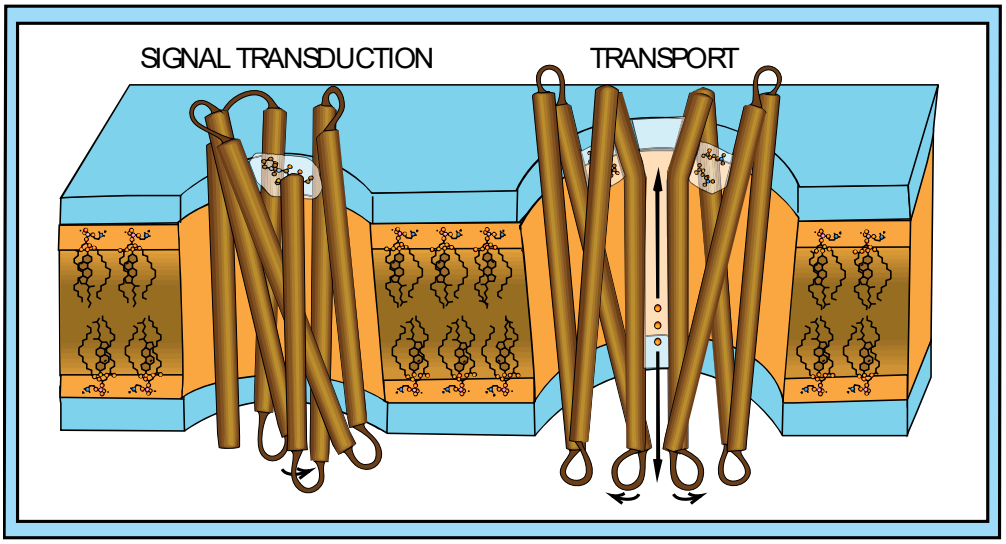
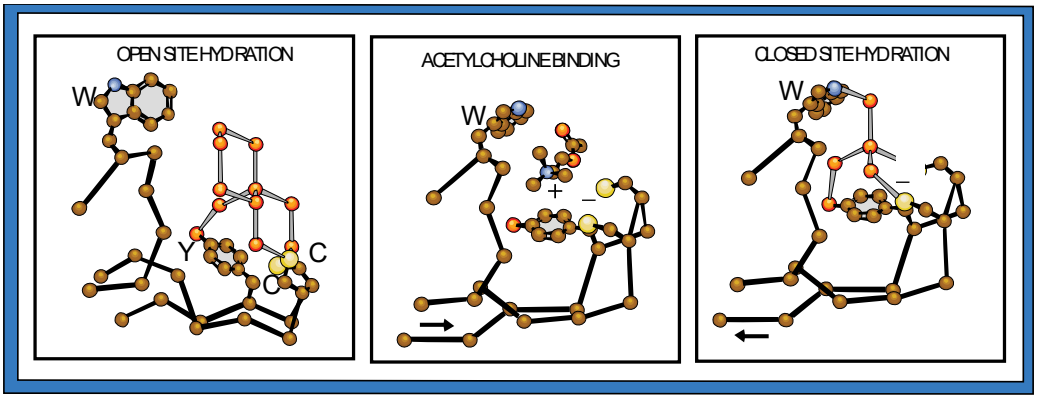
MEMBRANAL PROTEINS AND REGULATOR MOLECULES

Membranal Proteins

Undoubtedly, a number of proteins with coils began entering membranes with non-polar lipid peptides on the outer surfaces and a variety of polar and ionic peptides on the inside. Some of them formed simple trans-membrane pores to permit potassium ions and protons to pass in and out. Other **Transport Proteins** for sodium and calcium ions remained closed until neurotransmitter molecules bound to the outer surface of the coils opened the pores. Still other **Signal-Transduction Proteins** bound neurotransmitter or hormone molecules on the outside to rotate one or more coils and activate enzymatic proteins inside.[61,62]



Originally, thermal energy might have turned coils and opened pores but the binding of small molecules, which mimicked the dimensions of linear elements of water, provided prolonged activation.[62]



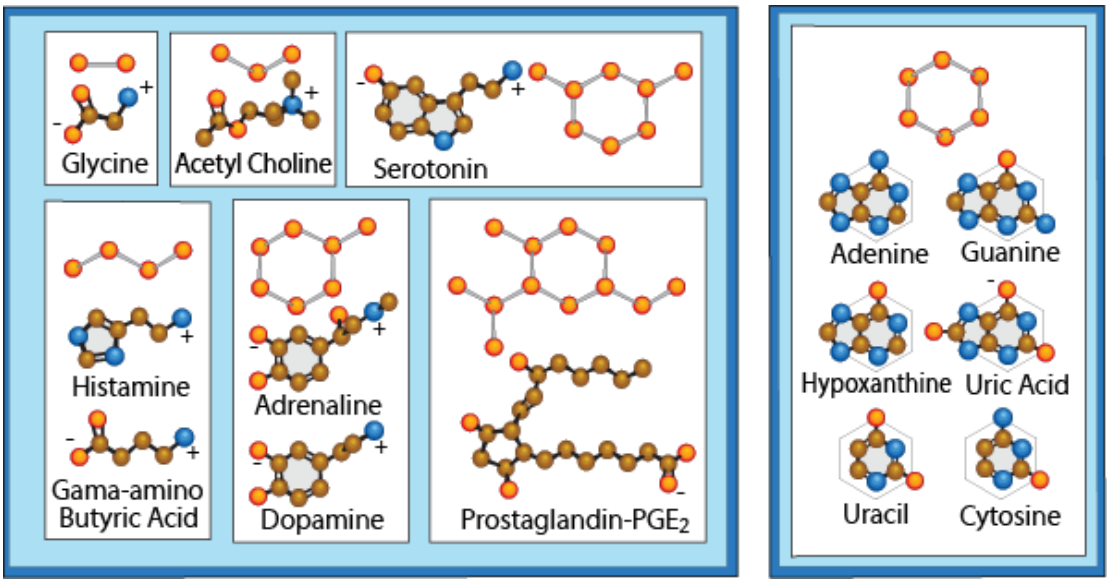
For example, **Acetyl Choline** is a good example of how a very small neurotransmitter

molecule can activate a large ion-transport pore in a number of types of cells. In the **Resting State** of a nerve cell in the electric eel, two binding sites for acetylcholine, are on opposite sides of a central pore. When the sites are open, they are highly hydrated with random water and transient linear elements of hydration filling the sites as shown on the left above.[64] However, when acetylcholine molecules are released from neighboring cells, they enter the sites, displace the water and draw the anionic cysteine sulfides (Cs) and tyrosine phenol ring (Y) up it around them. By closing the sites into **Activated States**, linear polypeptides attached to the sites rotate coils on both sides of a central pore. As the coils rotate, the pore opens and sodium ions to rush into the cell. However, activation is short because acetylcholine binding is weak and surface water rapidly displaces it to produce a hydrated closed state, as shown on the right, and then rapidly opens to the resting state. As the acetylcholine molecule moves out, hydrolytic enzymes nearby convert it into acetic acid and choline so it cannot produce further activation. Although water molecules are illustrated above only in ordered positions, it must be remembered that most water molecules are in random positions and only occasionally form covalently-ordered linear elements.

Thanks to professor Unwin and his coworkers, we have the above view of how this receptor protein functions. This one is more complex than most which appear to be opened and closed simply by admitting and deleting single water molecules.

Neurotransmitters and Hormones

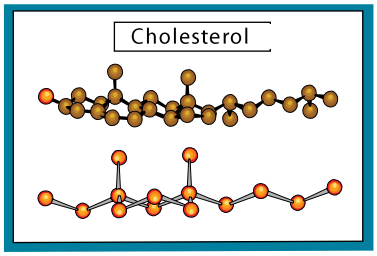
Of course, this is just one example of how neurotransmitters and hormones most likely activate binding sites in receptor proteins but, as illustrated below, all of them examined to date mimic dimensions of covalent linear elements of water molecules.[8,29] Thus, it is likely that they all displace transient linear elements of hydration as receptor binding sites open and close.

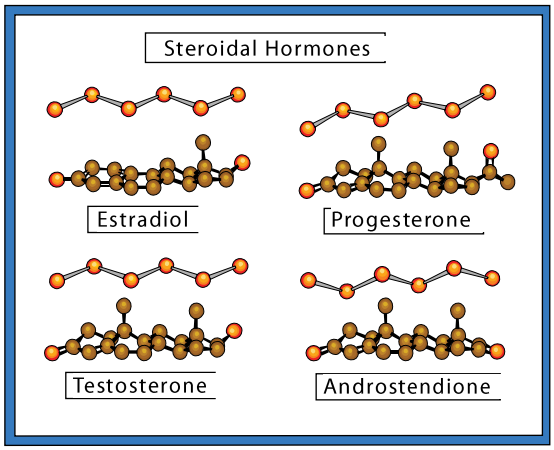


Only a few of the heterocyclic molecules on the right are regulators but all of them are important components of living cells and they all, like glucose, mimic hexagonal water.

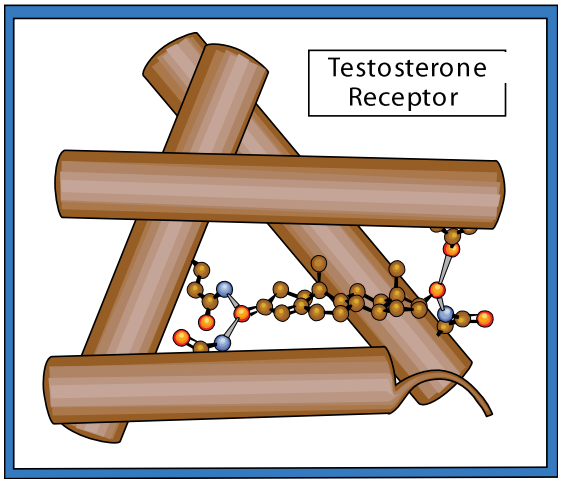
Based on the enzymatic property of "**Feedback Control**," if a molecule produced by an enzyme is not used and its concentration remains high, production slows and, eventually, stops. Molecules which were produced at random in the early phases of molecular evolution and found a use in binding to other molecules continued to be produced – those which did not serve a function, were no longer produced. Thus, molecular selection was based, not only on the spatial relationship to quantized linear elements of hydration but on the basic properties of the enzymes which produced those molecules.

For example, cholesterol is an extremely important molecular component of nerve and muscle membrane because it stabilizes phospholipid chains in their energetic, alpha state.[61,62] At the same time, by enzymatically clipping off the tail section and attaching oxygen atoms to various positions, a variety of molecules were produced which mimicked transient linear elements of six and seven water molecules.[8, 29] A number of those molecules became hormones which activate a variety of functions.





Each hormone molecule binds to a site with slightly different peptides around the site.[67] In viewing the receptor site occupied by testosterone, which was reported by Breton in 2006, it is easy to see how a transient linear element of water might briefly occupy the site in the absence of the testosterone molecule.[68]

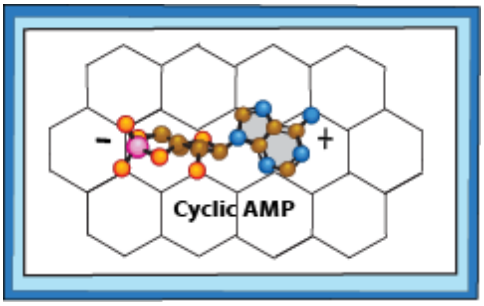


Thus, based on the TLH hypothesis, the "ability" of certain molecules to mimic the dimensions and polarity properties of transient linear elements of water might have played an important role in their "selection" as regular molecules and may continue to play a vital role in their functions today.[8,29]

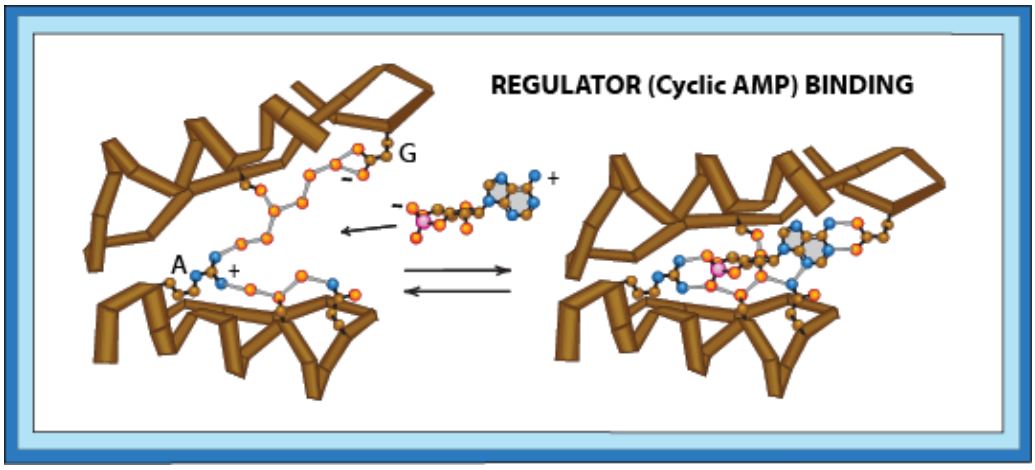
Unfortunately, if specific experimental evidence is not available to document the involvement of water in a process or in stabilizing a structure it is usually ignored. Today, most scientists believe that water is simply a solvent, like any other liquid - natural molecules and biomolecular processes, even in text-books, are viewed as if water is not involved. Water is so ubiquitous and order formation and decay so rapid, that experimental detection in molecular biology has been extremely difficult. Remove of water to examine the role has been unsuccessful because free **"disordered water**" is as important to function as "**surface-ordered water**." It is the interplay between disorder and order in surface water which provides for both spontaneity and order in function.

Cyclic Adenosine Monophosphate (Cyclic AMP)

Before we leave the subject of regulators, it is important to look at the structure of cyclic adenosine monophosphate, **cyclic AMP**.



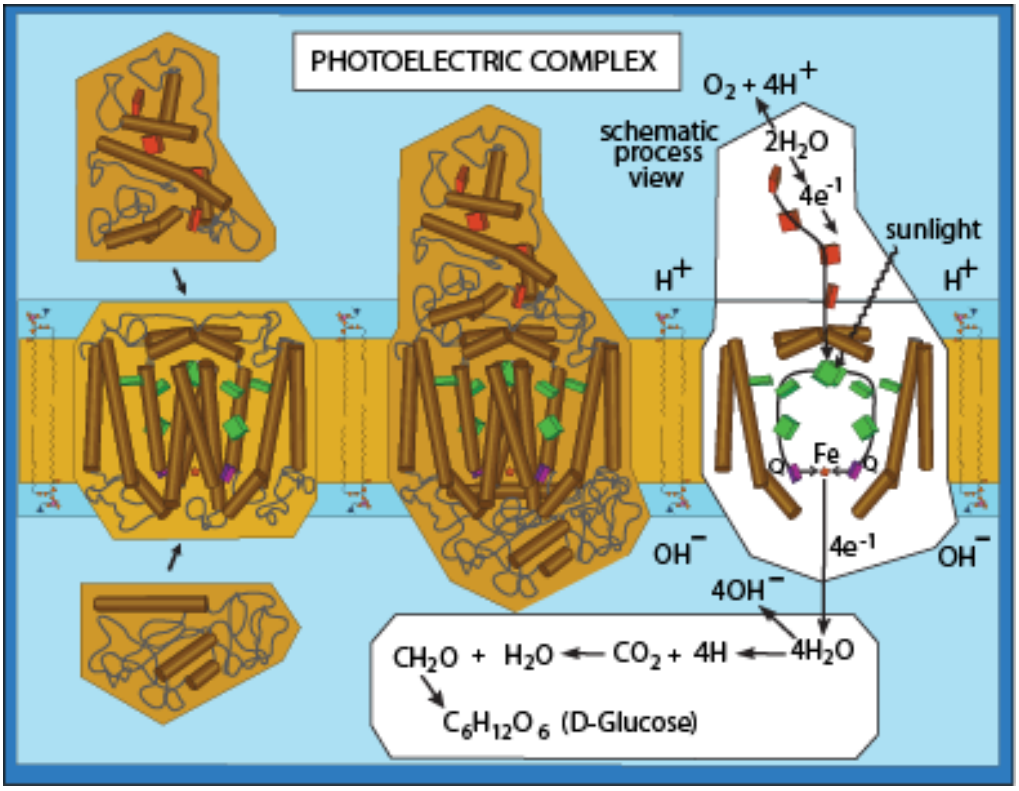
As a component of almost every living cell and one of the most important regulators in our bodies, it is an excellent example of a molecule whose spatial structure is nothing like ordered water and yet it fits uniquely into the cubic patterning of water. It is produced from ATP and called a "**second messenger**" because it binds to proteins within cells to regulate functions when regulator molecules bind to receptor sites on the outside. With two anionic oxygens on one end and a cationic nitrogen on the other end, the molecule in its extended form, is a dipole which binds to oppositely-charged groups in receptor sites which, like those of steroidal hormones, are separated by six linearly hydrogen-bonded water molecules. The two oxygen atoms on the ribose ring in the middle are both in cubic-lattice water positions.



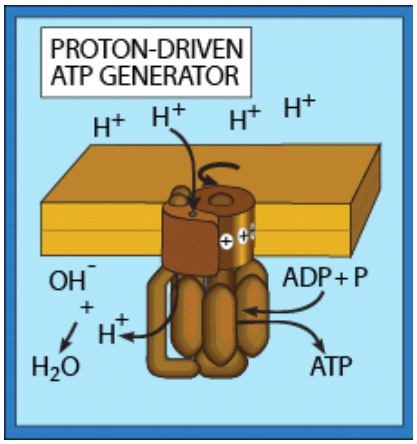
The above simulation illustrates how a cyclic AMP molecule, in binding to a positively-charged arginine, A, on one protein and a negatively-charged glutamate, G, on another, brings the two proteins together to activate an enzyme. Prior to binding, both surfaces are highly hydrated but, by binding cyclic AMP, all bridging water is displaced and a stable anhydrous union of the two proteins is established. Of course, like the acetylcholine receptor, the system is dynamic - external water continually competes for binding to displace the cyclic AMP molecule. Hopefully, as more detailed studies are performed, data will be obtained to document the role of water in receptor sites and in molecular biology.

Photosynthesis

One of the most important and absolutely amazing systems to evolve was the photosynthetic complex. Original complexes which accomplished photosynthesis were extremely crude involving iron ions complexed with copper, sulfur and other elements. Although the one shown below is extremely complex, it was isolated from a bacteria which is believed to have been on earth long before plants and animals.[65]



As you can see, it is composed of three protein complexes - one in the membrane composed of two identical proteins and one on each side of the membrane. The central unit holds eight electron-conducting green chlorophyll molecules in a circle. When a photon of sunlight energy is absorbed by an electron in an electron pair between the two chlorophylls at the top, the spin of one of the electrons is reversed and the two electrons repel each other - one goes to the left and one to the right - each to a quinone molecule, Q, and then to an iron atom below. As electrons move from the four red heme molecules in upper protein to replace those moved from the pair of chlorophyll molecules, they electrolyze water to produce an oxygen molecule and positive hydronium ions on the outer surface. At the same time, electrons passing through the lower iron ion electrolyze water to produce negative hydroxide ions and active hydrogen atoms in the lower protein which react with carbon dioxide to produce formaldehyde and then glucose. Although the protein is complex, the process of converting formaldehyde into glucose is the same as the one proposed earlier to have produced glucose when bioevolution began.



However, it is almost unbelievable that the positive protons produced on the outer surface of the membrane, to reach the negative hydroxyl ions inside, pass through molecular generators with a central rotor which drives **phosphate (P) ions** on the rotor into **adenosine diphosphate (ADP)** molecules on the walls to produce high energy **adenosine triphosphate (ATP)** molecules.[66] It is a molecular generator/motor with rotating parts which evolved a billion years ago but functions like electric motors today. Of course, the difference is that it is driven by protons, not electrons.

It seems almost impossible that such ingenious devices could have formed spontaneously from random parts. Even an ardent believer in evolution, on viewing the incredible complexity of this photoelectric/ATP-generating system, must be forced to agree with creationists that these systems are simply too **Perfect** to have been produced without a **Plan**. And yet, even these extremely complex molecular systems, on heating in the ionic medium of the cell, separate into their individual molecular components and, on cooling, spontaneously reassemble to give the same functional units. Again, as incredible as it may seem, if the parts were produced at random - even at separate times - they fit so perfectly together that they would have assembled spontaneously to form the functional units which exist today.

It is difficult to imagine how so many different parts, composed of only a dozen different types of atoms, could have programed their own assembly into life-giving forms. It seems almost impossible that it was not a **Plan** which produced the living cell but rather specific **Quantized Rules of Bonding** between sub-atomic particles, atoms and molecules lead to the formation of **Life**. Again, it seems that once the rules of bonding and distances were established, the system moved spontaneously to produce the living cell and all of its permutations. Each step along the way, even though fed by energy from the sun, was most likely guided by the order/disorder properties of surface water.

Now, let us look at the role that ions may have played in the formation of functional living cells.