

A selected history of the Planar Lipid Bilayer

Seminal References

Describes formation of monolayers of lipid on glass, mica, etc.

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Introduces voltage clamp to biological systems and creates electrophysiology

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3. Cole (1949) *Arch Sd Physiol* **3**: 258
4. Marmont (1949) *J Cell Comp Physiol* **34**: 351

Formation of bilayer by 'paint' technique

5. Mueller *et al.* (1962) *Nature (Lund)* **194**: 979
6. Mueller *et al.* (1962) *Circulation* **XXVI**: 1167

Formation of liposomes from dried lipids

7. Bangham *et al.* (1965) *J Mol Biol* **13**: 238

Loose patch clamp recordings

8. Neher and Lux (1969) *Pflugers Arch* **311**: 272

Show ion channels to be one of two broad classes of ion-transporting proteins

9. Mueller and Rudin (1969) *Curr Top Bioenerg* **3**: 157

First ion channel in BLM

10. Bean *et al.* (1969) *J Gen Physiol* **53**: 741

First discrete ionic currents in BLM

11. Hladky and Haydon (1970) *Nature (Lund)* **255**: 451
12. Ehrenstein *et al.* (1970) *J Gen Physiol* **55**: 119

Formation of solvent-free bilayers from monolayers

13. Montal and Mueller (1972) *PNAS* **69**: 3561

Analysis of torus surrounding bilayer

14. White (1972) *Biophys J* **12**: 432

Conditions for vesicle fusion

15. Cohen *et al.* (1989) *J Gen Physiol* **93**: 201
16. Niles *et al.* (1989) *J Gen Physiol* **93**: 211

Fuses vesicles to bilayer

17. Drachev *et al.* (1974) *Nature* **249**: 321

First to observe single channels in patch clamp

18. Neher and Sakmann (1976) *Nature (Lund)* **286**: 71
19. Neher, Sakmann and Steinbach (1978) *Pflugers Arch* **375**: 219

First incorporation of vesicles into bilayer

20. Miller and Racker (1976) *J Membr Biol* **30**: 283

Incorporate protein into bilayer from monolayer in equilibrium with vesicle suspension

21. Schindler and Rosenbusch (1978) *PNAS* **75**: 3751

Formation of bilayers using purified lipids

22. Waldberg and Szabo (1979) *Biochim Biophys Acta* **557**: 295
23. Schindler (1980) *FEBS Lett* **122**: 77

Excise patch technique

24. Horn and Patlak (1980) *PNAS* **11**: 6930

Sigworth describes the technique for formation of excise patch with gigohm seal

25. Hamill *et al.* (1981) *Pflugers Arch* **391**: 85

Technique for vesicle fusion below lipid phase transition temperature

26. Hanke *et al.* (1981) *Biophys Struct Mach* **7**: 131

Form bilayer by bringing together two supported monolayers

27. Setaka *et al.* (1982) *J Biochem* **91**: 79

Identify vesicle swelling as important for fusion

28. Cohen *et al.* (1982) *Science* **217**: 458

Formation of bilayer on fused quartz cuvette

29. Procopio *et al.* (1982) *Biochim Biophys Acta* **688**: 808

Patch onto a supported bilayer membrane

30. Andersen and Muller (1982) *J Gen Physiol* **80**: 403

Tip-dip technique

31. Suarez-Isla *et al.* (1983) *Biochem* **22**: 2319
32. Ehrlich (1992) *Methods Enzymol* **207**: 463

Folded membrane technique

33. Thrower (1999) *Methods Mol Biol* **114**: 221
34. Schindler (1980) *FEBS Lett* **122**: 77

Fusion of proteoliposomes to bilayer

35. Lee, *et al.* (1994) *J Biol Chem* **269**: 13305

Bibles

36. *Methods in Enzymology*, Volumes **207**, **293** and **294** – Each text is dedicated to ion channel technology (**207** is the best)
37. *Ion Channel Reconstitution*, by Chris Miller (1976) Plenum Press
38. *Ion Channels of Excitable Membranes* (3rd Ed), by Bertil Hille (2001) Sinauer Associates
39. *Single-Channel Recording*, by Sakman and Neher (1995) Plenum Press
40. *Biological Techniques: Planar Lipid Bilayers, Methods and Applications*, by Hanke and Schlue (1993) Academic Press
41. *Membrane Biophysics*, by Ti Tien and Ovotia-Lietmannova (2000) Elsevier Science Ltd.

Of particular interest from *Methods in Enzymology*

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Use of planar lipid bilayer membranes for rapid screening of membrane active compounds.
43. Woodbury (1999) *Methods Enzymol.* **294**: 319
Nystatin/ergosterol method for reconstituting ion channels into planar lipid bilayers.
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Reconstituting channels into planar membranes: a conceptual framework and methods for fusing vesicles to planar bilayer phospholipid membranes.
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Planar bilayer recording of ryanodine receptors of sarcoplasmic reticulum.
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Planar lipid bilayer membranes.
47. Finkelstein A. (1974) *Methods Enzymol.* **32(Part B)**:489
Bilayers: formation, measurements, and incorporation of components.

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