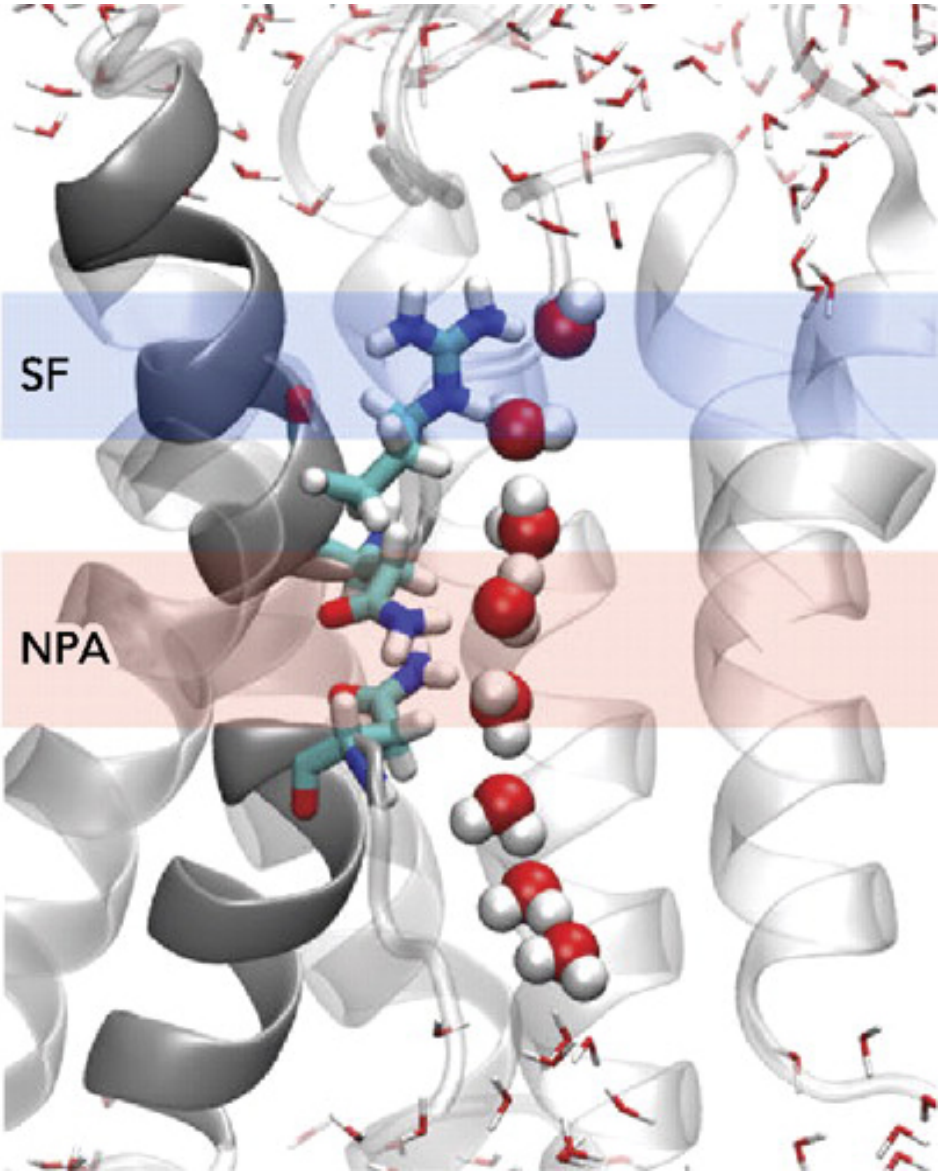
2006.Illimoise University

Physics, **Computer Science**, and **Biophysics** at **University of Illinois**

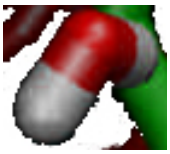
Peter Agre discovered the first aquaporin in 1992 in red blood cells and was awarded the 2003 Nobel Prize. Since then, 13 variants of aquaporin have been found in animals and humans and 35 in plants. There are thousands of these aquaporins in every cell membrane. Aquaporins contain a conduit that is so tiny that only a single water molecule at a time can pass through it. But this traffic can be lively indeed. In one second, several billion water molecules can get through. The direction of this water flow is contingent on the osmotic pressure. The water moves in a direction away from a low and toward a high concentration of salt and nutritional substances. But the conduit isn't always open. The Lund scientists have found out how it opens and closes. This was done in collaboration with a team at Chalmers University of Technology in Göteborg, Sweden, under the direction of Richard Neutze, and with Emad Tajkhorshid at the University of Illinois 2005.



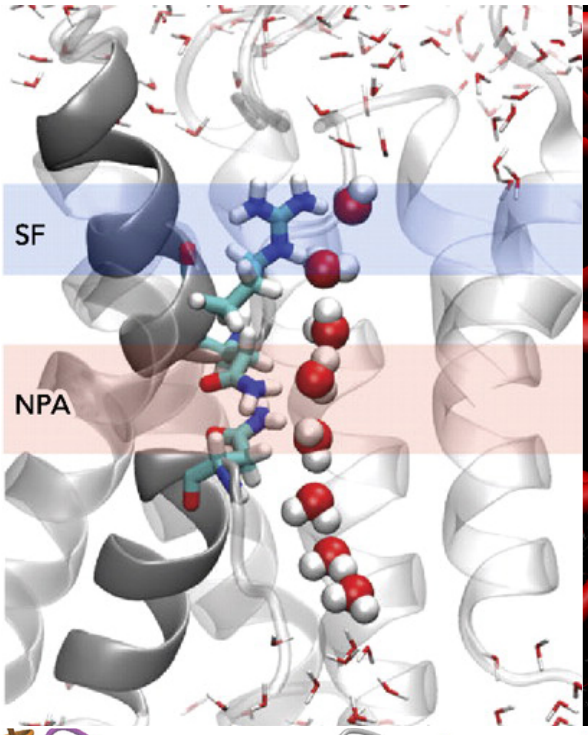
Mid-Stream Flip-Flop
This closeup snapshot **shows** the single-file 9 line of **water** 8 molecules **H_2O**

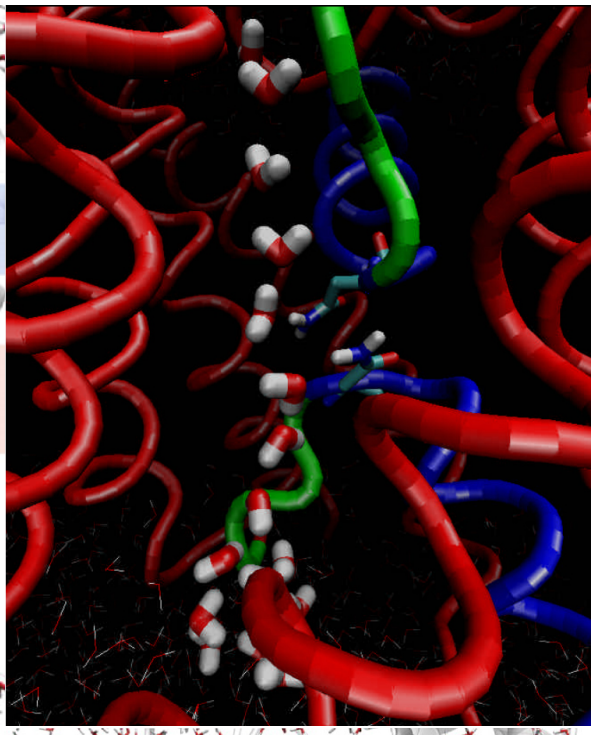

Hydrgen up

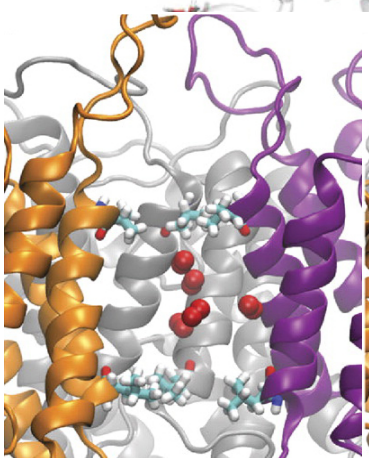
H-O-H
H-O-H
H-O-H
H-O-H
H-O-H
H-O-H
H-O-H
H-O-H

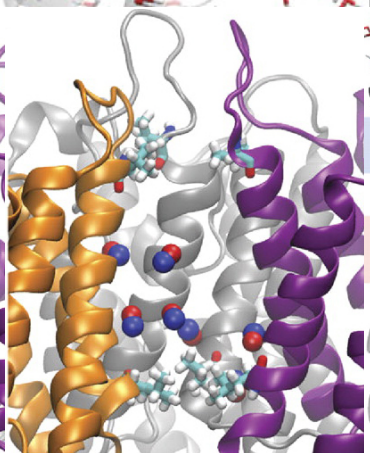

Hydrgen down

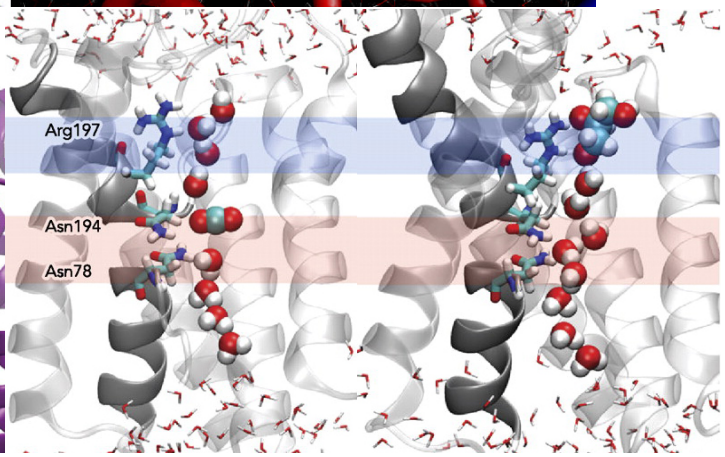
as they progress through the **aquaporin channel**. Because the **water** flips at the mid-point of the **channel**, **protons H^+** can't pass through.



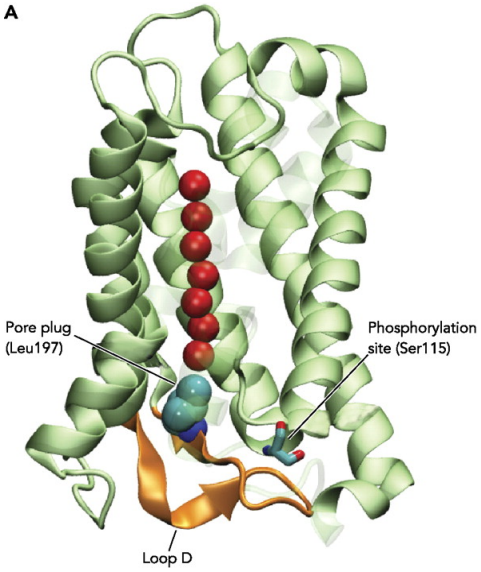


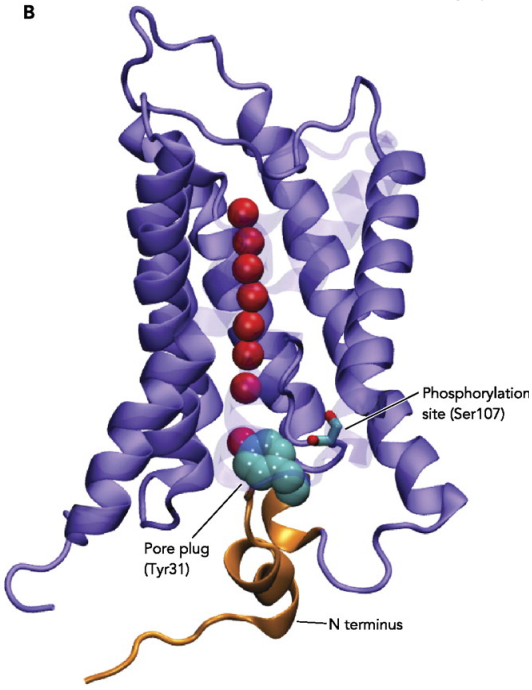






O_2 CO_2 NO glycerol $HOH_2C\text{-}HCOH\text{-}CH_2OH$





Pore Plug amino acid residues
Tyr31 on **N-terminus** and **Leu197** on **loop D**

Phosphorilation sites **Ser115** and **Ser107**