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Preface

Neher and Sakmann were the first to monitor the opening and closing of single ion channels in the membranes of cells by conductance measurements. In 1976 they used fire-polished micropipettes with a tip diameter of 3 to 5 μm to record currents from a small patch of the membrane of skeletal muscles, thereby decreasing background membrane noise. To reduce the dominant source of background noise (the leakage shunt under the pipette rim between membrane and glass), the muscle membrane had to be treated with an enzyme. Despite these early limitations, a new technique was born—the patch-clamp.

The final breakthrough came in 1981 when the same investigators, in collaboration with Hamill, Marty, and Sigworth, developed the gigaohm seal. Not only did this improve the quality of the recordings, it was now possible to gently pull the pipette with an attached patch of membrane of the cell and to study its trapped ion channels in isolation. Another offshoot of the gigaohm seal technique was the whole-cell patch-clamp technique, in which the attached patch of membrane is ruptured without breaking the seal. This technique is really a sophisticated voltage-clamp technique and it allows for the altering of cytoplasmic constituents if the investigator wishes.

This is the third edition of this best-selling neuroscience book by Humana Press. The rationale for its design was to represent any patch-clamp method that has been in more than 10 to 15 publications over the last three years. As well, newly emerging techniques, with future potential, such as uncaging experiments with lasers and high throughput techniques, have also been represented.

Thus, the reader will find the latest developments in the traditional patch techniques like whole cell and single channel as well as perforated patch, fast drug application, loose patch, and macro-patch techniques. The fields of internal pipette perfusion techniques and patch techniques combined with molecular biology represent major innovations. Three technical developments are brand new: (1) the combination of patch clamp and optical physiology has seen the introduction of two-photon lasers and uncaging experiments; (2) it is now possible to patch in animals in vivo; and (3) in phar-
macological testing, high throughput techniques are making their appearance with both automated glass pipettes and planar patch electrodes. Thus, the arrival of the planar patch electrodes has, for the first time, enabled patch clamping without glass pipettes.

It is obvious that patch clamping is a technique that is here to stay. We will probably see future developments in addition to the glass pipette. As well, the glass pipette will be used more and more as a tool to make discrete changes to the *milieu interieur* of cells.

*Wolfgang Walz*
Contents

Preface .......................................................................................................................... v
Contributors ................................................................................................................... ix

1. Technology of Patch-Clamp Electrodes
   Richard A. Levis and James L. Rae ......................................................................... 1

2. Whole-Cell Patch-Clamp Recordings
   Harald Sontheimer and Michelle L. Olsen ............................................................ 35

3. Single-Channel Recording
   David J.A. Wyllie .................................................................................................. 69

4. Combined Fluorometric and Electrophysiological Recordings
   Hartmut Schmidt and Jens Eilers .......................................................................... 121

5. Combining Uncaging Techniques with Patch-Clamp Recording and Optical Physiology
   Dmitry V. Sarkisov and Samuel S.-H. Wang ...................................................... 149

6. Visually Guided Patch-Clamp Recordings in Brain Slices
   James R. Moyer, Jr. and Thomas H. Brown ......................................................... 169

7. In Vivo Patch-Clamp Technique
   Hidemasa Furue, Toshihiko Katafuchi, and Megumu Yoshimura ......................... 229

8. Perforated Patch-Clamp Techniques
   Constantine Sarantopoulos .................................................................................. 253

   Manfred Heckmann and Stefan Hallermann ....................................................... 295

10. Pipette Internal Perfusion: Methods and Applications
    Srinivas M. Tipparaju and Aruni Bhatnagar ...................................................... 309

11. Loose-Patch-Clamp Method
    Héctor G. Marrero and José R. Lemos ................................................................ 325
12. Recording Currents from Channels and Transporters in Macropatches
   Guiying Cui, Matthew D. Fuller, Christopher H. Thompson, Zhi-Ren Zhang, and Nael A. McCarty ............................................. 353

13. Structure-Function Analyses of Single Cells by Combining Patch-Clamp Techniques with Reverse Transcription–Polymerase Chain Reaction
   Gerald Seifert and Christian Steinhäuser .................................................. 373

14. Planar Patch Clamping
   Jan C. Behrends and Niels Fertig .......................................................... 411

15. Automated Glass Pipette–Based Patch-Clamp Techniques
   Michael Fejtí, Uwe Czubayko, Alexander Hümmer, Tobias Krauter, and Albrecht Lepple-Wienhues ................................. 435

Index ........................................................................................................... 451
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