

# Chapter 7

## Appendix

### 7.1 References

- Adam, N.K. 1938. The physics and chemistry of surfaces. Oxford University Press, London.
- Albrecht, O., Gruler, H., Sackmann, E. 1978. Polymorphism of phospholipid monolayers. *J. Phys. (Paris)* 39:301-313.
- Allan, A.J.G. 1958. Wilhelm's plate and Young's equation. *J. Colloid Interface Sci.* 13:273-274.
- Andersen, O.S., Feldberg, S., Nakadomari, H., Levy, S., McLaughlin, S. 1978a. Electrostatic potentials associated with the absorption of tetraphenylborate into lipid bilayer membranes. In: Tosteson, D., Ovchinnikov, Yu.A., Latorre, R. (eds.), Membrane Transport Processes, vol. 2. Raven Press, New York, pp. 325-334.
- Andersen, O.S., Feldberg, S., Nakadomari, H., Levy, S., McLaughlin, S. 1978b. Electrostatic interactions among hydrophobic ions in lipid bilayer membranes. *Biophys. J.* 21:35-70.
- Andersen, O.S., Finkelstein, A., Katz, I., Cass, A. 1976. Effect of phloretin on the permeability of thin lipid membranes. *J. Gen. Physiol.* 67:749-771.
- Antonenko, Y.N., Bulychev, A.A. 1991. Effect of phloretin on the carrier-mediated electrically silent ion fluxes through the bilayer lipid membrane: measurements of pH shifts near the membrane by pH microelectrode. *Biochim. Biophys. Acta.* 1070:474-480.
- Awiszus, R., Stark, G. 1988. A laser T-jump study of the adsorption of dipolar molecules to planar lipid membranes. II. Phloretin and phloretin analogues. *Eur. Biophys. J.* 15:321-328.

- Bayerl, T.M., Schmidt, C.F., Sackmann, E. 1988. Kinetics of symmetric and asymmetric phospholipid transfer between small sonicated vesicles studied by DSC, electron microscopy and dynamic light scattering. *Biochemistry*. 27:6078-6085.
- Bayerl, T.M., Bloom, M. 1990. Physical properties of single phospholipid bilayers adsorbed to micro glass beads. A new vesicular model system studied by  $^2\text{H}$ -nuclear magnetic resonance. *Biophys. J.* 58:357-362.
- Bechinger, B., Seelig, J. 1991. Interaction of electric dipoles with phospholipid head groups. A  $^2\text{H}$  and  $^{31}\text{P}$  NMR study of phloretin analogues in phosphatidylcholine membranes. *Biochemistry*. 30:3923-3929.
- Ben-Yashar, V., Menashe, M., Biltonen, R.L., Johnson, M., Barenholz, Y. 1987. Interaction of transparinaric acid with phosphatidylcholine bilayers: comparison with the effects of other fluorophores. *Biochim. Biophys. Acta.* 904:117-124.
- Benz, R., Janko, K. 1976. Voltage-induced capacitance relaxation of lipid bilayer membranes. Effects of membrane composition. *Biochim. Biophys. Acta.* 455:721-738.
- Benz, R., Läuger, P., Janko, K. 1976. Transport kinetics of hydrophobic ions in lipid bilayer membranes. Charge-pulse relaxation studies. *Biochim. Biophys. Acta.* 455:701-720.
- Benz, R., Gisin, B.F. 1978. Influence of membrane structure on ion transport through lipid bilayer membranes. *J. Membrane Biol.* 40:293-314.
- Benz, R., Läuger, P. 1977. Transport kinetics of dipicrylamine through lipid bilayer membranes. Effects of membrane structure. *Biochim. Biophys. Acta.* 468:245-258.
- Benz, R., Cros, D. 1978. Influence of sterols on ion transport through lipid bilayer membranes. *Biochim. Biophys. Acta.* 506:265-280.
- Benz, R. 1988. Structural requirement for the rapid movement of charged molecules across membranes. Experiments with tetraphenylborate analogues. *Biophys. J.* 54:25-33.
- Biltonen, R.L., Lichtenberg, D. 1993. The use of differential scanning calorimetry as a tool to characterize liposome preparations. *Chem. Phys. Lipids.* 64:129-142.
- Blume, A. 1979. A comparative study of the phase transition of phospholipid bilayers and monolayers. *Biochim. Biophys. Acta.* 557:32-44.
- Borazio, A., Farrell, J.R., McTigue, P. 1985. Charge distribution at the gas-water interface. The surface potential of water. *J. Electroanal. Chem.* 193:103-112.

- Brockman, H. 1994. Dipole potential of lipid membranes. *Chem. Phys. Lipids.* 73:57-79.
- Bürner, H., Benz, R., Gimmler, H., Hartung, W., Stillwell, W. 1993. Abscisic acid-lipid interactions: A phospholipid monolayer study. *Biochim. Biophys. Acta.* 1150:165-172.
- Bürner, H., Winterhalter, M., Benz, R. 1994. Surface potential of lipid monolayers with grafted polyethylene glycols. *J. Colloid Interface Sci.* 168:183-189.
- Cevec, G., Watts, A., Marsh, D. 1981. Titration of phosphatidylserine bilayer membranes. Effects of pH, surface electrostatics, ion binding, and head-group hydration. *Biochemistry.* 20:4955-4965.
- Colacicco, G. 1988. Electrical potential of water surface. *Chem. Scripta.* 28:141-144.
- Coster, H.G.L., Smith, J.R. 1974. The molecular organization of bimolecular lipid membranes. A study of low frequency Maxwell-Wagner impedance dispersion. *Biochim. Biophys. Acta.* 373:151-164.
- Cousin, J.L., Motais, R. 1978. Effect of phloretin on chloride permeability: a structure-activity study. *Biochim. Biophys. Acta.* 507:531-538.
- Cseh, R., Benz, R. 1998. The adsorption of phloretin to lipid monolayers and bilayers cannot be explained by Langmuir adsorption isotherms alone. *Biophys. J.* 74:1399-1408.
- Cseh, R., Benz, R. 1999. Interaction of phloretin with lipid monolayers: Relationship between structural changes and dipole potential change. *Biophys. J.* (in press).
- Cseh, R., Hetzer, M., Wolf, K., Kraus, J., Bringmann, G., Benz, R. 1999. Interaction of phloretin with membranes: On the mode of action of phloretin at the water-lipid interface. *Eur. Biophys. J.* (submitted).
- Davis, R.J., Rideal, E.K. 1961. Interfacial phenomena. Academic Press, New York.
- De Jonge, P.C., Wieringa, T., van Putten, J.P.M., Krans, H.M.J., van Dam, K. 1983. An uncoupler and an inhibitor of mitochondrial oxidative phosphorylation. *Biochim. Biophys. Acta.* 722:219-225.
- De Levie, R., Rangarajan, S.K., Seelig, P.F., Andersen, O.S. 1979. On the adsorption of phloretin onto a black lipid membrane. *Biophys. J.* 25:295-300.
- Dewar, M.J.S., Zoebisch, E.G., Healey, E.F., Stewart, J.J.P. 1985. AM1: A new general purpose quantum mechanical molecular model. *J. Am. Chem. Soc.* 107:3902-3909.

- Dill, K.A., Stigter, D. 1988. Lateral interactions among phosphatidylcholine and phosphatidylethanolamine head groups in phospholipid monolayers and bilayers. *Biochemistry*. 27:3446-3453.
- Dluhy, R.A., Cameron, D.G., Mantsch, H.H., Mendelsohn, R. 1983. Fourier transform infrared spectroscopic studies of the effect of calcium ions on phosphatidylserine. *Biochemistry*. 22:6318-6325.
- Exner, O. 1975. Dipole moments in organic chemistry. Georg Thieme Publishers, Stuttgart.
- Flewelling, R.F., Hubbell, W.L., 1986. The membrane dipole potential in a total membrane potential model. Applications to hydrophobic ion interactions with membranes. *Biophys. J.* 49:541-552.
- Forman, S.A., Verkman, A.S., Dix, J.A., Solomon, A.K. 1982. Interaction of phloretin with the anion transport protein of the red blood cell membrane. *Biochim. Biophys. Acta.* 689:531-538.
- Franklin, J.C., Cafiso, D.S. 1993. Internal electrostatic potentials in bilayers: measuring and controlling dipole potentials in lipid vesicles. *Biophys. J.* 65:289-299.
- Frisch, M.J., Trucks, G.W., Schlegel, H.B., Gill, P.M.W., Johnson, B.G., Robb, M.A., Cheeseman, J.R., Keith, T.A., Petersson, G.A., Montgomery, J.A., Raghavachari, K., Al-Laham, M.A., Zakrzewski, V.G., Ortiz, J.V., Foresman, J.B., Cioslowski, J., Stefanov, B.B., Nanayakkara, A., Challacombe, M., Peng, C.Y., Ayala, P.Y., Chen, W., Wong, M.W., Andres, J.L., Replogle, E.S., Gomperts, R., Martin, R.L., Fox, D.J., Binkley, J.S., Defrees, D.J., Baker, J., Stewart, J.P., Head-Gordon, M., Gonzalez, C., Pople, J.A., GAUSSIAN 94 (Revision F.1); Gaussian Inc., Pittsburgh PA, 1995.
- Fuhrmann, G.F., Dervedde, S., Frenking, G. 1992. Phloretin keto-enol tautomerism and inhibition of glucose transport in human erythrocytes (including effects of phloretin on anion transport). *Biochim. Biophys. Acta.* 1110:105-111.
- Gaines, G.L., 1966. Insoluble monolayers at liquid-gas interfaces. Interscience, New York.
- Gawrisch, K., Ruston, D., Zimmerberg, J., Parsegian, V.A., Rand, R.P., Fuller, N. 1992. Membrane dipole potentials, hydration forces, and the ordering of water at membrane surfaces. *Biophys. J.* 61:1213-1223.
- Gunn, R.B., Wieth, J.O., Tosteson, D.C. 1975. Some effects of low pH on chloride exchange in human red blood cells. *J. Gen. Physiol.* 65:731-749.

- Hawkins, G.D., Giesen, D.J., Lynch, G.C., Chambers, C.C., Rossi, I., Storer, J.W., Rinaldi, D., Liotard, D.A., Cramer, C.J., Truhlar, D.G., AMSOL Version 6.1.1; University of Minnesota, Minneapolis, 1997, based in part on AMPAC Version 2.1 by Liotard, D.A., Healy, E.F., Ruiz, J.M., Dewar, M.J.S. and on the EF routines by Jensen, F.
- Haydon, D.A., Hladky, S.B. 1972. Ion transport across thin lipid membranes: A critical discussion of mechanisms in selected systems. *Q. Rev. Biophys.* 5:187-282.
- Haydon, D.A., Myers, V.B. 1973. Surface charge, surface dipoles and membrane conductance. *Biochim. Biophys. Acta.* 307:429-443.
- Heckl, W.M., Zaba, B.N., Möhwald, H. 1987. Interactions of cytochromes b5 and c with phospholipid monolayers. *Biochim. Biophys. Acta.* 903:166-176.
- Heise, H., Bayerl, T.M., Isenberg, G., Sackmann, E. 1991. Human platelet P-235, a talin-like actin binding protein, binds selectively to mixed lipid bilayers. *Biochim. Biophys. Acta.* 1061:121-131.
- Hladky, S.B., Haydon, D.A. 1973. Membrane conductance and surface potential. *Biochim. Biophys. Acta.* 318:464-468.
- Hodgkin, A.L., Huxley, A.F. 1952. The dual effect of membrane potential on sodium conductance in the giant axon of *Loligo*. *J. Physiol.* 116:497-506.
- Hsieh, C.-H., Sue, S.-C., Lyu, P.-C., Wu, W.-G. 1997. Membrane packing geometry of diphytanoylphosphatidylcholine is highly sensitive to hydration: phospholipid polymorphism induced by molecular rearrangement in the headgroup region. *Biophys. J.* 73:870-877.
- Ibdah, J.A., Phillips, M.C. 1988. Effects of lipid composition and packing on the adsorption of apolipoprotein A-I to lipid monolayers. *Biochemistry.* 27:7155-7162.
- Jendrasiak, G.L., Smith, R.L., McIntosh, T.J. 1997. The effect of phloretin on the hydration of egg phosphatidylcholine multilayers. *Biochim. Biophys. Acta.* 1329:159-168.
- Jennings, M.L., Solomon, A.K. 1976. Interaction between phloretin and the red blood cell membrane. *J. Gen. Physiol.* 67:381-397.
- Karakatsanis, P., Bayerl, T.M. 1996. Diffusion measurements in oriented phospholipid bilayers by proton-NMR in a static fringe field gradient. *Phys. Rev. E.* 54:1785-1790.
- Klotz, K.H., Benz, R. 1993. Kinetics of the iodine and bromine mediated transport of halide ions: a demonstration of an interfacial complexation mechanism. *Biophys. J.* 65:2661-2672.

- Köchy, T., Bayerl, T.M. 1993. Lateral diffusion coefficients of phospholipids in spherical bilayers on a solid support measured by  $^2\text{H}$ -nuclear-magnetic-resonance relaxation. *Phys. Rev. E.* 47:2109-2116.
- Krupka, R.M. 1985. Asymmetrical binding of phloretin to the glucose transport system of human erythrocytes. *J. Membrane Biol.* 83:71-80.
- Kurrle, A., Rieber, P., Sackmann, E. 1990. Reconstitution of transferrin receptor in mixed lipid vesicles. An example of the role of elastic and electrostatic forces for protein/lipid assembly. *Biochemistry.* 29:8274-8282.
- Läuger, P. 1972. Carrier-mediated ion transport. *Science.* 178:24-30.
- Lee, A.G. 1977. Lipid phase transitions and phase diagrams. *Biochim. Biophys. Acta.* 472:237-281.
- LeFevre, P.G., Marshall, J.K. 1959. The attachment of phloretin and analogues to human erythrocytes in connection with inhibition of sugar transport. *J. Biol. Chem.* 234:3022-3026.
- LeFevre, P.G. 1961. Sugar transport in the red blood cell: structure-activity relationships in substrates and antagonists. *Pharmacol. Rev.* 13:39-70.
- Lindsey, H., Petersen, N.O., Chan, S.I. 1979. Physicochemical characterization of 1,2-diphytanoyl-sn-glycero-3-phosphocholine in model membrane systems. *Biochim. Biophys. Acta.* 555:147-167.
- Linseisen, F.M., Thewalt, J.L., Bloom, M., Bayerl, T.M. 1993.  $^2\text{H}$ -NMR and DSC study of SEPC-cholesterol mixtures. *Chem. Phys. Lipids.* 65:141-149.
- Luckham, P., Wood, J., Froggatt, S., Swart, R. 1993. The surface properties of gangliosides. *J. Colloid Interface Sci.* 156:164-172.
- Macey, R.J., Farmer, R.E.L. 1970. Inhibition of water and solute permeability in human red cells. *Biochim. Biophys. Acta.* 211:104-106.
- Melnik, E., Latorre, R., Hall, J.E., Tosteson, D.C. 1977. Phloretin-induced changes in ion transport across lipid bilayer membranes. *J. Gen. Physiol.* 69:243-247.
- Minkin, V.I., Osipov, O.A., Zhdanov, Y.A. 1970. Dipole moments in organic chemistry. (English translation), Plenum Press, New York.
- Mozaffary, H. 1991. On the sign and origin of the surface potential of phospholipid monolayers. *Chem. Phys. Lipids.* 59:39-47.

- Naumann, C., Brumm, T., Bayerl, T.M. 1992. Phase transition behavior of single phosphatidylcholine bilayers on a solid spherical support studied by DSC, NMR and FT-IR. *Biophys. J.* 63:1314-1319.
- Owen, J.D. 1974. The effect of phloretin on the potassium conductance in *Aplysia* giant neurons. *J. Membr. Biol.* 16:65-78.
- Paltauf, F., Hauser, H., Phillips, M.C. 1971. Monolayer characteristics of some 1,2-diacyl, 1-alkyl-2-acyl and 1,2 dialkyl phospholipids at the air-water interfaces. *Biochim. Biophys. Acta.* 249:539-547.
- Parfenyuk, V.I., Krestov, G.A. 1992. Surface potential of water. *Colloid J.* 91:892-894 (Translated from Zhurnal, K. 1971, 53:1072-1074).
- Pauls, K.P., MacKay, A.L., Söderman, O., Bloom, M., Tanjea, A.K., Hodges, R.S. 1985. Dynamic properties of the backbone of an integral membrane polypeptide measured by  $^2\text{H}$ -NMR. *Eur. Biophys. J.* 12:1-11.
- Phillips, M.C., Chapman, D. 1968. Monolayer characteristics of saturated 1,2-diacylphosphatidylcholines (lecithins) and phosphatidylethanolamines at the air-water interface. *Biochim. Biophys. Acta.* 163:301-313.
- Pickar, A.D., Benz, R., 1978. Transport of oppositely charged lipophilic probe ions in lipid bilayer membranes having various structures. *J. Membrane Biol.* 44:353-376.
- Pickard, W.F., Sehgal, K.C., Jackson, C.M. 1979. Measurement of phospholipid monolayer surface potentials at a hydrocarbon-electrolyte interface. *Biochim. Biophys. Acta.* 552:1-10.
- Pohl, P., Rokitskaya, T.I., Pohl, E.E., Saporov, S.M. 1997. Permeation of phloretin across bilayer lipid membranes monitored by dipole potential and microelectrode measurements. *Biochim. Biophys. Acta.* 1323:163-172.
- Rauhut, G., Chandrasekhar, J., Alex, A., Beck, B., Sauer, W., Clark, T., VAMP 6.1; available from Oxford Molecular Ltd., The Medawar Centre, Oxford Science Park, Sandford-on-Thames, Oxford, OX4 4GA, England.
- Reinl, H.M., Bayerl, T.M. 1993. Interaction of myelin basic protein with single bilayers on a solid support: an NMR, DSC and polarized infrared ATR study. *Biochim. Biophys. Acta.* 1151:127-136.
- Reyes, J., Greco, F., Motais, R., Latorre, R. 1983. Phloretin and phloretin analogs: Mode of action in planar lipid bilayers and monolayers. *J. Membrane Biol.* 72:93-103.

- Scherer, P.G., Seelig, J. 1989. Electric charge effects on phospholipid headgroups. Phosphatidylcholine in mixtures with cationic and anionic amphiphiles. *Biochemistry*. 28:7720-7728.
- Singer, S.J., Nicolson, G.L. 1972. The fluid mosaic model of the structure of cell membranes. *Science*. 175:720-731.
- Sternin, E., Bloom, M., MacKay, A.L. 1983. De-pake-ing of NMR spectra. *J. Magnetic Res.* 55:274-282.
- Stewart, J.J.P. 1989. Optimization of parameters for semiempirical methods II. applications. *J. Comput. Chem.* 10:221-264.
- Strichartz, G.R., Oxford, G.S., Ramon, F. 1980. Effects of the dipolar form of phloretin on potassium conductance in squid giant axons. *Biophys. J.* 31:229-246.
- SYBYL: Tripos Associates, 1699 St. Hanley Road Suite 303, St. Louis, MO, 63144.
- Szabo, G. 1974. Dual mechanism for the action of cholesterol on membrane permeability. *Nature*. 252:47-49.
- Szabo, G. 1976. The influence of dipole potentials on the magnitude and the kinetics of ion transport in lipid bilayer membranes. In *Extreme Environment: Mechanisms of Microbial Adaption*. G.R. Heinrich (ed.) Academic Press, Inc., New York, pp. 321-348.
- Toon, M.R., Solomon, A.K. 1987. Modulation of water and urea transport in human red cells: Effects of pH and phloretin. *J. Membrane Biol.* 99:157-164.
- van Osdol, W.W., Ye, Q., Johnson, M.L., Biltonen, R.L. 1992. Effects of the anesthetic dibucaine on the kinetics of the gel-liquid crystalline transition of dipalmitoylphosphatidylcholine multilamellar vesicles. *Biophys. J.* 63:1011-1017.
- Verkman, A.S. 1980. The quenching of an intramembrane fluorescent probe. A method to study the binding and permeation of phloretin through bilayers. *Biochim. Biophys. Acta.* 599:370-379.
- Verkman, A.S., Solomon, A.K. 1980. Kinetics of phloretin binding to phosphatidylcholine vesicle membranes. *J. Gen. Physiol.* 15:673-692.
- Verkman, A.S., Solomon, A.K. 1982. A stepwise mechanism for the permeation of phloretin through a lipid bilayer. *J. Gen. Physiol.* 80:557-581.
- Vilallonga, F. 1968. Surface chemistry of L- $\alpha$ -dipalmitoyl lecithin at the air-water interface. *Biochim. Biophys. Acta.* 163:290-300.



- Vogel, V., Möbius, D. 1988. Local surface potentials and electric dipole moments of lipid monolayers: Contribution of the water/lipid and the lipid/air interfaces. *J. Colloid Interface Sci.* 126:408-420.
- Yamins, H.G., Zisman, W.A. 1933. A new method of studying the electrical properties of monomolecular films on liquids. *J. Chem. Phys.* 1:656-661.

## 7.2 Curriculum vitae

### Personal data:

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Date of birth        March, 15, 1961  
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### Education:

1967-1971           Elementary school Lauda  
1971-1977           Secondary school Lauda  
1981-1984           Secondary school Tauberbischofsheim  
School-leaving examination: Abitur

### Profession:

1977-1981           Apprenticeship electronic engineer, Trafö, Lauda  
1987-1990           Electronic engineer, Göttfert, Buchen

### University education:

1984-1987           Study of philosophy, psychology and linguistics at the  
Friedrich-Alexander-University Erlangen-Nürnberg  
Graduation: preexamination  
1990-1996           Study of biology at the Julius-Maximilians-University Würzburg  
Examinations passed:  
Major: biotechnology  
Minor: biochemistry, physiology of plants  
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