by Rhodopsin Monitored in Thin Membrane Films, *Biophys. J.* **7**1, 283-294. *[52]*

66. Job, C., Zajicek, J., and Brown, M. F. (1996), Fast Field Cycling Nuclear Magnetic Resonance Spectrometer, *Rev. Sci. Instr.* **67**, 2113-2122. *[13]*

67. Nevzorov, A. A., Trouard, T. P., and Brown, M. F. (1997), Correlation Functions for Lipid Membrane Fluctuations Obtained from NMR Spectroscopy, *Phys. Rev. E* **55**, 3276-3282. *[8]*

68. Nevzorov, A. A., and Brown, M. F. (1997), Dynamics of Lipid Bilayers from Comparative Analysis of ^{2}H and ^{13}C NMR Relaxation Data as a Function of Frequency and Temperature, *J. Chem. Phys.* **107**, 10288-10310. *[29]*

69. Brown, M. F. (1997), Influence of Nonlamellar-Forming Lipids on Rhodopsin, in *Current Topics in Membranes* (Epand, R. M., Ed.), Academic Press, San Diego, pp. 285-356 (invited book chapter). *[30]*

70. Schroeder, T. B., Job, C., Brown, M. F., Glass, R. S., You, N., and Block, E. (1997), ^{1}H-{^{125}Te} Indirect Detection in Nuclear Magnetic Resonance Spectra of Organotellurium Compounds, *Mag. Reson. Chem.* **35**, 752-756. *[4]*

71. Nevzorov, A. A., Moltke, S., and Brown, M. F. (1998), Structure of the A-Form and B-Form of DNA from Deuterium NMR Lineshape Simulation, *J. Am. Chem. Soc.* **120**, 4798-4805. *[9]*

72. Nevzorov, A. A., Trouard, T. P., and Brown, M. F. (1998), Lipid Bilayer Dynamics from Simultaneous Analysis of Orientation and Frequency Dependence of Deuterium Spin-Lattice and Quadrupolar Order Relaxation, *Phys. Rev. E* **58**, 2259-2281. *[27]*

73. Moltke, S., Nevzorov, A. A., Sakai, N., Wallat, I., Job, C., Nakanishi, K., Heyn, M. P., and Brown, M. F. (1998), Chromophore Orientation in Bacteriorhodopsin Determined from the Angular Dependence of Deuterium Nuclear Magnetic Resonance Spectra of Oriented Purple Membranes, *Biochemistry* **37**, 11821-11835. *[24]*

74. Kasal, A., Budesinsky, M., Pelnar, J., Bruck, M. A., and Brown, M. F. (1999), Structures and Synthesis of A-Homo-B,19-dinorsteroids by X-Ray Crystallography and NMR Spectroscopy, *Collect. Czech. Chem. Commun.* **64**, 2019-2034. *[2]*

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76. Trouard, T. P., Nevzorov, A. A., Alam, T. M., Job, C., Zajicek, J., and Brown, M. F. (1999), Influence of Cholesterol on Dynamics of Dimyristoylphosphatidylcholine Bilayers as Studied by Deuterium NMR Relaxation, *J. Chem. Phys.* **110**, 8802-8818. *[56]*

77. Brown, M. F., and Nevzorov, A. A. (1999), ^{2}H-NMR in Liquid Crystals and Membranes, *Colloids and Surfaces* **158**, 281-298 (invited review). *[8]*

78. Moltke, S., Wallat, I., Sakai, N., Nakanishi, K., Brown, M. F., and Heyn, M. P. (1999), The Angles Between the C_1–, C_5–, and C_9–Methyl Bonds of the Retinylidene Chromophore and the Membrane Normal Increase in the M Intermediate of Bacteriorhodopsin: Direct Determination with Solid-State ^{2}H-NMR, *Biochemistry* **38**, 11762-11772. *[13]*

79. Salamon, Z., Brown, M. F., and Tollin, G. (1999), Plasmon Resonance Spectroscopy: Probing Molecular Interactions within Membranes, *Trends Biochem. Sci.* **24**, 213-219 (invited review).

80. Nevzorov, A. A., Moltke, S., Heyn, M. P., and Brown, M. F. (1999), Solid-State NMR Lineshapes of Uniaxially Oriented Immobile Systems, *J. Am. Chem. Soc.***121**, 7636-7643. *[27]*

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82. Petrache, H. I., Dodd, S. W., and Brown, M. F. (2000), Area per Lipid and Acyl Length Distributions in Fluid Phosphatidylcholines Determined by ^{2}H NMR Spectroscopy, *Biophys. J.* **79**, 3172-3192. *[137]*

83. Brown, M. F., Thurmond, R. L., Dodd, S. W.,Otten, D., and Beyer , K. (2001), Composite Membrane Deformation on the Mesoscopic Length Scale, *Phys. Rev. E* **64**, 010901/1-10901/4. *[7]*

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85. Huber, T., Rajamoorthi, K., Kurze, V., Beyer, K., and Brown, M. F. (2002), Structure of Docosahexaenoic Acid-Containing Bilayers as Studied by ^{2}H NMR and Molecular Dynamics Simulations, *J. Am. Chem. Soc.* **124**, 298-309. *[47]*

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87. Brown, M. F., Thurmond, R. L., Dodd, S. W., Otten, D., and Beyer, K. (2002), Elastic Deformation of Membrane Bilayers Probed by Deuterium NMR Relaxation, *J. Am. Chem. Soc*. **124**, 8471-8484. *[20]*

88. Martinez, G. V., Dykstra, E. M., Lope-Piedrafita, S. Job, C, and Brown, M. F. (2002) NMR Elastometry of Fluid Membranes in the Mesoscopic Regime, *Phys. Rev. E* **66**, 050902/1–050902/4. *[9]*

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105. Vogel, A., Tan, K.-T, Waldmann, H., Feller, S. E., Brown, M. F., and Huster, D. (2007), Flexibility of Ras Lipid Modifications Studied by ^{2}H Solid-State NMR and Molecular Dynamics Simulations, *Biophys. J.* **93**, 2697–2712. *[3]*

106. Lau, P.-W., Grossfield, A., Feller, S. E., Pitman, M. C., and Brown, M. F. (2007), Dynamic Structure of Retinylidene Ligand of Rhodopsin Probed by Molecular Simulations, *J. Mol. Biol.* **372**, 906–917 (cover article). *[1]*

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110. Holland, D. P., Struts, A. V., Brown, M. F., and Thompson, D. H. (2008), Bolalipid Membrane Structure Revealed by Solid-State ^{2}H NMR Spectroscopy, *J. Am. Chem. Soc.*, in press.

111. Kobayashi, M., Struts, A. V., Fujiwara, T., Brown, M. F., Akutsu, H. (2008), Fluid Mechanical Matching of H^+-ATPsynthase Subunit *c* Ring with Lipids in Membranes Revealed by ^{2}H Solid-State NMR, *Biophys. J.*, in press.

112. Brown, M. F. (2008), Concepts and Methods of Deuterium NMR Applied to Membranes, *Concepts Magn. Reson.*, to be submitted (invited review).

113. Brown, M. F. (2008), Relaxation in NMR Spectroscopy with Applications to Membrane Dynamics, *Concepts Magn. Reson.*, to be submitted (invited review).

114. Brown, M. F. (2008), NMR Relaxation of Biomolecules, *Prog. NMR Spectrosc.*, in preparation (invited review).

Book Reviews:

1. Brown, M. F. (1983), Review of "Nuclear Magnetic Resonance and Its Applications to Living Systems" by David G. Gadian (Oxford University Press, 1982), *J. Am. Chem. Soc.* **105**, 5184.

2. Brown, M. F. (1990), Review of "Biophysical Chemistry of Membrane Functions" by Arnost Kotyk, Karel Janacek, and Jiri Koryta (Wiley-Interscience, 1988), *J. Am. Chem. Soc.* **112**, 8220.

3. Brown, M. F. (1997), Review of "NMR as a Structural Tool for Macromolecules. Current Status and Future Directions" by B. D. Nageswara Rao and Marvin D. Kemple, *J. Am. Chem. Soc.* **119**, 9937-9938.

4. Brown, M. F. (2004), Review of "NMR of Ordered Liquids" edited by E. E. Burnell and C. A. de Lange, *J. Am. Chem. Soc.***126**, 12709–12710.

GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS SUPERVISED

Graduate Students:

Ireena Bagai; Tim Bartels (Technical University of Munich); Ana Vitoria Botelho; James DeMar; Steven Dodd; Michael Hartman; Karen Freedman; Omar Peru; Pick-Wei Lau; Silvia Lope-Piedrafita; Alexander Nevzorov; Doerte Otten (University of Munich, Germany); Victor Pytlewski; Gilmar Salgado; Amir Salmon (NSF Predoctoral Fellow); Benjamin Schroeder; Yeonee Seol; Yaxiong Sun; Jay Shumway; Robin Thurmond; Theodore Trouard; Jinfa Ying; Alexander Vogel (University ofLeipzig, Germany); Yin Wang; Gerald Williams

Postdoctoral Fellows:

Todd Alam (NIH Postdoctoral Fellow); Maria Altbach; Reza Asdjodi; Judith Barry (NIH Postdoctoral Fellow); James Beach (NIH Postdoctoral Fellow); Stuart Berr (NIH Postdoctoral Fellow); Ana Vitória Botelho; Jeffrey Ellena (NIH Postdoctoral Fellow); Nicholas Gibson; Thomas Huber; Mikael Jansson; Suhkmann Kim; Karina Martinez-Mayorga; Gary Martinez (NIH Postdoctoral Fellow); Stephan Moltke (Deutsche Forschungsgemeinschaft Postdoctoral Fellow); Robert Pates (MDA Postdoctoral Fellow; AHA Postdoctoral Fellow); Kannan Rajamoorthi; S. C. Shekar; Andrey Struts; Qiuke Teng; Alexnader Vogel (Deutsche Forschungsgemeinschaft Postdoctoral Fellow); Timothy Wiedmann (NIH Postdoctoral Fellow); Jaroslav Zajicek

Faculty Sabbatical Visitors:

Prof. Maarten Heyn, Department of Physics, Free University of Berlin, Berlin, Germany; Prof. Göran Lindblom, Department of Physical Chemistry, Umeå University, Umeå, Sweden

EXTRAMURAL ACTIVITIES–NATIONAL AND INTERNATIONAL SERVICE (RECENT)

Referee for:

Accounts of Chemical Research; Biochemistry; Biochimica et Biophysica Acta; Biophysical Journal; International Journal of Peptide and Protein Research; Journal of the American

Chemical Society; Journal of Biological Chemistry; Journal of Chemical Physics; Journal of Magnetic Resonance; Journal of Physical Chemistry; Langmuir; Physical Review E; Physical Review Letters; Proceedings of the National Academy of Sciences; Solid State Nuclear Magnetic Resonance

Ad Hoc Study Section Member:
U. S. Public Health Service (NMR; Visual Sciences)
U. S. Public Health Service (Site Visit of Hormel Insitute)
U. S. Public Health Service (Site Visit of Center for Magnetic Resonance at MIT)
U. S. Public Health Service (Biology and Diseases of the Posterior Eye Study Section)
U. S. Public Health Service (Site Visit of Resource for NMR Molecular Imaging of Proteins at UCSD)

Study Section Member:
U. S. Public Health Service (Biochemistry and Biophysics of Membranes Study Section– Permanent Member)
U. S. Public Health Service (Biophysical Chemistry Study Section)
U. S. Public Health Service (Beamlines and Magnets Special Emphasis Study Section)
U. S. Public Health Service (High-End NMR Shared Instrumentation Grant Special Emphasis Study Section)

Proposal Referee:
U.S. National Institutes of Health; Natural Science and Engineering Council of Canada; Petroleum Research Fund; Research Corporation; U.S. National Science Foundation (Biophysics Program; Chemical Physics; Chemical Instrumentation Program); Welcome Trust (U. K.); Otto Klung Prize, Free University of Berlin, Germany; Australian Research Council

SEMINARS AND INVITED LECTURES (SELECTED)

"Membrane Deformation Energy, Curvature Frustration, and Rhodopsin Function", 40th Annual Biophysical Society Meeting, Baltimore, Maryland (February, 1996) - Invited Lecture

"Membrane Structure and Dynamics Studied with NMR Spectroscopy", Scripps Research Institute, La Jolla, California (February, 1996) - Lecture

"Modulation of Rhodopsin Function by Properties of the Membrane Bilayer", Department of Physical Biochemistry, University of Munich, Germany (August 1996) - Lecture

"Structure and Dynamics of Membranes Studied with NMR Spectroscopy", Department of Physics, University of Würzburg, Germany (August 1996) - Lecture

"Structure and Dynamics of Membranes Studied with NMR Spectroscopy", Department of Physics, University of Leipzig, Germany (August 1996) - Lecture

"Rhodopsin-Lipid Interactions and Visual Function", Department of Physics, Free University of Berlin, Germany (June, 1997) - Lecture

"Rhodopsin-Lipid Interactions and Visual Function", Department of Physical Biochemistry, University of Munich, Germany (June, 1997) - Lecture

"Rhodopsin-Lipid Interactions and Visual Function", Institute of Physical Chemistry, University of Freiburg, Germany (July, 1997) - Lecture

"Deuterium NMR Spectroscopy of Membranes", Institute of Physical Chemistry, University of Freiburg, Germany (July, 1997) - Lecture

"Deuterium NMR Spectroscopy of Membranes", Department of Structural Biology, Jülich Research Center , Germany (July, 1997) - Lecture

"Rhodopsin-Lipid Interactions and Visual Function", Department of Structural Biology, Jülich Research Center , Germany (July, 1997) - Lecture

"Deuterium NMR Spectroscopy of Membranes", Department of Chemical Physics, University of Padua, Italy (July, 1997) - lecture

"Rhodopsin-Lipid Interactions and Visual Function", Department of Chemical Physics, University of Padua, Italy (July, 1997) - Lecture

"Deuterium NMR Spectroscopy of Membranes", Institute of Chemical Physics, University of Bologna, Italy (July, 1997) - Lecture

"Deuterium NMR Spectroscopy of Membranes", Department of Chemistry, University of Calabria, Italy (July, 1997) - Lecture

"Deuterium NMR Spectroscopy of Membranes", Department of Chemistry, University of Florence, Italy (July, 1997) - Lecture

"Rhodopsin-Lipid Interactions and Visual Function", Department of Biophysical Chemistry, Biocenter, University of Basel, Switzerland (July, 1997) - Lecture

"Rhodopsin-Lipid Interactions and Visual Function", Department of Physics, University of Würzburg, Germany (July, 1997) - Lecture

"Lipid-Protein Interactions and Rhodopsin Function in Membranes", Department of Bioengineering, Yokohama National University, Japan (December, 1997) - Lecture

"Membrane Structure and Dynamics Studied with Solid-State NMR Spectroscopy", Department of Polymer Chemistry, Kyoto University, Japan (December, 1997) - Lecture

"Solid-State NMR Spectroscopy and Lipid-Protein Interactions", Himeji Institute of Technology, Himeji Science Garden City, Japan (December, 1997) - Lecture

"Solid-State NMR Spectroscopy of Membrane Proteins and Nucleic Acids", International Symposium for Design and Synthesis of Biofunctional Molecules, Tokyo, Japan (December, 1997) - Plenary Lecture

"Deuterium NMR in Liquid Crystals and Membranes", VIII International Symposium on Magnetic Resonance in Colloid and Interface Science, Namur, Belgium (May, 1998) - Plenary Lecture

"Lipid-Protein Interactions and Rhodopsin Function in Membranes", Division of Physical Chemistry 1, Center for Chemistry and Chemical Engineering, University of Lund, Sweden (June, 1998) - Lecture

"Deuterium NMR Spectroscopy of Integral Membrane Proteins and Nucleic Acids", Max Planck-Institute for Biochemistry, Martinsreid, Germany (July, 1998) - Lecture

"Membrane Elasticity and Lipid-Rhodopsin Interactions by Solid State NMR", Department of Chemistry, University of Washington (October, 1998) - Lecture

"NMR of Aligned Membrane Proteins and Nucleic Acids," 40th Experimental Nuclear Magnetic Resonance Conference, Orlando, Florida (March, 1999) - Invited Plenary Lecture

"Membrane Deformation on the Mesoscopic Length Scale Studied by ^{2}H NMR", German Biophysical Society Meeting, Ulm, Germany (October, 1999) - Invited Plenary Lecture

"The Investigation of Biomolecular Structure and Function Using Nuclear Magnetic Resonance Spectroscopy", Department of Physics, University of Würzburg, Germany (November, 1999) - The Röntgen Lecture

"Dynamics of Membrane Bilayers Probed by Nuclear Spin Relaxation", Department of Physics, University of Ulm, Germany (November, 1999) - Lecture

"Structure and Function of Membrane Proteins and Nucleic Acids Investigated by NMR Spectroscopy and Kinetic Spectrophotometry", Department of Physical Biochemistry, University of Munich, Germany (November, 1999) - Lecture

"Biomolecular Structure and Dynamics Investigated by Nuclear Magnetic Resonance Spectroscopy", Department of Organic Chemistry and Biochemistry, Technical University of Munich, Germany (November, 1999) - Lecture

"Deformationen von Membranen auf der Mesoskopische Längeskala Mittels Deuterium-NMR", Membrane Biophysics Workshop, Volkach.Germany (December, 1999) - Invited Lecture

"Deuterium NMR Spectroscopy of Membrane Lipids and Proteins", Department of Physical Chemistry, University of Stuttgart, Germany (December, 1999) - Lecture

Workshop on Properties of Polyunsaturated Lipid Membranes, 44th Annual Biophysical Society Meeting, New Orleans, Louisiana (February, 2000) - Invited Lecture

"Membrane Elasticity and Protein Function on the Mesoscopic Length Scale", Department of Physics, Technical University of Munich, Germany (July , 2000) - Lecture

Workshop on Membrane Protein Structure Determination, Max Planck Institute for Biochemistry, Munich, Germany (September, 2000) - Invited

"Deuterium NMR Spectroscopy of Membrane Lipids and Proteins", Department of Physical Chemistry, University of Stuttgart, Germany (December, 1999) - Lecture

"NMR Lineshape Calculations for Uniaxial Systems", New Mexico Regional NMR Conference, Socorro, New Mexico (April, 2000) - Invited Lecture

"Membrane Elasticity and Protein Function on the Mesoscopic Length Scale", Department of Physics, Technical University of Munich, Germany (June, 2000) - Lecture

"Membrane Elasticity and Rhodopsin Function on the Mesoscopic Length Scale", Department of Biophysics, University of Michigan (February, 2001) - Lecture

"Deuterium NMR Spectroscopy of Aligned Membrane Proteins and Nucleic Acids", Department of Chemistry, Francis Bitter Magnet Laboratory, Massachusetts Institute of Technology (February, 2001) - Lecture

"Relaxation and Elastometry of Fluid Membranes in the Mesoscopic Regime," 43th Experimental Nuclear Magnetic Resonance Conference, Asilomar, California (April, 2002) - Invited Plenary Lecture

"Relaxometry in Elastic Deformation of Membranes on the Nanoscale", XXth International Conference on Magnetic Resonance in Biological Systems, Toronto, Canada (August, 2002) - Invited Lecture

"Biochemistry of Vision", Sandia National Laboratory (November, 2003) - Lecture

"NMR Relaxation of Membranes", Department of Chemistry, New Mexico Institute of Mining and Technology (November, 2003) - Lecture

"NMR Structures and Molecular Modeling of Membrane Proteins", Department of Molecular Biophysics, Osaka University, Japan (January, 2004) - Lecture

"NMR Relaxation of Membranes", Department of Molecular Biophysics, Osaka University, Japan (January, 2004) - Lecture

"Biochemistry of Vision", Department of Biophysics, Kyoto University, Japan (January, 2004) - Lecture

"NMR Structures and Molecular Modeling of Membrane Proteins", Department of Chemistry, Yokohama National University, Japan (January, 2004) - Lecture

"Site-Directed Deuterium NMR Spectroscopy of Retinal Binding Proteins in Membranes", CREST International Symposium on "Frontier in Biological NMR Spectroscopy", Osaka, Japan (January, 2004) - Invited Plenary Lecture

"Elasticity of Membrane Bilayers Probed by Solid-State ^{2}H NMR Relaxation", 36th Central Regional ACS Meeting, Indianapolis, Indiana (June, 2004) - Invited Lecture

"Rhodopsin Activation Coupled to Elastic Membrane Deformation", FASEB Summer Research Conference on "Molecular Biophysics of Cellular Membranes", Tucson, Arizona (June, 204) - Invited Lecture

"Nuclear Spin Relaxation of Bilayer Lipids: Local or Collective Motions?", Henry Eyring Center for Theoretical Chemistry Conference on "Biological Membranes: Emerging Challenges at the Interface between Theory, Computer Simulation, and Experiment", Sun Valley, Idaho (June, 2004) - Invited Lecture

"Prokaryotic Ion Channels: Structure, Function, Lipid-Protein Interactions", Institute for Protein Research, Osaka University, Japan (September, 2004) - Lecture

"Site-Directed ^{2}H NMR Spectroscopy of Retinal Proteins in Membranes", 15th Annual International Society of Magnetic Resonance (ISMAR) Meeting, Jacksonville, Florida (October, 2004) - Invited Lecture

"Solid State NMR and Electronic Spectroscopy of Retinal Proteins in Membranes: From Dynamic Structure to Function", Department of Chemistry, University of Utah (November, 2004) - Lecture

"Solid-State NMR Spectroscopy of Retinal Proteins in Membranes", XXIst International Conference on Magnetic Resonance in Biological Systems (ICMRBS), Hyderabad, India (January 2005) - Invited Lecture

"Solid State NMR Relaxation of Biomolecules", International Workshop on recent Trends in Solid State NMR in Biological Systems, Indian Institute of Science, Bangalore, India (January 2005) - Invited Lecture

"Flexible Surface Model for Lipid-Protein Interactions", 49th Annual Biophysical Society Meeting, Long Beach, California (February, 2005) - Invited Lecture

"Structure, Dynamics, and Function of Retinal Proteins in Membranes", Institute for Protein Research, Osaka University, Japan (April, 2005) - Lecture

"Solid State NMR Spectroscopy of Biomolecules", Keck Science Center and Claremont Colleges, California (September, 2005) - Lecture

"Solid State NMR of Rhodopsin in Membranes: From Dynamic Structure to Function", Center for Structural Biology, University of Florida (October, 2005) - Lecture

"Solid State NMR of Rhodopsin in Membranes: From Dynamic Structure to Function", Department of Chemistry, Michigan State University (December, 2005) - Lecture

"Chromophore Dynamics in the Binding Site of Rhodopsin from Solid State NMR", Gordon Research Conference on Photosensory Receptors and Signal Transduction, Il Ciocco, Italy (May, 2006) - Invited Lecture

"Solid-State NMR Spectroscopy of Biomolecules", Department of Chemistry, University of Florence, Italy (May, 2006) - Lecture

"Structure and Function of Rhodopsin in Membranes", Department of Chemical Physics, University of Padova, Italy (May, 2006) - Lecture

"Structure and Dynamics of Membrane Lipids", Department of Chemical Physics, University of Padua Italy (May, 2006) - Lecture

"Structure and Function of Rhodopsin in Membranes", Department of Biochemistry, University of Munich, Germany (May, 2006) - Lecture

"Structure and Function of Rhodopsin in Membranes", Department of Pharmaceutical Chemistry, University of Modena, Italy (May, 2006) - Lecture

"Solid State NMR of Biomolecules", Department of Pharmaceutical Chemistry, University of Modena, Italy (May, 2006) - Lecture

"NMR Relaxation of Lipid Bilayers", Department of Chemistry, University of Florence, Italy (June, 2006) - Lecture

"The Age of Biology: Opportunities In Biochemistry", University of Arizona (November, 2006) - Outreach

"Dynamics and Relaxation of Membrane Constituents Viewed by Solid-State NMR", International Symposium on Molecular Soft Interactions in Biological Systems, Osaka, Japan (March, 2007) - Invited Lecture

"Biological Physics of Membrane Function", Arizona BioPhest, Tempe, Arizona (April, 2007) - Invited Lecture

"Curvature Forces in Membrane Lipid-Protein Interactions?", Park City Membrane Meeting, Park City, Utah (June, 2007) - Lecture

"Membrane Lipids as Activators of Rhodopsin Visual Signaling", National Institutes of Health, Bethesda, Maryland (October, 2007) - Lecture

"Retinylidene Dynamics in Rhodopsin Activation", 13th International Conference on Retinal Proteins, Barcelona, Spain (June, 2008) -Invited Plenary Lecture