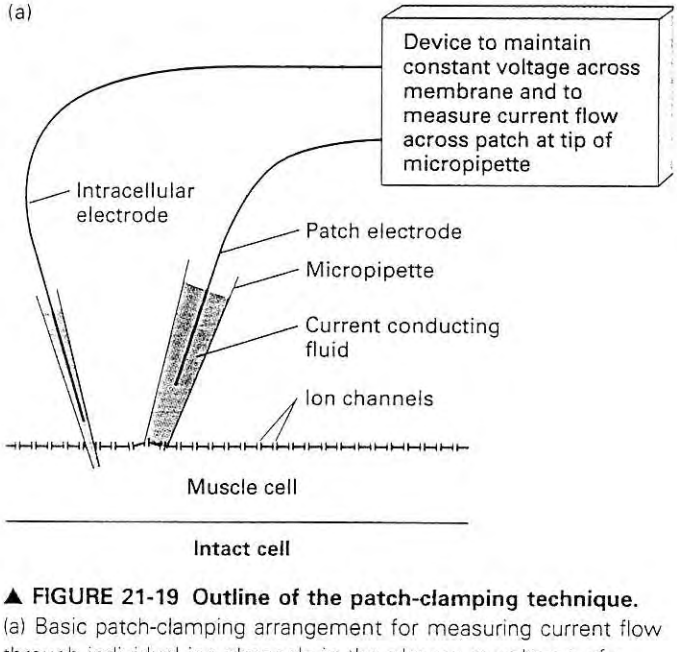
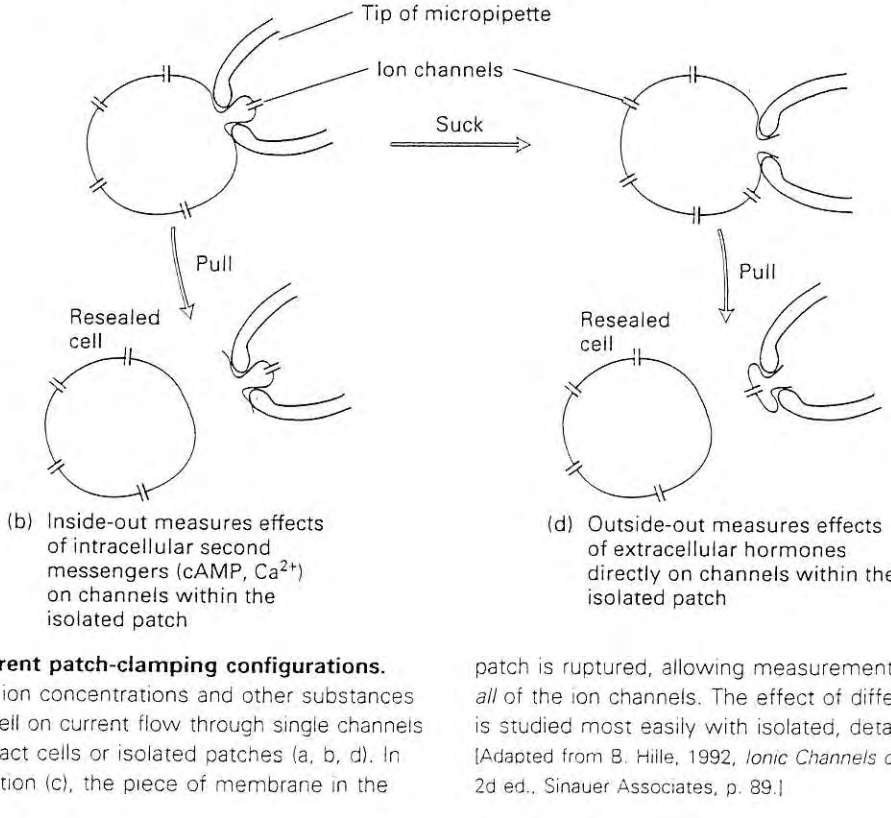


▲ **FIGURE 21-19 Outline of the patch-clamping technique.** (a) Basic patch-clamping arrangement for measuring current flow through individual ion channels in the plasma membrane of a living cell. The patch electrode, filled with a current-conducting saline solution, is applied, with a slight suction, to the plasma membrane. The 0.5-μm-diameter tip covers a region that contains only one or a few ion channels. The second electrode is inserted into the cytosol. The recording device measures current flow only through the channels in the patch of plasma membrane. (b) Photomicrograph of the cell body of a cultured neuron and the tip of a patch pipette touching the cell membrane. [Part (b) from B. Sakmann, 1992, *Neuron* **8:**613 (Nobel lecture); also published in E. Neher and B. Sakmann, 1992, *Sci. Am.* **266(3):**44.]



▲ **FIGURE 21-20 Different patch-clamping configurations.** The effects of different ion concentrations and other substances within and outside the cell on current flow through single channels can be measured on intact cells or isolated patches (a, b, d). In the whole-cell configuration (c), the piece of membrane in the patch is ruptured, allowing measurement of current flow through *all* of the ion channels. The effect of different solutes on channels is studied most easily with isolated, detached patches (b, d). [Adapted from B. Hille, 1992, *Ionic Channels of Excitable Membranes*, 2d ed., Sinauer Associates, p. 89.]