生物物理学 I　Handout No. 7

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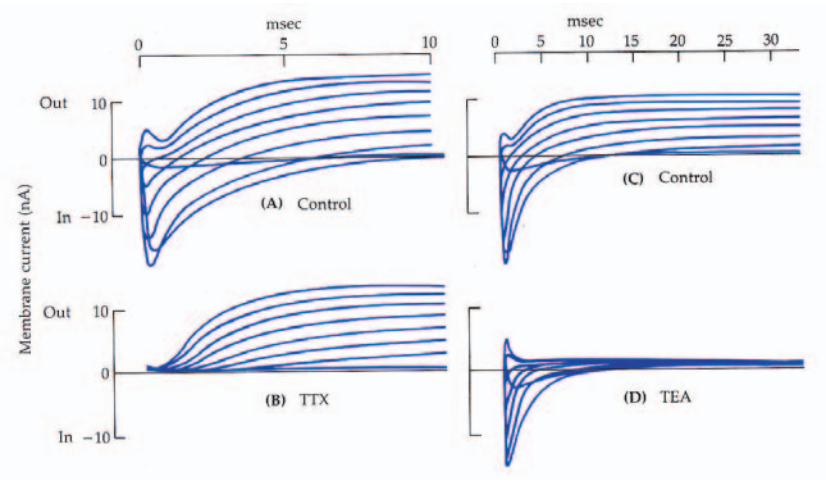

Figure 5.15. Voltage clamp records for frog nodes, showing separation of the sodium and potassium currents by the use of selective blocking agents. The membrane potential was clamped at -120 mV for 40 ms before the start of the records, and then depolarized to various levels ranging from - 60 to + 60 mV in 15 mV steps. Leakage and capacity currents were subtracted by computer. Records in a and c show the normal response. In b the node shown in a was treated with 300 nM tetrodotoxin (TTX), which blocks voltage-gated sodium channels: only the potassium current remains. In d the node shown in c was treated with 6 mM tetraethylammonium (TEA), which blocks voltage-gated potassium channels: only the sodium current remains. (From Hille, 1984, after Hille, 1966 and 1967.)

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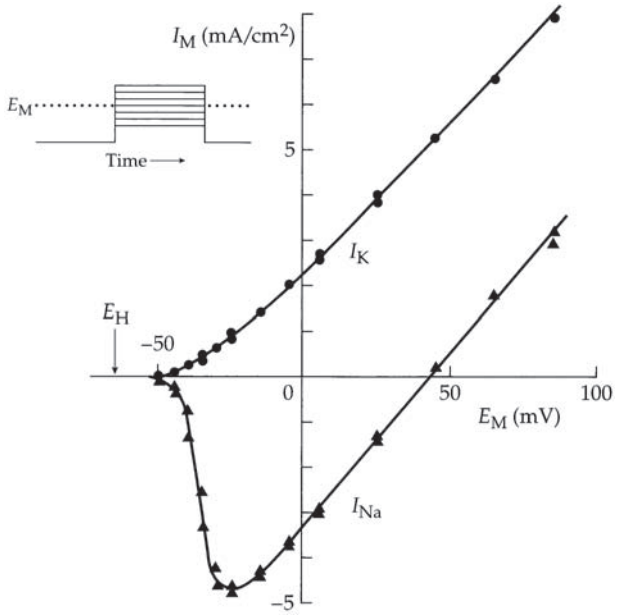

2.9 Current-Voltage Relations of a Squid Axon
The axon membrane potential is stepped under voltage clamp from the negative holding potential (E_H) to various test potentials, as in Figure 2.7. Peak transient Na^+ current (triangles) and steady-state K^+ current (circles) from each trace are plotted against the test potential. The nonlinearity of the two I-E relations between -50 to -20 mV reflects the voltage-dependent opening of Na and K channels by depolarizations, as explained in Figure 1.6. [From Cole and Moore 1960.]

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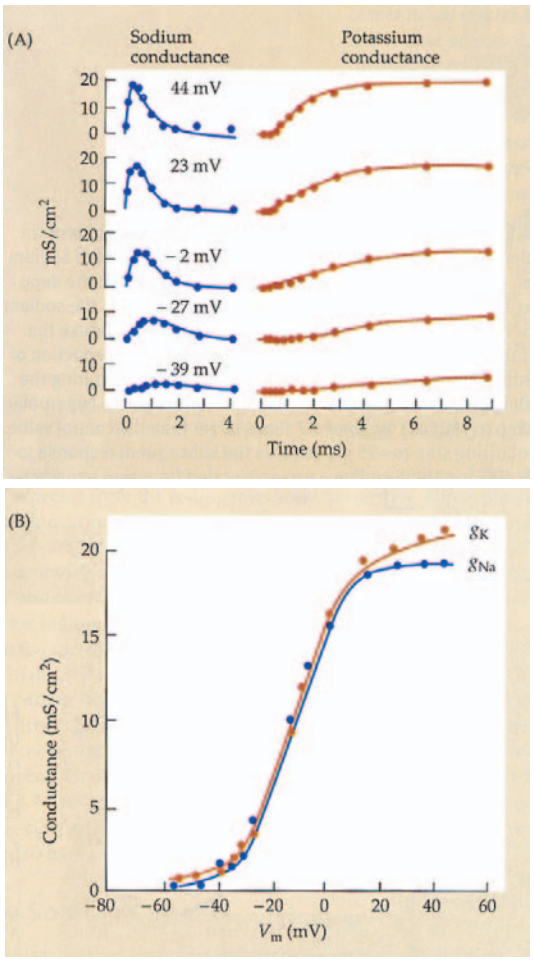

FIGURE 6.7 Sodium and Potassium Conductances. (A) Conductance changes produced by voltage steps from -65 mV to the indicated potentials. Peak sodium conductance and steady-state potassium conductance both increase with increasing depolarization. (B) Peak sodium conductance and steady-state potassium conductance plotted against the potential to which the membrane is stepped. Both increase steeply with depolarization between -20 and +10 mV. (After Hodgkin and Huxley, 1952b.)

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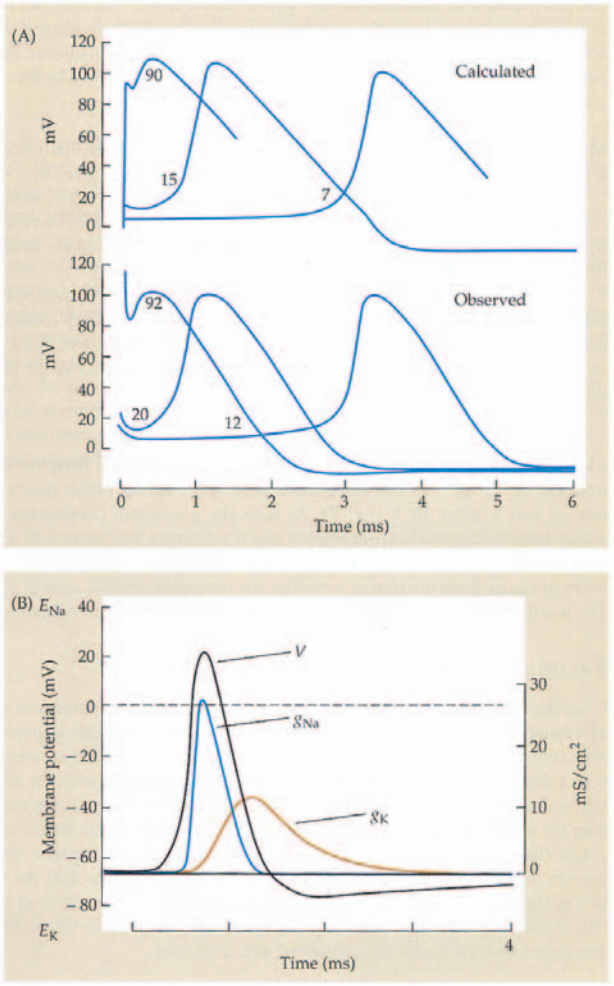

FIGURE 6.8 Reconstruction of the Action Potential.
(A) Calculated action potentials produced by brief depolarizations of three different amplitudes (upper panel) are compared with those recorded under the same conditions (lower panel). (B) Relation between conductance changes (g_{Na} and g_K) and the action potential (V), calculated for a propagated action potential in a squid axon. (After Hodgkin and Huxley, 1952d.)