

DOES EMF ALTER INTRACELLULAR WATER STRUCTURE? DOES IT INITIATE CA++ ENTRY INTO CELL VIA VGCC? OR DOES EMF CAUSE RELEASE OF INTRACELLULAR CA++ FROM STORES? OR DOES EMF CHANGE THE OSCILLATORY BEHAVIOR OF CA++ AND THUS ITS ACTIVITY? DOES EMF CHANGE REDOX WHICH INFLUENCES CA++ ACTIVITY?

MORE THAN ONE OF THE ABOVE? NONE OF THE ABOVE? DOES IT MATTER?

THIS "CHICKEN OR EGG" MAP OFFERS SEVERAL POINTS OF VIEW, BASED UPON THE RELATIVE IMPORTANCE GIVEN TO MEMBRANES AND THEIR PUMPS AND CHANNELS. THEY DO NOT NECESSARILY CONTRADICT ONE ANOTHER. MANY LINKS ARE TAKEN FROM OTHER MAPS ON CALCIUM EFFLUX, WATER, MEMBRANES AND EMF.

EZ/CD WATER  
CELL MEMBRANES  
CALCIUM CHANNELS  
TERAHERTZ ABSORPTION  
CALCIUM AND OTHER IONS  
ELECTROMAGNETIC ENERGY

WATER SCIENCE NOW DEMONSTRATES THAT BROWNIAN MOTION INVOLVES MOVEMENT OF PARTICLES IN WATER TOWARD AN EM SOURCE. (POLLACK, CHAPTER 9).

NEW STUDY DEMONSTRATES HF-EMF CAUSES IONIC CURRENT FLOW AND CONCENTRATION CHANGE IN CALCIUM CHANNEL MOVEMENT

MOLECULAR WATER MOTION, MACRO-MOLECULES, STRONG TERAHERTZ ABSORPTION

Water at VGCC affected by EMF, changing sensitivity, but not function of the channel.  
[EMF and channel sensitivity](#)

"... cell hydration is suggested to be a universal and extrasensitive biomarker for detection of biological effects of NIR on cells and organisms."  
[Cell Hydration as NIR Marker](#)

Water surface tension decreased for a period of time after exposure to microwaves.  
[Water/microwave study](#)

Changes in cell hydration by EMF affect functioning of cell and membrane components.  
[Cell hydration as a EHS biomarker](#)

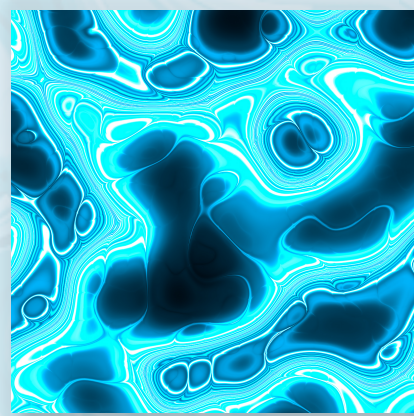
"Ion channel function and operation of molecular 'motors' can be interpreted in terms of the co-operative behavior of supramolecular water-ion-protein complexes."  
[Water and the Cell](#)

"... the explanation of NT MW-induced increase of [Ca2+]i by activation of potential- dependent Ca2+ channels seems unreliable... even low ionizing radiation, which changes the physicochemical properties of cell aqua medium, has an impact on 45Ca2+ uptake.'  
[Anna Nikoghosyan, et al](#)

It was assumed that the locus of Ca rise was VGCC because it has been difficult to measure water layering intracellularly before Pollack. Exclusion zone at protein/water interface prevents divalent Ca bonding. (Abstracted, summarized, paraphrased)  
[EZ Water](#)

"... an external electromagnetic field modulates IWS leading to the unfolded protein response (UPR), perhaps by increasing the hydrophobicity of water? NOS activation requires calcium-binding to calmodulin... calcium has been a proposed cellular target of magnetic fields... If the ion cyclotron resonance (ICR) frequency of calcium is induced by the magnetic field, this phenomenon may be generalizable to a larger number of functions, given the multifarious roles of calcium in biological signaling pathways."  
[Biological Water Dynamics](#)

"It was shown that the hydration of ions is highly sensitive to the effect of EMF... In this aspect Ca ions play a crucial role in realization of biological effect of EMF, because of forming the aqua-complexes [Ca(H2O6)]2+ in water making it very sensitive to EMF. Therefore the character of magnetic field effect on water structure depends on the concentration of Ca ions."  
[Water and the Cell](#)

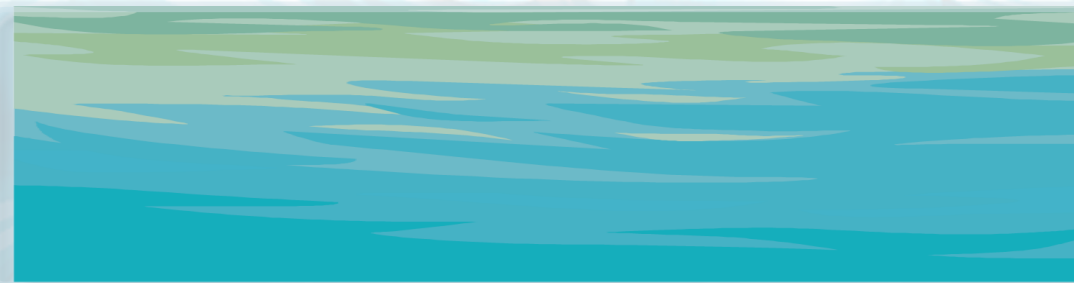


[VIDEO POLLACK: ELECTRICALLY-STRUCTURED WATER I, II](#)

★ [KRUSE: WATER, CALCIUM EFFLUX, EMF, CANCER](#)

★ [SENEFF: WATER AND EM THERAPY \(AND MORE\)](#)

## EMF, WATER, MEMBRANE CHANNELS, INTRACELLULAR CALCIUM: QUESTIONS AND CONCEPTS



Other Links:

[Conference on Water](#)

[Water surrounds protein](#)

[Sulfur/protein and water](#)

[Changes in Ca++ distribution](#)

[Changes in Ca++ oscillations](#)

[Water, protein hydration shell](#)

[Book questions channel/pump functions](#)

[First redox changes, then intracellular Ca++](#)



Interfacial water (IW) -- water at interfaces  
Interfacial water stress (IWS) -- xenobiotic substance or stress at interface  
Exclusion zone water (EZ) -- layered IW excludes solutes  
Coherent domain (CD) water -- EZ water is area with coherent behavior  
Liquid crystalline water (LCW) -- more descriptive of phase behavior

[CELL HYDRATION AS A MARKER FOR NIR \(NON-IONIZING RADIATION\) BIO-EFFECTS](#)

[MEASUREMENT, FORCE FIELD, EZ H2O](#)

[LINKS TO CA++ STUDIES](#)

[CA++, H2O, CELL FUNCTION](#)



Stephanie Seneff  
[Biological Water Dynamics](#)  
Interfacial water -- e.g. at membranes -- critical  
Exogenous interfacial water stress causes disease  
EMF affects water structure  
EMF affects intracellular calcium signaling

Paul Heroux  
[Alterations in Calcium Activity](#)  
MF changes properties of water, many field strengths  
Small changes in pH by ELF MF

Martin Pall  
[EMF Effects via VGCC](#)  
VGCC are in the outer membrane  
Ca Channel blockers block EMF effects  
Instant Ca intracellular increase after EMF  
No other mechanisms explains rapid Ca rise  
Therefore, Ca channels must be locus  
Every effect he has seen can be explained by VGCC



Gerald Pollack  
[Book Review](#)  
Layered EZ water separates protein/polymer strands (no Ca++)  
Intracellular calcium is divalent protein/polymer linker (no EZ)  
Water and calcium both participate in cytoplasmic functions  
Membrane channels less relevant than gel/sol phase transitions

Carl Blackman  
[Alterations in Calcium Activity](#)  
Intracellular Ca ions indicates 2nd-messenger signaling  
Both ELF and RF, sine-wave pulse, increased Ca signaling  
There are specific frequency and intensity windows

Hinrikis, Bachman, Katai, Lass  
[Mechanism of low-level MW on Nervous System](#)  
First effects are on the h-bonds of the water molecules  
Next comes neurotransmitter diffusion, membrane effects  
Then the neuron resting potential is altered

Home: [Oscillatorium](#)  
Newest version [this map](#)  
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