

**LIVING SYSTEMS DEPEND UPON OSCILLATORY ACTIVITY TO ORGANIZE FUNCTION, RESPOND TO THE ENVIRONMENT, INTERACT, AND SURVIVE. OSCILLATIONS ARE INITIATED, SUSTAINED AND TERMINATED BY A DELICATE BALANCE OF PHYSIOLOGIC REQUIREMENTS AND EXPOSURES AS WELL AS SHIFTING CHEMICAL/SUBSTRATE GRADIENTS.**

**THE CELLULAR AND SUB-CELLULAR UNITS OF LIVING TISSUES ARE MEMBRANE DENSE AND THE MEMBRANE STRUCTURES -- LIPIDS AND PROTEINS -- PARTICIPATE IN MUCH OF THIS OSCILLATORY ACTIVITY.**

**THIS MAP CANNOT EVEN PROPERLY INTRODUCE THE CONCEPTS INVOLVED -- OTHER THAN TO SUGGEST THAT THE APPRECIATION OF OSCILLATIONS IN AND THROUGH THE MEMBRANOUS STRUCTURES OF LIVING SYSTEMS MAY JUSTIFY CONCERN ABOUT ALTERING THEM (OR THE MEMBRANES WHICH PARTICIPATE) WITH OUR TECHNOLOGIES.**



[Mitochondrial oscillations, EM quality](#) Articles, Reports

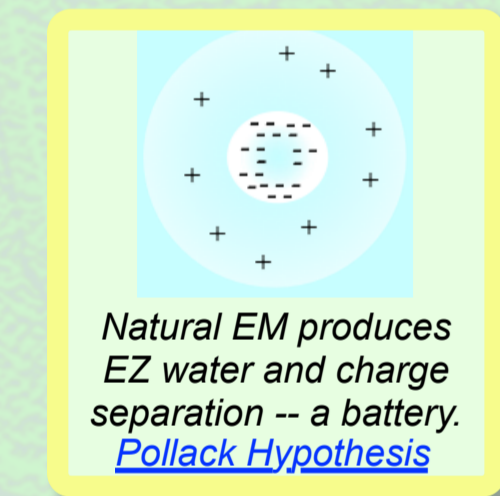
[Ross Adey: EMF/toxin interactions, membranes](#)

[Modulated microwaves and neuronal response, membrane effects](#)

[Electromagnetic Biocompatibility: Compensatory Magnetic Oscillation](#)

★ [Panagopoulos: Health Impacts of Modern Telecommunications Microwaves](#)

★ **REPAIR CELLULAR MATRIX TO REPAIR LEAKY MEMBRANES FROM EMF**



[Oscillometry](#) Oscillations in living tissues

[Water and oscillations](#)

[Oscillations, cell signaling](#)

[Oscillations in Cell Biology](#)

[Oscillation, Synchronization](#)

[Classification of biologic oscillators](#)

[Variety of oscillations in living tissues](#)

**ROLE OF MEMBRANES (NEW CELL BIOLOGY)**

[Plant chloroplasts oscillate](#)

[Plant circadian oscillations](#)

[Bacteria, predator-prey oscillations](#)

[Animal mitochondrial oscillations, health](#)

[Neuronal membrane potential oscillations](#)

[Pancreatic membrane potential oscillations](#)

Membranous oscillating structures



Related maps [Nonlinearity](#)

[EEG and EMF](#)

[Calcium Efflux](#)

[EMF and Blood](#)

[Interfacial Water](#)

[Brain Oscillations](#)

[Free Radical Activity](#)

[Melatonin Hypothesis](#)

[EMF and Living Systems](#)

★ [EMF and the Blood-Brain Barrier](#)

Home: [Oscillatorium](#)  
Newest version [this map](#)  
Date of this update: 09-03-18

"According to the Ion Forced-Vibration theory, the action of external EMFs on cells is dependent on the irregular gating of membrane electrosensitive ion channels..."

Panagopoulos

EMF, Membranes

[MF, lipid orderliness affected](#)

[RF, voltage changes induced](#)

[MF, membrane channel changes](#)

★ [EMR, membrane peroxidation](#)

[EF, induced membrane potentials](#)

[ELF, membrane protein clustering](#)

[EF, lipid-water interface sensitivity](#)

[ELF, membrane enzyme changes](#)

[MF, electrical conductance changes](#)

[EF, membrane permeability increases](#)

[EF, structure and conductance affected](#)

[ELF-EMF, membrane is locus of effects](#)

[EMF, membrane potential, other changes](#)

[EMF polarization and formation of rouleaux](#)

[MF, changes in lipid spectrum of membranes](#)

[EF, pulsed, GHz and MHz, membrane effects](#)

[MF, membrane synchronized function disruption](#)

[RF, membrane receptors one of the main targets](#)

[MF, magnetic reorientation, membrane distortion](#)

[ELF, lipid peroxidation, membrane destabilization](#)

[ELF, membrane bound carbonic anhydrase effects](#)

[UHF, effects on membrane nanopore forming protein](#)

[EF, pulsed, membrane permeabilization, cell swelling](#)

[EF, membrane fragmentation, increased conductance](#)

[MW, nonthermal effects on membrane integrity, E coli](#)

[MW and other tools to overcome dermal barrier to drugs](#)

[ELF, membranes, mag field, alteration of ion movement through](#)

★ [EMF, increased membrane potential with increased frequency](#)

★ [Pulsed THz frequencies, reorientation of water dipoles in membranes](#)

EMF, BB Barrier

[EF, pulsed, focal BBB disruption](#)

[RF, blood brain barrier permeability](#)

[MW, mechanism of BB barrier injury](#)

[RF, permeability of blood-brain barrier](#)

[MW, pathways involved, BBB damage](#)

[MW, integrity of blood-brain barrier, transthyretin](#)

[MW, smart meters, Wi-Fi, cellphones, BBB leakage](#)

EMF, Oscillations

[MF, intracellular calcium oscillations](#)

[EMF, effects on lipids, biomembranes](#)

[Neil Cherry: EMR Spectrum Principle](#)

[EMF, calcium oscillations induced in cells](#)

[EMF, ion concentration oscillations altered](#)

[ELF, calcium oscillation changes in 40 minutes](#)

[EF, emergent oscillations induced in rat brain](#)

[Intracellular Ca++ oscillations, altered by EMF](#)

[Geomagnetic oscillation response disabled by EMF](#)

**EMF AND MEMBRANES, OSCILLATIONS: SOME REPORTED EFFECTS**

*Membrane potential changes*

*Membrane distortion may occur*

*Membrane permeability changes*

*Membrane enzymes change*

*Channel proteins change structure*

*Channel proteins change function*

*Intramembrane protein clustering*

*Lipid structures move*

*Lipid structures fragment*

*Calcium oscillations/fluxes change*

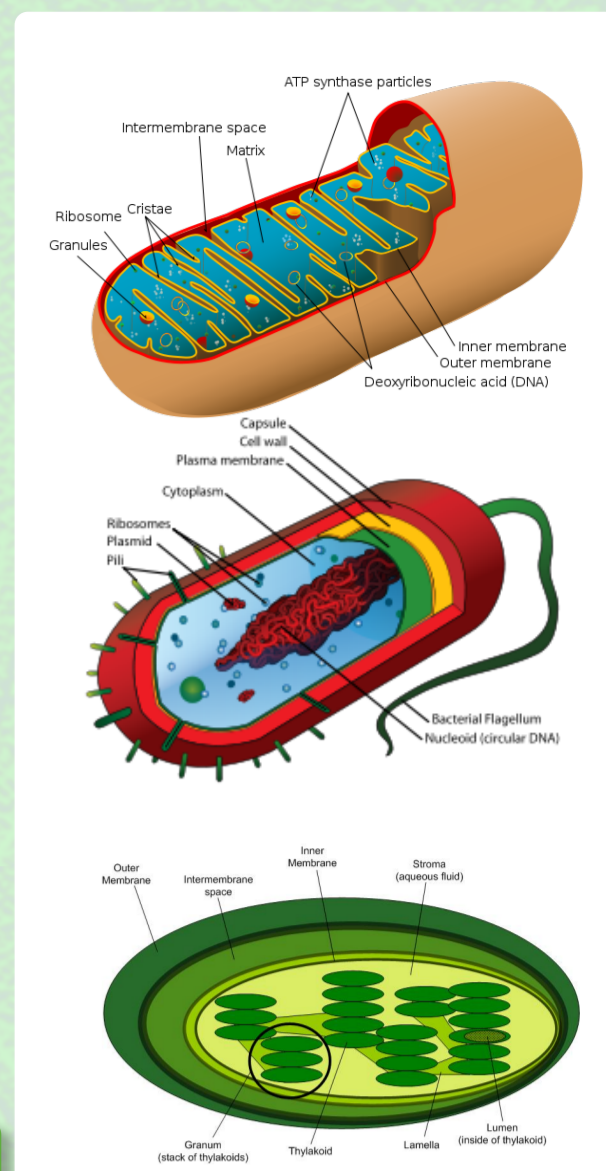
*Calcium and other ions move differently*

*Geomagnetic oscillation response is disabled*

*Oscillations emerge in neuronal assemblies*

**TIME-VARYING MF, CHANGES IN ORGANELLE MEMBRANE POTENTIAL.**

**CELLPHONES AND BLOOD BRAIN BARRIER**



**Important living membraneous structures:**

*Above: Mitochondria*

*Middle: Bacteria*

*Below: Chloroplast*

*Water next to membranes (interfacial water) has liquid crystal properties (sensitive to EMF) which are involved with cellular functions. Natural ambient EMF is required for normal water/membrane physiology.*

**ARE MEMBRANES NECESSARY FOR LIFE?**



**Normal cells, Rouleaux formation**

**ROULEAUX: EMF AND MEMBRANES**

[Dr. Havas explains rouleaux and shows an example. The cell membranes stick together.](#)

[German students perform study which demonstrates RBC "string of pearls" clumping by mobile phone use, due to thromboxanes.](#)

[Red blood cells are hypothesized to develop/sustain rouleaux formation due to these Froelich "resonance" vibrations.](#)

