Reconstitution of water, salt and protein potential by gravity

Running title: Gravity and hydrogen bonding in biology

Jan Bijman. Dept. of Cell Biology, ErasmusMC, The Netherlands

Keywords: Molecular biophysics, mRNA, siRNA, hydrogen bonding, mRNA strings, siRNA, gravity

j.bijman@erasmusmc.nl

Abstract:

Free intermolecular space of frozen water is 0.0809 ltr/ltr ice, which allows 4.89 mole H_2O_ice dipole capacitance to sublimate as hydrogen H^+gas and hydroxyl OH^-gas buffer ions into this space when ice melts. Super fluidity of water by gas formation is due to hydrogen bonding. It generates reversible adiabatic isentropic sublimation of ice into gas and vice versa, with corresponding changes in volume energy, +8.3 Joule/mole. Bonding ‘admittance’ is 15mCoulomb(H^+OH^-) or 0.83 Joule per ltr.sec, causing the accumulating of buffer gas to 8.3 Joule/ltr 10 sec in the intermolecular gas space. Capacitance (C) to current (C/sec) phase shifting in this space reconstitutes the H_2O_ice dipole capacitance at an acceleration of 10 mtr/sec^2. One mole ice is disassembled and reconstituted every 10 seconds. The bonding activity of water enables enzymes like 3Na/2K-ATPase or ribosomal mRNA to reconstitute information from a remote source across large distance. Sets of enzymes divided over 10 subspaces send each 1/10th of this remote information (-0.83 Joule/sec) to a receiver, e.g. the genome, while reconstituting the remote information (8.3 Joule/mole) in 10 seconds.

Introduction:

An electromagnetic water H_2O_water dipole is unable to move because the molecule would generate capacitance and current simultaneously. It is therefore a H_2O_ice
Results:

Water reconstitution Bonding activity generates 30mC(e)'/mole'H2O'ice. This electron activity is wrapped up as capacitance (C) in 'H2O'ice molecules that can dissociate as H' and OH' gas buffer ions per cm² in i_g. Using Faraday's law (Eq.3) it can be shown that half of this charge returns as non-dissociated 15mCH2O gas bound to one mole'H2O'ice (fig.1b, Eq.4). The other half of the buffer capacitance temporarily is stored as 30mC(H' + OH')gas capacitance in ig. The size of ig is 0.0809ltr/ltrice (Eq.2b). Knowing the size of the pool allows calculation of the equilibrium volume of ice sublimated to gas (Vice, δVgas) and the volume of gas sublimated to ice (Vgas, δVice, Eq.'s 5a,d). The equations show that in equilibrium 15mC'H2O'ice enters the pool as 30mC(H' + OH')gas (+0.83Joule/mole) while 15mCH2O gas non-ionized gas bound to one mole'H2O'ice (-0.83joule/mole) exits the pool. The pool is saturated with 300mC(H' + OH')gas capacitance (8.3Joule/mole) when the capacitance of 10 serial 0.11ltrice subspaces of 1ltrice have been collected. The pool then contains all the information, 8.3Joule/mole, for complete reconstitution of the original dipole capacitance (before bonding activity started to disentangle it). At saturation the pool capacitance (C10sec) turns into current (C0.1sec) and the pool is emptied at an accelerated rate of 10mtr/sec² (= 10x0.1sec⁻¹x1000cm²/cm²sec). By emptying the original dipole the energy of 8.3Joule/mole is transferred to the ice dipoles attached to the gas ions. The original dipole capacitance becomes reconstituted while simultaneously the bound H2O gas capacitance is released from the 'H2O'ice dipoles as (H' + OH')gas capacitance, which start to refill the gas store.

Salt reconstitution and salt admittance The enzyme 3Na/K-ATPase (fig.2a) mimics the water capacitance generation for realization of transcellular NaCl salt transport. By current clamping the enzyme collects in 1mole(H' + OH')gas an amount of 30mC(Na' + Cl')gas in ig, at the outside of the apical membrane where it precipitates as 15mCH2O/moleH2O'ice (-0.83Joule NaCl/litrsec¹, Eq.5c). Subsequently this information is also collected from other enzymes active in 9 other subspaces of 1literice until ig at the apical membrane is saturated with non-
ionized 150mC NaCl/mole_{ice}. The information of this amount is 8.3 Joule/ltr and is collected as serial capacitance in a period of 10 seconds (fig.2b). It is transported at once (gravity) to the basolateral side of the cell, while 300mC (H^+ + OH^-)_{gas} returns in the gas phase while imploding by gravity to 150mC non-ionized gas. The latter is the driving force for the NaCl uptake, initiated by a phase transition from water capacitance to ion current, causing a net admittance or net NaCl uptake of 8.3 joule/mole. 10 seconds or 15mC NaCl/mole H_2O sec^{-1}. Ice is not compressible and salt transition is therefore invariant with the distance \Delta x. The enzymes require ATP. The enzymatic NaCl ice/gas conversion is compatible with the gas constant 8.33Joule/ltr + H_2O - ice (0.150*55.55 Joule/ltr.10sec or 8.3Joule per mole_{ice} in 10sec)\textsuperscript{1-3}. Note that the NaCl volume is disassembled and reconstituted in different spots.

**Protein reconstitution and protein admittance** In the previous section reconstitution by the enzyme 3Na/2K-ATPase of a given salt volume has been shown, but reconstitution of a given mass by current, for example protein reconstitution, is also possible. The complementary fusion of H^+ and OH^- ions or amino acid terminals by the ribosomes generates a capacitative current of mRNA bound to H_2O_{ice} (fig.3a). This ribosomal pairing of amino acids yields a shift in the water bonding potential of 15mC(e') per \textsuperscript{18}H_2O/3mRNA_{ice} when a mRNA codon and 2 amino acids are read and fused simultaneously by the ribosome (Eq.5d). This \textsuperscript{18}H_2O/3mRNA_{ice} codon capacitance has an equivalent bonding value of 6\delta H (fig.1a) and replaces existing bonding capacitance of trapped \textsuperscript{18}H_2O_{ice} in the genome, which escapes as 30mC OH_{gas} and H^+_{gas} (fig.3a). The entire process can be calculated as follows. A string \alpha with given volume and information content is copied as capacitance to the genome where it replaces a string of \textsuperscript{18}H_2O_{ice} capacitance in the genome with given length \beta (Eq.6a-c). The latter escapes from the genome as (H^+ + OH^-)_{gas} current. Both strings are supposed to have identical bonding potential (sum of potentials is zero, Kirchhoff’s law). This sum describes the sublimation of a volume of ice capacitance to capacitive gas current \iota_{gas} (V_{ice}, \delta \iota_{gas}) and the sublimation of gas capacitive current to ice capacitance (iH_2O_{gas}, \delta V_{ice}). To solve this equation we need to know the equivalent capacitance of a volume H_2O_{ice}, which is calculated as follows. Current/mtr (100cm) is converted to capacitance/cm$^2$ in a volume of 1/10ltr (100cm$^3$) and the equivalent capacitance of 0.1ltr_{ice} is therefore 10$^{22}$C/10$^{18}$ltr H_2O_{ice} (Eq.7). Substitution of these values in Eq.6a yields a value of 0.83Joule per 0.1ltr for the string ratio of \alpha/\beta, and the value becomes 8.33Joule per mole/ltr.10sec (fig.’s 1e,3b, Eq.6c). The result strongly suggests that electro dynamical mRNA strings containing \textsuperscript{18}H_2O/3mRNA_{ice} codons (-0.83Joule) with protein information from 10 subspaces are sent to the genome. On the genome this information is collected from ribosome’s in 10 subspaces up to -8.3Joule/ltr.10sec at once (by gravity). Simultaneously (H^+ + OH^-)_{gas} starts...
refilling the gas space of water\textsuperscript{1d}, while it accepts the energy contents of the information strings (8.3joule/10sec) A transmission stop is provided by non-coding genes, which generate double free radical strands RNA\textsubscript{gas} of 22 nucleotides short interfering siRNA\textsubscript{gas} or micro RNA\textsuperscript{4,5}. These strands have a surplus bonding potential of 22 bonding units, enough to eliminate 18mRNA nucleotides from the genome Fig.5b\textsuperscript{1d}. These siRNA strands bind to antisense sequences of a given mRNA strand that is attached to the genome, short-circuiting the RC-circuit of information transmission. It results in mRNA break down\textsuperscript{5,6} of a given protein and withdrawal of genomic mRNA (fig.5b).

Discussion:

The unifying concept to transmit particles from one place to another is simple. The concept relies on exchange of energy, 8.3Joule/mole, obtained by the reversible isentropic adiabatic sublimation of ice to gas. First the particles are dissected in mass and electricity while the surround of the particles is divided in 10 subspaces. The particle mass is buried in ice, e.g. a combination of 15mCNaCl/mole\textsuperscript{-}H2O\textsubscript{ice} (fig.2) is essentially electroneutral, having no charge at all\textsuperscript{1a,b,c}. These particles are free to go, sensing no mobility constraints from the environment (superconductivity) while their energy and mass coordinates are stored in the gas phase. The information content of this set of particles is minimal, -0.83Joule/mole. The electrical content, 15mC, of these particles is simultaneously stored as 30mC electro dynamical capacitance strings in the gas phase. (fig.'s 3,4). By this volume expansion the information content of these particles in the gas phase becomes +0.83Joule/mole. Particle information is collected from 10 sub-spaces, which yields total information of +8.3Joule/10sec in the gas phase. With this information content the gas phase is saturated. It is emptied by collapse (10msec\textsuperscript{2}), and while the gas collapses to ice the energy content of 8.3Joule/mole simultaneously is transferred to given particles that were frozen and stored somewhere else. Thus, this way volume and charge of original particles – ice dipoles, protein, salt solution etc- are reassembled or reconstituted somewhere else. It is the net effect of the entire operation that is known as admittance (fig.5). Admittance is the net information of 15mC/sec that can pass the dielectrical vacuum of a capacitor. The genome for example is such a capacitor\textsuperscript{1a-d}.

Literature

1 www.bijman.info  
   a The Enzyme 3Na/2K-ATP-ase  
   b The action potential  
   c Hydrogen bonding, water monopoles and electron splitting  
   d RNA mathematics  
Equations:

\[
\begin{align*}
\frac{10^{10} \cdot 10^{12} C(e') \text{ mtr. ltr}}{10^{-7} \cdot 10^{7} \cdot 10^{7} \text{ mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} &= \frac{10^{13} \cdot 10^{12} C(e') \text{ ltr}}{10^{-7} \cdot 10^{7} \cdot 10^{7} \cdot 10^{2} \text{ cm}^2 \cdot \text{mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} \\
\frac{10^{7} \cdot 18 \cdot 10^{12} C(e') \text{ ltr}}{1/3 \text{ mole H}_2 \text{O}_{\text{ICB}} \cdot \text{cm}^2 \cdot \text{sec}} &= 3.10^{2} C(e') / \text{cm}^2 \cdot \text{sec} = 30 \text{mC}^{+} \text{H}_2 \text{O}_{\text{ICB}} / \text{cm}^2 \cdot \text{sec} \\
\frac{1.68 \text{ ltr}}{18 \text{ mole +H}_2 \text{O}_{\text{ICB}}} &= 60.44 \text{ mole +H}_2 \text{O}_{\text{ICB}} \\
\frac{6.10^{2} \cdot 1.66 \cdot 10^{16} C(e') \text{ mtr}}{10^{7} \cdot 10^{7} \text{ mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} &= \frac{10^{2} \cdot 10^{3} C(e') \text{ mtr}}{10^{2} \text{ mole H}^{+}_{\text{GAS}} \text{ sec}} \\
\frac{10^{-7} \cdot 30 \text{ mC} (e') \text{ sec}^{-1}}{1.5 \text{ mC} (e') \text{ sec}^{-1}} &= (\frac{1.5 \text{ mC} (H^{+} \text{OH}^{-})}{\text{mole H}_2 \text{O}_{\text{ICB}} \text{ sec}}) \\
\frac{2.10 \cdot 10^{7} \text{ mole H}_2 \text{O}_{\text{ICB}} \text{ sec}}{\text{ mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} &= \frac{1.5 \text{ mC} (e')}{\text{ mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} \\
\frac{\alpha \cdot \text{ mole } \text{(H}^{+} \text{OH})}{\text{mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} &= \frac{\frac{\delta V_{\text{ICB}}}{\delta V_{\text{GAS}}}}{\text{ mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} = \frac{\ln 0.015}{\ln 0.0009} = 1.67 \\
\frac{\text{ mole } \text{(H}^{+} \text{OH})}{\text{mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} &= \frac{0.83 \text{ C(H}^{+} \text{O})}{\text{mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} = 0.83 \text{ Joule/ltr/sec} = 8.3 \text{ Joule/litr. 1/sec} \\
\frac{\text{ mole } \text{(H}^{+} \text{OH})}{\text{mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} &= \frac{30 \text{ mC}}{\text{ mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} = \frac{1.5 \text{ mC}}{\text{ mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} \\
\frac{\text{ mole } \text{(H}^{+} \text{OH})}{\text{mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} &= \frac{\alpha \cdot \text{ H}_2 \text{O}_{\text{ICB}}}{\text{ mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} = \frac{\delta V_{\text{ICB}}}{\delta V_{\text{GAS}}} \\
\frac{\alpha}{\beta} &= \frac{\delta V_{\text{ICB}}}{\text{ mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} = \frac{\delta V_{\text{GAS}}}{\text{ mole H}_2 \text{O}_{\text{ICB}} \text{ sec}} = \frac{\log 10^{8}}{\log 10^{7}} = \frac{18}{22} \\
\frac{\alpha}{\beta} &= \frac{6.10^{2} \cdot 1.66 \cdot 10^{13} C(e') \text{ mtr}}{1/10 \text{ mole H}_2 \text{O}_{\text{ICB}}} = \frac{10^{2} C(e')}{10^{8} \text{ mole H}_2 \text{O}_{\text{ICB}}} \\
\frac{\alpha}{\beta} &= \frac{18}{22} \cdot 1 \text{ sec}^{-1} = \frac{0.82 \text{ Joule}}{0.1 \text{ ltr/sec}} = \frac{8.3 \text{ Joule}}{1 \text{ ltr/sec}} \\
\frac{10^{2} C(e')}{10^{8} \text{ mole H}_2 \text{O}_{\text{ICB}}} = 10^{10} \text{ ltr/sec} = 10^{8} \text{ mole H}_2 \text{O}_{\text{ICB}} \\
\end{align*}
\]