CHAPTER 13. CHANNELS AND FUSION

Ion-Selective Channels Allow Rapid Movement of Ions across Membranes

An **ionophore** (from Greek *ion* and *-phore*, "ion carrier") is a chemical species that reversibly binds ions. Many ionophores are lipid-soluble entities that transport ions across the cell membrane. Ionophores catalyze ion transport across hydrophobic membranes, such as liquid polymeric membranes (carrier-based ion selective electrodes) or lipid bilayers found in the living cells or synthetic vesicles. Structurally, an ionophore contains a hydrophilic center and a hydrophobic portion that interacts with the membrane.

Ion channels are distinguished from ion transporters in at least three ways. First, the rate of flux through channels can be several orders of magnitude greater than the turnover number for a transporter— 10^7 to 10^8 ions/s for an ion channel, near the theoretical maximum for unrestricted diffusion. Second, ion channels are not saturable: rates do not approach a maximum at high substrate concentration. Third, they are "gated"—opened or closed in response to some cellular event. In ligand-gated channels (which are generally oligomeric), binding of an extracellular or intracellular small molecule forces an allosteric transition in the protein, which opens or closes the channel.

Membrane fusion, one of the most fundamental processes in life, occurs when two separate lipid membranes merge into a single continuous bilayer. Fusion reactions share common features, but are catalyzed by diverse proteins. These proteins mediate the initial recognition of the membranes that are destined for fusion and pull the membranes close together to destabilize the lipid/water interface and to initiate mixing of the lipids.

Exocytosis and endocytosis, mechanisms of transport (out of and into cells, respectively) that involve membrane fusion and fission, provide paths between the cytoplasm and surrounding medium, allowing for secretion of substances produced within the cell and uptake of extracellular materials.

Aquaporins Form Hydrophilic Transmembrane Channels for the Passage of Water