

Displacement currents in the node of Ranvier - Voltage and time dependence

Nonner, W.

Rojas, E.

Stämpfli, R.

The time course of the membrane currents in the node of Ranvier in which the sodium and potassium conductances have been blocked reveals asymmetries during and after the application of depolarizing and hyperpolarizing voltage-clamp pulses of identical size. Since, 1. the integrals of the "on" and "off" current transients were found to be equal and opposite, 2. the charge displaced reached saturation (about $140 \cdot 10^{-15}$ C/node) when the internal potential was taken to a sufficiently positive value during the depolarizing pulses and, 3. the size of the charge transferred was unaffected by temperature although its time constant had a large temperature coefficient ($Q_{10}=2.4$), these currents to our opinion must result from charge movements confined to the membrane and, therefore, can be considered as non-linear displacement currents. The steady-state rearrangement of the charges is consistent with a Boltzmann distribution of charges (effective valence $z=1.65$) between two configurations charact