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 5μm 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 macropatch 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