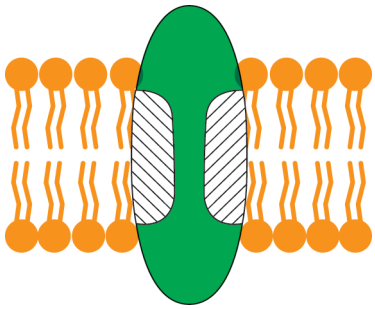
Chapter 9

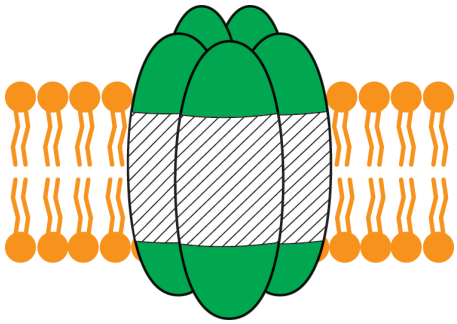
Web Text Box 3

How channels are built: an illustration of protein three-dimensional structure

The first channel we meet in the book, the connexon (book page 46), is formed of six identical transmembrane protein subunits called connexin. In fact, most channels are, like connexons, multimeric. To simplify an enormously complex subject, the individual oligomers that make up channels are usually integral membrane proteins with a hydrophilic streak down one side. The diagram below shows one oligomer, with the parts of its surface that are hydrophilic shown green and the parts that are hydrophobic shown black.



These oligomers then assemble in a rosette in which the hydrophilic streaks are located at the center of the cluster, as indicated in the diagram below. It is energetically profitable for them to do so, because otherwise the hydrophilic streak would be sitting in the hydrophobic interior of the membrane. The hole through which hydrophilic solute passes lies at the center of the rosette and is lined by the hydrophilic streaks of the individual oligomers.



Changes of shape of the entire complex or within the individual oligomers, sometime subtle, sometimes more major, act to gate the channel open and closed. One channel whose gating we understand in considerable detail is the nicotinic acetylcholine receptor (book page 274). For an animation of its operation see http://www2.mrc-lmb.cam.ac.uk/groups/nu/research2.html .